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Industrial Clusters as Institutions of Regional Economic Development: An Exploratory Study of Mexico

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JEL Classification: Keywords: Regional Development, Mexico, Latin America, Competitiveness, Active Labour Programs, Employment Activation Policies, Triple Helix, Traded Clusters, Institutions

Abstract

This scholarly enquiry is about improving competitiveness across Mexican states to achieve a more homogeneous regional development. The letter a development dynamic that can translate into higher national-level competitiveness promoting industrial clusters as institutions of economic growth. All to help fill the institutional void present across Mexico's regions setting the framework of sharp regional disparities that translate into weak social programs. Often, as discussed as part of this thesis weak social programs, form part of deficient human capital development strategies at the national and regional level; strategies this study discusses as ALPs or Active Labour Programs initiatives. This weak institutional context fosters high concentrations of industrial activity in wealthy regions while promoting inequality in other regions.

The study addresses two main questions; one, asking whether industrial cluster as ecosystems can serve as institutions of regional development by supporting social programs. The second; asking if the volatility of GDP correlates to the country's institutional weaknesses. In, the national competitive debate developing economies legislate and implement policies with the goal of having a widespread impact. However, we observe that some organizations are better organized to respond to the demands of the central government. Often the result is that national-level policies don't have the widespread impact intended. Creating a disconnect between national level competitive objectives and regional realities in less affluent regions.

This thesis would investigate whether clusters can act as organizations facilitating regional responses to the government demands. If yes, in terms of policy implications the question becomes, if the organisation of clusters in less developed regions could enable these areas to better respond to the differences often created by national level policies. This research expands between the period of 2003-2016, a time window of profound liberalization and market reforms where industrial agglomerations i.e. cluster grew along with knowledge-infused activities. This empirical analysis uses a Time-Series-Cross-Section data panel comprising 32 Mexican states, economic indicators over time, and the chosen proxy for social programs (ALPs) Active Labour Programs. In addition, the two geographical units of analysis Triple Helix and Traded clusters.

It obtained the data on the above-mentioned geographical units from the European Commission and Dr Mendoza's research centre. The main estimators to test this study's null hypotheses uses several linear and dynamic panel data models to validate or reject each hypothesis in favour of the alternative hypotheses here stated. The present research project shows a data science approach guided by Dr Warin's data analytics and coding using R-statistical software within the R Studio working environment. R Studio served this thesis scholarly intentions as it provided an efficient and effective way to collect, manage and segment the data in use for this enquiry. This data science platform also facilitated the different data graphs created as part of this research project.

Keywords: Regional Development, Regional Disparities, Mexico, Latin America, Competitiveness, Active Labour Programs, Employment Activation Policies, Triple Helix, Traded Clusters, Institutions,

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Abbreviations and Acronyms

List of Terms, Abbreviations and Acronyms	
Terms	Description
tHelix	Triple Helix Industrial clusters
Triple Helix	Knowledge-infused industrial cluster with strong government support
regionCode	Code assigned to each of the 32 Mexican states
idSectoral	Code assigned to each of the 5 regions selected for this study based on Mexico's Electoral Distribution Map
Traded Clusters	Industrial cluster catering a foreign market
(NAFTA)	North American Free Trade Agreement
(NAFTA)	North American Free Trade Agreement
Regional Champions	Industrialised with the capacity to better respond to National Level Policy & Capture more resources
(ALPs)	Active Labour Programs
(WEF)	World Economic Forum
AI	Artificial Intelligence
FDI	Foreign Direct Investment
(EU)	European Union
ProMexico	Government entity in charge of Investment, Commerce , & Trade
(LANGEBIO)	The National Genomics Laboratory for Biodiversity
(ITESM)	The Technological Institute of Higher Studies of Monterrey
(UNAM)	The National Autonomous University of Mexico
(WIPO)	The World Intellectual Property Organization
(LAERFTE)	The Law for the use of renewable energy and financing of the sector's transition towards a cleaner energy market
(RBV)	Resource-Based View
(OECD)	The Organization for Economic Co-operation and Development
MASST	(Macroeconomic Sectoral Social and Territorial Model
(INADEN)	The National Institute of Entrepreneurship
(El SENA)	Governmental Institution providing vocational training in Colombia
(SENAI)	Governmental Institution providing vocational training in Brazil
(SNPP)	Governmental institution providing vocational training in Paraguay
(INFOTEP)	Governmental institutions providing vocational training in Dominican Republic
BECATE	Short-term training programs promoting basic job skills
SNE	National Employment System
TSCS	(Time-Series-Cross-Section)
Region 1a	Group of states located in the North West of Mexico
Region 2a	Group of states located in North East East Mexico
Region 3a	Group of states located in the South of Mexico
Region 4a	Group of states located in South Central Mexico
Region 5a	Group of states located in Central Mexico

List of Terms, Abbreviations and Acronyms	
(GMM)	Generalized Method of Moments Conditions : efficient estimator is an estimator that estimates the quantity of interest in some “best possible” manner.
NAICS	The North American Industry Classification System

Terms of Variables	
Variable	Description
proximity	Code assigned to account for US value chain influence
Triple Helix & Traded Clusters	The Geographical units selected for this analysis
GDP	GDP index per each Mexican state during the prescribed time period
Population	Data on the growth of Mexico’s population over time
fdi	Foreign Direct Investment for each Mexican state during the period of analysis in USD
addedValue	Added-value manufacturing activity expressed as a % of GDP
GDP in MXP	The contribution to the GDP of each Mexican state for each year during the prescribed period
Formal	The estimated number of people formally employed for each of the 32 states during the prescribed time period (Formal means people contributing to social security)
Informal	The estimated number of people informally employed for each of the 32 states during the prescribed time period (informal means people no contributing to social security)
employment	The estimated total number of people employed in each of the 32 Mexican states. This figure includes all estimated individuals in formal and informal economic activities
contributions	Federal funding disbursed to the different states as compensation or incentives for the states’ contribution to the overall economic outlook of the country
allocations	The variable identifies federal resources allocated to all the states for the purpose of education, health and basic infrastructure at the state level
subsidies	These are fiscal spending measures at the state level geared to provide housing, consumption, and education subsidies, scholarship programs and aid programs at the municipal level. It also involves social spending to educational institutions, and training programs.
investment	spending at the state level in public works and infrastructure
municipalities	the fiscal allocation at the state level to the different state municipalities in each state
exports	the levels of exports of each Mexican state in US dollar terms during the prescribed period
cCourses	This variable measures the number of “courses”or labour training for basic job competences

Terms of Variables	
cScholarships	The total number of participants receiving federally funded scholarship for basic labour training
cPlacements	The total number of jobs created stemming from the direct participation in basic job training
eScholarships	Entrepreneurial driven scholarships to promote new business creation
ePlacements	The number of self-employment opportunities created after participating in the entrepreneurial segment of ALPs
aRegister	Number of participants registered for Agricultural training programs
aPlacements	Number of participants placed in Agricultural sector employment activities
ptScholarhips	Number of federally funded scholarships for professional training
ptPlacements	Number of professional job placements after participating in a professional training program
year	2003-2016

Preface

This master's thesis centres on the ever-changing debate of international competitiveness, one broad and that continue to be of interest among firms, academics, governments and international institutions. In, the age of globalization its importance has transcended the boundaries of developed economies to become the centre of the debate in the emerging world. Despite this, the international competitive debate is a mixture of different approaches, in the realm of economics, and government policy (De Grauwe 2010; Krugman 1994). Scholars Cellini and Sochi 2002 argue the vagueness of the topic is because of factors relating to the uncertainty of "indicators" (Cellini and Soci 2002). A perception which echoes Paul Krugman's sentiment on the elusiveness of the topic itself. In one of Krugman's texts "Competition: A Dangerous Obsession" he points to the term as empirical, one which has often been conducive to wrong economic policies, and inequalities (Krugman 1994). Under this context and basing this thesis' inquiry on Michael Porter's paradigm shift, this thesis sets to analyse the patterns and causes of regional disparities as these relate to industrial clusters as institutions of economic development.

If international competitiveness traces back its roots to the literature of Adam Smith, placing the debate at the national level. It is the work of Michael Porter that leads the debate as one regional in connotations where industrial clusters are fundamental for economic growth (Porter 1998). The relevance of this paradigm shift as it applies to emerging economies could provide these economies with a path to overcome economic challenges. All which range from the institutional weaknesses affecting the levels of central government funding to the lack of social programs which could yield a much better outcome in supporting human development strategies. Emerging economies are countries that in terms of economic growth exhibit features of developed countries but no meet the standards of developed. Often this lack of development pertains to the factors upholding the country's economic instability and inequality as posited by (Stiglitz, 2000; Stiglitz & Ocampo, 2008).

Set on the basis leading this inquiry, this thesis chose Mexico, as a focal point of our analysis because of the following key factors (1) the country's development and an increase in the number of industrial agglomerations; (2) the country's liberalizations agenda; (3) its membership in (NAFTA) the North American Traded Agreement and; (4) the country's marked regional disparities. Regional disparity is a term inspected by (Porter & Ketels, 2003) delving in the countries' economic growth as stemming from the most industrialized regions AKA regional champions. Under the above-stated aim, I set this research on improving competitiveness across Mexican states to achieve a more homogenous regional economic development. It proposes a closer examination of the country's divergent patterns of cross-regional development. Hence, proposing to examine the institutional role of clusters in supporting social programs, in this case, the proxy for social programs is (ALPs) Active Labour Programs.

Mexico's patterns of industrial development show the bulk of the country's high value-added activities remain within the country's central and northern regions. Critical aspects like the proximity to the US market, these regions' human capital and the integration within the U.S.' value chains explain this phenomenon. The consequences are two-fold. First, it contributes to reinforcing the cycle of marked regional inequalities, lack of competitiveness and productivity among other Mexican regions. Second, it generates some endogenous dynamics: the already developed regions capture industrial policies designed by the government and its financial programs in infrastructure, education and public services. Firms within wealthy regions have the resources and the positive results to support their application to the various governmental programs they are a better position to support them. This reality is resulting in other regions remaining underdeveloped and stagnant because of the lack

of impactful institutional support and industries supporting economic growth.

The research will draw on the success of Active Labour Programs in industrialized nations as the foundation to advocate for the institutional role of clusters to improve cross-regional competitiveness. A reality that proposes to create a better alignment of global, national and regional policy objectives thus allowing a better regional response to government programs in less developed areas. The latter a conceptual outcome that might accomplish:

- 1) shape two augmented competitive dimensions as postulated by the literature inspired model set as part of this inquiry.
- 2) Create reciprocity between the national and regional level in terms of policies and government programs.
- 3) Promote knowledge-infused activities as the basis for this economy to sustain and upgrade their national level advantage in a climate of rapid industrial change.
- 4) Allow emerging economies to mitigate better external economic shocks that can lead to enhanced institutional strength i.e. higher levels of national and regional competitiveness.

The method of this research relies on a cross-section time-series estimation of data from pre-establish government archives. The empirical analysis centres on two key objectives; (1) testing the institutional role of Triple Helix and Traded clusters in their interaction with (ALPs) and; (2) it will test the correlation between GDP fluctuations and regional levels of central government funding over time. This research uses various linear and dynamic panel models to test the institutional role of the two geographical units for clusters above-stated in Mexico and in the most industrialised regions checking for robustness in our analysis. In brief, validating the null hypotheses set to guide this scholarly inquiry or rejecting them in favour of the alternative hypotheses here stated.

Acknowledgements

I would first like to thank my thesis advisor Dr Thierry Warin of the Department of International Business at HEC Montreal for his guidance throughout this process. Dr Warin provided inspiration and expert insights in leading me to test the institutional role of industrial clusters within debate around competitiveness. An area of work that not only enriched my knowledge allowing to gain a relevant set of skills, it also led me to gain great passion on the area of international competitiveness as relates to regional and industrial development. My expectation for this introductory inquiry is to open the door for further research on the topic testing the institutional capabilities of industrial clusters in emerging economies. Prof. Warin's door was always opened whenever I run into trouble or had a question about my area of research steering me in the right direction whenever he thought I needed it. Under his mentorship, I expanded my research skills and in the process enhanced my abilities to thinks critically about the different concepts, data, and literary evidence covered as part of this master's thesis. My experience working under his supervision allowed me the opportunity to gain important transferable skills that without doubt shall have an important impact on my future professional endeavours.

I would like to thank my wife Katherine Pelaez-Quintero for her exceptional support and sacrifices in being there to give me the space needed to advance in this research project. My wife's support has been instrumental in allowing to complete the previous and current academic achievements and for that, I shall be forever grateful. I also would like to thank the staff at HEC Montreal, my academic advisor Mrs Jehanne Almerigogna, for her support and attention throughout this process and journey at HEC Montreal. Mrs Jehanne Almerigogna always provided a friendly voice and a platform to voice past challenges and concerns throughout my journey at HEC Montreal. I would like to thank the experts and past professors that provided advice on the literature and other relevant topics which serve as guidance towards this thesis's completion. I would like to thank my close friend and future scholar Dan Rothes, for his help in some aspects of this thesis work. His collaboration and time served as a second voice serving as guidance towards the completion of this project.

Finally, I would like to thank my sister, Erika Pappas, at the University of California Santa Cruz for her support and guidance throughout past challenges. Her support and counsel throughout my academic journey as an adult learner is only a small testament of her devotion to her chosen career in academia and as an aspiring scholar. It is a testament to her human character and firm desire to help others reach their own academic goals.

Chapter 1: Introduction

This master's thesis inspects the institutional role of industrial clusters in a context of sharp regional disparities. It addresses the question of whether industrial clusters can substitute as institutions in a weak institutional context, thus serving as economic institutions of regional development. When we look at developing economies, their governments legislate and implement policies that are designed to have a widespread impact. However, in practice, we observe that some organisations are better organised to respond to the demands of the central government. Often the result is that national-level policies do not have the intended widespread impact in all country regions. Therefore, creating a disconnect between national level competitive objectives and regional realities in less affluent regions. This thesis investigates whether clusters can act as organisations facilitating regional responses to the government demands. If yes, in terms of policy implications the question becomes, if the organisation of clusters as ecosystems in less developed regions, enables these areas to better respond to the differences often created by national level policies. In, terms of the method to address this research agenda, this inquiry will use an empirical strategy to address the main research question. Mexico constitutes the chosen case study and the primary focus of this research agenda because of the country's liberalisation agenda of the first part of the millennium. The time frame that shall be analysed is 2003 to 2016 a period during which Mexico underwent substantial economic growth and profound structural adjustments in terms of policy changes. These structural adjustments saw an aggressive liberal agenda aimed to position the country as the gateway to the North American market because of the country's NAFTA membership.

This research uses a panel dataset covering the 32 Mexican states over the prescribed period and the proxy of choice for a national level policy will be ALPs (Active Labour Programs). The institutional measure for this enquiry will inspect two datasets; (1) in Traded clusters provided by Dr Mendoza's research centre and; (2) the European Commission through its cluster collaboration platform. This study comes from a close inspection of the past and current international competitive research looking at industrial clusters as primal in national and regional development. A paradigm shift where the work of Michael Porter and other scholars here mentioned frame these ecosystems as epicentres of efficiency, growth and innovation. This literary inspection let us believe to the best of our knowledge that the study of economic development in the thirty-two Mexican states based on the two units of analysis here mentioned. In addition, to Mexico's inspection of its national level policy efficiency through ALPs as a unique combination in terms of scholarly contribution. Opening the door for future scholarly research is this topic in Mexico and throughout emerging Latin America economies. I will conduct this enquiry using a data science approach guided by Dr Warin's data analytic and coding expertise using R-statistical software within the R Studio working environment. This unique platform served the scholarly intentions as it provided an efficient and effective way to collect, manage and segment the data in use for this enquiry. At the same time, this data science platform also created the different data graphs shown as part of this research project.

This thesis started on the premise that industrial clusters may be fundamental institutional drivers of regional economic development. an area of scholarly interest which in emerging economies takes relevance due to (GDP) fluctuations and sharp regional disparities (Porter and Ketels 2003). As covered by the literature, international competitiveness industrial clusters are often the result of the right set of economic conditions and institutional framework where institutional support is an important driver in creating industrial agglomerations. This thesis aims to position the enquiry as an introductory contribution aiming to test the extent to which clusters as geographical units can help fill the institutional void in Mexico's social programs. This approach, could not only help this thesis

assess the institutional strength of Mexico's social programs but also help assess the institutional role of clusters in supporting Mexico's human capital development strategies. As dictated by the literature most of the institutional debate around industrial clusters, revolved around whether public and private institutions play key roles in supporting industrial agglomerations activities. This institutional debate on clusters has extended to the institutional role of academia in supporting knowledge-driven activities within clusters and the impact these activities have in areas ranging from recruiting, the enhancement of capabilities to the transfers of knowledge (Parto 2008 ; Braunerhjelm and Carlsson 2003 ; Dahms 2003 ; Perez-Aleman 2005; Porter 1998). All literary evidence that furthers the novelty of this research emphasis and frames this study as perhaps the first of its kind in the Mexican and Latin America context.

In our literary inquiry, we see how Michael Porter's contribution sets the foundation for a paradigm shift taking the international competitive debate from the national level to one of the regional dimensions (Keefer and Knack 2008; Ketels 2003; Pointon and El-Masry 2007; Porter 1990; Porter 1994; Porter 1998; Porter 2000). This research builds on further literature on international competitiveness and clusters in the regional context. It draws on clusters' linkages to GVCs, the role of clusters in less developed countries, and the liberal reforms upholding economic instability in Latin America. The discussion above inspired other trends in research as part of this thesis covering regional competitiveness. It calls for the need to promote better alignment between GVCs, National Level objectives and regional realities to strengthen the countries' growth potential (Humphrey and Schmitz 2000; Humphrey and Schmitz 2002; Messner 2004; Nadvi and Schmitz 1994; Stiglitz 2000). The latter, a central point explained by the twelve points later discussed that are part of the World Economic Forum conceptual framework on competitiveness (Ramoniene and Lanskoronskis 2011 ; Schwab 2017). The twelve points outlined by the World Economic forum are important as these helped set how important territorial capital is as one the most important aspect of regional competitiveness as posited by(Camagni and Capello 2013). Territorial capital is said to be driven by knowledge and a key precursor of industrial agglomerations in the regional context. The latter point, highlighting the relevance of Active Labour Programs (ALP) as a potential human capital development policy that could promote territorial capital improvements across Mexico's regions thus fostering more industrial agglomerations as geographical units in less developed regions.

The inspiration to inspect ALPs in the Mexican context stemmed from "Active" policies in Advanced European economies and Japan (Martin and Grubb 2001). Two regions where these active initiatives have contributed to industrial growth, higher levels of competitiveness, and a more skilled labour force (Fredriksson 1999; Martin and Grubb 2001). The Japanese approach to industry policy and including ALPs as industrial drivers of increasing competitiveness and growth served as the key motivation for this research in assessing the interaction of clusters with ALPs (Martin and Grubb 2001). With globalisation, regional economic realities are driven by global competition, the need for knowledge and the need to create new industries to promote economic growth. Globalisation has demanded improvements in communications, transportation, logistics, and markets, thus leading world economies to become more liberalised. It is also fading the traditional border lines as countries are becoming more interdependent (De Grauwe 2010; Moon 2000; Porter and Millar 1985; Porter and Advantage 1985). All key aspects placing clusters as geographical units of efficiency, technology and innovation that could mitigate the regional impact of globalisation in less developed areas.

Over the past decades, globalization has been viewed as a phenomenon leading the migration in manufacturing practices towards locations offering substantial cost advantages. This global reality has exacerbated competition while creating a global landscape where there are winners and losers (Camagni and Capello 2013; Porter 1990). The context of increased competition not only

creates winners and losers at the firm level or among competing nations in the global economy. What we have seen is globalization creating threats and opportunities for regions within competing countries driven by external global economic factors. It also places the regional debate as one of primary importance in addressing the impact of globalization on key development areas such as population, inequality and economic growth. The impact of globalization in the above areas placed the competitive debate as one of the pressing social connotations where national and regional inequalities are central. Consequently, posing economic challenges while limiting higher levels of competitiveness and industrial growth at the national and regional level (BenDavid-Hadar 2013; Kentor 2001; Nissanke and Thorbecke 2010).

The above-mentioned realities suggest defining globalization as the embedded national level problems within the complex multi-dimensional view of international networks. Dynamics that are affecting and exacerbating national and regional conditions creating a situation where winners remain winners and losers remain stagnant and disenfranchised. Under these pressing realities, it is important to touch upon the elements allowing nations and regions to cross over to the winning side (Camagni and Capello 2013). Global realities such as the uncertainty of markets, technologies, companies' strategies and the diversity of organization models mark the pace in the competitive debate. Increased competition has required firms to relay in high-quality human factors, information systems, policies and workers' access to information to create companies' strategic decisions. It has also facilitated cooperation among firms and further promoted the transfer of information within the companies operating in the same industry. It likewise, placed human capital factors as the driver of regional growth, clusters as industrial agglomerations, and the companies' locational decisions as pivotal to the transition in markets and growth(BenDavid-Hadar 2013; Camagni and Capello 2013; Ramoniene and Lanskoronskis 2011).

It is important to highlight as we discuss it in the literature review that the complexity around international competitiveness is diverse. Competitiveness includes static and dynamic mechanisms: though competitiveness at the macro level conceives the country's ability to foster growth and sustain income levels as a factor determining returns on investment. It also encompasses factors determining the country's growth potential or as Porter postulates location advantages (Porter 1990; Porter 1998; Ramoniene and Lanskoronskis 2011). These growths potential factors range from the strength of institutions, the countries 'macro-economic stability, infrastructure, health, primary education, a healthy workforce to professional training. It also considers important aspects such as labour market efficiency, financial market sophistication, and innovation as the primary drivers of industrial growth (Ramoniene and Lanskoronskis 2011). These factors make up what this thesis considers the most pressing elements of the list of twelve points in the World Economic Forum's conception of competitiveness (Ramoniene and Lanskoronskis 2011). The following table elaborates on the competitive factors from the World Economic Forum which guided the data collection on the case of Mexico as the central focus of this thesis.

Table 1: (WEF) World Economic Forum Competitive Factors

Competitive Factors	
Institutions	HE Training
Technological Readiness	Goods and Market Efficiency
Market Size	Labour Market Efficiency
Macroeconomic Stability	Financial Market Sophistication
Business Sophistication	Infrastructure
Health & Primary Education	

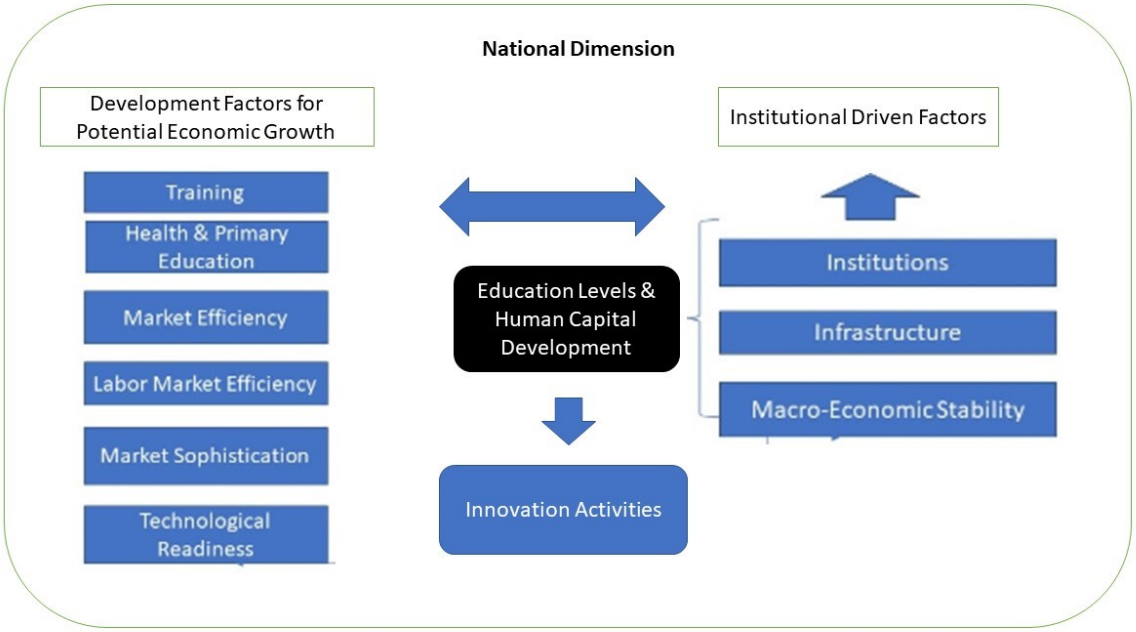

Figure 1: The Influence of Education and the Impact on the Twelve Factors Driving Innovation

Competitive Factors

Source:World Economic Forum & Ramoniene & Lanskoronskis, 2011

The factors determining the countries' competitive potential are not unrelated, these are inter-connected and have the tendency to reinforce one another (De Grauwe 2010). These factors have been validated through multiple econometric studies as these pillars set the basis for the data gathering and econometric analysis in the study of competitiveness at the national-regional level (Sala-i-Martin et al. 2008). An example of this inter-related relationship takes place in the analysis of institutions and the drivers of innovation in determining the countries' competitive potential. The literature sources inspected for this thesis assert innovation cannot take place in an economic environment empty of the proper institutional foundation. A reference is that innovations activities without suitable intellectual property rights would deter foreign direct investment thus halting innovation activities (Prestowitz Jr 1994). Innovation can never take place without the right skill sets and education that promotes a healthy workforce (Ramoniene and Lanskoronskis 2011). Last, an educated and well-trained labour force can never emerge in an environment where the markets do not show a certain level of efficiency. The World Economic Forum pillars of competitiveness helped this research directly or indirectly assess the influence of education in the countries' and regions' economic potential. The following graph provides a visual perspective of the national level dimension and how education influence and impact the twelve factors driving innovation activities, see also figure 1.

The above graph builds upon the World Economic Forum's definition of competitiveness placing education at the centre and innovation activities at the bottom. The latter reflects how education

must promote innovation activities that are key factors in attaining higher levels of national-level competitiveness. Situated on the left, are the development areas it considers impacted by education, and on the right, potential factors called institutional driven factors. The graph aims to show the linkage between the factors influenced by education and the institutional elements likewise the macro level forces affecting education levels. The graph frames how the interaction of institutional- and likewise macro-level forces-with education impact key development areas. In our view, this constitutes a reciprocal relationship, fostering or constricting innovation activities. All of which are placed at the centre affecting economic growth and regional development. The significance of the World Economic Forum's definition of competitiveness is that it resembles the key features of Michael Porter's competitiveness as the competitive factors relate to Porter's location advantages (Porter 1990). One aim in this study is to validate how the impact of these forces on education-as shown in the graph-help exacerbate economic conditions in the context of regional economic disparities.

The national-regional implications of globalization relating social issues was also a factor leading this research to examine the interaction of clusters and ALPs (Active Labour Programs) as a national level policy. A stronger interaction of industrial clusters as geographical units and ALPs can strengthen the role of clusters as institutions of regional development. At the same time helping fill the institutional voids present in emerging markets, one where champions remain champions and less developed regions remain stagnant and disenfranchised. This is important as the OECD and the World Bank place key emphasis on the necessity of emerging economies to strengthen their institutions, improve social programs and attain higher levels of education to cope with the fourth industrial revolution (Bhawsar and Chattopadhyay 2015; Bonaglia and Goldstein 2007; Hallward-Driemeier and Nayyar 2017; OECD 2018). This fourth industrial revolution is marked by technological advances changing the manufacturing-driven development responsible for fostering economic growth in advanced and recently industrialized nations. Under this new foreseeable reality, the demand for high levels of education and skills take centre stage. It also speaks to the unskilled workers in the industrial sector facing the need to migrate towards knowledge-driven activities (Hallward-Driemeier and Nayyar 2017).

The following figure shows the historical association between Per capita GDP growth and the industrialization of robust manufacturing-driven economies as posited by (Hallward-Driemeier and Nayyar 2017), see also figure 2.

We have seen industrialization promoting economic development in most advanced economies with high incomes. These economies have achieved wealth by implementing export-driven strategies. The World Bank's report on the future of manufacturing led development points to the fact the leading economies in the 18th century remain at the forefront of industry and innovation (Hallward-Driemeier and Nayyar 2017). It indicates that most of these developed economies displayed manufacturing activity within 25-30 per cent of these countries' GDP. The report also speaks to the growth of Asian countries, such as China, in the rankings of middle to a high-income economy, and the primary example of economic growth. In China's case, this growth trajectory had been driven by the presence of high levels of manufacturing activity in fostering development(Hallward-Driemeier and Nayyar 2017). A strong manufacturing sector boosts the productivity of many unskilled workers due to aspects that the World Bank refers to as scale economies. Likewise, facilitating technology diffusion, greater competition among other spillover effects, which are important in helping emerging economies drive industry and economic growth. However, would these positive externalities endure with the rapid change in technologies? The World Bank's report suggests this is unlikely due to chief factors like 1) The rapid deployment of robotics, AI (Artificial Intelligence) and advanced information systems and 2) The impact these technological events would have in shaping the labour market

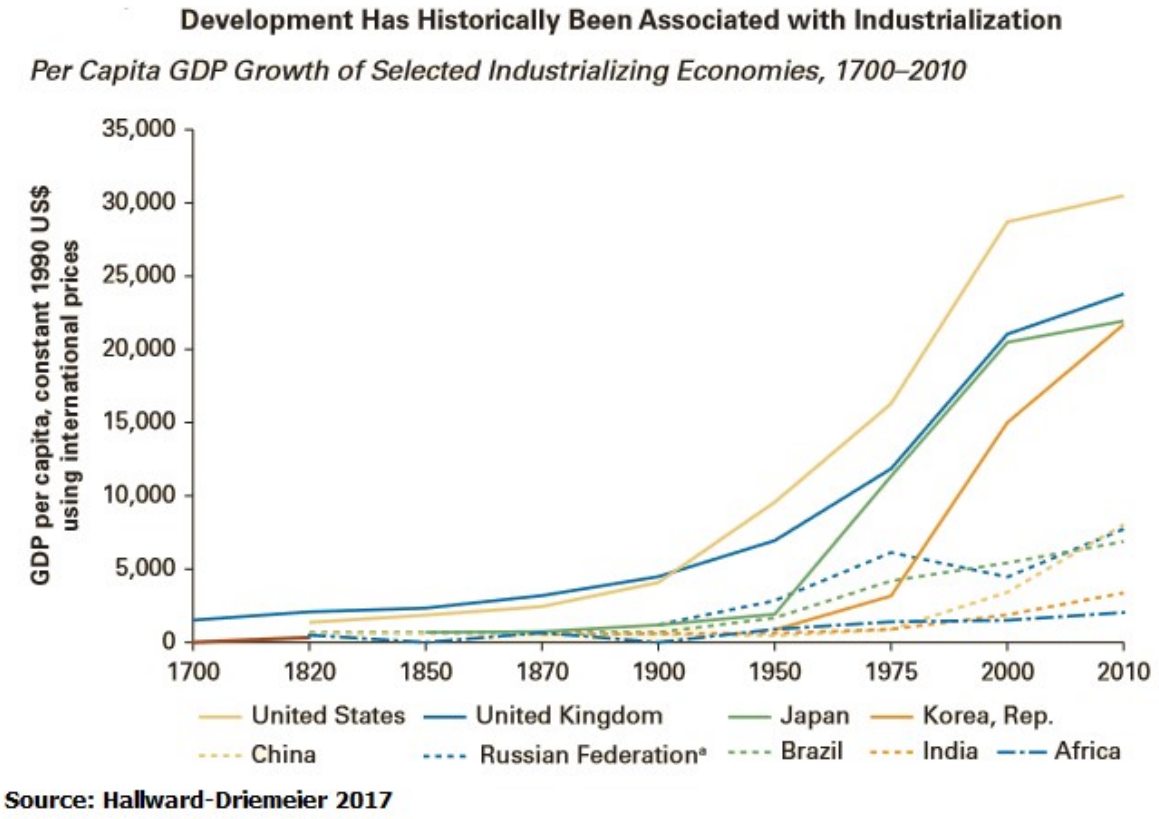

Figure 2: Source: Hallward-Driemeier 2017,Association Between Per Capita GDP Growth and Industrialisation.

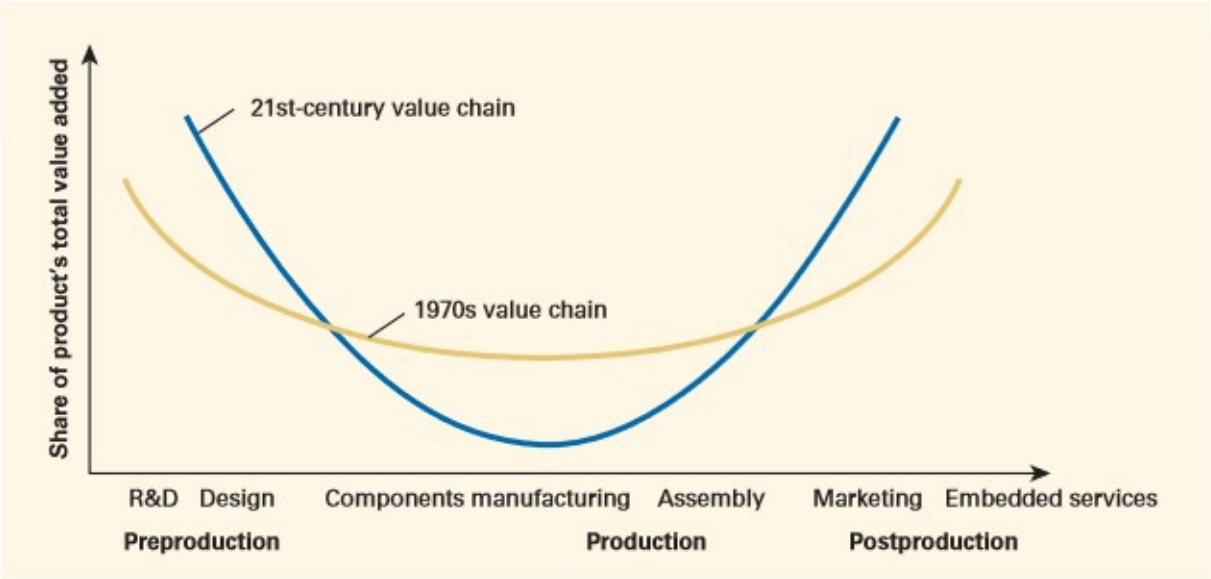

Figure 3: Source: Hallward-Driemeier 2017,The Growth of Service Activities in the Manufacturing Sector.

as it relates to industrial activity (Hallward-Driemeier and Nayyar 2017). The two factors further motivate advocating for stronger institutional programs that through higher training, education and technology promotion can better impact labour market outcomes. All of which could further help increase national-regional competitiveness while helping promote the role of clusters as institutions.

The positive effects of industrial development and the intensity of manufacturing activity have proven to increase productivity growth. Key aspects linking innovation driven by industrial activity, the growth of knowledge-driven tasks and the productivity gains from the advances in novel technologies is changing the manufacturing landscape beyond the positive externalities mentioned. It is in fact, fading the lines of sectors and manufacturing activities representing entire value chains. According to the World Bank's reports service, efforts in the manufacturing industry are making up a growing source of value-added activities. This is clear as we look at the increasing role of R&D, design, marketing and supporting embedded activities in the manufacturing sector in the 21st century. This change is compared to the mentioned service activities in the 1970s which reflect less involvement of service activities in the manufacturing sector. The chart taken from the world bank's report on manufacturing led development shows this change requiring more knowledge infused activities in the manufacturing sector (Davies 2001a), see also figure 3.

The graph shows the percentage share of total value-added activities, and R&D, components, manufacturing, marketing and embedded services. The two lines compare the increase of R&D activities along the x axis or production line. It also shows an increase in the influence of marketing and services in the manufacturing sector which suggest the intensification of knowledge-driven activities. This reality is relevant as this thesis discusses the importance of the manufacturing sector in Mexico and the role of clusters as drivers of efficiency, growth and innovation(Porter 1998). The

graph shows a manufacturing sector dynamic prompted by globalization and suggest the necessity for further reforms in Latin America economies. In, Mexico's case suggests the need for more government emphasis on education and human capital development strategies. A finding which led this examination to concentrate on the analysis of Mexico's social programs where human capital development is key to promote employment and skills in the industry sector.

Latin America is a region that in the last thirty years has grown; countries like Brazil, Argentina, Colombia, Chile and Mexico have strengthened the manufacturing sector. However, most of these industrial activities concentrate on outsourcing manufacturing of low to mid-value-added products. If the governments in the region have improved their industrial capacity likewise the level of skills and education, thus attaining higher levels of investment and industrial activity(Acs and Amorós 2008; Feinberg 2008). It is also true, according to OECD data that these economies are still behind in terms of adequate education levels compared to industrialized nations. A pressing reality which not only places education at the core of the competitiveness debate but also places the topic as central for regional development. The data got from the OECD reflects the spending on tertiary education as of the year 2014 and positions Latin America economies' spending compared to one of the developed economies.

The above-mentioned OECD data shows Colombia as having the least levels of tertiary education investment followed by Argentina, Chile and Mexico. Advanced economies such as the United Kingdom, the US, Sweden and Norway place at the top with spending ranging from twenty to twenty-nine thousand dollars. The following table shows the value OECD member states invested per student in tertiary education for the year 2014. Regarding the level of investment in this area, the numbers speak for themselves. It shows that Latin America countries are the lowest ranked among the member countries according to the data on education spending got from the OECD. The previous finding is consistent with the literature showing the Nordic countries' role in promoting human capital development through education and ALPs. The latter suggesting these countries have some higher levels of institutional strength represented by the countries' social programs and human development objectives. Table2: Provides an illustration of the values these economies displayed according to the above-mentioned data source.

Table 2:Tertiary Education Investment Values in Comparison Based on OECD Data

US & Europe		Latin America	
United States	29328.00	Colombia	3887.00
United Kingdom	24542.00	Chile	7886.00
Sweden	24072.00	Argentina	5.085.00
Norway	20962.00	United States of Mexico	8949.00

Research Question & Hypotheses

Promoting education has been a key area for countries' efforts to increase competitiveness while achieving social cohesiveness. Government resources allocated to education are a significant factor in shaping the distribution of the students' performance. Fair access to education or providing the right set of employment opportunities makes up a key part of social justice. Fair access, is particularly relevant in countries hit by external economic shocks, where GDP fluctuations may affect the level of government funding. Education is constantly impacted by institutional elements such as the government's inability to invest in infrastructure, the weakness of social programs and a country's

macro-level instability (Stiglitz and Ocampo 2008; BenDavid-Hadar 2013; Stiglitz 2000).The aspects shaping the countries' and the regions' ability to compete relate to attaining higher levels of global value chain integration and industrial development as postulated by (BenDavid-Hadar 2013). In brief, the ability to achieve competitiveness within the international competitive debate is more important than achieving competitiveness itself as postulated in the literature.

Under the stated precepts education is said to ensure a nations' ability to recover the loss of competitiveness thus highlighting human capital development strategies in the global, national and regional economic context. Education is one of the key aspects to predict the country's future competitiveness. The impact of education, on enhancing labour market productivity, directly contributes to increases in the countries' industrial output (Ramoniene and Lanskoronskis 2011). Relevant scholarly literature on education and competitiveness portrays how human capital development strategies show high returns on investment. The literature also describes how human capital development strategies provide higher economic outcomes by increasing labour productivity (Hanushek and Kimko 2000). Likewise, improving the quality of schools increases average earnings and productivity while lowering the likelihood of social problems, thus avoiding harmful outcomes in national-regional economic development (Sahlberg 2006). It is suggested that successful economies compete based on high human capital development, which is best guaranteed by educated personnel. Therefore, highlighting the need for education to increase competitiveness. A corollary statement would be that improvements to new skills acquisition, improve the positive outcomes and lead to civic, business and industrial success (Sahlberg 2006).

The course of my introduction and the discussed background on the literary foundations aim to highlight the relevance of this thesis' topic in the international competitive debate. It also served this thesis' motivation to address the two questions governing this research.

- RQ1.) Can industrial clusters in Mexico serve as formal and informal institutions supporting the role of federal social programs in a context of regional disparities?
- RQ2.) Does Mexico's GDP volatility explain the weak institutions' assumption in a context of sharp regional disparities in Mexico?.

The first question guiding this research stemmed from the analysis of Mexico's institutional complexities and the discussed international competitive literature highlighting the importance of regional assets. All of which highlight the importance of Michael Porter's paradigm shift, the role of education as it relates to industrial activity in the current global context. The second question guiding this research regards the literature by Joseph Stiglitz, inspecting the impact of liberal reforms on GDP volatility and its relation to inequality and development in emerging economies. Literature which highlighted the fluctuations of central government funding as one of the key components affecting development areas and institutional components such as social programs (Stiglitz and Ocampo 2008; Stiglitz 2000).

The hypotheses governing RQ1 & RQ2 point to the assumed role industrial clusters as geographical units in supporting social programs. At the same time, it places Mexico's institutional weakness as caused by the country's volatility of GDP. The two hypotheses are here stated in the following form:

- H01.) Industrial clusters play an institutional role in improving federal policies' impacts at the regional level
- H02.) The volatility of Mexico's GDP correlates to Mexico's institutional weaknesses.

The first hypothesis further stresses the need for an increase in education, and technical training in a country with high levels of inequality and without a deep-rooted high-technology sector. The lack

of a deep-rooted technology sector is represented in the low number of knowledge-infused ecosystems defined here as Triple Helix clusters. It is also seen in the lack of widespread technology integration among all of the country's traded clusters and regions in Mexico. Recent studies conducted by Dr Alfonso Mendoza, inspected the effects of industrial clusters on Mexico's unemployment[1].

Dr Mendoza's analysis did not yield significant results, thus providing further motivation for the analysis and formulation of this thesis' main hypothesis (H01). The second hypothesis governing this research further emphasizes the country's propensity to experience harder GDP contractions by exogenous economic shocks. A phenomenon which according to the previous literature by Stiglitz, not only disrupts central government funding but pertains to the following factors; (1) the country's resource wealth dependence; (2) the lack of more knowledge and innovation-driven activities and; (3) the country's sharp regional disparities.

Mexico as the Focal Point of Analysis

Having defined the above-stated research objectives, it is important to further explain why Mexico serve as an important focal point of analysis in this research. It bases Mexico's case on the following key factors; (1) the Mexican current political landscape; (2) its role in NAFTA; (3) the country's stellar industrial growth in the Latin America context; (3) and; (4) the need of emerging economies like Mexico to further promote education, training and skills to better cope with rapid industrial changes. The latter being a primordial element which according to the World Bank is a pressing need to ensure emerging economies maintain and upgrade their competitive advantage (Nissanke and Thorbecke 2010).

Mexico's political landscape thrives by a reformist agenda, one which began in the early 2000s with the structural reforms pushing for higher openness and integration into the global economy. The political climate of the last sixteen years have seen reforms to advocating for more transparency, fiscal accountability, and efforts to combat the country's high levels of corruption (IMCO 2016). These measures have had an overall positive economic impact in terms of the overall macro-economic performance. The country's GDP per capita is one of the highest among Latin America economies due to these policies but, the volatile nature of the GDP leads to the country's high level of inequality, marked by regional disparities which challenge the transition to an advanced economy (IMCO 2016). Figure 4: shows Mexico's GDP per capita growth using data from the World Bank from 1990 to the present day which evidences an upward trajectory, since the country entered The North American Free Trade Agreement (NAFTA), see also footnotes[2].

Figure 4: shows an ascending trajectory in the growth of Mexico's GDP per capita from just over three thousand US Figure 5: shows an ascending trajectory in the growth of Mexico's GDP per capita from just over three thousand US dollars in 1990 to over nine thousand in 2008. The sharp declining trend in the 2008-2009 period is coherent with one of the main assumptions guiding this research and reflects Mexico's sensitivity to exogenous economic shocks. The declining trend in 2014 as shown in the graph shows one point highlighted in this study; Mexico's economic dependence on its resource wealth. The graph reflects the impact Mexico's NAFTA membership has had on the performance of Mexico's macro-economic indicators. A positive performance, which, as covered later in this study also reflects on other economic indicators such as GDP growth and FDI (Foreign Direct Investment). Mexico's role in NAFTA has seen an increase in cross-border transactions

[1]Dr. Alfonso Mendoza is a contributor to this thesis as he kindly provided the dataset on Traded clusters across the thirty-two Mexican states.

[2]The data obtained from the world bank showing Mexico GDP Per Capita Growth from 1990 to 2016 only shows available data values.

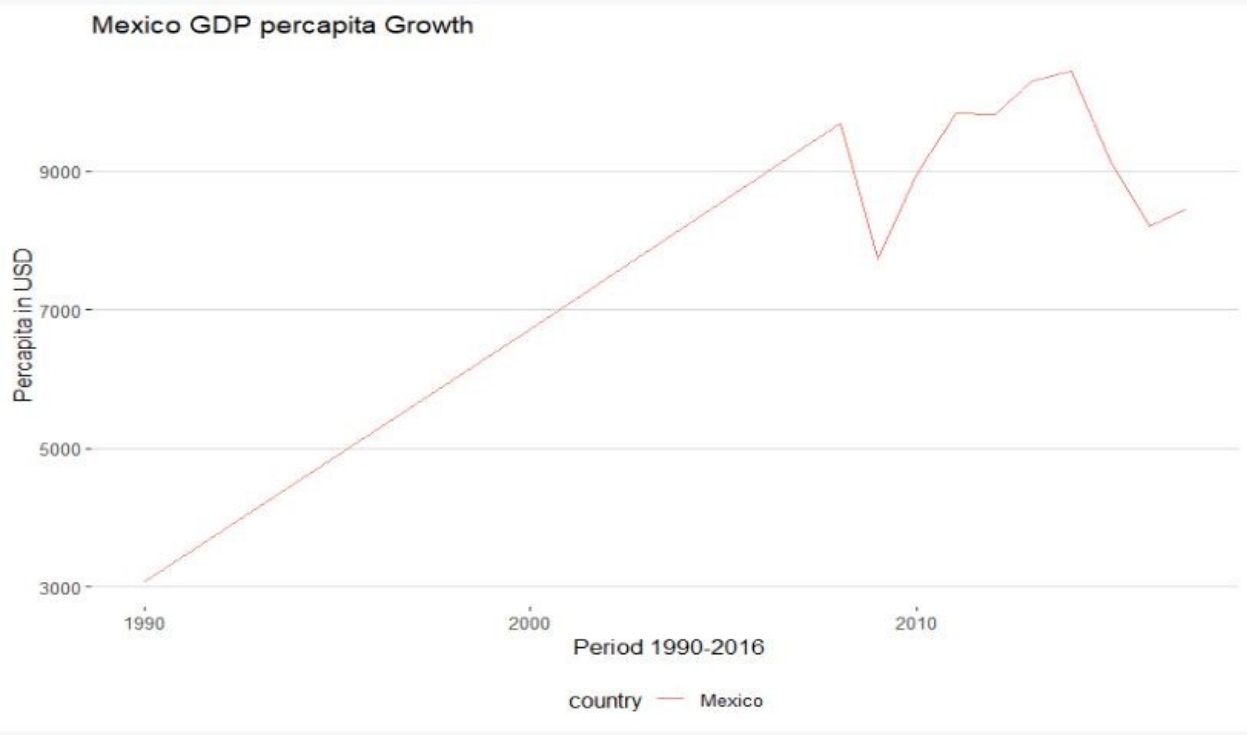

Figure 4: Source: World Bank,Mexico GDP Per Capita Growth from 1990 to 2015.

and in the activities of many multinational companies establishing and outsourcing manufacturing activity in the country (IMCO 2016; ProMexico 2017c). All important elements, that since the signing of NAFTA, show evidence in an increase in the number of industrial agglomerations, defined as clusters, contributing greatly to the country's attained competitive advantage.

Mexico's stellar performance in the Latin America context is partly attributed to its access to the US and Canadian economies, thus fostering the growth of Mexico's automotive industrial sector and the country's value chains. This proximity and easy access have also fostered significant industry growth in the electronics and aerospace industrial segment as later covered in this thesis report (ProMexico 2017c). All of which have improved the transfer of knowledge and capitalized in higher Foreign Direct Investment levels than many of the economies in Latin America. These factors have helped position the country's manufacturing sector as a focal point in this analysis and an important factor in appealing to developed and emerging regions, meaning the interests of Europe and Asia (ProMexico 2017c). Despite the country's progress, Mexico still shows high levels of inequality where the lack of education and professional training across all regions in the country poses a challenge in promoting higher levels of industrial development. In fact, the lack of proper training and education acts as a constraint which hinders the country's ability to cope with rapid industrial changes. Education is a primordial element, which according to the Word Bank is a pressing need to ensure emerging economies maintain and upgrade their competitive advantage (Nissanke and Thorbecke 2010). These factors are relevant to the analysis of this research and link clusters, education and institutional elements, as the key to improve labour market efficiency.

Improving Labour Market efficiency across all regions in Mexico is an important aspect that combined the growth in the labour force can translate into higher levels of regional competitiveness. These

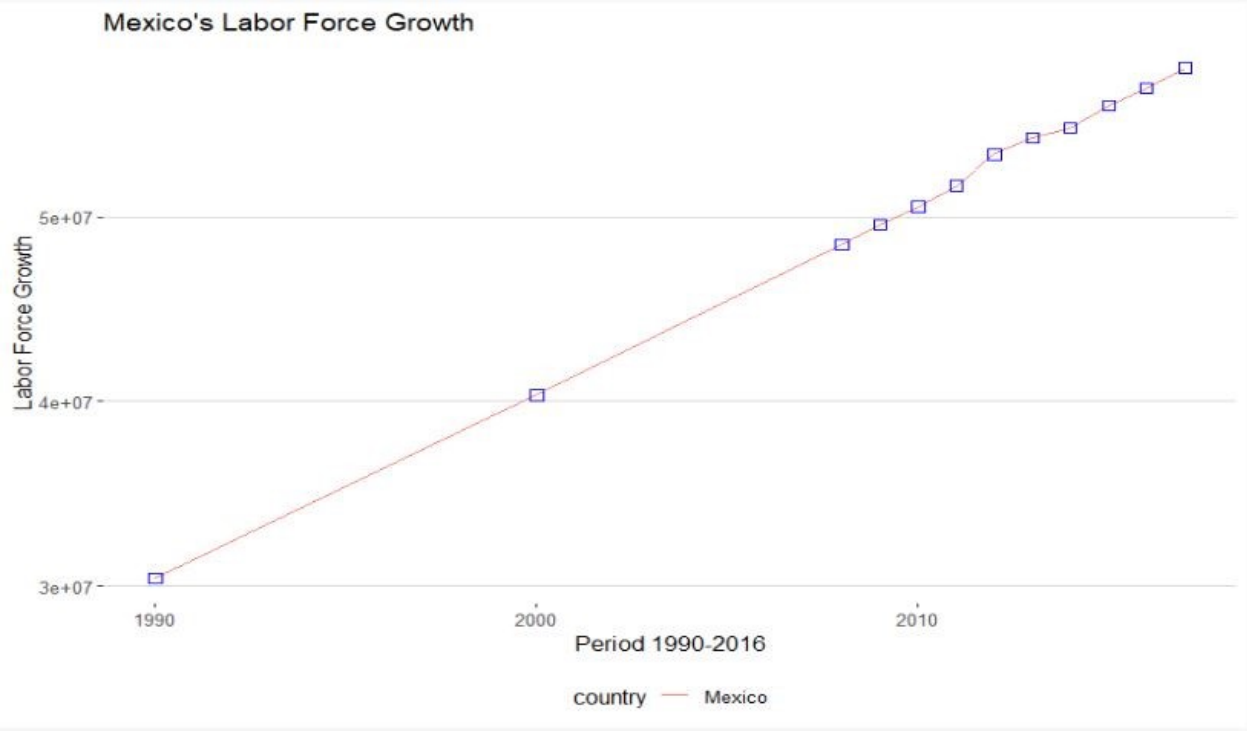

Figure 5: Source: World Bank,The Growth of Mexico's Labour Force Over the Years.

two important elements could help Mexico yield better economic outcomes all the while, aiding in bridging the gap of regional disparities and fostering a greater number of knowledge-infused industrial agglomeration. The country's growth in the labour force has been significant since 1990 to the present day. It has grown from 30 million to close to 60 million people in less than three decades but such significant growth has also created pressing challenges such as high levels of informality and a very rigid labour market (Delajara, Freije, and Soloaga 2006). This issue is present throughout all Mexican regions and is said to be the chief factor, according to the literature, halting economic growth and perpetuating regional inequality. The next figure shows the previously mentioned growth in Mexico's labour force. It also portrays one of the key factors in the proliferation of low value-added industrial activity in the country, which, is primarily driven by the readily available human capital and the lower cost associated with these activities. See, also figure 5.[3]

Joseph Stiglitz's literature on the impact of liberal reforms in emerging economies provided inspiration to explore one of the hypotheses governing this research. It sets this analysis to closely examine Mexico's volatility of GDP by measuring its standard deviation. The volatility of economic indicators such as GDP has been an area of study with important policy implications in terms of economic growth. Over the years, countries have implemented policies aimed to promote economic stabilization as a short-term measure aiming to attain higher economic growth. Previous studies suggest an increase in volatility across economic indicators are related to decreasing averages in long-term economic growth rates. The latter established by (Ramey and Ramey 1994), in an analysis of 92 countries examining their average growth rate and volatility of indicators over time. The next

[3]The data points in figure 5, only show the growth of Mexico's labour force showing data in 1990,2000, and 2010. Data and statistically compiled yearly only occurred after 2009.

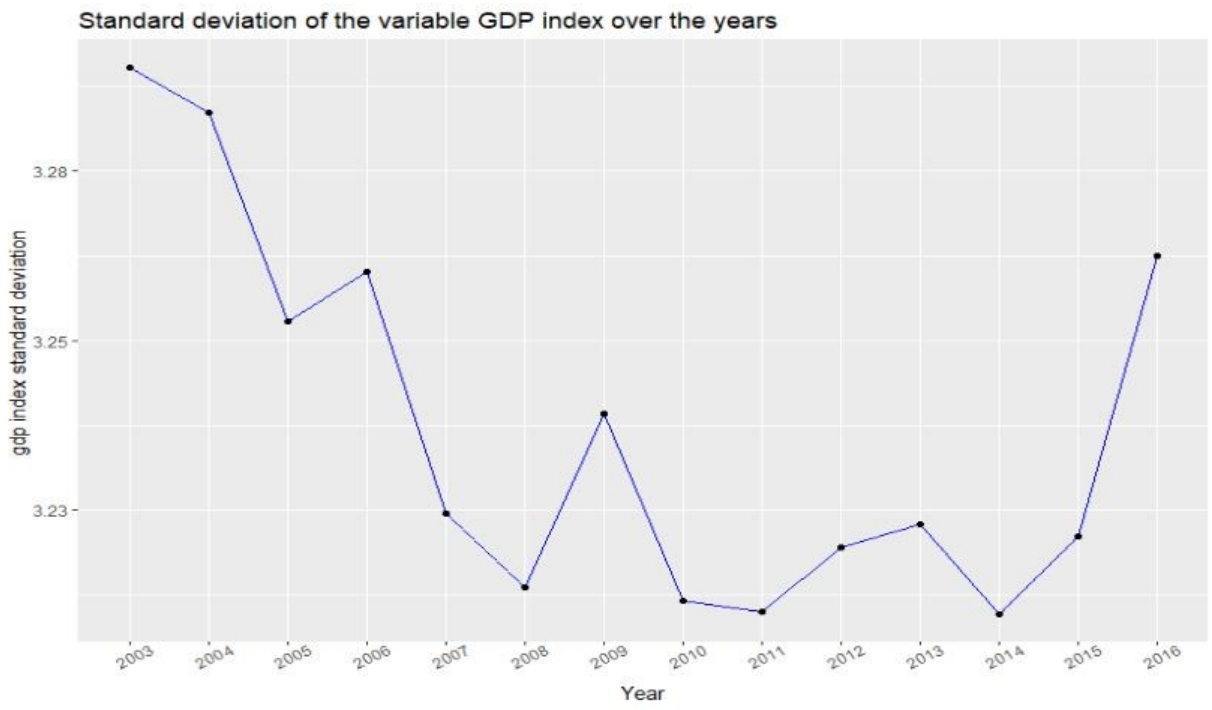

Figure 6: TSCS data,Mexico's Volatility of GDP index Over the Years. Source:

figure shows the volatility of GDP index over the years, which, in the descriptive statistics sections concentrates on looking more at the volatility of other indicators and their relationship to regional development and clusters, see also figure 6.

The graph shown in (Figure 6) observes the volatility of Mexico's GDP index by measuring its standard deviation over the years of the prescribed period. It displays the country's economic progress and lack of economic stability during this thesis's period of analysis 2003-2016. The declining trend in the years 2003 -2008 coincides with the years in which the Mexican economy showed the best growth performance. It also relates to the period the country enacted its market liberalization policies. These events according to the graph saw the declining trend in the volatility of the country's GDP in the early 2000s. However, in 2008-2009, and from 2014 onward the graph evidenced ascending trends, thus, suggesting higher levels of volatility at the country level. The two periods showing a spike in the country's volatility are pointing to two of the assumptions stated in this research; (1) the role of external economic shocks in the country's economic fluctuations and; (2) the country's resource wealth dependence. The former represented by the global economic crisis, and the latter by the decline in oil prices. These spikes, also relate to strong regional economic performance or industrial activity in some areas while signalling risk and regional inequality in others (Chatterjee and Shukayev 2005).

The literature on this topic sees macroeconomic volatility as a major obstacle for growth.(Hnatkovska and Loayza 2005), conducted a study on this relationship based on a data sample from 79 countries. Their analysis of the study findings concluded that increasing the average volatility by the value of its standard deviation causes an average growth rate loss of 1.3% in GDP during the period of analysis of 1960-2000. It also proved the loss in the average growth rate was 2.2 points just in

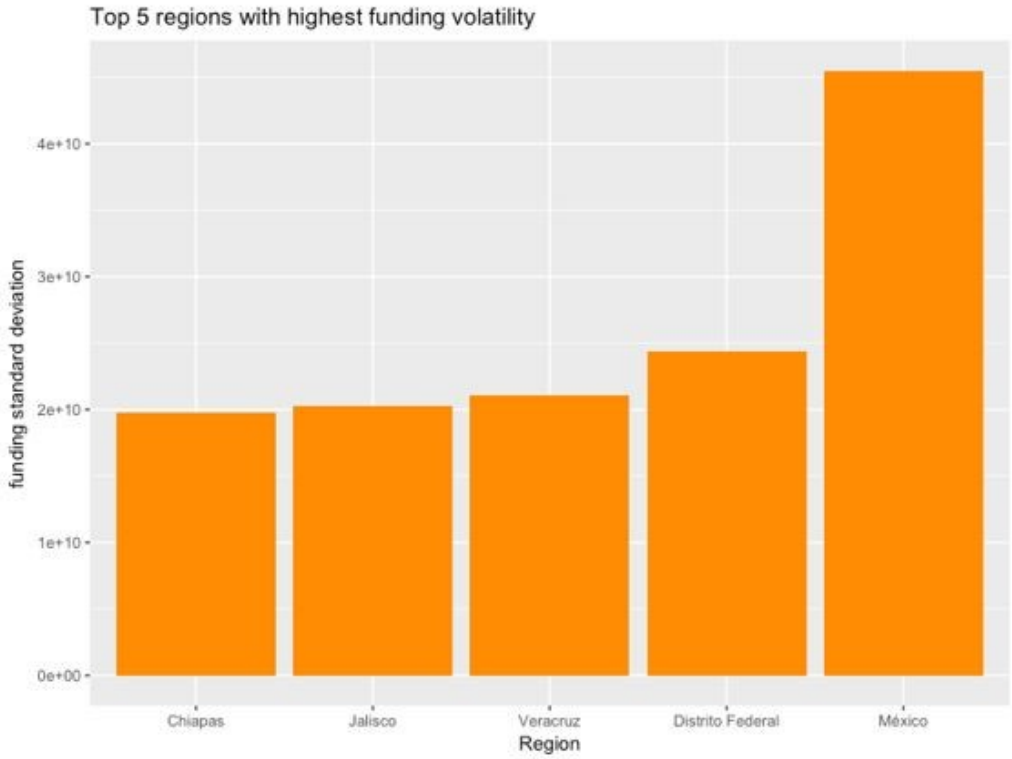

Figure 7: Source:TSCS data,The Most Volotile States in Term of Funding.

the decade between 1990 -2000. This fact, in the countries, observed, not only impacted economic development but also social development (Hnatkovska and Loayza 2005). These findings further corroborate one of the primary assumptions of this thesis of Mexico's GDP volatility as a key driver fostering Mexico's social inequality, marked regional disparities and institutional weakness. The latter here represented by the country's ALPs as the proxy for social programs. Figure 7: data graph shows the five top regions with the highest volatility in central government funding. The data graph uses the variable "funding" within our TSCS data panel to look at the regions with the highest variations in the levels of central government funding.[4]

[4]The variable "funding" represents all the combined transfers assigned to the different Mexican states every year. The variable is the total amount transferred to the states from the federal government based on economic performance, basic education, health and infrastructure.

Figure 7 bar-chart shows the states of Chiapas, Jalisco, Veracruz, Mexico City, and Mexico state. The graph shows all the states in the chart as having Triple Helix and Traded clusters. These findings link the upward variations of central government findings to the growth of industrial activity represented by industrial clusters. It also points to the relevance of Triple Helix agglomerations in fostering this upward trend with the states Chiapas and Veracruz. These two estates created one Triple Helix cluster per state in Mexico's southern region, thus positioning them as leaders in a region. However, compared to the north these southern states still lack development. Table 3: shows the total number of industrial clusters by the proxies selected as part of this study and the regions where these states locate.

Table 3: Concentration of Triple Helix & Traded Clusters based on figure 7.

State	Region	tHelix	Traded
Chiapas	3a	1	62
Jalisco	1a	6	65
Varacruz	3a	1	63
DF	4a	6	64
Mexico State	5a	1	63

Figure 7 and previous summary table show that two out of the five states are located in the southern region. It also indicates that the rest of the states with the highest variations in the total levels of funding are in the central to the northern region. The northern region is the most industrialized region in Mexico with 31 Triple Helix clusters and 496 Traded Clusters housing high technology sectors. It also identifies the most industrialized state in the region, Nuevo Leon, with 12 Triple Helix clusters. Nuevo Leon, as mentioned in this thesis is one of only a few states with a high level of government involvement. This state's government takes an active role in promoting technology, research, and innovation within the agglomeration of industrial activity (RVCNL 2018).

Research Roadmap

This introduction laid out the foundation for this thesis based on Michael Porter's competitiveness, institutional factors, industrial realities and social programs. It validated the effort, to concentrate on higher education and skills as the primary drivers to improve regional assets and attain higher numbers of industrial agglomerations. At the same time, it provided a rationale substantiating Mexico as the Focal Point of Analysis. Chapter Two inspects Mexico's economy, location advantages, and identifies barriers Mexico must overcome. It also describes the two proxies for industrial agglomerations selected for this thesis. The two proxies for industrial clusters depict Mexico's manufacturing sector and the new emergence of knowledge-infused technology driven ecosystems. The description of Mexico's two geographical units here stated leads this research to investigate the country's most relevant industrial segments. It summarises the Mexican economy's make-up, composed of a mixture of traditional industries, and technology-driven one's by describing the six most important segments. It will also confirm the influence of US value chains in the patterns of industrial agglomeration in the central to northern regions. A concentration of industrial activity that intensified since the country signed NAFTA; trade agreement that led to an increase in the Automotive, Electronic and Aviation sectors. In fact, the findings will show the relevance of Mexico's automotive sector in GDP terms (ProMexico 2017c; Cardenas 2017).

Chapter Three of this thesis presents the literature review and eight sub-sections. It details the

evolution and the shift in international competitive thought and ends with the presentation of the literature-derived models helping guide this research. A paradigm where the work of Michael Porter helped to position clusters at the forefront of economic growth and regional development. All literary arguments helping this research postulate the role of industrial clusters as institutions for regional economic growth and improved national-level competitiveness. The theoretical review of competitiveness will show the ideological tenets influencing how the competitive debate evolved. It also unveiled the implications these tenets have had in terms of policy design and implementation which according to scholars such as Stiglitz have led to unfortunate economic outcomes (Stiglitz 2003). The theoretical background also highlighted key principles which led to important contributions in precepts like the entrepreneurship, comparative advantage, and trade theory. Foundations, which, permeated Porter's work on important elements like the Resource-Based View, the Five Forces framework, and Porter's Diamond. These theoretical frameworks not only shape the firm's strategic management but shed light on the internal and external factors fostering industrial agglomerations (Porter 1990).

The empirical literature on clusters focuses on how important global value chains are in the international competitive debate (Humphrey and Schmitz 2000). It aims to present two central ideas: First, the view of competitiveness and clusters as the firm's engine in technical sectors. A precept which after Michael Porter's work on clusters, apply theory-driven models as seen in the literary review (Porter 1998; Porter and Ketels 2003). Second, the role of the global value chains debates as one where improvements in communications, technology and logistics allow for better external linkages and deeper market penetration (Gereffi, Humphrey, and Kaplinsky 2001). These factors show that industrial clusters have played a preponderant role in furthering the above market integration within the global value chains structures. The above contentions will lay the foundation to argue for the role of clusters as institutions of regional-national development. It aims to substantiate the aforementioned by testing the institutional role clusters play in supporting social programs. The focus of observing Mexico as a case study brought this literary inquiry to inspect the state of competitiveness in Latin America. The existing literature suggests that although positive changes have led to an increase in multinational industrial activity in Latin America, their economies and the liberal reforms adopted by most of the region's economies have created recession periods riddled with economic instability and stagnation. A regional reality which has limited this region's ability to foster investment in human capital, create knowledge-based economies, improve infrastructure, and encourage innovation activities (Feinberg 2008; Stiglitz 2003; Stiglitz 2000). The above constraints exacerbated by concurrent factors such as a high level of informality, crime and corruption (Albaladejo 2001). In addition, there are disconnects in the economic objectives of the regional and national levels, and misalignments in the objectives and pressures of the global economic market with the economic context in Latin America.

Chapter Three, also speaks to the state of Mexico's competitiveness further affirms Mexico's selection as our case of analysis. It unveils Mexico's macro-economic performance and the dominance of the country's manufacturing sector in its economy. An industrial segment of activity which since the signing of NAFTA has seen a surge in cross-border trade and industrial activity. This section highlights Mexico's economy and the role of industrial clusters in supporting the country's economic growth in locations close to the US border and in the central regions. It also touches upon the country's aggressive economic liberal approach from the onset of the 21st century until now (Garria Angel and Torres Carlos 2017). Rounds of reforms which have brought an increase in Mexico's location advantages and appeal as a place that provides substantial cost advantages for US and foreign multinationals. The last two subsections of the literature review will touch upon ALPs; first, as a development tool in advanced European countries, Germany as an example and; second, in Latin

America and Mexico where the approaches have varied (Almeida et al. 2012; Kluve 2010; Rinne and Zimmermann 2013; Sianesi 2004). In the case of advanced European economies, the implementation of these "active" employment initiatives, has been attributed to making these economies more competitive while helping reduce unemployment. In Latin America, the most successful case and the pioneer in the institutionalization of these programs according to the literature is Chile (Ibarrarán and Rosas Shady 2009). Whereas, in Mexico, these programs have undergone several reforms and have been in existence since the 1970s. In Mexico, ALP initiatives were transformed to seek higher levels of engagement from the private business sector in the early 2000s. However, the most recent round of reforms was adopted in 2014 with a push toward attaining higher levels of efficiency and productivity in the Mexican labour force (OECD 2015).

Mexico's ALPs is an area where it is thought the growing presence of clusters in the country could have a positive impact in supporting these active labour initiatives throughout the country's regions. More specifically in areas where the two geographical units Triple Helix and Traded Clusters are present. The literature review of ALPs not only stemmed from the motivation taken from scholars like Stiglitz, Camagni and Capello 2013. But, at the same time substantiate the focus of these active labour initiatives as a key element in answering the main hypothesis governing this research. In brief, what this thesis presents throughout its literature review, is how important ideas about international economics have progressed and the effect on the Mexican economic system and economic policy. These ideas include:

- 1.) The evolution of the international competitive debate, which has led to the paradigm shift, where clusters gained key regional importance.
- 2.) The relevance of clusters not only at the firm level but also in the promotion of national, regional competitiveness. A dynamic which results in alignment between regional, national and global value chains' structures.
- 3.) The idea of clusters as formal and informal institutions of regional-national competitiveness.
- 4.) The framing of the debate on Latin America's and Mexico's factors limiting economic development despite attained progress.
- 5.) The reality that industrial clusters can play a primal role in not only fostering policy changes but also helping these economies support institutional human capital development initiatives through government programs.
- 6.) An explanation of ALP's through a European perspective and the impact of these active initiatives in Europe, as well as an examination of how these programs have helped these economies better mitigate external economic shocks.
- 7.) The various approaches, strategies and policies that countries' have used as part of their welfare and capital development strategy, with a focus on Mexico.
- 8.) It compiles the most relevant pieces of scholarly research in a competitive model presenting two augmented proposed competitive dimensions.

Finally, chapter three presents a literature inspired model showing the compilation of key pieces of scholarly research guiding this study. Further, explaining the relevance of ALPs in enhancing regional assets. It also provides a compelling rationale of important factors enabling the research to set the context on existing literary evidence in the international competitive debate. Last, it presents two augmented regional dimensions speaking to the two hypotheses governing this research, and the proposed combination in this master's thesis that as stated at the outset is unique as a scholarly contribution. The literature derived model aims to conceptually postulate the argument of clusters as institutions of national and regional development. It inspires the model on key literature guiding this analysis inspecting impact of delta GDP on key national economic drivers (Camagni

and Capello 2013). It brings relevance to the impact of GPD fluctuations on public expenditure as posited by (Stiglitz 2003; Stiglitz 2000). It shows the impact this volatility carries on national GDP growth and competitiveness, thus framing this issue as a chief cause in the country's institutional weakness (Ramey and Ramey 1994). A situation which, as shown in the model, is influenced by the global dimensions, thus having regional economic growth implications.

All of which validates this thesis' intention of measuring the volatility of GDP and its impact on the variations of central government funding thus guiding the testing of one of our hypothesis. Our model proposes a stronger interaction of ALPs in the promotion and development of regional assets where education and technical training play a key role. The model proposes this key role as being to strengthen the role of existing clusters as institutions while fostering an increase in industrial agglomerations. It proposes to place the interaction between ALPs, regional assets, and clusters within two augmented national regional dimensions. One which could help improve reciprocity between these two levels of analysis, thus bringing in line national, regional and global competitive objectives. The rationale explained by this literature inspired model not only further inspires our argument of clusters as institutions, but it provided the basis to further test this assumption by measuring the supporting role of clusters and ALPs in Mexico.

Chapter four of this master's thesis presents some relevant descriptive statistics from our two datasets. It also validates the volatility of indicators such as GDP and other variables as an important element in our analysis (Stiglitz 2003; Stiglitz 2000). It shows the impact this volatility carries on national GDP growth and competitiveness, thus framing this issue as a chief cause in the country's institutional weakness (Ramey and Ramey 1994). This section presents a performance plot on key variables in the data such as "gdppesos", "contributions", and "funding". This approach observes the similarities of these variables performance in relation to our dependent variable "gdppesos" thus testing the correlation among them. One, that further tests this relationship by using Pearson's moments' correlation as part of this section (Crewson 2006). In addition, it shall present graphs examining the volatility of other variables in the data set and the relations to our proxies for industrial agglomerations. A look at the variations of some proxies accounting for federally funded ALPs, while providing a closer look, using data-graphs, at Dr Mendoza's data on traded clusters. Last, this chapter presents a section showing the heterogeneity of indicators from our data panel.

It shall test the heterogeneity of GDP and other variables such as population, exports and employment, thus revealing Mexico's regional development patterns as they pertain to these indicators across the states and through time. It will also observe the heterogeneity of central government funding, to validate the regional champions assumption. We shall also observe the heterogeneity of our selected proxies for industrial clusters and some proxy variables looking at ALPs. In brief, the descriptive statistics section concentrates on measuring the volatility of indicators and their relationship to economic growth and clusters (Cariolle 2012), it will set the basis for the hypothesis testing by regressing the standard deviation of our dependent variable "gdppesos" on the standard deviation of mentioned funding variables. Thus, aiming to validate or invalidate the second hypothesis accounting for GDP fluctuation as a cause of Mexico's institutional weaknesses.

Chapter five of the master's thesis presents the methodological design and models. It uses a quantitative method based on a Time-Series-Cross-Section data compiling Mexico's key economic indicators over time. It compiles data on the geographical units used for industrial clusters, Triple Helix and Traded clusters at the same time that compiles proxy variables for Mexico's ALPs. The TSCS data structure serves the method of testing the institutional role of industrial clusters represented by the above-stated geographical units. It assesses this institutional role by measuring

these units' interaction with the different proxies for ALPs. It will also test this the second leading hypothesis by measuring the impact of GDP volatility on key data variables. These variables signify the transfer of central government funding to all the Mexican states over time. The method section covers the background, the methodological objectives, the data samples used the analysis and estimators involved in testing the above-stated hypotheses. At last, it will present the models as part of the hypothesis section and Time-Series-Cross-Section Analysis presented in this chapter.

The thesis presentation of findings will provide a broad analysis from the results of the linear models and econometric estimations used to test this thesis two hypotheses. It will highlight observations from these findings in relations to policy areas affecting national and regional development while touching on literary elements covered in this thesis. Also, it touches upon the challenges faced by this research pertaining to the lack of consistent data availability regarding data indicators. The policy recommendation section will explain how this thesis' analysis and findings could help bring to light areas where industrial and economic policy might need reform in the Latin America context. The policy recommendation section will highlight how important these reforms are if Mexico and the regions expect to increase their levels of national competitiveness by adopting a regional focus. This approach, mentioned throughout this thesis, will help reduce regional disparities, promote more equitable growth, and constrain the impact of GDP fluctuations due to external shocks. Policy reform in Mexico and other economies in Latin America could help these economies fill their institutional void while helping clusters play a stronger role as institutions of regional development. Suggestions which, just as with Japan, could see the inclusion of ALPs in the country's industrial policy to improve skills, promote innovation and attract new industries (Martin and Grubb 2001).

The closing arguments and conclusion section present a closing analysis of the project. We shall revisit the core literature that helped frame our research argument to add weight to the conclusions found. The proposed model, derived from the literature, postulated a framework that can strengthen the interaction between clusters and ALPs by improving regional assets. It not only proposes an augmented national and regional dimension, but it could also help present the impact of GDP fluctuations on the levels of central government funding. A hypothesis here proposed, which as discussed, shapes the global and regional dimensions. Last, the analysis of the methods used as part of this thesis tests the way industrial clusters represented by the two geographical units facilitate a better regional response to national level policy objectives. Policy initiatives in the context of this research represented by ALP Active Labour Programs as social programs as a human capital development strategy. All of the above-stated arguments to prove or reject H01 and H02 as the two leading hypothesis governing this research and opening the door for further research on the institutional features of industrial clusters.

What this thesis has presented throughout this introduction is how diverse the field of international competitiveness continues to be for firms academic and international institutions. A debate key relevance due to globalization and rapid industrial changes imposing competitive challenges to emerging economies like Mexico's. If international competitiveness traces back its roots to the literature of Adam Smith, placing the debate at the national level. It is the work of Michael Porter leading the debate as one of the regional connotations where industrial clusters are fundamental for economic growth (Porter 1998). The relevance of this paradigm shift in emerging markets could provide these economies with a path to overcome economic challenges. All which range from the institutional weaknesses affecting the levels of central government funding to the lack of social programs which could yield a much better outcome in supporting human development strategies. All interrelating factors prompting this research to draw on the literature above-mentioned to test the institutional features of industrial clusters in helping regions fill the institutional void in

less developed regions. Developing this introductory scholarly inquiry in the premise of industrial clusters as institutions of regional economic development. The next section as part of this scholarly inquiry touches upon Mexico's location advantages as posited by Michael Porter. It discusses key factors driving Mexico's economic growth during the prescribed period. Also, the increase in the number of geographical units defined as industrial clusters here represented by Triple Helix and Traded clusters. The guidelines set down in this introduction shall carry out our research questions and hypotheses to direct the course of the research, and our discussions in upcoming chapters. Since Mexico is our selected case study for this research inquiry, Chapter Two provides an economic perspective of Mexico's economy. It also positions the country's location advantages as drivers of industrial growth. The information depicting the drivers and constraints of Mexico's economic growth. Helped this thesis provide validation as of why Mexico has experienced significant growth in industrial clusters as ecosystems of productivity and growth.

Chapter 2: Mexico & its Economy

Mexico's growth in the number of industrial agglomerations relates to the country's set of location advantages as defined by Michael Porter. The country excels by its proximity to the United States and since the signing of NAFTA has seen an increase in the US and multinational companies settling in the country(Bank 2018). Mexico is a federal state with thirty-two federal entities and the administrative region of Mexico City. In the north, the states enjoy access to various key US points of entry and the south borders Guatemala, and Belize. Its territory extends 1,964,000 km^2 and Mexico access to two ocean fronts which given its location, turns Mexico into a mid-point where European, North American, and Asian trading interests collide. The country richness in natural resources, such as oil and various other minerals like gold and copper, mark the country's resource-based wealth (ProMexico 2017c). The country's resource-based wealth, plays a key role among key industrial sectors, like the automotive industry, and makes up an important source of income and a driver of foreign direct investment(IMCO 2016).

Its territorial size ranks Mexico as the sixth largest in Latin America and access to a thriving labour force provides multinational companies with a cost advantage in manufacturing activities. The country's proximity to the US market has positioned Mexico as a strategic location for establishing cross-border multinational activity. Activity which concentrates more in the northern states such as Nuevo Leon, and Baja California. The country is the second largest economy in Latin America, and despite the external shocks, due to events such as the recent oil crisis, the country's economy displays an average moderate growth of 2.5% in GDP terms (Pattinson and Duran 2016; ProMexico 2017c). Mexico's territorial extension spreads 3000km from its northern to its southern region, thus equating the same distance it would take to travel from Moscow to Barcelona. In addition, the country's coastlines are the biggest in Latin America, and it ranks 13th in the world in maritime trade (IMCO 2016; ProMexico 2017c). The following map shows Mexico's political divisions accounting for all of the Mexican states in our panel data, see, also figure 8

The country's proximity to the US provides Mexico with an important role in global trade. One, which given the country's economic growth, has allowed Mexico to integrate well into global value chains(IMCO 2016). Mexico's participation in NAFTA positions the nation as a participant in a 20.5 trillion USD market in GDP terms. Mexico's border with the United States extends for 3152 km and is a crucial trade access point for several multinationals moving finished products across the border (ProMexico 2017c). This strategic location gives Mexico an advantage as a leading exporter of advanced high technology manufacturing in Latin America. In fact, the country's exports of goods and services have surpassed 121% growth over the last sixteen years when compared with figures from the year 2000. Therefore, contributing to making Mexico's economy one of the twenty top global economies (Pattinson and Duran 2016; Bank 2018). Its economy has shown a superior transition in terms of exports, in 1993 the country recorded exports of 51.8 billion USD. A number far below the number reported in 2015 which surpassed 380 billion USD. In, terms of global trade agreements the country's Secretariat of Foreign Affairs reports 12 Free Trade agreements with 46 nations. However, Mexico's main export market remains the US with over 81% of Mexico's exports heading to this market (IMCO 2016). The following line chart shows the trajectory of Mexico's exports since the signing of NAFTA, see, also figure 9.

Figure 9: show that Mexico's trade activity increased from just over 53 billion USD to 412 billion USD in exports of goods and services over the time period. This marks an impressive growth of over 121% in trade from the year 2000, and a 243% increase in the six years prior. The trajectory of Mexico's growth in exports also coincides with increased values of (FDI) Foreign Direct Investment

Figure 8: Source:INEGI, Mexico's Map of Political Divisions Showing the Thirty-two Federal Entities.

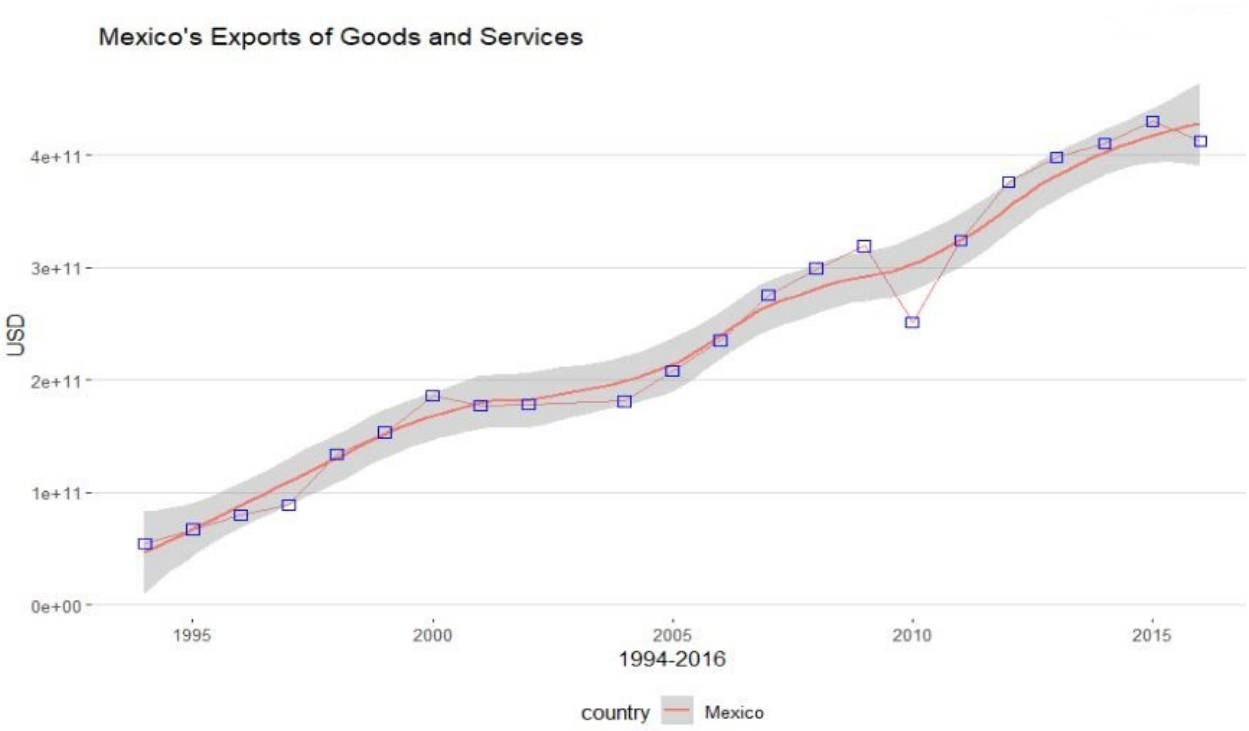

Figure 9: Source: World Bank, Mexico's Growth in Exports of Goods and Services.

and also increased levels of industrial activity in the manufacturing sector. The latter is a critical driver that inset to have fostered the agglomerations of industrial activities and the creation of industrial clusters. Mexico is a country where competitiveness and trade openness form an integral part of the government's economic development agenda in the years to come. It points to the structural reforms undertaken by the government to improve efficiency, counterbalance corruption, invest in education, and improve the country's facilitation towards business (Deloitte 2015; Pena Nieto 2016). In brief, Mexico's integration in NAFTA, its economic openness, human capital, and relative cost advantage vis-à-vis other more industrialised economies, are important factors in making Mexico a primal destination for the agglomeration of industry activity and therefore, cluster formation(ProMexico 2017b).

Despite, the country's location advantages and positive economic growth which have led to the localized agglomeration of industry activity, Mexico's industrial policy remains segmented and uncoordinated around the concepts of clusters as critical drivers of national economic growth(Pattinson and Duran 2016). Moreover, the literature and analysis of the two types of clusters selected for this study, Triple Helix and Traded Clusters, show the following. 1.) There is a lack of knowledge-intensive activities in the country, a fact represented by the relatively small number of Triple Helix Agglomerations vis-a-vis the ones defined as Traded Clusters. 2.) It shows Mexico's clusters and industrial agglomerations are export-driven where manufacturing activities and business process outsourcing takes centre stage(IMCO 2016).

Having said this, Mexico's increased industrial activity and its industrial concentrations have impacted the country's competitiveness. It has also turned these ecosystems into hotbeds of efficiency, productivity and innovation in some key states such as Nuevo Leon.(Delgado, Porter, and Stern 2014; Porter 1998; Porter 2000; Porter and Ketels 2003). The "maquiladora" system established over four decades ago, created an outsourcing network. It also led to more technology driven activities as cross-border agglomerations made up an essential driver of exports (Carrillo and Hualde 2002). Therefore, providing incentives to further the agglomeration of industries in sectors such as the automotive and electronics industry. However, Mexico experienced latency, compared to other more industrialized nations in knowledge-driven industry activities, and in terms of a well-coordinated industrial policy agenda (Pattinson and Duran 2016). Two realities that if reformed would further increase investment and create supporting industries in knowledge-driven sectors. The automotive industrial segment exhibits the highest number of exports, lightweight vehicles make up 8.2% of the country's exports. Likewise, 80% of lightweight vehicle exports have, as the primary destination, the American and Canadian markets (Pattinson and Duran 2016).

Mexico's evolution in exports have propelled a further liberalization agenda of the last decade, clusters as ecosystems have gained further relevance in the regional context. Despite the nation's growth, Mexico still lacks a coordinated effort to centralize its industrial agenda, thus bringing in line national and regional objectives. This lack of coordination is a reality that prevents a more inclusive regional economic growth model which would reduce regional disparities (Porter and Ketels 2003). The promotion of regional clusters as drivers of regional economic growth carry positive externalities across Mexico's regions. In fact, Delgado, Porter and Stern 2012, postulate these positive externalities promote the better alignment of clusters driven by a regional initiative. Local industries taking part in clusters register higher employment, growth, higher wages and a higher number of institutions in promoting patents and innovation at the regional level. This is conducive to new industries emerging at the regional level. In brief, the above-stated points signal to "cluster-based agglomerations" as a factor of improved regional economic growth for Mexico's economic performance (Delgado, Porter, and Stern 2014; Sölvell, Lindqvist, and Ketels 2003). This

factor aids in reducing regional disparities and improving cross-regional competitiveness, while also promoting a better alignment or inclusion of GVCs' governance structures within the context of national and regional realities, thus attaining higher levels of competitiveness (Delgado, Porter, and Stern 2014; Sölvell, Lindqvist, and Ketels 2003).

Mexico lacks a unified industrial policy where clusters are central to regional-national competitiveness as noted earlier. Although, industrial clusters play an important role as key drivers of industrial activity and economic growth. There is a rupture between the policies and approaches to clusters at the central government level and the decisions taken at the state level(Pattinson and Duran 2016). Hence, a call for a cluster-based policy and further inclusion of the business sector within the country's industrial policy echoing the call of authors such as Hernandez & Montalvo, 2012. Including clusters within the industrial and economic policy framework to achieve higher levels of economic growth at the regional and national level is an optimal scenario for Mexico as posited by Michel Porter (Porter 2007). In recent times, the European Collaboration Platform on Clusters calls for the same policy approach in Mexico. The country's industrial policies, at the federal level, are run by The National Secretary of Economic Affairs. This government department is also responsible for the promotion of clusters at the federal level. While at the regional level the Secretary for Economic Development ensures implementation of cluster-based initiatives at the state level. The literature evidenced that most of these initiatives stem from international actors and are supported by regional governments with a highly active industry sector(Pattinson and Duran 2016).

The only states making information freely available on clusters are the states of Baja California, Nuevo Leon, and Aguascalientes (Estado de Aguascalientes 2018; RECBC 2018; RVCNL 2018). The facts from the information lead to the conclusion that in Mexico, national-level policies do not stimulate competitiveness through the active promotion of a Cluster-based approach (Pattinson and Duran 2016). This section has tested Mexico's location advantages and the basis for the country's formation of industry agglomerations. At, the same time it has revealed the challenges Mexico continues to face. Challenges which are tampering with the country's ability to achieve more inclusive and fair regional development, where clusters can be the drivers of economic growth and act as institutions of social change. The following aspects need to improve in order to spur these changes: (1) more centralization of Mexico's industrial objectives with regional scope; (2) the improvement of regional assets represented in a knowledge-driven labour force; and (3) push toward more knowledge-intensive industry activity that is more equitably distributed throughout Mexico's states.

2.1 Triple Helix & Traded Clusters as Geographical Units of Analysis.

Mexico's regional development shows asymmetric patterns where not all states enjoy similar economic growth (Pattinson and Duran 2016). These asymmetric patterns also translate to the way industrial agglomerations are concentrated in the country. This research evidences that industrial concentrations i.e. clusters, are primarily in states that are more industrially advanced and that enjoy proximity to the US market (Pattinson and Duran 2016). The previous examination of the state of Mexico's competitiveness observed the growth of the country's economy in macro-economic terms. An economic growth partly because of the country's reforms, membership in NAFTA and the previously discussed location advantages. The latter is a chief cause behind the country's propensity towards industrial agglomerations of industry competitors within a specific area (Porter 1998; Porter 2000). However, can all industrial agglomerations in Mexico have the definition of industrial clusters?

The literature findings suggest no; formally organized clusters go beyond the grouping of industry competitors within a specific geographical area and encompass institutional driven support. It is precisely why; this research has concentrated on two notions of clusters, one being the formally organized notion or "Triple Helix" as defined by the European Union and the one labelled as "Traded Clusters" (Etzkowitz 2014; Hennig 2015). These geographical units of industrial agglomeration are only two of the broad range of industrial agglomerations making up the country's industrial landscape. Triple Helix enjoys a synergy of institutional support where knowledge and innovation take centre stage and enjoy the coordinated network of public and private institutions where the government promotes knowledge infused activities likewise an engagement with civil society. While Traded clusters are ecosystems catering to foreign markets and with a wide range of industrial activity across a wide latitude of manufacturing activities. Traded ecosystems are also formed by traditional industrial segments, low-end manufacturing, and outsourcing activities. The latter is often defined as lacking the right institutional components as later explained in this thesis(Hennig 2015).

The analysis of these two definitions of industry agglomerations as units of analysis within Mexico's regions find two key facts; (1) an assessment of the impact of these two geographical units of localised industry activity in economic terms and; (2) an assessment the impact of ALPs as a proxy for social programs and the interaction with these two types of geographical units. Two facts which this thesis postulate could lead to economic growth while promoting regional development and improvement in Mexico's regional assets(Camagni and Capello 2013). In addition, leading these two to possibly act as institutional drivers facilitating a better regional response to national level policy objectives as it shall be inspected in this masters thesis. This research also links industrial clusters to increased levels of education and skills not only fosters industrial activity; it promotes higher levels of employment formality and social equality among Mexico's regions. Hence, promoting fair development (Abdel-Rahman 1990; Camagni and Capello 2013). Fair development will allow regional economies to more significantly impact their levels of national competitiveness while helping to reduce cross-regional disparities. Michael Porter regarding regional disparities posited that this phenomenon is felt more acutely in developing and emerging economies but is also present in advanced economies as the bulk of the countries' industrial output and wealth stems from the countries "regional champions"(Porter and Ketels 2003).

In the last ten years, Mexico has seen a surge across a broad latitude of industries such as renewable energies, engineering, manufacturing technologies, automotive, aerospace and biotechnology(ProMexico 2017a; ProMexico 2017c). All industrial segments where the selected geographical units play a key role in activities ranging from the low value-added outsourcing activities to the technology-driven manufacturing. The data observations point to the bulk of Mexico's Triple Helix and Traded clusters existing in the central and northern part of the country. The data shows the highest concentration of these two types of industry agglomerations living in the states of Baja California and Nuevo Leon. Regarding Triple Helix, Nuevo Leon has twelve ecosystems and Baja California has eleven clusters of this type in industrial sectors such as the automotive, aerospace, renewable energy and biotechnology (RECBC 2018; RVCNL 2018). Also, it is important to highlight that these two states also show among the highest concentration of Traded Clusters with sixty-four in Baja California and Sixty-Five in Nuevo Leon. Hence, these findings reiterate our initial assumption regarding the northern regions. Regional champions in Mexico house the most industrial capacity, thus contributing to foster marked regional disparities in Mexico. Also, it shows the influence of US value chains in regional agglomeration patterns across northern state-regions in Mexico.

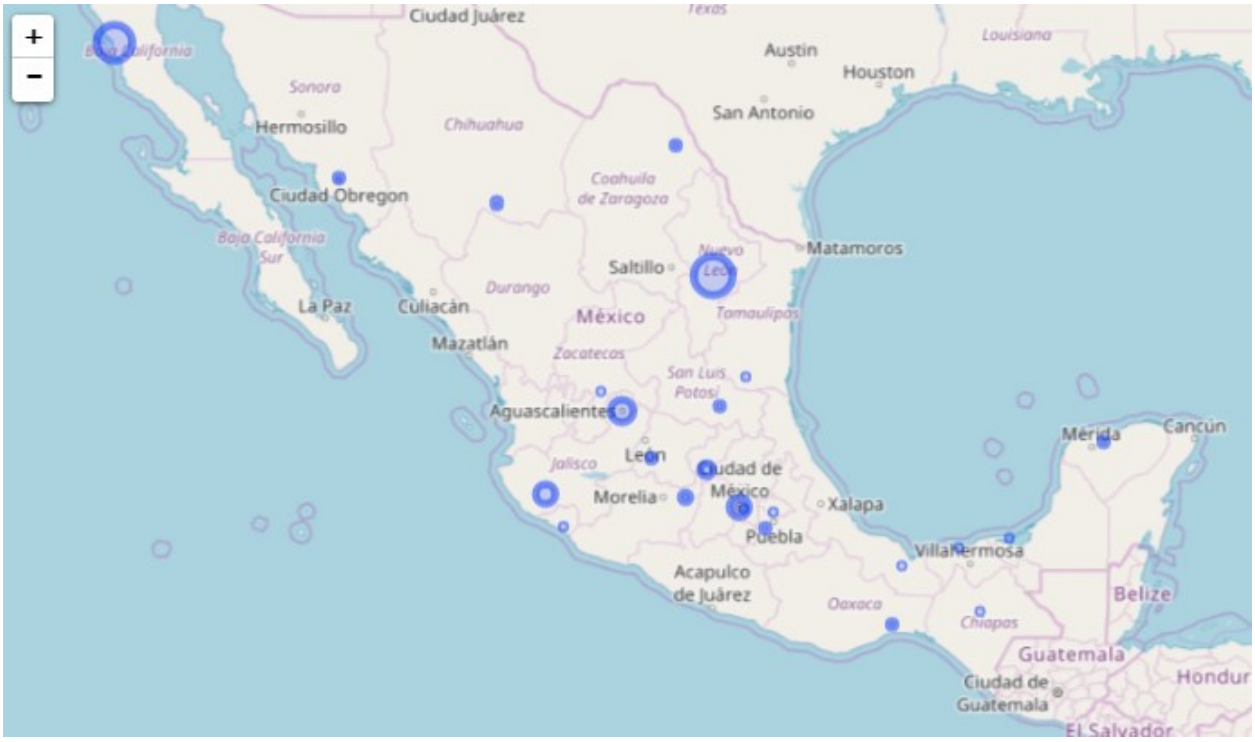

Figure 10: Source of Data: Eurepean Commission, Mexico's Geographical Location of Triple Helix Clusters.

2.1.1 Triple Helix Clusters

The definition of Triple Helix, as posited by the government of Nuevo Leon, is the alignment of government, state, academia and private institutions, to provide incentives to clustering activity (RVCNL 2018). The European Union (EU), through its division the cluster's collaboration platform, defines these ecosystems as integral in terms of regional development strategy (Etzkowitz 2014). The EU classifies these ecosystems as formally structured clusters with the right institutional elements. The latter according to the EU places strong emphasis on the active engagement of academia, think tanks and research centres as joint elements which promote knowledge infused activities, thus rendering these ecosystems into knowledge-infused clusters. According to the European Union, these types of clusters as ecosystems of productivity need further promotion and require government policy support in emerging economies such as Mexico. A strong governmental support system these ecosystems have to create an alignment of these institutional elements with civil society, which fosters regional development (Etzkowitz 2014; Pattinson and Duran 2016). According to the data from the European Cluster Collaboration Platform, Mexico has seventy-five formally structured clusters that fall under the Triple-Helix definition. The following map shows the concentration of Triple-Helix clusters per state as per the European Union data obtained for this thesis, see also figure 10.

The map on Mexico's agglomeration of Triple-Helix clusters shows that the states with the highest numbers of these ecosystems are Aguascalientes, Baja California and Nuevo Leon. These three states house the highest concentration of ecosystems with (30) thirty knowledge-driven agglomerations. Ecosystems where the alignment of institutional support of industries, higher education, and

government take place to advance innovation activities. The map validates the states and regional assumptions placing the southern part of the country as less industrialized. so, validating the first assumptions on the inequitable patterns of regional development in Mexico considered one driver for the study. Based on the data from the European Union and its Cluster Collaboration Platform this research looked at the regional distribution of Mexico for which it used the country's electoral distribution map from the Mexican Institute of Geography and Statistics (INEGI). This government agency divides Mexico's territory into five greater regions, this thesis uses this map as a point of reference in the regional analysis of the concentration of the two types of geographical units selected for this case study (see Appendix 1.1).

2.1.2 Traded Clusters

As previously stated Traded clusters in Mexico are mainly export driven and combined a mixture of traditional industries and manufacturing activities ranging from low to the high value added. Some of these ecosystems have the right institutional support but most lack the knowledge infused activities present in the Triple Helix ecosystems. Traded clusters agglomeration revolve around catering to other markets' demand thus speaking to the growth of Mexico's manufacturing sector(Etzkowitz 2014; Ketels 2003; Porter 1990; Porter 1998; Porter 2000). This sets the context, in which Traded Clusters take centre stage in the discussion of Mexico's economic performance and regional development patterns. The reason lies in the makeup of the Mexican economy as one export driven where the influence of its neighbour north influence its industrial agglomeration patterns. The data on Traded clusters show these geographical units concentrate across Mexico's states showing a much larger number that with knowledge-driven ecosystems. A fact, which speaks to the strong position of Mexico's manufacturing sector while also alluding to traditional industries and low value-added labour(Hennig 2015). The higher number of agglomerations defines Traded clusters as essential for economic growth and diversity in their industry composition The latter representing the diverse nature of the growth experienced by the Mexican economy during the prescribed period of analysis. It says traded clusters to evidence higher efficiency, productivity and wages while also linking these ecosystems to higher levels of knowledge spillovers that boost local, regional, and national economic development(Hennig 2015). The next section elaborates on what this research determined to be the six more relevant industrial sectors in Mexico out of the nine mentioned by ProMéxico. The following table shows key figures on the Mexican industrial segments for this study. It shows the size of the industry in monetary value and the various sub-segments.

Table4:Key Figures on Mexico's Industrial Segments

Ranking	Cluster Activity	Sub-segmnets	Industry Size
1	Automotive	Parts, Heavy and Light Vehicles	3% GDP
2	Processed Foods	Domestic Production	121.6 Billion
		Exports	8.25 billion
3	Electronics	Components and Devises	77.5 billion
4	Medical Devises	Equipment	13.3 billion
5	House Appliance	Electronic Appliances	7.85 billion
6	Aerospace	Parts and Components	7.1 billion
7	Information Technology	IT Services	7 billion
		Software	4 billion
8	Biotechnology		

Ranking	Cluster Activity	Sub-segmnets	Industry Size
9	Renewable Energy		

Source: ProMexico

Mexico's economy has been one of overwhelming growth compared to other economies in Latin America. This growth can observe this ascending trajectory in terms of GDP, foreign direct investment and industrial concentration of activity AKA clusters. The make-up of the Mexican economy is contrasting, on one side, comprising modern industries driven by technology while also having many industries that are outdated and labour intensive. This contrast leads to different levels of industrial output that then exacerbate the regional disparities. In Mexico, a significant part of the country's industries, cater to the US market and show high integration into US value chains. According to ProMéxico, the Automotive Industry shows as the leading industrial sector in the Mexican manufacturing sector with an industry size of 3% of the country's (GDP)(Pattinson and Duran 2016).

The first part of Chapter two disclosed key aspects of Mexico's economy and defined the two geographical units selected for this analysis. It not only emphasized the relevance of the Mexican economy, but it also showed the relevance of these two ecosystems in the growth of knowledge-infused activities and the country's manufacturing sector. The latter and the former areas that as postulated by this master's thesis could test the institutional role of our two units of analysis in supporting ALPs as social programs. Also, in facilitating a better regional response to national level policies by filling some institutional voids in less developed regions. The next section of this master's thesis provides a closer look at the industrial segments shown in this report while aiming to provide a more detailed picture of Mexico's main industries.

2.2 Mexico's Industry Segments

2.2.1 The Automotive Industrial Segement

The automotive segment is one of Mexico's leading industrial drivers and ranked number two and number one in Latin America. The segment's production as of 2017 surpasses that of Brazil by approximately one million units(ProMexico 2017c). In the last few years, Mexican output of exports of light and heavyweight vehicles reached new historic levels surpassing the internal production of other leading countries such as France and Spain, according to ProMexico. The output of the lightweight segment has grown at an average of 5.6% thus surpassing 3.2 and 3.4 million units in the last four years. The heavyweight vehicle segment grew about 13.1% in production. Therefore, reaching new highs of 190,978 units produced(ProMexico 2017c). Mexico has positioned itself in this industrial segment as a key producer of vehicles for the North American marketplace with the bulk of the country's exports destined for the US market and Canada. It is well-known for its outstanding quality and innovation, thus complying with the highest quality standards in the industry. Mexico has thirty-one industrial agglomerations all within proximity of the US border due to the segment's integration into the US Global Value Chains according to the European Union Cluster Collaboration Platform (See. Appendix 1.3). Appendix 1.4, reflects the three Mexican state-regions where the automotive sector has the highest number of companies per cluster. The state of Guanajuato has the highest concentration followed by the state of Chiguagua and Nuevo Leon(Pattinson and Duran 2016).

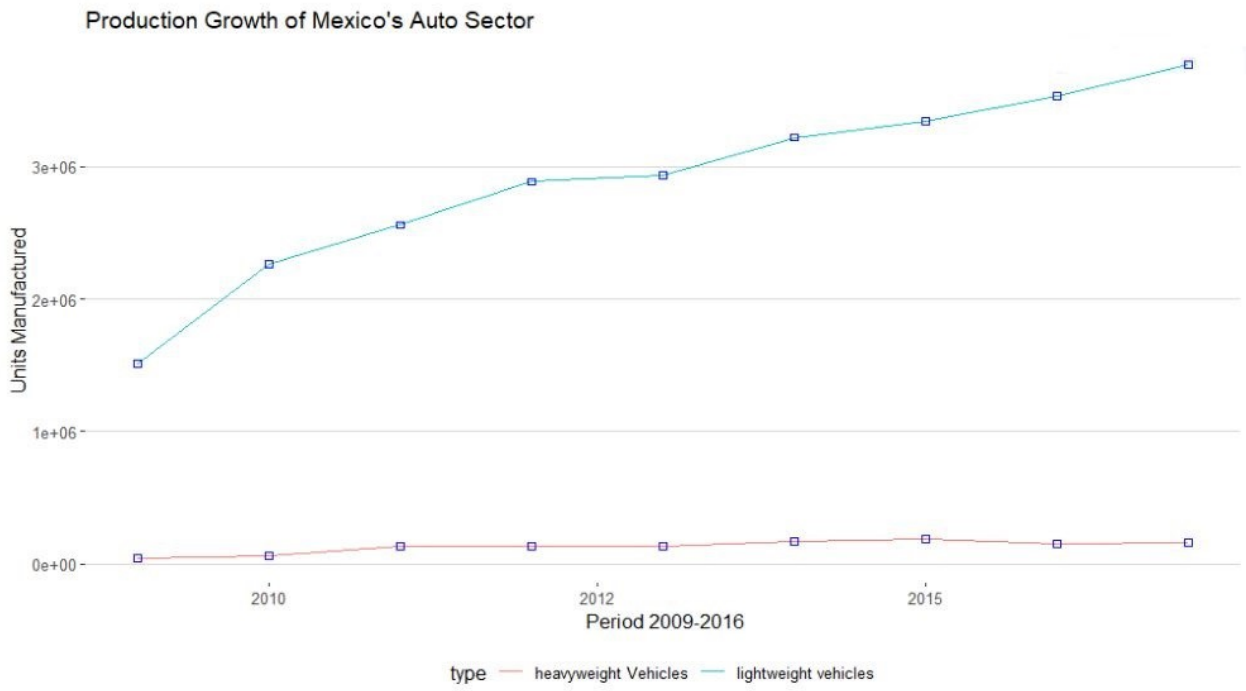

Figure 11: Source: ProMexico,The Growth in Production of Mexico's Auto Sector.

The leading automotive clusters in Mexico comprise 559 companies with the support of government agencies and academic institutions such as universities and technology institutes. Clusters, as industry ecosystems, also have supporting companies such as Tier 1,2 and 3, suppliers supporting manufacturing activities and providing logistical support within the network of companies. Mexican clusters include global manufacturing brands like General Motors, Mazda, and Volkswagen among others. These Industrial concentrations are well-integrated into ecosystems that manage the bulk of the country's manufacturing production in this industry segment(Pattinson and Duran 2016). Let us take a look at number numbers measuring the production of vehicles in Mexico since 2009. Figure 11: gathers data from ProMexico, the EU and Forbes Mexico.

The above line-chart on the growth of the Mexican automotive production by industry sub-segments separates the output in heavyweight and lightweight vehicles. The chart is taking into account the period between 2009 and 2017; showing the highest growth in production taking place in the lightweight vehicle segment, almost reaching 4 million units manufactured. The output of heavyweight vehicles in the country is not as dominant when compared to the lightweight sub-segment. However, the segment exports an average 80% of its production to the United States and Canada and has shown significant growth in percentage. Besides, during the prescribed period the output of heavyweight vehicles increased from forty-three thousand in 2009 to one hundred and fifty-seven thousand in 2015 thus showing an accumulated increase of 265%. Although the last two years in the heavyweight sub-segment according to the data shows a decline, this sub-segment growth outpaced the percentage growth of Mexico's lightweight sub-segment. Traditionally, Mexico's leading automotive production sub-segment. The line-chart below better provides a comparison of these two sub-segments regarding percentage growth. A data graph of the growth trajectory using the log data values for the number of units manufactured during the prescribed period of analysis.

It shows that while the lightweight sub-segment has remained dominant with high production values and sustained production in percentage terms. The heavyweight sub-segment thus evidences a higher percentage growth although production numbers remain low compared to the lightweight segment. The most significant growth in the heavyweight sub-segment took place between 2009 and 2011 with a slight increase in percentage growth until 2015, and a declined in the last two years of the prescribed period (see, Appendix 1.2).

Mexico's auto exports during the prescribed period show most of the country's production is export driven. In the lightweight sub-segment, exports account between 60% to 80% of the country's production output. In the heavyweight sub-segment, this percentage has reached 100% of production destined towards the export market. In the Lightweight subsequent exports in 2009 were one million two-hundred and twenty-eight thousand units and in 2017 this number reached almost 3 million. Figures which reflect an accumulated percentage total of 140.23% growth in exports. While the exports of Heavyweight during the period reflected growth in exports of 149.42%, in 2009 exports in this sub-segment where 43, 000 vis-a-vis 107,250 at the end of the period. The following chart shows the percentage of growth in this industry sector in the previously described categories (see, Appendix 1.3). The export's log data shows similar findings to the ones from the sector's production figures. The findings show that while the lightweight sector in the percentage of exports has remained dominant, the heavyweight sector has shown a higher percentage growth in exports, mainly during 2009, 2010 and 2011 showing its peak in the year 2015. At the same time, the line-chart shows a decline in exports in the heavyweight sub-sector which is congruent with the decline in this subsector's production in the last two years of the prescribed period (see, Appendix 1.5).

The growth of Mexico's auto sector is due to crucial international car manufacturers placing assembly lines in the country. Well-known brands like Audi, BMW, Fiat-Chrysler, Ford, General Motors, Honda, Mercedes Benz and Volkswagen are present in 23 productive centres located across twelve state-regions. In these production centres, over fifty models undergo production. This localized industrial activity also encourages other supporting industry sectors like the auto parts sector thus being conducive to industrial agglomeration or clustering. An example of this is the automotive cluster of Aguascalientes where Nissan Aguascalientes handles production for the North American market mainly the United States and Canada. The automotive, industrial sector in Mexico makes up 19.9% of the FDI totalling almost 6.4 billion. The acceleration of the automotive industry in Mexico likewise increase levels of Foreign Direct Investment, increasing Mexico's industrial strength. According to ProMéxico, the findings of this brief sector overview reveal that out of the twelve primary states with high levels of automotive industry activity, in six states, there is a strong presence of Triple Helix clusters (See. Appendix 1.6).

According to ProMexico, Mexico exhibits essential advantages facilitating the agglomeration of industrial activity and operations of companies in the automotive sector across Mexico's vital regions. (1) Cost competitive advantage: compared to the EU Mexico offers a cost advantage of 12.3% in manufacturing savings of auto parts, 9.8% in precision components, 15.2% in plastics raw materials, and 16.3% in metal components (ProMexico 2017c; Wiebe 2016). (2) Mexico's Industry Experience: the automotive industry has sustained industrial activity in Mexico since 1921, therefore ranking the country as one with vast experience in the industry not only in Latin America but globally. (3) Ample Network of Suppliers: Mexico counts with a wide-ranging network of assembly lines representing the most valuable brands in the automotive industry due to factors such as quality and operational cost advantages. (4) Human Capital: According to figures from the National Institute of Geography and Statistics, the Automotive industry employs over 875,383 people across the twelve states where there is industrial activity. Also, a significant percentage of the engineers used in the

industry are proficient in English as a second language (IMCO 2016).

The brief analysis of Mexico's automotive sector shows the importance of this industrial sector as a leading one in the country. It also validates the influence of clusters of the type of Triple Helix and Traded clusters in facilitating the agglomeration and operations of industrial activities in the sector. This observation relates to the benefits these ecosystems play in the following areas; (1) productivity, efficiency, and innovation; (2) access to skilled human capital; (3) supporting industries and; (4) technology. The next sub-sector overview discussed is the airspace industry due to the substantial growth in activity this sector has seen over the last few years in states such as Queretaro.

2.2.2 The Aerospace Industrial Segment

The aerospace industry in Mexico ranks among the top three significant sectors in Mexico's most industrialized regions. Mexico's industrial base in the last decade categorizes the sector as a profitable investment, an area which has reached three billion in capital invested and is expected to continue growing. In fact, in the next five years employment in the segment is expected to generate thirty-five thousand new jobs. In Mexico, there are over 200 aerospace companies undertaking manufacturing activities with some employers reaching two-hundred thousand employees (Haytko, Kent, and Hausman 2007).

The country's aerospace industry is a new industrial event in Mexico. However, the state of Baja California had seen manufacturing activity in the sector for close to sixty years, and the industry represents one of the primary industrial segments in the state's economy. From 2013 to 2015 exports grew by twenty percent, job-creating reached sixty-three thousand jobs while drawing 6 billion in Foreign Direct Investment in 2015 (Cardenas 2017). This surge in industrial activity links the low-cost of manufacturing with human capital availability. In fact, today Mexico's industrial development can produce every component used in an aircraft assembly line (Cardenas 2017). The relevance of this industrial sector follows the Mexican government plan aim to increase and improve the country's design, development and engineering output. Thus referring to the country's comparative advantage regarding labour which gives the country a substantial competitive edge (Maquiladora 2017).

One area of higher growth within the aerospace sector is it's supply chain and production. The number of companies in this segment saw a sixty-five percent increase since 2009. With Quebec's company Bombardier to the state of Queretaro, it encouraged other international firms to view Mexico as an appealing destination (Maquiladora 2017). These events led the Mexican government to create programs to promote employment opportunities, provide business incentives and training programs. The federal government has called this effort "Triple Helix," not only fostering the agglomeration of industrial activity in this industry sector but also calling for the collaboration of the private sector, government and academia (Cardenas 2017). The above-stated industry findings reveal that while Mexico in the aerospace segment is prone to clustering, not all industrial activity in this segment constitutes industrial clusters as this segment is divided between a network of maquiladoras and well organized structured Clusters according to the EU cluster collaboration platform. The following table provides a summary of the most important facts about these industrial segments as discussed in this section.

Table5:Key Figures About the Mexican Aerospace Industry}

Aerospace Key Industry Facts	
Categories	Commercial & Military
Exports Growth	14% per year
Exports Value	7.2 billion USD
Imports Value	5.9 billion USD
Companies in Operation	330
Main Exports	Parts & Components
Cost Advantage	15.8% less than other advanced economies

Source: ProMexico

According to ProMéxico, the Mexican aerospace sector divides companies' activities by primary tasks including manufacturing, maintenance, repair, engineering and design. There are auxiliary services created by airlines, including testing laboratories, and training centres. All of these tasks and services are primarily destined for commercial and military aviation. The country has positioned itself as a leader in the aerospace sector with exports growing 14% on average between the periods of 2010-2016. In 2016 export figures reached almost 7.2 billion while imports reached close to 5.9 billion, thus showing a trade surplus (ProMexico 2017b). In the country, there are 330 companies as supporting industries of which most of them have NADCAP and AS9100. These companies concentrate primarily within five state-regions of the union and according to the Ministry of Economic Affairs accounts for forty-five thousand jobs. The following graph will show the growth of companies supporting the aerospace industry in the periods between 2010-2016. Mexico's leading exports within the segment are parts and components which for international companies outsourcing operations in Mexico represents a comparative advantage regarding cost. Parts and components manufactured in Mexico are 15.8% less in price than parts produced in the United States and other industrialized nations. The following chart will show Mexico's comparative advantage vis-à-vis other industrialized nations:

The cost advantage passed to companies operating in this sector, coupled with the country's efforts to improve the sector's manufacturing capabilities, constitute part of the country's competitive advantage. These are two of the main factors supporting the surge in the segment's industrial activity. Mexico migrated from the production of components and small parts to the manufacturing of airframes, flight surfaces and controls. In fact companies like Aernova, GE and Rolls Royce are working in Avionics and turbine systems (Cardenas 2017). Fokker Aerostructures is also manufacturing wings for jets, and the Safran Group have seven facilities in the state of Queretaro. The latter is manufacturing landing systems, engine parts, jet engine components among other components. It is that the Mexican government projects to attract the production of large commercial aircraft over the long-term (Cardenas 2017).

Among the sector's strengths in Mexico is the logistical aspect because of the country's integration with US Value Chains, the country's manufacturing experience in other technological sectors, the country's reliability in its quality assurance processes and cost. The country shows industrial clustering in this segment in the following states; Baja California, Chihuahua, Nuevo Leon, Queretaro, and Sonora. It applies to mention that as opposed to other industrial segments where industrial clustering is present in Mexico. The findings showed that all the clustering activity in the aerospace sector develops under a "Triple Helix" knowledge infused principle with significant institutional support. Table 6, shows the states in Mexico where industrial activity in this industry sector concentrates. Triple Helix clusters have a strong influence the technological innovations and

advancement of research and development. The literature findings revealed by this research show the aerospace industry enjoys this method of clustering in particular (RVCNL 2018; Pattinson and Duran 2016).

Table 6: Ranking of the States with the Highest Levels of Industrial Activity in the Aerospace Industrial Segment.

States with the Highest Industry Activity
Baja California
Chihuahua
Nuevo Leon
Querétaro
Sonora

Source:ProMexico

Table 6: shows the most important Mexican states where the Aerospace Industry concentrates. Out, of the five states shown the one that in the last few years gained important relevance is Queretaro because: 1,) the development of Triple Helix clusters. 2,) the expansion in operations in the major airplane and helicopter manufactures such as Bell Helicopters.

2.2.3 The Electronics Industrial Segment

Mexico's electronics segment originated with the establishment of the "maquiladora" system to take advantage of Mexico's cost advantage and facilitate cross-border transactions mainly within proximity to the US border. In this context, the state of Baja California takes importance since there is a high level of concentration in this segment(RECBC 2018; ProMexico 2017c). Since the signing of NAFTA, the establishment of well-known manufacturers has turned Baja California and Mexico's northern regions into highly technical ecosystems of productivity and efficiency in this segment. Where? Mainly all production is for the export market. This industrial segment makes up five sub-segments (1) audio-video, (2) home-office computers, (3) semiconductors and communication, (4) medical equipment and precession instruments and (5) navigation systems. These industries related areas offer Mexico the ranking of number 8th producer of electronics globally and the first one among Latin America Countries. Let us look at the production and exports of electronics in Mexico from 2009 to 2016 (see, Appendix 1.7).

The data shows the production and exports of Mexico's electronics segment during the prescribed period of 2009-2016. It reflects a decline from roughly 85 billion in 2010 to 72.2 billion in 2014. However, it notes that in the period between 2015 and 2016 Mexico's production levels rebounded to 79.5 and 77.5 billion approximately. Regarding exports, the same period reflects a moderate increase from 57.2 billion in 2009 to 71.7 billion in 2016 according to ProMéxico. The highest recorded year for Mexican electronics exports was 2014 with 76.4 billion in exports. The Mexican electronics segment is very competitive, and products manufactured undergo the highest levels of quality standards. In Mexico out of all the electronic devices produced, the highest penetration in the export market are computers, flat screen TVs and cell phones where vital global manufacturers have facilities across various Mexican state-regions. Overall the segment's production performance evidenced an accumulated growth of 41.43% and 25.33% in exports during the prescribed period.

Two figures which signal that although this industry segment remains an export-driven market, it also shows patterns of internal consumption of the products manufactured in the country (see. Appendix 1.8).

This industry segment is competitive in sub-segments such as consumer electronics positioning the country as one of the leading global exporters. In 2015 the country ranked as the number one exporter of flat-screen TVs surpassing Asian nations. In the segment of computers, Mexico is number fifth globally. According to the Mexican Ministry of Economic Affairs and the National Institute of Geography and Statistics, the highest agglomeration of industrial activity in the segment concentrates in the state-regions of Baja California, Mexico City, Chihuahua, Sonora, Nuevo León and Jalisco. The total number of business units in this segment surpassed 766 with a total employment number near 291,000 jobs throughout the country (ProMexico 2017c). Another important aspect of this industrial segment is the impact it has in attracting Foreign Direct Investment. According to Mexico's secretariat for economic affairs, the estimation is that between 2009 to 2015 this segment drew almost 7.7 billion in investment, mainly in communication equipment. The leading countries from where this FDI originates are the United states-regions, Netherlands, South Korea, Sweden and Japan. The following table outline the states where industrial agglomerations activity in this segment take place and also the states where formally organized clusters according to the "Triple Helix" or knowledge infused concept concentrates, also, see table 7.

Table 7: Comparison Table of States with Industrial Activity in the Electronics Segment & States with Triple Helix clusters.

Agglomeration Activity	Formally Organized or Thelix
Baja California	Aguascalientes
Chihuauhua	Jalisco
Maxico State	Nuevo Leon
Jalisco	
Nuevo Leon	
Sonora	
Tamaulipas	

Sources:(Promexico, European Cluster Collaboration Platform)

Mexico's electronics sector according to ProMexico has proven to be one of the early precursors of industrial agglomerations in the country. It continues to be one of key relevance to the Mexican economy and contributes to Mexico's position as a leading exporter. The structural reforms adopted by the Mexican government in the last two decades and Mexico's improvements in technology have led this sector's growth. A growth that can further influence the nation's patterns of regional development as Triple Helix ecosystems experiences higher penetration throughout Mexican regions. A projected reality that would show less regional disparities across Mexico's regions, higher penetration into global value chains, and improved competitiveness. However, for this to happen, an increase in interaction between the government's institutions and clusters to further promote economic growth would need to take place., the unification and coordination of industrial policy, in which it improves social programs, would aid human capital development across Mexico's regions. These improved would support industrial agglomerations i.e. clusters and would promote their role as formal or informal institutions of economic and social change.

2.2.4 The Biotechnology Industry Segment

Mexico as a nation is ranked fifth regarding biodiversity, and it has a long-standing tradition in biological research. The country's commercial biotechnology activity is the most diverse in the segment according to ProMéxico, 180 companies developed and used modern biotechnology in 31% of agricultural businesses, 23% in environmental applications, and 18% in healthcare. Large multinational companies in the sector operate in Mexico developing biotech products for agricultural activities. The country experienced significant growth in biotechnologies in health care, marine resources and energy. Therefore, these areas are enjoying modernization and innovation programs, involving research institutions and private industry (ProMexico 2017a).

Mexico's Biotechnology segment ranks one of the ten most competitive according to "the Guide for International Business Location" done by KPMG consulting group (Wiebe 2016)The sector in Mexico has great potential for growth because of elements mentioned like the country's biodiversity, skilled human capital and its international cost advantage. In the last few years, Mexico has ranked as the fifth largest supplier to the US, surpassing countries like China, Japan, Singapore and India (Wiebe 2016). In Mexico, there are 400 biotechnology companies of which 33% are in human health care, 19% in industrial applications and 14% in food solutions (Wiebe 2016; Pattinson and Duran 2016).

Table 8: outlines the main sub-sectors within the biotechnology segment according to the respective percentage of industrial activity within the sector:

Sector Subsegment	Percentage of Activity
Human Health	33%
Industrial Applications	19%
Food Solutions	14%
Environmental Applications	13%
Agricultural Soluctions	12%
Animal Health	8%
Other	1%

Source: ProMexico

In Mexico, the industrial clustering activity in this sector takes place in eight state-regions as per data collected from the European Union Cluster Collaboration Platform and ProMéxico. However, organized clusters take place only in three out of these eight state-regions.

Table9: outlines the state-regions where industrial agglomerations in this segment take site and also the state-regions where organized clusters according to the "Triple Helix" or knowledge infused concept concentrate.

Agglomeration Activity	Formally Organized or "Triple Helix Cluster"
Baja California	Nuevo Leon
Guanajuato	Queretaro
Jalisco	Campeche
Campeche	
Queretaro	
Nuevo Leon	
Mexico	
Morelos	

The most important cluster organizations in the biotechnology segment are in the Bio cluster of Nuevo Leon and the Biotechnology Cluster of Queretaro. The biotechnology cluster of Nuevo Leon has twenty-five active members, twenty-one taking part companies and four universities and government agencies. Its main mission is to support the transfer and commercialization of new technologies so that products originated in Mexico biotechnology segment meet international market demand. The Biotechnology cluster of Queretaro has thirty-five members and include the collaboration of companies, universities and government entities as an integral part of this ecosystem's operations. This Cluster's main mission is to create a cooperation network which could speed up innovation in health and environmental solutions. An important mandate that furthers positioning Mexico as a global leader in the Biotechnology sector(ICluster 2018).

Mexico's strengths in the Biotechnology sector are because of its human capital and the cost advantage regarding operations, research and development. Mexico has over one hundred and thirty universities with six hundred and fourteen study programs related to the Biotech field. Also, the country has over eight thousand five hundred researchers working in the area according to ProMéxico, industry segment's figures. It also counts with ninety institutions of higher education offering over three hundred graduate programs in biotechnology, biology, biomedical engineering, biochemistry and genetics (ProMexico 2017c).

The strength mentioned above it couples with access to high caliber research centres. For example, in Guanajuato, several institutions carry out research on biotechnology, including the National Genomics Laboratory for Biodiversity (LANGEBIO), an institution which ranks among the most important centres for sequencing in the world. Biotechnology activities revolve around the analysis of plants, animals and microorganisms for the potential applications in agriculture and medicine. In Nuevo Leon, the Technological Institute of Higher Studies of Monterrey (ITESM) has a Biotechnological Center which integrates programs in chemical engineering, Agro-biotechnology, biology and biomedicine. In, Morelos The National Autonomous University of Mexico (UNAM) is the institution that leads the cluster of life sciences in the state, having a Biotechnology Institute specializing in plant molecular biology, molecular medicine and biotechnology, and a Centre for Biotechnology likewise Genomic Sciences.

Intellectual property laws are other of the relevant aspects making of Mexico fertile ground for the biotech sector. Based on data from the World Intellectual Property Organization (WIPO), it is said the number of patents' filings in the country has grown at an average of 1.3% per year on average

(ProMexico, n.d.). Last, Mexico's location advantages further close the circle making of Mexico an attractive location for industrial activity in the Biotechnology sector. Its geographic positioning allows considerable savings in Logistics, and quality assurance processes, not to mention the growing number of markets available for exports. The latter because of the Mexican government's ability to expand free trade by engaging in bilateral and multilateral trade agreements (ProMexico, n.d.).

The literature and concentration of industrial activity in Mexico's Biotech sector not only validates the relationship between industrial capacity and technology. It also ratifies the segment's link to regions where Triple Helix ecosystems are present as drivers of institutional support, and knowledge innovation. Just as the Electronics Segment in Mexico, the country's Biotech industry could experience further growth and proliferation of knowledge infused ecosystems across Mexico's regions. A projected reality that in regional disparities could further promote regional economic and social equality.

2.2.5 The Renewable Energy Clusters

The Mexican renewable energy market emerged because of Mexico's structural reforms in the last decade. The General Climate Law enacted in 2012, affirmed Mexico's willingness to create clean energy sources. It set clear targets for this sector's industry growth and nuclear energy objectives by the year 2024 and 2050. Mexico's central government committed to producing thirty-five percent of its energy from clean sources by its first target and fifty percent by its second target. Likewise, it also placed a strong emphasis on reducing gas emissions by thirty percent within the first ten years after the enactment of this legislation. The country's policy commitments are part of the country's *National Determination Strategy* tabled at the Paris conference in 2015 (Export 2017). With these policy initiatives, Mexico has become a leader in Latin America by liberalizing the energy sector, enticing future technology development in the industry and creating competition to foster innovation (Export 2017).

Another aspect to the highlight of Mexico's reformed legislative framework is "La Ley para el Aprovechamiento de Energias Renovables y el Financiamiento de la Transition Energetica." The Law for the use of renewable energy and financing of the sector's transition towards a cleaner energy market (LAERFTE) enacted in 2008 was the beginning of the government transition towards the active promotion renewable energy sources and clean technologies. It is also noteworthy to highlight to highlight that besides the Federal framework, related legislation passed at the state level. Nine states have their regulations on the use of cleaner forms of energy. There is a project financed by the European Union to promote the reduction of Carbon emissions in the Mexican business sector "The Low Carbon Business Action in Mexico". Therefore, encouraging Mexican Clusters and companies to establish cooperation agreements in areas such as energy efficiency and waste management initiatives (Pattinson and Duran 2016).

Evidence of this policy impact saw further growth at the end of 2016. In fact, according to ProMéxico, the installed capacity for the production of renewable energies grew 10.2% concerning previous years, likewise 15.4% of the total energy produced in the country stemmed from cleaner energy sources (ProMexico, n.d.). In fact, based on the most recent report from the National Inventory of Renewable Energy Sources. The Mexican production potential for clean energy is of 13,167 GWh per year (ProMexico 2014).

Table 10: Estimation of the country's future production capacity in the sector to the year 2028.

Energy Source	2018	2024	2028	Market Share
Wind	7608	10260	11585	59%
Geothermal	178	258	338	2%
Bioenergy	92	494	671	3%
PV Solar	503	1941	3121	16%
Hydro < 30 MW	110	352	502	3%
Hydro > 30 MW	1230	3017	3544	18%
Total	9761	16322	19761	

Source: Renewable Energy Prospects 2014-2028 (ProMexico 2014) (Ministry of Energy)

The table above shows the projected growth of the six areas that in the renewable energy sector will attain by the year 2028. The analysis of these figures shows the Bioenergy segment experiencing a projected growth of 629.35% in the next decade, followed by the PV Solar with an estimated projected growth of 520.48%. The other segments within the sector evidence a projected growth of 356.36% in the generation of Hydro energy of over 30 megawatts and 188.13% in the generation of fewer than 30 megawatts capacity. Wind and Geothermal energy production will see a projected growth of 52.27% and 31.01% respectively. According to the Ministry of Energy and ProMéxico.

Table 11: Findings and the future growth of the sub-sectors in Table 10.

Energy Source	2018	2028	Segment Growth
Geothermal	258	338	31.01%
Bioenergy	92	671	629.35%
PV Solar	503	3121	520.48%
Hydro < 30 MW	110	502	356.36%
Hydro> 30 MW	1230	3544	188.13%
Win	7608	11585	52.27%

Source:Renewable Energy (ProMexico 2014) (Ministry of Energy)

After the government's structural reform, the renewable energy sector has seen a noticeable increase of transnational companies wanting to invest in Mexico, as they consider the country an attractive destination. Key companies developing projects and equipment providers have established operations in Mexico while others are preparing small-scale projects in the areas of manufacturing and commercialisation of renewable equipment. The above is not only taking place because of the country's liberalisation of the energy sector but also considering the country's sectoral advantages. Mexico is a leader in manufacturing power generators and towers. In fact, in power generators, US companies like Dynamik and Kontroll have settled in the state of Jalisco. While companies like Trinity, Tubac and Enertech are producing Aeolic towers for the domestic market. Mexico is also an essential player in manufacturing components for the Aeolic segment with companies like Kaydom and Liebherr that have a strong presence in the country. The facts mentioned above combined the country's vast industrial experience, human capital and cost advantages make of the Mexico renewable energy sector and attractive industry to Foreign Direct Investment. Mexico renewable energy sector since the industry's liberalisation has seen rapid industrial agglomeration. In fact, according to ProMéxico, in the Aeolic segment, there is industrial agglomeration in 18 states.

While the renewable energy industry in Mexico has seen exponential growth in the last decade, industry agglomerations or structured clusters of the Triple Helix type will take more time. This delay may serve as a constraint in the Mexican development of innovative technologies in this sector. According to the European Union and the European Cluster Collaboration platform, there are only two clusters under the "Triple Helix" concept, one in the state of Coahuila and then another one in the state of Tamaulipas. However, the expectation is that with time, an increase in production capacity and higher levels of Foreign Direct Investment. All combined with the already strong government support and higher competition levels structured clusters will increase in the next decade.

2.2.6 The Processed Foods Segment

The processed food industry makes up another important sector in Mexico's industrial activity and represents a significant part of the country's exports. It composes this segment of essential sub-sectors such as grains, seeds, oils, cacao, fruits, processed vegetables, processed meats, poultry, fishery and bread. This industrial segment exports to over 40 countries where Mexico has bilateral trade agreements in place. The total production for this industry segment as of 2016 reached 104.8. billion in US dollar figures. The primary destinations of these food products are the United States' regions, Japan, Canada and Guatemala totalling 71.1% of this segment's exports. According to data from ProMéxico Mexico's production and exports of processed foods during the period 2009 to 2016. The data shows the growth and recent decline in the prepared foods' levels of production, yet it also shows a steady increase in the industry's levels of exports. Regarding production in 2009 this industry segment manufactured goods for an estimated value of 96.5 billion USD, the growth in production peaked in 2013 with 137.8 billion in production. Since 2013, this segment's level of production declined to reach 104.8 billion in 2016. The level of exports has flourished reaching about 8.3 billion in 2016 from almost 5.4 billion in 2009. The findings from the data suggest that while the processed foods industry in Mexico it is prone to Clustering activities. The percentage ratio of this industry segment's levels of domestic production and its exports. Shows that most of the internal output is primarily for internal consumption. Another critical aspect to highlight is that as opposed to the automotive, and electronics industry where a lot of multinational companies have operations in Mexico. In, this industrial segment, this research revealed domestic companies primarily dominate the processed food industry in the country.

Table 12: the main Mexican corporate entities in Mexico capturing the bulk of the country's industrial activity in the processed foods segment

La Costerna	Milk Producers	Industrial Bachoco
Grupo Bimbo	Alfa-Sigma	Grupo Bafar
Grupo la Moderna	Grupo Industrial LaLa	Grupo Minsa

Source:ProMexico

The following table outline the main states where agglomerations of compnaies concentrate in this undustry segement.It also will show the breakdown of this segment's foreign direct investment per state.

Table 13: states where agglomerations of compnaies concentrate & the breakdown of this segment's

foreign direct investment

States of Clustering Activity		States Recipients of FDI	
State	Number of Business Units	State	Foreign Direct Investment
Mexico State	24926	Baja California	235.7 Million
Puebla	17415	Mexico City	140.7 Million
Oaxaca	15748	Mexico State	135.9 Million
Veracruz	11941	Jalisco	123.6 Million
Mexico City	11813	Queretaro	39.1 Million
Jalisco	10794	Chihuahua	18.6 Million
Michoacan	9654	Michoacan	16.5 Million

Source: ProMexico

The overview of the Processed Foods sector suggests that while this sector is prone to clustering industrial activity in the above-stated regions, this sector displays only one cluster falling within the "Triple Helix" category dedicated to Agro-food activities. A fact which speaks to the manufacturing and export-driven nature of this industry segment reflected in the number of Traded Clusters in the industry. It also shows that while Foreign Direct Investment in other high-tech sectors is export driven, the Processed Foods sector has inward patterns of Foreign Direct Investment, meaning it concentrates on the demand of Mexican domestic consumption.

Section 2.2 of this master's thesis provided a brief description of Mexico's most relevant industrial segments such as Automotive, Aerospace and Electronics. No to mention other relevant industrial areas such as the Biotechnology and Renewable Energy segments that in the last years of the prescribed period of analysis experienced substantial growth. The overview of these industrial segments provided a picture of the industries serving as drivers of industrial agglomerations AKA industrial clusters. All where the two ecosystems here mentioned assumed to play an important institutional role facilitating a better regional response to national-level policy objectives. It provides also a validation of the assumption suggesting the influence of U. S value chains in the patterns of industrial agglomeration in Mexico showing most of these industries locate from the centre to the northern Mexican regions. The overview of these industrial segments and the regional concentration of industrial activity in the areas before mentioned. It set the basis of our analysis by assuming these regions and the concentration of our two geographical units could help fill the void present in national national level policies. In brief, as this inquiry will later test it allowing the two types of industrial clusters here under analysis provide institutional support to ALPs as social programs. As mentioned earlier in the roadmap for this master's thesis, the next chapter will provide a comprehensive review of the literature on international competitiveness and industrial clusters. At the same time, it will build on key literary sources to construct the literature model justifying our proposed argument of clusters as institutions while also speaking to the relevance of this master's thesis hypothesis.

Chapter two divided into two sections, the first one discussed the advantages and constraints of Mexico while defining the two industrial agglomerations selected. The second part summarized Mexico's main industrial segments and how important these segments are for industrial clustering activity. The lessons learned in the first part of the chapter showed that a complete transition towards a fully developed economy is hindered in an environment where institutional voids are present. This sections highlighted relevant themes such as education and infrastructure as key areas of development that as stated earlier concentrate industrial activity in wealthier regions. The

second part of chapter two teaches us that although Mexico's economy has advanced in terms of knowledge-infused activities. Low-end manufacturing activity still dominates the bulk of the country's production and export capacity. A key finding that has postulated in this research requires further policy changes and an augmented competitive dimension. One national and the other regional that can be reciprocal, thus bringing in line global, national, and regional policy objectives. The next chapter of this research project delves further into the competitive debate covering relevant literary sources shaping the past and current competitive debate. Helping frame these research intentions of placing clusters as institutions of national-regional economic development.

Chapter 3: Literature Review

3.1 International Competitiveness: A Theoretical Approach

The literature suggests international competitiveness continues to be of interest among firms, academics, politicians, and international institutions. Its importance has transformed with globalization, its effects on the state, domestic firms, foreign firms and industries. Despite its ample acceptance, international competitiveness is one of the most misunderstood concepts, in the realm of economics, and government policy (De Grauwe 2010; Krugman 1994). The term is inclusive and requires a close examination of the different levels of competitiveness: the product, the firm, industry, state and regional trading blocs (Olczyk 2016). Amid this uncertainty on the topic's definition scholars Cellini and Sochi 2002, argue the vagueness of the topic because of factors relating to the uncertainty of "indicators" (Cellini and Soci 2002). These two scholars echo Paul Krugman's sentiment on the elusiveness of the topic itself. In one of Krugman's texts "Competition: A Dangerous Obsession" he points to the term as empirical, one which has often been conducive to wrong economic policies, and inequalities (Krugman 1994). Regardless of the novelty of international competitiveness, earlier theoretical writings have influenced the topic and had an inspirational role on economics, theoretical frameworks, and the necessity to analyze why some regions and companies succeed while others fail (Porter 1979; Porter 1990).

The literature points to the term competitiveness as one that traces back to the writings of philosopher Adam Smith (Olczyk 2016). Smith's work on trade as a factor in the state's wealth marked the onset of the industrial revolution and points to modern capitalism. It served as the basis for later theories on trade and economics as later discussed in this section. The most important aspects of his work were his postulates on the division of Labour, efficiency and free market (Smith and McCulloch 1838). The literature suggests David Ricardo, Heckscher, Ohlin, and Michael Porter, built upon Smith's precepts to further contribute to the analysis of economics, production, trade and competitive issues. In fact, it spoke to specialization and free exchange as the pillars of classical economic thought. His writings on the "Division of Labor" are of great importance on wages and David Ricardo's later work on the theory of comparative advantage. The postulates on comparative advantage have been an important topic of debate in areas such as international trade, the establishment and dispersion of production networks, and in the global commodity chains debate (Bair 2005).

David Ricardo made further contributions to labour productivity, production cost, and price among industry competitors, as further support to his work on "comparative advantage" (Moon 2000). Ricardo's work on comparative advantage was a dominating force in the competitive debate until Raymond Vernon's work on "The Product Cycle Hypothesis". but, his comparative advantage postulate remains valid in the international competitive debate, mainly within the realm of global commodity chains (Bair 2005; Gary Gereffi 1999a; Vernon 1966; Vernon 1979). In addition, the precept of comparative advantage has been present in Michael Porter's work on competitive advantage of the firm, industries and nations (Porter and Advantage 1985; Porter 1990; Porter 1996). This secures his place as one of the fundamental contributors of comparative business analysis at the state, region, and the firm level. Mainly, for the analysis of the off-shoring options available to multinational companies across global production networks.

According to the literature, the first half of the twentieth-century brought essential contributions from the economists Heckscher and Ohlin. These authors built on Smith's and Ricardo's postulates on trade theory thus claiming countries export goods when the countries' endowment factors are

abundant and used as the input of production (De Grauwe 2010). While countries import products to substitute its scarce resources due to the relative comparative advantage of other nations with more abundant endowment factors. Heckscher and Ohlin posited that; "A capital-abundant country will export the capital-intensive goods, while the labour-abundant country will export the labour-intensive goods" (Moon 2000). Although the Heckscher-Ohlin model contributed to further, the views on trade and the countries' competitiveness based on endowments conditions, the literature by Kelvin John Lancaster challenged that of Heckscher and Ohlin.

Lancaster, in his work "The Heckscher-Ohlin Trade Model: A Geometric Treatment" argues that Heckscher's and Ohlin's work on trade theory is an "unrealistic" assumption, as their work alludes to identical production functions (Lancaster 1957). A fact which, according to Lancaster, is devoid of any other external consideration as later posited by Michael Porter in his attempts to reconcile the internal and external competitive pressures, thus resulting in his theory of "competitive advantage." In brief, they prove the debate around international competitiveness to have influenced wide-ranging topics such as (but not limited to) economics, management, history, politics and cultural studies (Olczyk 2016). The above vital facts, reinforce the diversity of the topic and the difficulty to find an encompassing definition which, according to Krugman, could lead to a more optimal policy outcome (Krugman 1994). In a nutshell, the argument on international competitiveness has ideological underpinnings rather than philosophical ones and is likely shifted by the concept of power.

In the 20th century, intellectuals such as John Maynard Keynes and Joseph Schumpeter contributed to the field with their economic perspective. A contribution, which led to other writings on innovation, and economic development and the perspective on "endogenous growth theory" (Greenwald and Stiglitz 1987; Olczyk 2016; Witt 2002). According to the literature, Endogenous Growth posits that economic development does not originate from external factors. It derives from the enhancement of human capital, which at the same time facilitates new forms of technology and innovation (Romer 1994). Endogenous Growth bases economic performance on internal change and the improvement of human capital and accounts for positive externalities. This precept refers specifically to the knowledge spillovers in economies devoid of technical knowledge, (i.e. development). (Romer 1994), suggests that less developed economies transition from low added value to the high added value as the knowledge gap closes. He argues that improved knowledge facilitates the advancement of new skills, processes, and technologies which translate into higher efficiency, i.e., productivity. A fact that will not only increase these less developed countries level of exports but also facilitates better integration into the Global Value Chains (Romer 1994).

Although Romer's work on technological change brings forward the essential precept of innovation as a development factor, i.e. economic growth. The literature suggests it does not account for upholding the balance of external factors which can make the country and firm more responsive to current and future market pressures (Michael E. Porter 2008). The literature suggests the need to maintain a high level of responsiveness to internal and external changes because of the transformation brought about by globalization and new technologies. New methods of transportation and technologies, as factors of increasing globalization, render countries more interdependent on one another. This event requires a more nuanced examination of the issues facing firms and states. The literature shows that competition is no longer a game of comparative advantage or an argument based on the companies' trade, investment or its products' life cycle (Vernon 1966; Vernon 1979). The modern debate in international competition point towards one of regional focus but global in proportions thus aligning regions, nations, and global governance structures to promote a fairer development. This debate places knowledge and clusters at the center of new competitive thinking, requiring new conceptual frameworks of competition.

The debate on international competitiveness calls for new considerations that can expect domestic and foreign needs, thus, leading to create competitive advantage (Porter 1990). The last forty years of scholarly research, brought further work on the new trade theory and neo-liberalism. Two influential schools of thought shaping the policy outcomes of transitioning to emerging economies and dominating financial institutional regimes such as the (IMF) International Monetary Fund and the World Bank (Stiglitz 2003 ; Stiglitz and Ocampo 2008). In the last three decades, these two ideologies have gained prominence, given globalization is constantly fading borders, thus making national boundaries a less important consideration. The latter being responsible for making it more difficult to draw domestic and international market lines (Olczyk 2016). A circumstance, which logically calls for the competitive debate as regionally driven, thus making this thesis' topic of important consideration, and relevant to the existing literature.

The last three decades of international competitiveness narrative brought concerns of growing inequality coupled with unfair competition among emerging and transition economies. These concerns have seen an allusion to the term competitiveness as a zero-sum game where some countries win at the expense of others. but, Paul Krugman, in his publication "Competition: A Dangerous Obsession", called for a more nuanced approach. His approach calls for a distinction between firms and states to avoid policy decisions which can lead to adverse economic outcomes (Krugman 1994). Since Krugman, there have been other scholars echoing a more careful evaluation of competitive issues and the different dimensions affecting industries, companies, states and regions. The call for a more nuanced examination argues that countries do not compete with one another and places the competitive debate as one guided by policy and ideological objectives. Krugman argues, that the wealth of one nation does not apply over the macroeconomic indicators of other nations, suggesting increased internal analysis of the policies causing negative externalities as opposed analyzing the external factors.

The term, international competitiveness, is vague and overarching. It is not realistic according to Krugman and suggests that global competitiveness issues need analysis on a case-by-case basis as other authors have postulated (Aghion, Caroli, and García-Peñalosa 1999; De Grauwe 2010; Krugman 1994; Melitz 2003; Prestowitz Jr 1994). The competitive debate, is not a one-dimensional perspective but a composite of interrelating factors where economic development and disparities take centre stage. A reality which, among less developed economies, hinders the ability of firms to compete in domestic markets. It limits the countries' export potential as only a few firms have the capital and resources necessary to compete. This limitation carries a trade imbalance, i.e., the deficit in retrospect to other more advanced nations, thus limiting the countries' ability to integrate into the Global Value Chains. These limits, become a detriment to the countries' level of industry growth, and productivity as other authors have also postulated (Aghion, Caroli, and García-Peñalosa 1999; Melitz 2003; Melitz and Ottaviano 2008).

According to the competitive literature, issues need an examination beyond macro-level indicators. Economic outcomes need analysis on policy and the ideological tenets guiding political agendas to reconcile contentious issues (De Grauwe 2010). The creation and maintenance of competitive advantage in international markets inevitably link to policies at the national level. A reality which dictates the pace of governments' policies in Latin America and in Mexico as the focus of this study. Market liberalization and structural changes adopted toward creating a more open economy and the need for further integration into global value chains exemplifies the tension between policy and the new regional reality of international competition.

Krugman 1994, exposes the internal and external dichotomy in his approach to policy measures. He explains this issue by pointing to the opposing views policymakers have in solving unemployment

issues in the European Union in the early 1990s. At, the time politicians explained high levels of unemployment, by the lack of competitiveness this economic block had in relations to other developed nations. According to Krugman's view, key policymakers linking unemployment with external factors were not looking at the issue as one that originated within the policies adopted to promote fairer standards of living. According to his view, the robust regulatory framework and overly generous social safety net were the primary drivers of unemployment. The high levels of government regulation, the role of the worker's unions, and overly generous social benefits hindered free enterprise, thus impacting the countries' level of investment inflows, industrial output, and competitiveness (Krugman 1994; Marcuzzo 2005).

Krugman's writings spoke to the cause of the high levels of unemployment in Europe by looking at Keynes' underpinnings of a strongly driven welfare state. An event that according to Keynes hinders free enterprise and calls for government intervention. For Keynes, this intervention is necessary to promote economic growth and to uphold minimum standards of living. Instead, Krugman's classical view stems from providing incentives for employment by adopting a much friendlier business environment, thus preventing voluntary unemployment. A much different perspective to the one that advocated for the creation of more fiscal spending to promote aggregate demand. Hence, driving consumption to generate employment during recessionary periods. This intervention to increase net consumption was is intrusive, thus undermining free market principles and disrupting the law of a self-regulated market (Greenwald and Stiglitz 1987; Keynes 1936). The case analyzed by Krugman and the link to the policies' ideological underpinning reaffirms the competitive debate as one noted in ideological tenets as the backdrop of economic policy and decisions at different levels of government.

Other essential texts on international competitiveness are those of Austrian economist Joseph Schumpeter. His work brings innovation to the contentious debate by putting it as a driver of economic growth. Schumpeter saw the connection between innovation and higher profit margins as a factor for economic growth and prosperity at the firm level. According to Schumpeter innovation yields higher returns and improved efficiency in competing with others in the industry. His teachings are influential as these confer topics such as entrepreneurship and the role of "financial agents" or institutions in facilitating economic change (King and Levine 1993). His hypothesis on the role and strength of financial institutions in the promotion of economic growth at the country level have the validation in earlier studies comparing developed vis-à-vis less developed economies (King and Levine 1993). In a comparative quantitative study, the writings of King and Levine, 1993, measure economic growth by looking at two sets of countries. The findings found an existing correlation showing that underdeveloped countries are lacking economic growth and a robust financial institutional framework. Developed economies that attained higher levels of economic growth had a stronger financial institutional framework and market development.

In developed economies, the literature suggests a coordinated effort between banks, intermediary clearinghouses, financial institutions and these countries' central banks. This results in having a much more developed financial system where a smoother flow of capital takes place to attract higher levels of Foreign Direct Investment. These facts generate not only investor confidence but are conducive to a good business environment (King and Levine 1993). Last, the literature suggests that Schumpeter considered the precept of endogenous change as being triggered by external factors, an assumption impacting the field of competitiveness as it was later to build upon by Michael Porter in his writings on the factors leading to create competitive advantage (Ankli 1992). In addressing the way state and non-state actors respond to internal and external pressures, the field of international business evidence how government and firms respond to external forces (Porter

1986; Porter 1990). How external dynamics influence the company's strategic management decisions which lead to the creation of competitive advantage. According to Porter, this is a balancing act as innovation happens out of necessity and in anticipation of internal and external competition (Porter and Advantage 1985).

The literature suggests the improvement and creation of a more extensive conceptual framework by Michael Porter built on Schumpeter's work on innovation. One that has broadened the analysis of competitive issues in the global context and has placed the role of clusters as drivers of innovation and growth. It has provided a close study of the conditions affecting the firms and state-regions. In brief, what Schumpeter's and Porter's input postulate is that innovation grows out of the internal challenges countries and companies face. It often links to external pressures but, internal dynamics are the most critical. The wealth of nations according to Porter's view is not "inherited" it drives on the dynamics of change imposed by market conditions (Porter 1990). According to Porter, the creation of wealth (driven by external and internal factors) is conducive to principal activities where innovation thrives on creating and sustaining competitive advantage. Schumpeter sees this as a disruption of the circular flow of the economy and essential views of entrepreneurship (Witt 2002). The latter being a postulate touched upon by Porter as he places clusters as drivers of innovation and entrepreneurial activities as principal in supporting innovation activities in a cluster environment.

Schumpeter's influence on entrepreneurship is noticeable in the theory of "competitive advantage." Porter views the competitive advantage as the by-product of innovation as a wealth generating act. The latter being the backbone of entrepreneurship, and key in achieving a constant revision of activities aimed to sustain and improve "competitive advantage" (Porter 1979; Porter 1990; Witt 2002). The literature suggests entrepreneurship is the organization, launching and running a new business by assessing the risks involved with the creation of the firm. One related to innovation as the process generating competitive advantage and guiding the debate on competitiveness, cluster and globalization. In, brief aspects of creating a firm, in filling the market gap produced by internal or external factors or the breakthrough of new technologies stems from entrepreneurs' efforts fostering innovation while creating and sustaining competitive advantage. Again, as Schumpeter say disrupting of the circular flow of the economy to maximize profit-making activities (King and Levine 1993; Witt 2002). The following image represents Michael Porter's "Five Forces" on the key conceptual frameworks pointing to the elements that influence the firms' competitive strategies, see, also figure 12.

According to the literature on International Competitiveness, the topic has two eras of literary analysis. The first before globalization, and the modern period covering to the present date. The latter period is where Michael Porter has set the foundation for further scholarly research in the field. His teachings have influenced the modern competitiveness debate with theoretical tools such as the Five Forces Framework and the Diamond model, along with the "Resource-Based View.". This set the analysis of countries', industries', and companies' competitiveness in this global context. Porter's Five Forces analyzes business competition by inspecting aspects of the industrial organization, and economics to decide the level of competition or market intensity. This market intensity along with other factors such as the levels of market attractiveness and profit potential in a specific industry. Make up the determinants of how industries influence each one of Porter's forces has in diminishing the profit potential (Porter 1979; Porter 1980; Porter and Advantage 1985; Porter 1990).

The literature suggests that each of these micro-environments is important, in contrast to a more macro view affecting business competition at the firm level thus determining its profitability. In referring to these micro-environments, Porter coined the bargaining power of suppliers, the threats of new entrants, the threats of substitutes, and the bargaining power of buyers. These

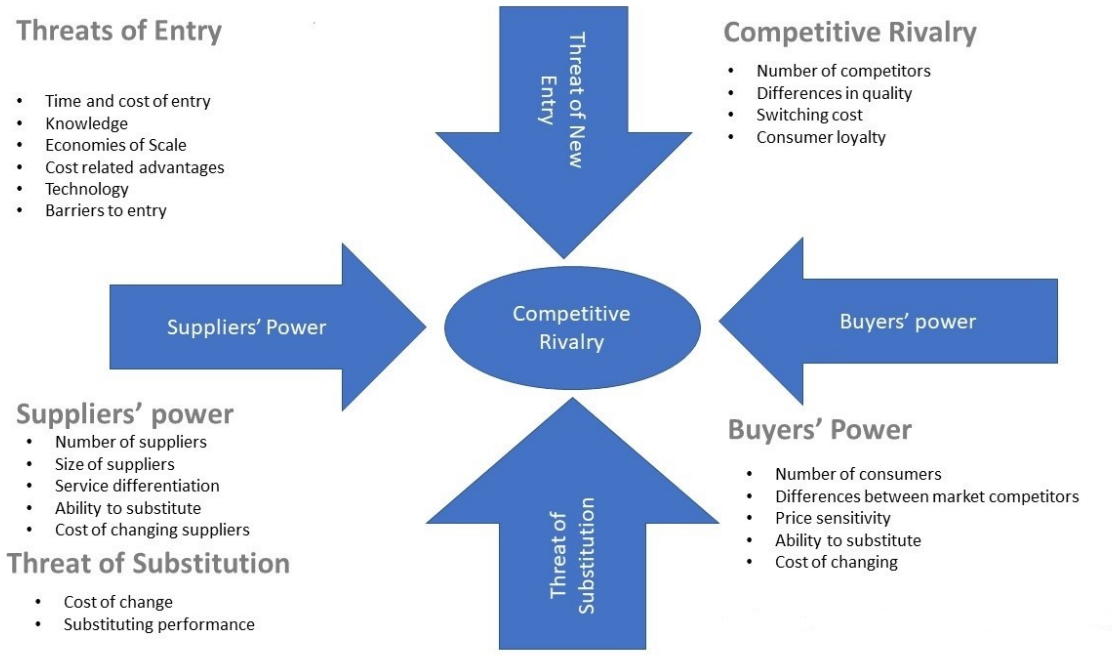

Figure 12: Source:Porter 2008, The Five Competitive Forces That Shape Strategy Porter 2008

micro-environments according to Porter affect not only the level of competition but influences a firm's market share potential. He suggests that any change in these forces trigger the firm's strategy reassessment (Porter 1979). Despite his contribution to assessing the competitive landscape, and overall business potential in the industry, other writings show that Porter's postulates do not determine that a company can experience above-average returns in a highly competitive environment. Although, these forces are essential in strategic planning, and considered in market entry considerations.

Other variables such as the firm's core competencies, business model or network are of great importance in achieving higher profits above the industry average. To conclude, Porter's five forces are the consolidation of two forms of competition vertical and horizontal where the power of buyers is a factor interrelated to vertical and horizontal forces (Steiner 2008). Following the work on the five forces shaping the firm's micro-environment, Michael Porter's next contribution to the field is an economic tool used to figure the strategic resources available to a firm. The Resource-Based View affirms that it can exploit the firms' resources to achieve competitive advantage. The Resource-Based view combines the firm's potential resources with VRIN elements in strategy formulation to test the firm's capacity to create and sustain competitive advantage. These VRIN elements are how valuable, rare, inimitable, and substitutable the company's products or services are as key determinants of the firms' markets potential. but, other scholars have further contributed to the theory by introducing the resource position barriers being analogous to entry barriers. Figure 13: shows the Resource-Based View (RBV) proposing that firms be heterogeneous because they have different resources (Barney 1991; Barney 1995; Barney and Hansen 1994; Wernerfelt 1984).

Another of Michael Porter's contributions to his work on competitive advantage was his highly appraised publication "The Competitive Advantage of Nations." This literary contribution brings

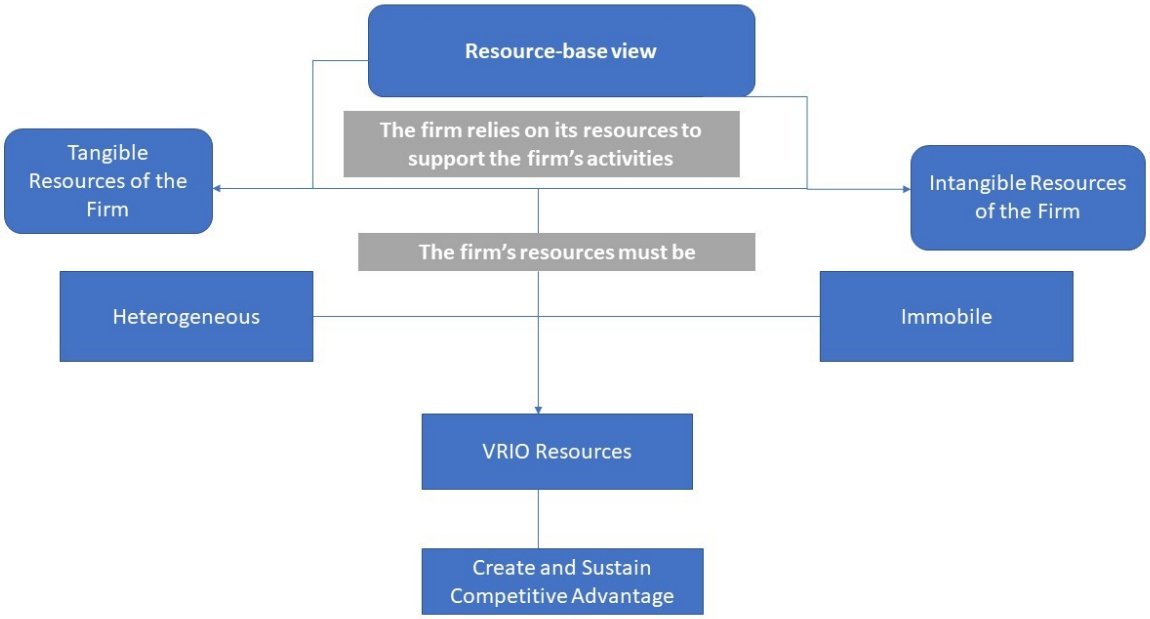

Figure 13: Source:(Porter 1979),Resource-Base View

further analysis of industries and the factor conditions determining the wealth of nations (Porter 1990). This analysis tool focuses on two organizational vantage points, the industry view, and the Resource-Based View. These two reflect the position of the firm within the broader context of the forces affecting any specific industry. The National Diamond refers to the firm's strategy and factors such as rivalry and the role played by governments in shaping these conditions. Additional considerations such as the countries' factor-conditions, demand conditions, and supporting industries play a role in explaining why individual companies are in countries while other firms locate themselves elsewhere (Porter 1990). Michael Porter's National Diamond touches upon the connection between the firm's strategy, the external industry forces and the influence of institutions as drivers of a favourable industry environment.

Domestic policies such as industry subsidies, education, and labour programs are only a few examples of what Michael Porter defined as an institutional influence. These institutional frameworks create conditions that increase economic activity in industry-specific sectors. At the same time, they have a significant influence on the creation and maintenance of each country's national competitive advantage. Asian countries, well exemplify the influence of institutions on the creation and sustainability of a nations' competitive advantage as the hub of manufacturing activity and fertile ground for clusters. The latter, as ecosystems of industrial productivity, allow for the agglomeration of firms centred in specialized production activities and innovation (Pack 1994). The literature suggests that Porter's National Diamond makes up another pillar of his most relevant contribution on "Clusters and the New Economics of Competition." Porter 1998, points to the ability of companies to source materials internationally due to advances in technology and transportation. The latter and the former call for a revision of the comparative advantage framework on international competition while unveiling what he defines as "the paradox of location" in the global context (Porter 1998).

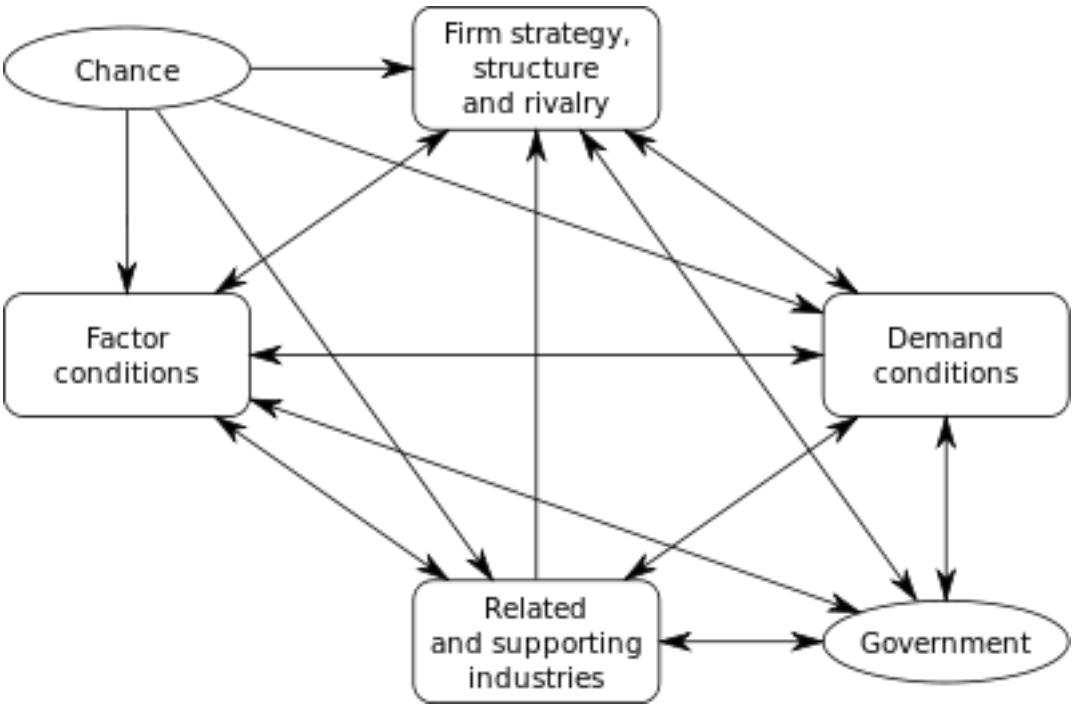

Figure 14: Source:(Porter1990), National Level Diamond

The relevance of Porter's literature lies on the shift of new competition as depending on high-level productivity than access to inputs or economies of scale (Porter 1998). In his depiction of clusters as new agglomerations of companies operating in a local context but competing on a global level, His work brings elements to the National Diamond and allude to institutional and industry dynamics and how these influences encourage the creation of clusters as drivers of national and local competitiveness. See, also figure 14.

The literary review on international competition looked at many of the interrelating theories which shaped the discussion around competitiveness as a contentious issue. It validated the rationale that competitiveness is not a zero-sum game, but a debate requiring evaluation in each specific context. The research suggests that the evolution of the debate shaped the contributions of various thinkers such as Ricardo, Schumpeter and in modern times Michael Porter. The literature shows the new scope of analysis is not an input of factors or economies of scale; it is of local and regional connotation playing a preponderant role in the global economy. Michael Porter, and Ketel 2000, posit that economic development lives on the factors shaping regional economic growth where clusters are central for development (Martin 2005; Porter and Ketels 2003; Schmitz 2004). Local clusters in the global economy not only impact regions and nations as participants in Global Value Chains. But, also shape the relationship between the central governments' industrial policy and regional realities (Porter and Ketels 2003).

Michael Porter viewed competitiveness at the national level as the nations' productivity, one that needs to be regional in scope. Where industrial clusters play a fundamental role in promoting his proposed paradigm shift. A similar view takes The World Economic Forum's Global Competitiveness Report, defining competitiveness as a set of institutions, policies, and factor conditions determining the nations' productivity (Atkinson 2013). Competitiveness can touch upon the factor conditions valuable for both the firms, states and regions as part of the micro-macro level determinants of

competitive advantage. It lives in the internal process of creating innovation while remaining responsive to internal and external pressures. The latter and the former continually driving the necessity for a change in this global context where education and skills take centre stage in the promotion of economic regional development. The lessons learned from this chapter related to ever changing debate around the topic of competitiveness and competitive advantage. However, although the narative is in constant evolution, the main teachings from this literary review section are the need to embrace change and adapt to internal and external demands. This reality in our analysis of Mexico requires higher levels of technology driven education that combined with better-structured policies around industrial clusters could lead to the following two outcomes. (1) Clusters as institutions facilitating a better regional response to national level policy objectives. (2) Higher national-level competitiveness and a more equitable regional development. The next section builds on the diversity in theoretical perspective shaping the competitive debate by centring the debate around industrial clusters and these ecosystems competitive paradigm shift. It will provide an empirical perspective of these ecosystems as it relates to regional development.

3.2 Clusters & International Competitiveness: An Empirical Approach

This section of the literature review builds upon the theoretical foundation and the competitive debate evolution. It looks at clusters within the international competitive debate through an empirical approach. The empirical body of literature on the study of international competitiveness suggests the broad aspects of the topic. It reflected on the relevance of clusters, and the different conceptual approaches to the new paradigm of regional-national competitiveness. The literature review covers the broad-ranging contentious issues that are a central part of the debate in this study. The theoretical work on the topic has influenced writings in logistics, SMEs in Latin America, and education. All key aspects contributing to the firms' strategic decisions, capabilities and the ecosystems of efficiency and innovation defined as industrial clusters (Ketels 2003). In this research, the agglomeration of interconnected companies defined by Michael Porter as "clusters" are central in placing these ecosystems as the primary drivers of regional-national economic growth. One of the primary objectives of this thesis is to draw on the vast writings of international competitiveness, clusters and clusters as drivers of economic growth. The purpose to build the case of how clusters can help strengthen government programs thus acting as institutions of regional economic and social change. A dynamic which could further promote the new paradigm shift in international competitiveness while advocating for a more inclusive economic growth. A case that in this thesis could help Mexico overcome the country's regional disparities while helping Mexico's meet higher levels of competitiveness circumstance which according to the literature-derived model presented as part of this thesis could help Mexico's and emerging economies better mitigate exogenous economic shocks.

According to the literature the term industrial clusters within the international competitive debate is not only the synonym of regional economic growth, but it has also promoted different definition among academics and policy makers. These various definitions show terms such as business networks or industrial districts but have covered not all these definitions point to the scholarly definition of clusters (Hernandez and Montalvo 2012). Despite its historical roots scholars such as Ketels consider, Michael Porter's body of literature sets the engines of efficiency, productivity and economic growth as cluster driven. This sets Porter's debate as the point of reference in the paradigm shift placing clusters and regional dynamics at the forefront of the international competitive debate. Since Porter further empirical contributions on the topic and the analysis of transition or emerging economies' competitive issues have taken place. The literature suggests that with globalization and the economic growth of emerging markets the study of clusters as engines of national and regional development gained importance (Albaladejo 2001; Martin 2005; Porter 1998)., as the economic analysis of emerging economies range from the institutional weaknesses to the impositions of international economic regimes and structural change programs. These previously mentioned elements according to the literature are the few of the main precursors of GDP contractions in the regional and domestic economy [Krugman (1988); Stiglitz and Ocampo (2008); Krugman, Obstfeld, and Melitz (2015);]

Michael Porter's work on "Clusters and the New Age of Competition" marked a new era of international competitiveness. A new era manifested by the role of clusters as "ecosystems of unusual competitive success across various industries" (Porter 1998). Porter's literature pointed to the local origins of the cluster and the impact these ecosystems have on the global economy. According to Porter, the influence of clusters triggers local features, such as knowledge, relationships, motivation and a broader set of regional and national conditions (Porter 1998). These "geographic concentrations" of interconnected companies within one specific geography are unique in their

features. These agglomerations enjoy the help of the internal knowledge transfers and robust institutional support. Key features that join with the promotion, cooperation and competition and place these ecosystems as a pillar of efficiency, productivity and innovation (Porter 1998; Tallman et al. 2004). Aspects that in the regional and local economic context catalyzes social and economic change and align with the proposal of an augmented competitive model.

The literary assessment suggests the analysis of international competitiveness and clusters as the firms' engine in technical sectors. thus guiding the different theory-driven models. These theoretical approaches are providing insight to better understand the internal and external dynamics of these ecosystems. The factors impacting the creation, promotion, and maintenance of clusters at the national and regional level. This foundation is central to this research as contribute to the paradigm shift while proposing the view of clusters as institutions as stated. This position aims to reconcile key literature on the factors it says to mark Mexico's and Latin America's underdevelopment, and sharp regional disparities as covered by scholars such as, (Kitson, Martin, and Tyler 2004; Krugman, Obstfeld, and Melitz 2015; Stiglitz 2003; Stiglitz and Ocampo 2008; Storper 1997). One instrumental driver fostering these markets' underdevelopment is infrastructure and these nations' inability to invest more in this development area due to exogenous economic shocks (Jimenez 1995; Stiglitz and Ocampo 2008). Jimenez 1995, discusses infrastructure develop to education and healthcare as key drivers in improving human capital. Elements according to the author necessary economic development in emerging and developing economies (Jimenez 1995). Other literature on the topic looks only at the role of public infrastructure to foster regional equality and growth. Other academics have concentrated their analysis on public policy initiatives as factors for better regional integration. It often relates these vital policies to updating and investing in infrastructure projects to facilitate trade and mobility (Deen-Swarray, Adekunle, and Odularu 2014; Démurger 2001; Joshua 2015; Sawada et al. 2014; Zheng and Kuroda 2013).

In observing aspects of regional development in transportation infrastructure as promoting regional economic development Démurger 2001, brings relevant points. He posited through the analysis of a panel data from twenty-four Chinese provinces during a 13-year period. A time linking "endowments" in transportation infrastructure and the economic growth of Chinese provinces vis-à-vis other provinces less endowed (Démurger 2001). These findings show that more endowed regions developed faster support for infrastructure thus over time having a better economic performance. Literature suggests validating regional infrastructure investment as a differentiating factor in explaining regions growth gaps while disclosing the policies intricacies around the issue (Démurger 2001). The author's writings not only bring relevance to transportation infrastructure gaps as development factors but brought light to the internal policy dynamics affecting China's cross-regional development. A phenomenon which became acuter because of the country's decentralization, and its transition to a market-based economy. In China, these economic reforms led local governments in less endowed areas to give primacy to industrial activities (Démurger 2001), as opposed to making investments in transportation and telecommunications infrastructure the foundation for a more sustainable regional development. China's issues on cross-regional development during its transition to a more market-based economy show relevance to this research project. Because it alludes to the divergence in cross-regional and national level policy priorities.

A reality that in this research aims to call include a cluster-driven national and regional in focus industrial policy. One which strengthens the role of clusters not only as ecosystems of efficiency but as institutions of social change (Démurger 2001). The similarities between China and Mexico are a few, both countries had in the same stagnant economy, both countries opened to trade, and both have a sizeable number of industrial clusters. Does the question remain why China has attained

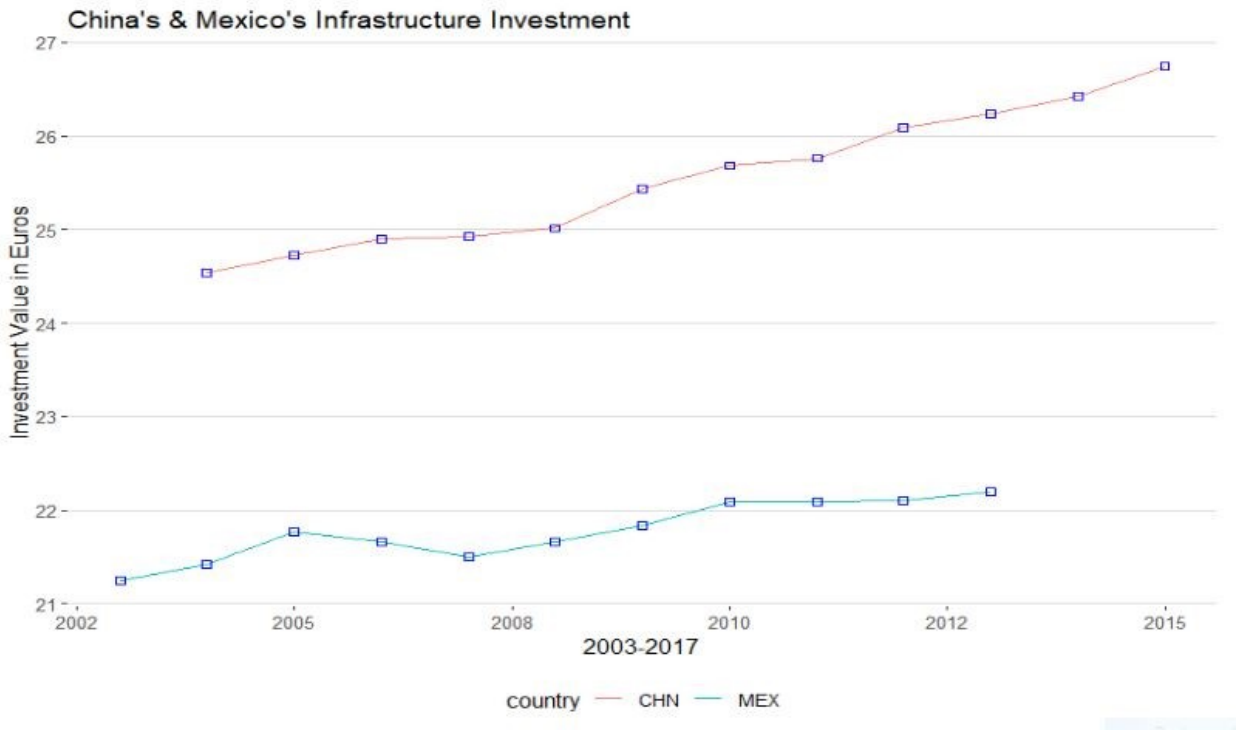

Figure 15: Source: OECD, The Investments of China and Mexico in Infrastructure over Time

higher levels of integration in global value chains while transitioning towards an advanced economy status? While it still considers Mexico a less developed economy despite the changes in policy and market direction. Is infrastructure a vital driver to analyze these two country's divergent patterns of development? The following line chart shows China's and Mexico's level of investment in transportation infrastructure with data from the Organization for Economic Co-operation and Development (OECD). It identifies as mentioned earlier infrastructure investment in the literature as one of the key drivers of development allowing economies to meet higher exports, i. e. global value chain integration. The data is the value in Euros of each country's investments in this area; the graph shows the log value of the variable as to better show the growth trajectory of these two countries, see, also figure 15.

The chart above shows that while China has maintained and increased its investment in transportation infrastructure during the prescribed period, the Mexican economy shows a trajectory that had been much more unstable. In brief, the primary aim of the line-chart is to point to the divergence in the levels of investment in the infrastructure of the two countries which have seen impressive market openness and increased industrial activity (OECD 2017a). In this context investing in updating the countries' infrastructure makes up one of the primary factor conditions being conducive to higher Foreign Direct Investment influx, multinational activity and industrial agglomerations. With better transportation infrastructure, a higher level of logistical support and higher integration into global value chains, a more dynamic export market unfolds (De Grauwe 2010). However, other regional drivers that according to the literature make up "regional assets" are also of great importance, like skilled labour, a growing workforce, industrial activity and local government involvement in supporting industries and development (Camagni and Capello 2013). The following graph showcases

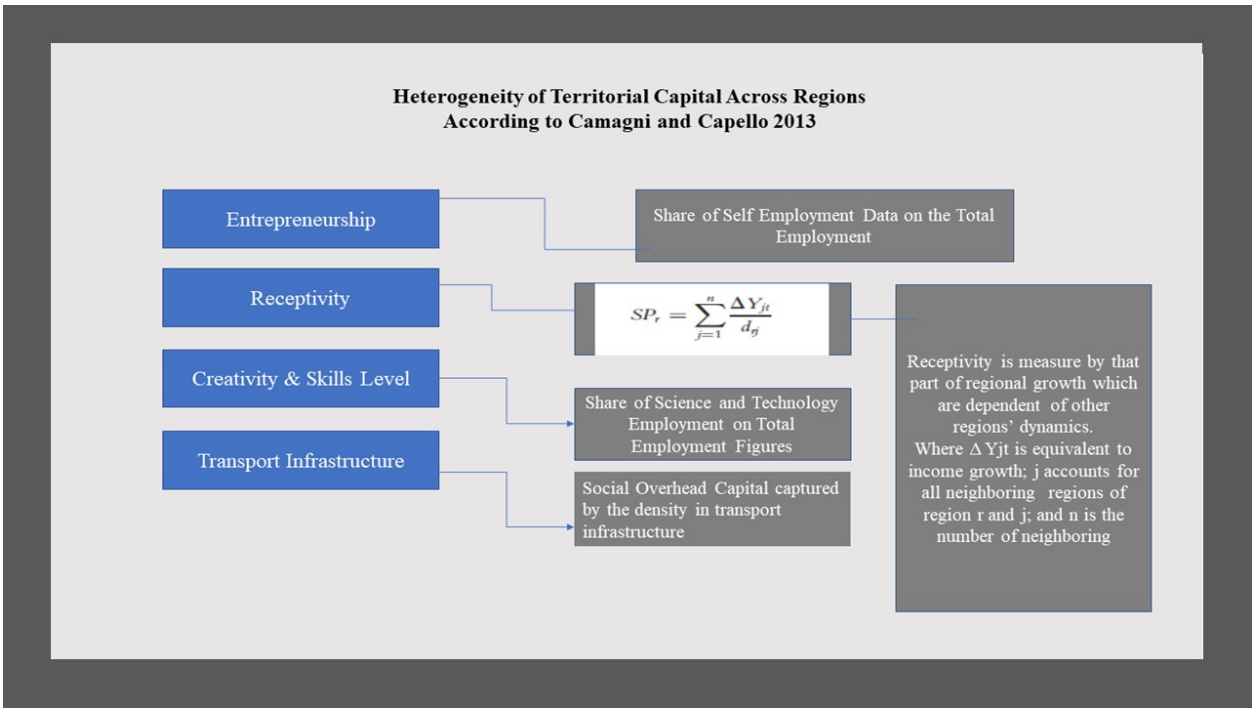

Figure 16: Source: Camagni & Capello,Heterogeniety of Territorial Capital

Camagni and Capello (2013)'s argument showing the four different variables of territorial capital measured by the authors to describe critical aspects of heterogeneity across regions. Therefore, using these four variables to encompass a wide latitude of interrelating factors contributing to marked regional disparities or the perpetuated superiority of industrialized regions, i.e. regional champions (Camagni and Capello 2013), see, also figure 16.

The literature by Camagni & Capello 2013, and the previous literature in the field looking at the drivers of growth bring the debate to the assessment of clusters as ecosystems of national and regional development. Clusters gained relevance as the factors influencing the competitiveness of private, state and regional actors at the micro- and macro-level are under analysis as precursors of regional cluster formation(Porter and Ketels 2003). The literature suggests that one of the most relevant factors as a precursor of cluster formation and higher levels of regional-national competitiveness is government policy (Porter 1990). The literature also points to the disconnect that some countries experience between regional and national level policies, regarding industrial policies where regional champions hold a better position to capture government resources. An aspect touched upon as part of this thesis and a pillar in building our case of clusters as institutions. This policy disconnect is not only conducive to regional disparities but likewise influences the allocation and disbursement of public funds flowing from the central government to the various regions. A reality where regional champions expect to remain champions due to its industrial strength and leadership role they play in the national sphere. Thus, continuing to perpetuate the vicious cycle of inequalities and regional disparities [Ketels (2003); Stiglitz (2000).

The literature by Porter and Ketel (2003) propose that regional inequalities are because of not only different policies but factors such as the lack of physical infrastructure, and low levels of R&D investment. The lack of these factors shows the country's institutional weakness, and an acute skills

deficit translating into lower levels of education (Porter and Ketels 2003). A circumstance, that, by other academic work done on the topic, impacts the "locational decisions" of firms' regional objectives (Camagni and Capello 2013). At the regional level, locational decisions by multinational companies in noteworthy industries take place through the analysis of the factor conditions and location advantages. Camagni and Capello (2013) advocated these two elements as taking superiority over factors such as markets, technology, and the firm's organizational models. The appraisal is that given the competitive landscape it attributes the "territorial capital" of regions to high human capital, access to information, and cooperation (Camagni and Capello 2013). The argument by Camagni, and Capello, 2013, helped guide this research in the analysis of ALPs as institutional elements promoting the higher skill set in Mexico's industrialized regions. An impact which this thesis assesses further in the empirical and quantitative analysis section.

Knowledge predisposes firms to drive investment towards regions where these factors of territorial capital are in place. The relevance of Camagni's and Capello's work is the analysis of the forces impacting clusters as depicted by Michael Porter, placing regional assets as driven by knowledge (Camagni and Capello 2013). This analysis added a new layer to Porter's view of the macroeconomic factors affecting national, state, and local competitiveness in the global context. Michael's Porter contribution to the debate on clusters serves as the pillar for other academic work on the subject. These writings range from the firm's patterns of learning behaviour within clusters, the clusters' capabilities across regions, and their global value chain integration (Maskell and Malmberg 1999). A backdrop where regional dynamics take great importance as magnets of clusters as ecosystems of productivity (Porter 1990; Porter 1998; Porter 2000; Porter and Ketels 2003). Under this scope of high-intensity competition, the factors of regional development, the different dynamics making up regional competitiveness as it relates to "regional assets" is of high standing. Hence, validating the conceptual framework put forward by Michael Porter as the foundation guiding the modern International competitive debate (Camagni and Capello 2013).

The link found connecting various empirical literature to Porter's contribution will further reaffirm the focus of this research on more just regional development. Mainly, through the proposal of cluster-based policy initiatives aimed to further substantiate our case of clusters as institutions of social-economic change. Additionally by identifying the determinants of regional competition issues related to regional economies and the different models coupled with theoretical viewpoints thus touching on the strategic elements of regional competitiveness. Early writings on regional development centred on the analysis of 'Demand Driven' models. These models reference that regional growth depends on the demand of a specific sector in the local economy (Myrdal 1957; North 1955). However, in this global context regional competitiveness has diverse assessments, such as an increase in the region's exports along with a price performance element or an increase in productivity (Porter and Ketels 2003; Storper 1997). The literature by Porter and Ketel's, 2003 in the analysis of the UK competitiveness brings forward points on the conditions for fair regional development. It suggests that aside from the country's level of economic development, different policies equate to the levels of regional prosperity. A fact devoid from the factors determining the country's wealth as in the wealthy nations the bulk of the country's development stems from the wealthiest regions(Krugman 1994; Porter and Ketels 2003).

Porter and Ketel's, 2003 examined these factors leading to regional inequality by examining the economies of the UK, Japan, and the United States' regions. It notes the findings as divergent compared with regions in the U. S, which on regional prosperity exhibits much fairer regional development (Porter and Ketels 2003). These findings are relevant as they give an empirical framework for the analysis of Mexico's Southern regions. Thus, setting the stage for this research

contribution and argument as it proposes fair and sustained regional development through "regional assets" AKA human capital. Likewise, the proposal of an augmented industrial and national level competitiveness framework to position clusters as institutions of social-economic change. Porter's and Ketel's findings also point to political leaders as an important authority in promoting a better alignment of national policy with regional objectives. Political leadership can be an important factor in regional development initiatives as they can promote alignment and strengthen the role of private organizations in providing an extra level of support across specific industries (Porter and Ketels 2003).

The main contribution of Camagni and Capello 2013 points to the broad heterogeneity of regional capital and the interrelated factors present in the MASST (Macroeconomic Sectoral Social and Territorial) model built by the authors. The MASST model is a representation of regional growth as the sum national growth and local differential components. The model stemmed from previous work on regional growth which were a direct replication of the national level model (Camagni and Capello 2013). The national macroeconomic model represents an outdated paradigm which does not call for long-term growth and leads to faulty policy objectives (Krugman 1994; Stiglitz 2000). The national level macroeconomic model disregards the regional objectives thus creating a policy disconnect between national and regional economic goals. Often regional economic growth halts in the absence of national and regional institutional support. Public and private organization provide industrial initiatives while creating the right set of conditions for the advancement of industrial objectives. The MASST model points to all of these interrelated factors affecting the national and regional competitive dimensions. In these national-regional dimensions, Michael Porter sees as a primordial the role of institutions in the formation of industrial agglomerations or clusters (Porter and Ketels 2003).

In fact, several case studies advocate for the role of private institutions and their impact in supporting clusters. An example is the Australian wine cluster, in this case, the role of private institutions in promoting higher exports had been of impact in the internationalization of Australia's wine industry. In fact, this institutional role helped double Australian wine exports for five consecutive years while also fostering the growth of Australia's wine region. so, ratifying institutional agents on improving competitiveness at the regional level, and their importance in the creation and sustainability of clusters (Keefer and Knack 2008; Porter and Ketels 2003). Also in the role, these ecosystems have as a promoter of innovative technology, productivity and FDI. It is worth noting also the vital role research centres, and universities play in the supporting role of the conditions to incentivize companies' agglomeration, i.e., regional economic growth (Porter and Ketels 2003).

Based on the existing body of literature our research shows the field has conducted limited scholarly work on clusters as institutional agents of regional economic and social change. The conceptualization of this viewpoint provides a nuanced perspective on industrial policy, social programs and clusters. Hence, calls for the promotion of regional-national competitiveness through the proposal of an augmented competitive model. One, that needs regional focus and global scope. Without a doubt, "clusters" as ecosystems of productivity have been the focus of analysis in advanced economies such as the United States' and Australia, but, the literature also suggests that a close analysis of clusters as drivers of productivity in emerging and transition economies is equally important (Hernandez and Montalvo 2012; Sarturi et al. 2016). In this context, the attained position of China as an economic power-house has led to a mounting body of texts. Literature closely testing the competitiveness of clusters across various industrial sectors, and regions (Jie-bing 2002; Wang, Liu, and Ma 2016; Zeng 2010). In Latin America, the case of Mexico also takes paramount importance as these economies struggle to break the recurrent cycles of inequality. Mexico's case is unique among Latin America

economies, because of NAFTA. Mexico's proximity to the US makes the country a hub of localized industrial activity across various specific sectors. An event which has been encouraging cluster formation and promoting their advantages as engines of economic development and innovation over the last three decades.

In a comparative analysis of China's and Mexico's entrepreneurial clusters by Hernandez and Montalvo, 2012. The mentioned literature points to seven factors of commonality defining Chinese and Mexican clusters thus impacting regional and national level competitiveness. These factors range from the agglomeration of economies, knowledge spillovers, enhanced productivity, i.e., efficiency to the social, economic impact at the regional level (Hernandez and Montalvo 2012). The following graph showcases the seven elements as posited by (Hernandez and Montalvo 2012), which make up factors of commonality between Chinese and Mexican cluster. These components in the represent the areas of impact for the agglomeration of economies and knowledge transfer in the broader social context. This societal impact is so much more conducive to fair economic development at the regional and national level in regional economic disparities The literature suggests China's and Mexico's cluster agglomerations thrive by a forward-thinking industrial policy besides these two countries' location advantages. Chinese and Mexican industrial policy places a strong emphasis on cooperation between governments, banks, private firms, and workers to enhance the national economy. These aspects are indispensable to give support to national and regional level policies (Beck and Demirguc-Kunt 2006; Hernandez and Montalvo 2012; King and Levine 1993). The relevance of the literature by Hernandez and Montalvo 2012, is the inclusion of business insights into the policy formulation at the national level. This inclusion promotes a better business environment, aiding clustering activity and industry agglomerations. Public entities enforce these cluster-based policy guidelines, creating an environment for industrious businesses and enhanced performance in the local economy (Hernandez and Montalvo 2012). The commercial and financial benefits of promoting a cluster-based approach to policy, the link to the benefits attained when companies form clusters. It increases the benefits of cooperation, regional standing, a broader market economy and an improvement in the regions' innovation capacity. Relevant points which will attract more regional suppliers, supporting industries, sales and improvements in Regional Value Chains, thus increasing competitiveness (Ketels, Lindqvist, and Sölvell 2006; Porter 1998).

Ketel's, Lindquist, and Sölvell 2006, further extrapolate on the deficiencies emerging and transition economies have on a better approach to clusters through policy initiatives. These authors aim to set the foundation for improving the quality of cluster-based initiatives. While providing a framework as a tool for economic development (Ketels, Lindqvist, and Sölvell 2006). Through an analysis of data encompassing 1400 cluster-based initiatives among transition and developing economies. It establishes that government centralization plays an adverse effect on cluster-based initiatives. Literature shows that policy centralization does little to support competitiveness and clusters initiatives. It determined that developing governments and transitions economies focus on macroeconomic policy measures such as interest rates, fiscal policy and currency stability. These findings also suggest that government centralization stems from the lack of institutional development and support at the regional level thus showing weaker local and regional administrations. A fact, which according to Porter, and Ketel, 2003 hinders the efforts to align policy with regional economic objectives. so, reinforcing our assumption of regional champions and marked "regional disparities" as the cause of underdevelopment (Porter and Ketels 2003). The linkage between these national-level policies, the impact at the regional level vis-à-vis national economic objectives and policies that often disregard clusters is studied (Bathelt 2008; Ketels, Lindqvist, and Sölvell 2006; Sölvell, Lindqvist, and Ketels 2003). Reflecting on the literature by Asheim, Cooke, and Martin, 2006, on regional development (Bathelt 2008), these pieces of literature allude to the equality and diversity of regional

labour markets as preponderant factors promoting a better adaptation of the regional labour force to new industries.

The literature posits this element as significant in understanding clusters' success, this taking into consideration that clusters lack a strong "internal-output relation." A finding which might suggest that labour market regional issues might also be of central importance agglomeration and knowledge transfer within the ecosystem (Bathelt 2008). The literature points to the writings by Steiner on institutions guiding knowledge creation and cooperation among industry players. The latter as a precondition for further technological innovations and added integration into global value chains. On knowledge at the regional level, the literature findings determined it facilitates information exchange. A process, that according to Steiner is fundamental for what he defines as "nonmarket institutional arrangements." It considers these arrangements essential elements validating the literature findings for ongoing interaction between local agents thus enhancing the ecosystems' knowledge base (Bathelt 2008). According to the literature, home-grown agents' interaction and cooperation within clusters are vital for understanding the dynamics among competing firms.

The narrative suggests the impact the organizational structures on the different firms within the ecosystem (Steiner and Hartmann 2006). According to the research conducted on the mechanism to manage the knowledge adopted by firms within the ecosystem also impact companies learning behaviour. It grounds the writing in an analysis of known theories of organizational behaviour to differentiate learning patterns according to a specific technology, and the product orientation of the cluster. It also unveils the need for specific knowledge and its characteristics-an event which calls for further institutional backing (Steiner and Hartmann 2006). Through their analysis of five areas of economic activity defined as "material linkages", joined with other factors such as "immaterial relations.", identified two learning systems within clusters facilitating the knowledge acquisition among competing firms. These systems are "informal learning," and "participative learning." The latter takes relevance in how companies control unconscious "spillovers" within the clusters while also seeking further support from institutions to exchange information (Steiner and Hartmann 2006). The literature showed clusters and regions as promoting economic growth. It showed the concern of regional factor conditions as crucial features on improving competitiveness at the national level and better integration in the global economy (Hui 2005). Where clusters are the engine driving this change in paradigm from political macro-level analysis to a more regional approach. but, clusters no longer pertain to advanced economies. The last two decades evidences a growing body of empirical research stemming from emerging and transition economies. In this context, China is a country requiring careful consideration. Since 1978, the nation integrated at the low-end of the Global Value Chains, a fact because of the country's large comparative advantage, in low-end value-added industrial activity and as a processing hub because of low wages.

China's rapid increase in exports along with localized centres of technological productivity and clusters are factors responsible for moving the country up the Global Value Chains. Positions China as a manufacturing hub of value-added products, R&D, and technological innovation thus placing the country at the centre of the international competitiveness debate (Pan and Chen 2017). Under this shift in economic reality, China shows clusters across various regions and industries. A circumstance which prompted scholarly research on the factors driving these ecosystems' competitiveness, internal dynamics and impact at the national and regional level. In the analysis of Chinese clusters, it has applied Michael Porter's Resource-Base View to examine the unique capabilities of the clusters competing firms that is indicative of facilitating resource integration. Also, the structural conformation of Chinese clusters calls for analysis to set up these ecosystems' organization and scale hence affecting the cluster's level of competitive advantage (Jie-bing 2002). Other literature use

cluster's model applications in the analysis looking at factors of communality determining the cities' level of competitiveness across various Chinese regions (Zeng 2010). In the book "building engines of growth and development in China" published by the World Bank, the role of individual economic zones and clusters as engines of growth and competitiveness. These ecosystems helped increase the country's GDP, employment, exports and an increment in Foreign Investment Inflows. These are vital aspects of this research as the main aim is to confirm and encourage clusters in the policy term across regions in Mexico. The literature points that these ecosystems brought to China's provinces new technologies and new models of management practices thus improving aspects of corporate governance (Zeng 2010).

To conclude, other scholars such as Wang, Liu, and Ma 2016 have also tested the competitiveness of two essential automotive clusters in the Changsha and Liuzhou regions. Important aspects such as these two ecosystems' technological innovations, the competitive and cooperative effect among cluster's firms tested served these thesis regional intentions. The analysis examined complex decisions within a group of competing firms examining areas such as the number of patents, the scale of industrial facilities and management capabilities (Wang, Liu, and Ma 2016). This analysis of the two clusters' internal resources and capabilities among competing clusters' firms. Echoed literature on the internal resources, capabilities, and long-term strategic vision clusters as factors of competitiveness (Porter 1990; Prahalad and Hamel May/Jun 1990). It also touches on competition from and strategic management viewpoint as it pertains to the way competing firms within these two automotive clusters manage resources and carry out capabilities(Ireland, Hitt, and Sirmon 2003). The literature in this section not only validates the broadness of clusters in guiding scholarly research. It also substantiates our call for the view of clusters as institutions within and an augmented regional and national competitive model. One, where the institutional features of industrial clusters claimed as part of this master thesis could allow industrial clusters to facilitate a better response to national level policies in less developed regions. The latter proposed reality that not only could validate the purpose of this master's thesis as an introductory lesson in the contemporary competitiveness debate. It can also open the door for further research on the topic of industrial clusters as institutions of regional development in other emerging economies. The next section will revisit important literature on the topic of competitiveness and global value chains debate as a key aspect where clusters facilitate regional integration.

3.3 International Competitiveness A Global Value Chains Approach

The debate on value chains is important in the realms of international trade, competitive strategy, industries, and international competition. The literature on the topic suggests in the last thirty years this area has evolved from the national level debate to one of global significance (Gary Gereffi 1999a). To this evolution, Michael Porter's contribution shifted the paradigm from key aspects of physical transformation to a much more comprehensive understanding. (Kaplinsky and Morris 2001). Porter's work on the realm of Value Chains included functions such as management, technology development, and procurement bringing relevance to the strategic value of inputs, moving products from creation to its delivery; thus equating into higher profit margins (Porter 1980; Porter and Advantage 1985). His writings touched upon the transportation cost, improvement in communication, technology, market's liberalization, and governments' policy. All areas creating and sustaining competitive advantage while fostering economic growth and keep up with rapid globalization changes. His writings highlight how logistical improvements facilitate international cooperation and enhance technology standards thus enabling a further value chain integration (Porter and Advantage 1985; Porter and Millar 1985; Michael E. Porter 2008).

Developments in communication technology not only improve coordination in facilitating internal and external linkages. It also improves the firm's competitive advantage allowing companies to integrate further into the global value chains. An integration process that in transnational operations permits higher market integration and divides company operations into technology driven and economically distinct activities making up the firms' value activities (Porter and Millar 1985). Using information systems facilitates internal communication, also supporting firms' value chain pursuits providing primary and secondary support activities. Such integration of the firms' value chain activities makes it more interdependent and responsive at every stage of the value creation process. An interdependence that impacts the cost and effectiveness of internal and external activities with vendors and suppliers. In brief, Porter and Millar 1985, point to information technology as influencing all categories of value chain thus providing the company with a better way to exploit linkages (Porter and Millar 1985).

The following graph exemplifies Michael Porter's conceptual framework on value chain as a vital component of all value creation activities. The graph explains activities a firm operating in any specific industry performs to deliver value to products or services to market. I take figure 17 from Michael Porter's publication "Competitive Advantage: Creating and Sustaining Superior Performance" (Porter and Millar 1985).

The literature by Kaplinsky, 2001 suggests globalization impacted the notion of value chains, thus creating two different conceptual frameworks: global value chains and commodity chains. The terms value chain or global value chains can have multiple definitions which extend the scholarly analysis. Authors like (Gereffi and Fernandez-Stark 2016; Humphrey and Schmitz 2000; Kaplinsky and Morris 2001), called for a comprehensive understanding of the breadth and depth of the topic. Henceforth, pointing to the building blocks of value chains as not having a merged framework. These building blocks defined as "spatial scales" involve; supply chain, production networks, global commodity chains, the French institutional approach and global value chains (Humphrey and Schmitz 2000; Kaplinsky 2000; Gereffi, Humphrey, and Kaplinsky 2001). All aspects bringing the analysis close to the system of governance in value chains, an important area in development research and policy (Gereffi, Humphrey, and Sturgeon 2005).

Other literary sources point to the way value chains evolved into value networks of production in

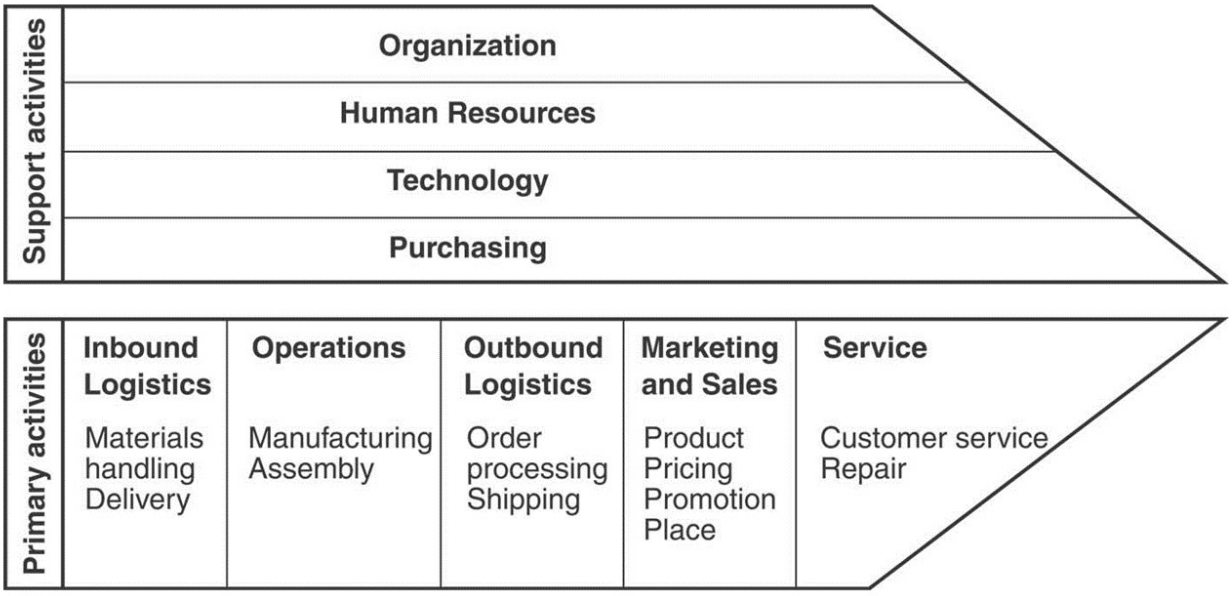

Figure 17: Source:Porter 1985, Michel Porter's Value Chains Framework

the low value-added manufacturing sector. Another important contribution in the realm of value chains is the concept of "shared value". This precept establishes a reciprocal relationship between productivity, efficiency, cost savings and positive social externalities. It refers to the approach taken by multinational corporations such as Walmart in improving their value chains while also impacting society and the environment (Grandori 2012; Kramer 2011; Sturgeon 2001). Companies like Walmart have embraced this principle and, materialized higher profit margins (Sturgeon 2001). Integrating Global Value Chains according to Bair 2005 relates to the level of distance between the local producer, the providers of goods and services with consumers. Bair 2005 explains that distance in correlation to policy interventions allowing local entrepreneurs a better positioning in GVCs (Bair 2005). In, relation to emerging or developing economies, the author, points to the need of having better policy instruments that could provide an incentive for economic integration into Global Value Chains. Higher integration along value chains often trigger positive externalities like enhanced knowledge and skills, thus providing better support for industrial development (Bair 2005). These "externalities" are crucial to fostering economic growth as an essential element in creating clusters and the promotion of more in-depth local and regional development.

Aside from the discussed topic of Value Chain integration, the literature on the topic also covers sectoral dynamics shaping the different levels of analysis. This narrative advises that sectoral forces relate to the complexity of the global value chains that correlate to the product. The literature proposes not all products or commodities in the global value chains have the same integration nor the same positioning in the upwards or downwards stream. Therefore, the factors relating to the global macro, meso, and the micro-level of analysis deserve a careful examination of the forces creating or hindering GVCs' activities (Gereffi, Humphrey, and Kaplinsky 2001; Van Dijk and Trienekens 2012). Likewise, the relationship of these forces, to the global, national, regional, cluster

and city context. This is important as the literature calls for a distinction between the two global value chain activities (producing and buying). Global value chains are networks of producers and buyers driven by the forces of globalization, and these two scopes operate differently. Although these distinctions are part of international commercial networks, a producer's value chain is capital and technology intensive, while, a buyer's value chain is labour intensive and geographically dispersed because of its decentralized nature. In, the latter context, large retailers play a significant role in the outsourcing of manufacturing activities to countries with cost-efficient labour markets (Gereffi and Memedovic 2003). In contrast, a producer's value chain has high coordination among its network of producers in industries ranging from computers to aviation (Gereffi 1994; Gary Gereffi 1999c; Gereffi and Memedovic 2003).

Another critical aspect of understanding global value chains is its governance structures. Governance makes up a vital approach to the knowledge of the forces determining the patterns and interaction and actors' constraints along the chain in this modern age of globalization. The changes in international trade and industrial organization as posited by Gereffi, Humphrey, and Sturgeon 2005, in their work "governance in global value chains." considers relevant contributions to the variables and key determinants in the governance debate on global value chains (Gereffi, Humphrey, and Sturgeon 2005). Their work is essential in having a more specific notion of the level of power asymmetries along the different global supply chain governance structures. However, early texts show that governance in value chains stems from a variety of approaches grounded in sociology, power dynamics, and opportunity cost theory as hypothesized by Gereffi, Humphrey, and Sturgeon 2005. In addition, Bair 2008 suggests the analysis of global economic organizations, explains the different views on global value chain governance. This is significant since Bair's literature suggests that the origins of governance in value chains are indebted in the power dynamics of Wallerstein's world systems view (Bair 2008). A precept that is also present in the debate on global commodity chains (Bair 2008). The relevance of Wallerstein's view of power asymmetries among nations is vital as economic actors embedded in the global supply chains influence policy in both producing and consumer countries. It alludes to the power of multinational companies as the precursor of global production networks and the way they operate (Gereffi 1994).

Development strategies also play a role in the Global Value Chains debate as governments play an active role in industrial relations and developing an infrastructure to support export-oriented industries (Gereffi 1994; Gary Gereffi 1999a; Gereffi and Memedovic 2003; Gereffi, Humphrey, and Sturgeon 2005; Humphrey and Schmitz 2008). Hence having a direct impact in GVCs activities such as sourcing, logistics, and marketing through the governance structures these economic actors (Gereffi, Humphrey, and Kaplinsky 2001). Higher levels of investment in infrastructure shift the organization of some countries' development strategies from a commodity-based export-oriented model to one of the high value-added activities. The literature suggests that intensity in worldwide competition as stated earlier and higher levels of technology in some emerging economies are shifting the paradigm. This shift observes the way political actors shape policy geared to increase these economies participation in the global value chains and production networks. All critical factors to attain higher levels of economic growth and higher national-level competitiveness (Gereffi, Humphrey, and Kaplinsky 2001).

Mexico is an excellent example of the paradigm shift in the industrial organization. Although the country still has a dynamic agricultural sector, significant improvement in industrial technology and the concentration of high-added value industrial activity drive the country's progress. The latter an important aspect propelling Mexico's economic growth of the last four decades as American companies sought more cost-effective destinations. Sturgeon 1997 suggests that American high-tech

firms, in the electronics sector, are seeking suppliers to outsource production, while keeping control of critical areas such as distribution and marketing. This control-focus suggests that with higher levels of technology attainment and industrial capacity in emerging economies, the interaction between multinational companies and merchant suppliers has changed. This change is because of the organizational split between innovation and production; a feature that "formalized links" at the inter-firm boundary (Sturgeon 1997). It proves that this turnkey approach to production in producers' sectors, like the technology, automotive and aerospace, to be of vital importance for emerging economies in Latin America. The literature suggests the new levels of industrialization and technology in some of these countries are creating a hybrid system of buyers driven networks but inter-firm vendor supplier networks. The latter not only helping these economies further integrate into the global value chains but also changing the systems of GVCs governance like in Mexico's case.

Perhaps of the literature sources consulted on Global Value Chains Gereffi, Humphrey, and Sturgeon 2005, marked a key contribution in the scholarly debate. The authors identified a broad set of variables like; the transaction complexity; the ability to codify them; and the capabilities in the supply chain (Gereffi, Humphrey, and Sturgeon 2005). The five governance structures derived from their contribution acknowledge the changes in the global pattern of production and cross-border interaction as factors fostering economic development. At the same time also leaving in place the power asymmetries as essential components for the design and implementation of technical integration policies. Making up a more efficient global value chains integration while fostering economic growth. The proposed stronger policy framework suggested by the authors' literature points to a better policy formulation required to address GVCs governance issues. All issues that are affecting small, and medium-size company's clusters in their efforts to upgrade as posited by (Humphrey and Schmitz 2008). The lessons learned from the literature review on Global Value Chains unveiled how the concept evolved from a modest analysis of value activities at the firm level to one of global connotation. In this context, the literature suggests that globalization is a vital force propping the dispersion of production processes into global production networks. The higher levels of industrialization in emerging economies such as Mexico requires an analysis of the processes by which these economies have upgraded industrially. How these economies face current challenges to further upgrade in global value chains while fostering a fairer local and regional development. The literature on upgrading value chains shows this discussion links to the global value chains' governance structures. A fact which determines to upgrade outcomes at the national, regional, and within the firms' level. (Gereffi and Fernandez-Stark 2016).

Upgrading in the global value chains also relates to innovation as a process upgrading practice and performance. Kaplinsky and Morris 2001, defined the factors of upgrading as improving processes and efficiencies to introducing new products, changing activities within the value chain or changing to a new value chain (Kaplinsky and Morris 2001). These four factors are key in the process of innovation, further integration in global value chains, and creating a competitive advantage for the firm. Upgrading at the company level and in global value chains cannot stand an examination in isolation of one another. It relates these two concepts as companies need to improve core competence and capabilities to better compete in a global value chain (Prahalad and Hamel May/Jun 1990; Prahalad and Hamel 2006). The literature suggests that the industrial upgrade takes place through knowledge improvements (Gary Gereffi 1999b). It points to the fragmentation of industrial activity as a factor improving organizational learning to refine the firms' and nations' position in international trade networks. An event that according to the literature has facilitated social learning and increase commercial subcontracting throughout production networks (Gary Gereffi 1999c). The following chart on the five different Global Value Chain governance showcases the connection between industry activities within the chain. According to Gereffi, Humphrey, and Sturgeon 2005, this merged model

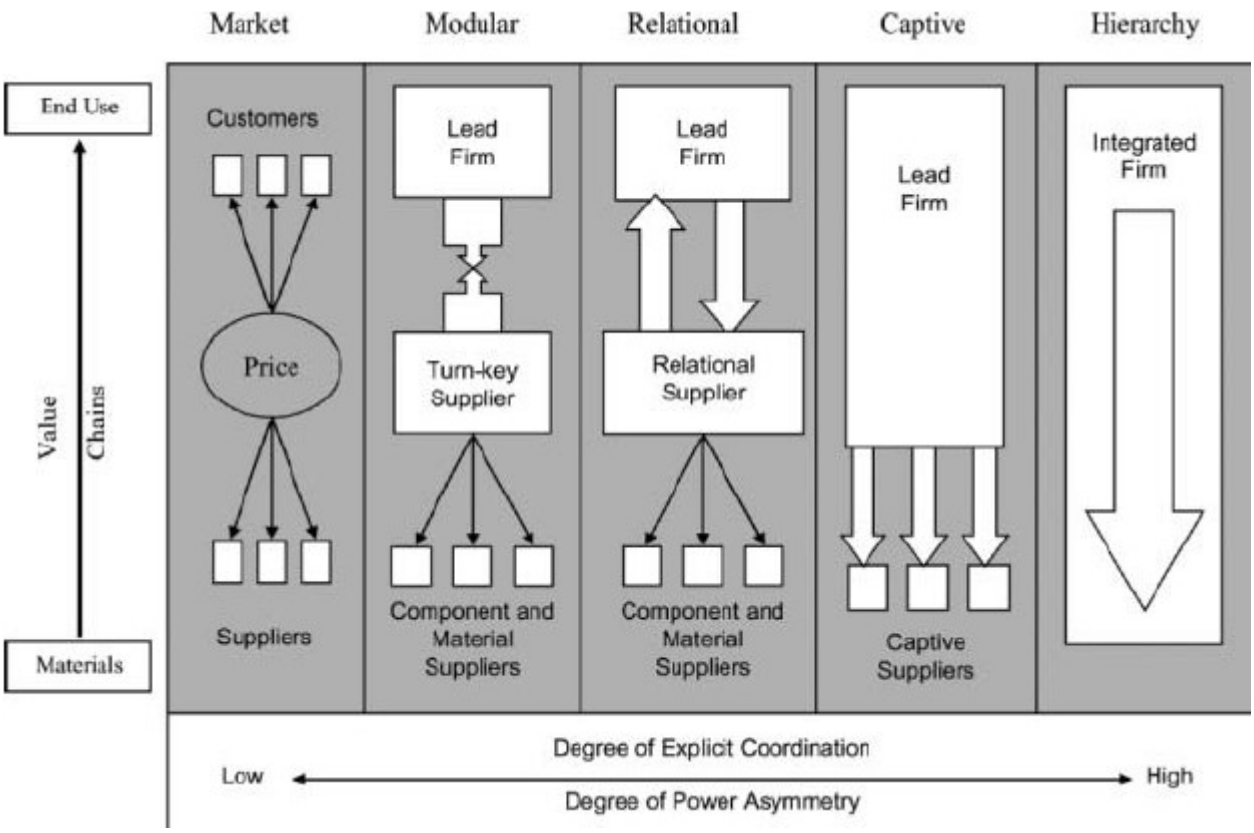

Figure 18: Source:Gereffi 2005, Types of Global Value Chains' Governance

can describe the continuum extending from the market, characterized by "arms-length" relationship, while, also pointing to hierarchical structure value chains illustrated through direct ownership of production processes. In between these two different arrangements we observe three different networks of governance, see, also figure 18.

Industrial upgrading within the GVC's is another area of relevance in the debate. Value chain upgrading not only relates to trade but also factors of regional disparities or uneven economic development. It marginalizes impoverished areas which cannot integrate into the global economy or find export markets. While clusters further promote GVC integration, driven by technology innovation and the promotion of entrepreneurship as a factor of development. The importance of these ecosystems is primarily because of the tension or disconnect that still exists in reconciling national, social and economic issues with the cluster-based objectives. Objectives based on the literature require examination away from the macro-level analysis to focus on local and regional development (Gereffi and Fernandez-Stark 2016). In further addressing the local issues of governance likewise upgrading in global value chains. Schmitz 2004 touches on the framework by Dirk Messner calling for a World economic triangle of clusters, global firms, and global standard-setting policies. Therefore, alluding to the different governance influencing the upgrading of local firms (Messner 2004; Schmitz 2004). Schmitz 2004, also proposing a new category of upgrading and he calls it "inter-sectoral" to the local SMEs.

According to the literature, this category would create an environment where features of global governance can integrate into the local context. Thus, having the input of lead firms in the global

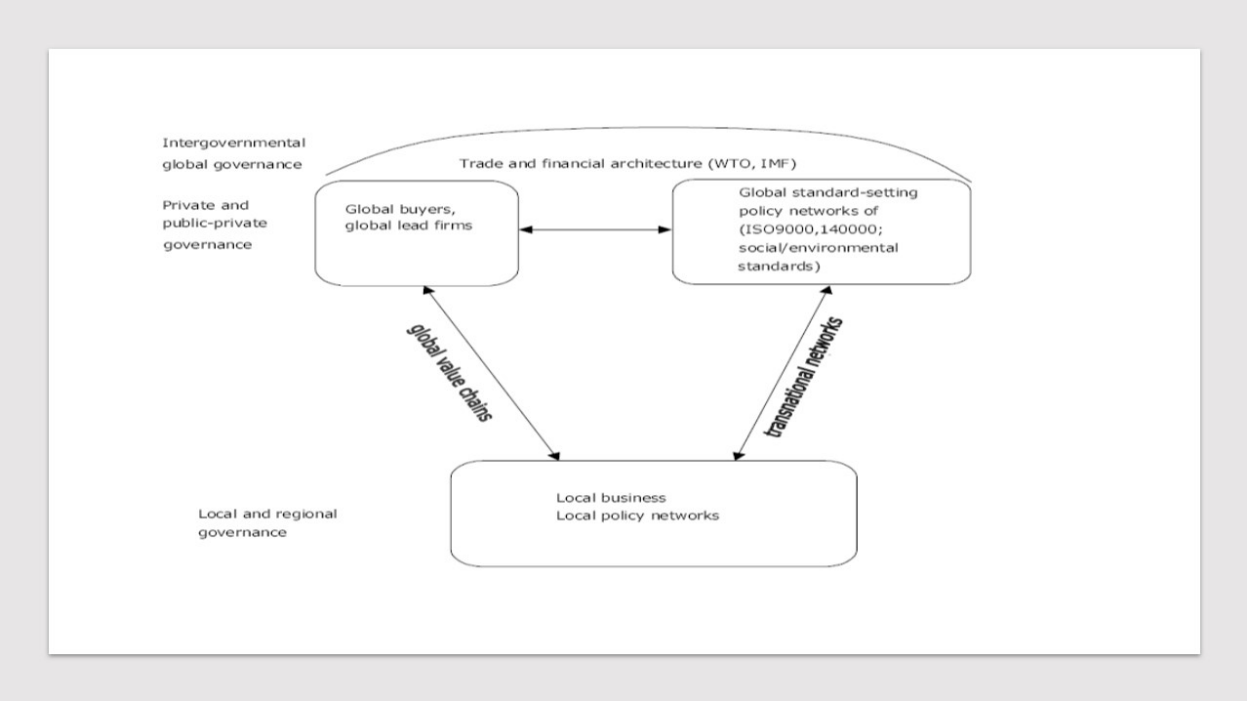

Figure 19: Source: Messner 2004, World Economic Triangle

value chains promoting a much fairer regional development. Schmitz proposes the upgrading of governance structures and the role of global standards in materializing regional development objectives. Last, Gereffi and Lee 2016, examine economic and social upgrading in value chains through clusters and the role of CSR programs as governance. The authors address upgrading in global value chains by pointing to the existing gap between clusters and the external pressures of global value chains in national forms of governance. The literature suggests that while upgrading in global value chains takes a macro perspective shaping national industrial policy outcomes. It has done little to reconcile this external dynamic with the social and economic upgrading of small and mid-size companies within clusters (Gereffi and Fernandez-Stark 2016). An issue that, if solved, would bring more balance in promoting a fairer outcome from the interaction of clusters at the local level with the national objectives. The work by Gereffi and Lee 2016, is relevant as the author's highlight the tension to promote economic and social upgrading between GVCs, clusters, and public stakeholders. Proposing an expansion of the classification of GVCs and clusters to consider both the vertical and horizontal relationships between public and private forms of governance. (Gereffi and Fernandez-Stark 2016).

The following graphs call for a mode of integration between local industrial locations, global value chains, and global networks as posited by the author. It highlights four essential elements. The actors, the different governance and its architecture likewise its system of rule. Therefore, calling for the integration and adaptation of local economies into the multilevel arrangement of management consequently breaking down local GVCs' integration challenges. A perspective which based on the literature can lead to optimal local and regional development outcomes, see, also figure 19 (Messner 2004; Schmitz 2004)

This part of the literature review has covered the relevance of global value chains and their impact

on shaping the competitiveness of various actors from firms to national level policy and regions. The latter is making up the centre of a new paradigm shift, one regional in scope and global in dimension. The literature on global value chains has shown the trajectory of the concept one from a process devoid of any value significance. Towards one driven by value and the calling for better integration of regional actors along the global value chain structures. As the literature evidenced, this new conception owns a new challenge in the analysis of international trade and countries' competitiveness. The latter and the former, evidencing the different points of view ranging from the different governance structures to regional realities dictating the modern competitive discourse.

In this context, the literature suggests the rise of global value chains taking centre stage in the analysis of international trade, national, and regional competitiveness. What the above-stated suggests is that the traditional assumption based on activities taking place within the firm or in the domestic economy is no longer preponderant. Chiefly, because of the increasing fragmentation of production across the global borders. Also, the use of external inputs into added-value activities taking place in ecosystems or clusters of efficiency, productivity, and innovation are primal. Besides the role, these ecosystems would play in fostering a paradigm shift aligning economic and social upgrading between GVCs, clusters, and stakeholders as noted. The alignment above not only will improve the various forms of governance but will produce better policy outcomes, thus leading to a more similar regional development. Last, a policy geared towards clusters with a strong backing of government social programs, not centred in employment reduction. But, rather on human capital development to promote clusters as institutions would further enhance the value chain integration features of clusters as centre stage of regional-national economic growth. In brief, industrial clusters as institutions not only promote the value chain integration of less developed regions. But, as claimed in this master thesis would allow less developed regions to respond better to national level policies. The next section of this literature review outlines key aspects of Latin America competitiveness in the global context. A region where the scope of this master thesis could entice further areas of research involving the regions' industrial clusters and the regional level of response to various national policy objectives.

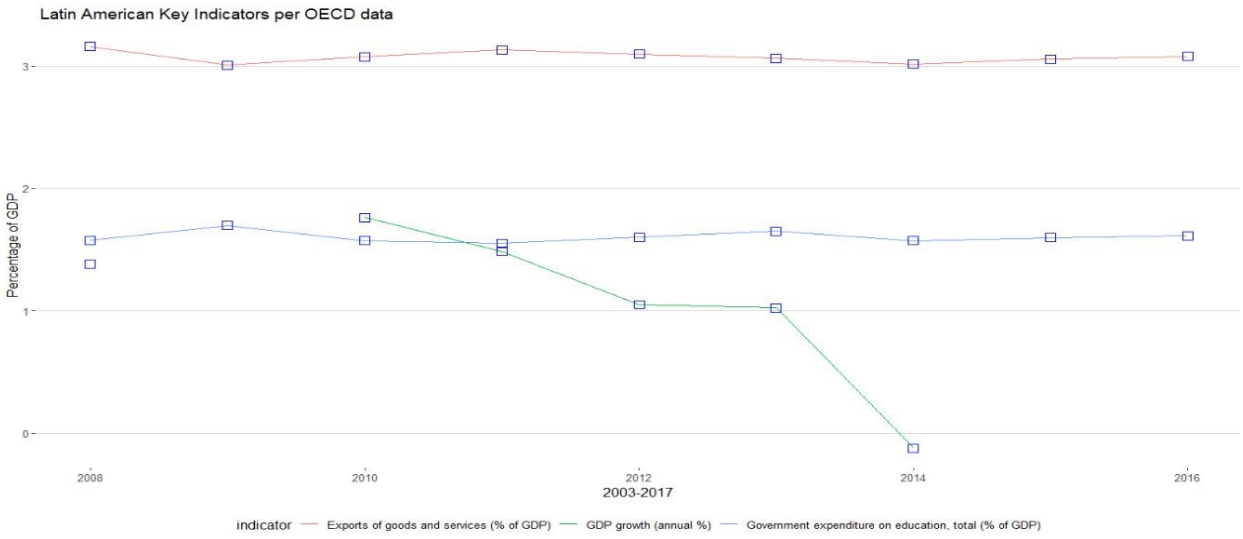

Figure 20: Source: OECD data, Key Drivers of Development in Latin America

3.4 Latin America Competitiveness:The Different Competitive Issues

The make-up of Latin America composes multiple economies, and these vary in economic performance and development. Mainly, the region's economic driver is exporting accounting for most of the economic growth. These economies still experience high levels of inequality where regional disparities are a key cause of the lack of industrialization in some areas and the void in better education and technical training. A commodity export-oriented policy where these economies resource wealth takes centre stage had driven the early integration of the region in the global economy. It has also caused these economies propensity to have more volatile economic implications in times of global economic crisis (Krugman 1994; Stiglitz 2003; Stiglitz 2000). According to the World Bank, this region's population is 633 million people as of 2016, and the combined Gross Domestic Product over five trillion in US dollar value. Human capital availability has been one of the main factors in the increase of outsourcing activities in the manufacturing sector. A factor that, with Mexico, has promoted an increase in Foreign Direct Investment and Industrial agglomerations. According to the literature, the most relevant issue facing Latin America is the disconnect between societies in their economies and public institutions.

Although, the region has made a significant economic gain in the last fifteen years. Indicators are still stagnant in critical areas such as education, health and skilled training (OECD 2018). A pressing reality that continues to undermine the public trust in public institutions and is chief in the ever-growing inequality and regional disparities. The following graphs will show the key economic indicator in Latin America expressed as a percentage of GDP. The aim is to notice these economies liberalization represented in the growth in exports while looking at other indicators in other critical development areas. Figure 20: uses the log Gross Domestic Product (GDP) as the standard of measurement. Therefore, providing a much better sign of the growth or decline patterns across these indicators.

A comprehensive assessment of competitive issues in the regions requires an analysis based on the context of the region's market liberalization efforts and structural adjustments. Although

liberalization efforts have yielded an increase in exports, the economies in the region continue to suffer from an inequitable wealth distribution, low level of industrial innovation and education. However, market liberalization has improved levels of FDI, promoted the internationalization of firms, pushing for innovation, while also strengthening institutions (Kumar, Mudambi, and Gray 2013). Despite the positive, a lot more progress needs to take place in the region due to the clear disconnect that exists between national level policies and regional realities.

The literature suggests, this policy disconnect has a direct impact on the level of infrastructure development in these economies. No to mention the sustainability of a fairer and robust regional development (De Grauwe 2010). Latin America economies are falling short of keeping up with the level of infrastructure development of advanced economies and emerging Asian markets. A reality which brings attention to the argument presented by Démurger2001 as the author's findings suggest a positive correlation between infrastructure development and improved levels of regional economic growth (Démurger 2001).

The literature also points to the region's level of investment in human capital, knowledge-based economies, regional assets, and friendly business environment. All vital aspects which, with Latin America, have proven to impact these nations' competitiveness negatively while also being a limit for FDI. Although, the region has seen improvements across some industries and in macroeconomic terms. It still lacks a push towards industries based on R&D where innovation takes primacy, thus improving the overall competitiveness of these economies (Démurger 2001). The following line chart builds on the literature sources pointing to the factors affecting Latin America's development and placing infrastructure spending as an essential development aspect. It showcases the level of the expenditure on infrastructure for the region compared to the United States, Europe, and China. Figure 21: shows the region's spending in infrastructure as a percentage of GDP using log of (GDP) as the standard of measurement.

The above line-chart shows that despite the relative advancement in economic terms as postulated earlier. Latin America economies still show one of the lowest levels of infrastructure spending in GDP terms. Out of the regions and countries that were chosen for this comparison, the US ranks at the top followed by the European Union and China. While Latin America ranks at the bottom with a combined investment in GDP terms that does not surpass 1.0% of the total combined GDP among these economies. Despite these low levels in critical areas like infrastructure, which represent a constraint for the region to attain higher levels of competitiveness and domestic, regional interaction, Latin America showed favourable improvements in domestic policy. This signals an increase in the levels of concentrated industrial activity (Kumar, Mudambi, and Gray 2013). Multinational companies' activity along with the internationalization efforts of the regions' MNEs is because of the strengthened institutional environment. All are significant factors which have helped the regions attain considerable industrial progress despite the above-mentioned challenges. The literature also suggests this new institutional reality is witness to improvements in the regions' levels of economic performance, i.e., competitiveness. However. These improvements are moderate and still constrained by the lack of investment in education, entrepreneurship activities and corruption (Kumar, Mudambi, and Gray 2013).

The region has faced high levels of violence and corruption, factors which have impacted the region's development. The high levels of corruption and crime in the region, carry implications ranging from a reduced performance at the company level to hindered FDI. Gaviria 2002 examines the impact of corruption and high levels of bureaucracy in the regions and its effects. According to the literature, corruption slows economic growth, increases irregular activities, and negatively impacts social spending. Therefore, inequality remains, but it halts human development. All of which

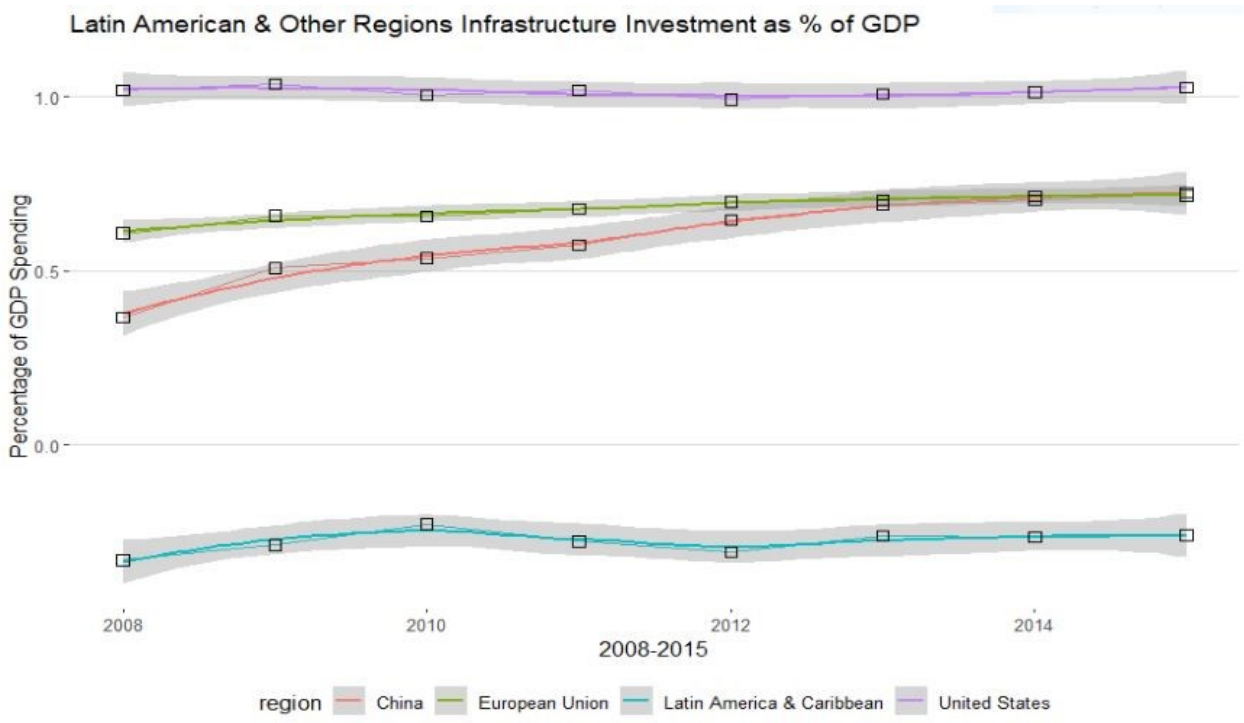

Figure 21: Source: World Bank, Latin America & Other Regions Investment in Infrastructure

translates into slower progress for these countries and these countries' regions (Gaviria 2002). The above-stated factors contribute to limiting the chances of more inclusive human development in the region while also bringing attention to relevant points brought forward by Kumar, Mudambi, and Gray 2013. The authors posited that low levels of investment in human development, and education not only limit new enterprises creation, thus restricting innovation but also impacts the countries' export orientation. The levels of exports in these economies are in part because of high value-added activities and improvements in manufacturing technology. Two areas where education, knowledge transfers and R&D activities are essential for a dynamic and competitive export industry integrated into the global markets (Kumar, Mudambi, and Gray 2013).

The overall competitiveness of Latin America as mentioned earlier requires an inclusive perspective that promotes further growth. The World Bank's in its 2017-2018 competitiveness brings attention to a much more human-centric approach and the necessity for human development as a critical driver of competitiveness. The World Bank's report suggests that higher levels of human development will increase new technologies' adoption thus helping to close the national-regional productivity gap (Schwab 2017). The index proposed by the World Bank considers twelve different indicators divided into three areas of analysis like the level of growth and development, and the level of social inclusion. Two factors which combined with inequality and sustainability brings a much more multidimensional view which can guide the assessments of Latin America competitive issues.

According to the World Bank's last competitive report, the region still shows gaps across these twelve competitiveness indicators ranging from health, education, financial market development, readiness for new technologies and business sophistication (Schwab 2017). After two years of economic recession because of the collapse of the commodity market, the recovery for the regions

shows that is a slow process. It expects the economies in Latin America to grow a modest 1.1% in GDP terms while also persisting in showing under development in areas such as infrastructure, labour market efficiency and innovation. All aspects representative of the sharp regional inequalities limiting the region's ability to cope with the changing industrial landscape (Schwab 2017).

The low levels of productivity in the region, the improved but stagnant institutional development, and the regional disparities regarding trade are areas in need of improvement. The barriers to facilitate trade interaction as observed by the IMF also pose a regional problem in attaining higher levels of competitiveness. Although the region shows a reasonable level of integration into the global trade network, the volumes of import and exports are low when compared to Europe, Asia or the United States regions. However, the literature suggests the region has attained a reasonable level of integration because of the number of trading partners these economies have with the global market and the regions' trading block partners. Regarding trading volumes, Latin America still lags compared to other regional players such as Asia. The region's levels of integration into the global trade networks are in the agreements these economies have with at least 70% of countries according to 2015 figures (Beaton Kimberly et al. 2017). Despite the push, these markets' liberalization in the 1980s and 1990s, the percentage of exports among the economies in the region remains stagnant. In fact, the joint number of exports only accounts for 5.1% of the total global volume when compared with Europe's, Asia's and the United States regions. According to the IMF, the total number of exports and imports of these economies account only for 44% of the total economic activity in GDP terms. This figure is low compared to other emerging regions which have a much deeper integration in the global value chain (Beaton Kimberly et al. 2017). In fact, the most significant economies in South America are the ones driving the regions' low averages of trade openness.

An example of this is Argentina and Brazil where trade accounts only for 27% and 24% of these nations' GDP. In Latin America according to figures from the International Monetary Fund, cross-country differences in the regions' openness to trade with these disparities ranging from 25% to 125% of the GDP. It bases these trade differences in geography as countries in Central America, and Mexico is much more open to trade, thus exhibiting a better integration into global trade networks and value chains. Detail, which can find an explanation in the proximity to the US market and more MNEs in these regions outsourcing production (Beaton Kimberly et al. 2017). According to the Global Competitive Index, this region is being affected by the global trends impacting the level of national competitiveness. These trends according to 2017-2018 report stemmed from the necessity for labour market flexibility, protecting labour rights, and improved levels of openness, i.e. economic integration. The literature by the world bank is viewing these trends as a challenge to Latin America Economies and advanced industrial nations (Beaton Kimberly et al. 2017). For, Latin America countries the ability to move factors of production to be flexible and responsive to technological tendencies is a primordial driver of future competitiveness. Under this pressing circumstance the need for a better policy response, an increased emphasis on high skills professional training, and the need to further positioning clusters as regional institutions of social change is of urgent importance. Being aware of the implications of such new technologies' adoption can allow these economies to mitigate the impending impact on the labour force.

In this context, Latin America economies still lack coping mechanisms for these new economic trends and the rapid changes in the demand for a higher level of integration into the global economy. The literature suggests the region still shows low levels of productivity compared to advanced economies owed to the low level of investment in growth areas infrastructure, skills development, and innovation (Schwab 2017). Countries in the region show signs of insufficient reforms to improve its business environment with policies conducive to a fairer distribution of resources. It is the latter fostering

the inability of local and regional economies in these markets to move towards more productive sectors. so, limiting the ability of these countries to meet higher levels of competitiveness and better integration into global value chains ("Latin America and the Caribbean" 2015; Martin 2005). What the literature is telling us is that although economic conditions in the region changed over the years, these improvements are not yet enough to give a sustained reduction of poverty and advances in the quality standards of these regions' citizenry. In brief, improved competitiveness among these Latin America economies depends on having a much more in-depth understanding of the conditions and priorities at the regional level. The latter striving for higher incomes and more well-being, enjoying globalization while improving cross-regional development. Joint aspects which, not only offer a higher level of national competitiveness but will contribute to closing the social gap existing in these societies (Schwab 2017).

Inequality and poverty in Latin America have hindered further economic growth and competitiveness. These social dynamics have been the centre of discussions at the United Nations and among the scholars Joseph Stiglitz and Thomas Piketty. In fact, the United Nations, in 2004, undertook to study factors impacting the growing inequalities, and the impact of globalization has on the poor. The findings yielded that although globalization has promoted growth and openness in trade, capital mobility, labour migration, and technology. The impact on the lower classes varies depending on the national resources, human capital, and the various institutional frameworks of governance. With Latin America, the analysis yielded a different result than among Asian economies China (Nissanke and Thorbecke 2010). In, a contrast to countries such as India and China where globalization is conducive to lowering the patterns of poverty despite income inequality remaining very relevant. With Latin America, and globalization the literature suggests poverty has expanded instead of contracting while the income inequality gap increases. These findings are very relevant as they confirm the wealth' concentration existing among Latin America economies and its influence in perpetuating inequality. This evidence signals to why disparities and socio-economic gaps form part of increased regional disparities at the national level. All evidence pointing to the high concentration of poor inhabitants across different regions and the relation to low levels of productivity and industrial growth thus impacting regional competitiveness (Nissanke and Thorbecke 2010). In this context of low growth and growing regional and social disparities in Latin America, Scholar Joseph Stiglitz in his 2003 publication. "Whither reform? Towards a new agenda for Latin America" calls upon the necessity to a more balanced policy agenda in the region. The literature suggests past reforms in Latin America promoting economic growth are the ones responsible for augmenting poverty, inequality and low levels of economic growth across regional economies.

Stiglitz identified two factors as the leading causes of those above: the first one due to the increased exposure of these economies to risks and their inability to carry out the mechanism to mitigate it. The second lives in the unbalanced policy agenda pushing market driven macro-level economic reforms without accounting for the implications of fostering low growth, poverty, and inequality. The literature suggests that while these economies were centring their improvements on privatization, inflation and trickle-down economics (Stiglitz 2003). The governments in the region should have placed more emphasis on policies to promote job creation, creating new industries and implementing poverty reduction strategies (Stiglitz 2003). Stiglitz in his later work on "Capital Market Liberalization and Development" Ocampo and Stiglitz 2008, further, propose a balanced framework for a fairer regional development in Latin America. Ocampo and Stiglitz's literature tries to reconcile a policy dialogue highlighting the aspects of past reforms and its implications. The authors touched on the benefits and risks of financial globalization, and the impact of capital markets liberalization as it related to development. The literature brings attention to the role of the IMF as an external agent exercising outside pressure on governments' policy reforms. A case

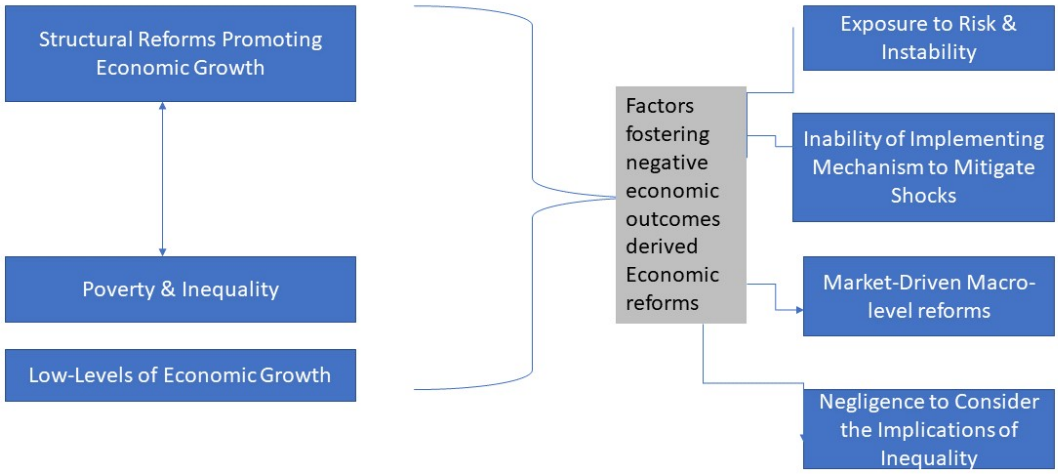

Figure 22: Source: Stiglitz 2008,The main causes of inequality and poverty

that in the experience of Latin America has proven to weaken financial institutions and creating perpetual cycles of economic instability (Reinhart and Trebesch 2016; Stiglitz 2000; Stiglitz and Ocampo 2008). According to the authors, capital market liberalization has been conducive to the regions' volatility of output and the intermittent flows of public investment. A fact which impacts infrastructure development and education in the region while fostering low levels of growth and stagnant productivity. According to the literature high-interest rates, coupled with external pressures on policy impositions have limited the efficiency in which these economies public funding (Stiglitz and Ocampo 2008). Figure 22: outlines and summarizes the main causes of inequality and poverty in the region according to Joseph Stiglitz's factors affecting economic growth in the region.

The lack of proper or fairer distribution of public funding because of fiscal constraints which translates into low growth levels contributes to promoting uneven regional development. Besides bringing attention to the high concentration of wealth among specific economic sectors and the unequal distribution of income increasing the inequality gap which hinders a possible more inclusive growth. Regarding, wealth and income inequality Thomas Piketty on his work "Capital in the 21st century" evidences income and capital structures as fostering inequality. According to the author, the high levels of wealth and income ratios is a phenomenon observed worldwide. But, in low growth, economies are signalling the return of a "patrimonial wealth-based society (Piketty 2014)." One societal arrangement where extreme labour income inequality is the number one denominator among developing and emerging markets. According to the literature low levels of productivity, competitiveness and economic growth in the region relate to failed policies and the necessity to change them. That, coupled with engrained and traditional social structures, reinforce the patterns of poverty and marginalization, thus hindering more inclusive policies.

In Latin America, better strategies can have a positive impact on managing capital inflow to avoid

periods of the economic meltdown when foreign capital is absent (Stiglitz 2000). Reforms for more sustainable levels of public investment require discussions of inequalities and promotion of human capital strategies. The literature suggests that the contentious issues in the policy disconnect between the macro-level market-driven policies, and local-regional society in these economies are of crucial importance (Calvo, Leiderman, and Reinhart 1993). A pressing reality which suggests using other models constructed from Michael Porter's national-level Diamond (Porter 1990). National Diamond models are only assessing what the country-specific factors can offer. Models constructed from Porter's other methods give a more nuanced understanding of policy gaps and divergent views around contentious competitive issues in smaller markets. In broadening the competitiveness analysis, the Double Diamond model uses an augmented framework to assess the competitiveness of smaller economies, i.e. regional.

According to the literature, the Double Diamond model has served Canada's and South Korea's competitiveness. In, this assessment the different approaches to competitiveness in emerging markets served as a foundation to look at the innovation capacity and business environment of firms. In particular, in transitioning economies such as Mexico and its auto segment. In fact, the Double Diamond model served as a conceptual framework to examine the sources of competitiveness in Mexico's regions where the auto industry is prominent for its manufacturing activities (Barragán and Usher 2009; Carayannis, Wang, and Liu 2012; Rugman and D'Cruz 1993; Leon 2017; Castro-Gonzáles, Peña-Vinces, and Guillen 2016; Pena Nieto 2016). Castro-Gonzalez, Peña-Vinces, and Guillen 2016, used the Double Diamond to look at Latin America's competitive issues using the model as a theoretical foundation based on [Chang Moon, Rugman, and Verbeke (1995); Moon (2000); Rugman and D'Cruz (1993);@] work.

The Double-Diamond approach takes on the analysis of a small economy's home-based Diamond as it relates to the economy's most significant trading and investment partner. Hence, according to the literature allowing a better allocation of Foreign Direct Investment inflows (Desai, Foley, and Hines 2003). Castro-Gonzáles, Peña-Vinces, and Guillen used the DD model to examine other Latin America economies' competitiveness. The authors gathered data on Argentina, Brazil, Colombia, Peru, Venezuela, Chile, Ecuador, Bolivia, Paraguay, and Uruguay. To measure the weight in which the factors considered in the Double Diamond Model affected these country's competitiveness. The findings suggest that factors examined in the DD model do not carry enough weight in the authors 'quantitative model because of regional complexities. so, bringing attention to examining more local and regional realities while inspecting the country's policies as these relate to underdeveloped areas. Castro-Gonzáles', Peña-Vinces', and Guillen' work highlights the need for establishing a symbiotic dialogue between local competitiveness and aspects of international global competitiveness in Latin America (Castro-Gonzáles, Peña-Vinces, and Guillen 2016). It is precisely, the need for a symbiotic discussion that brings global, national and regional objectives into a more homogeneous development agenda our motive to position clusters as institutions within an augmented competitive framework.

The literature review on the assessment of these Latin America economies places Brazil and Argentina as the most competitive countries in the region. An evaluation which contradicts the postulated by (Beaton Kimberly et al. 2017), as these authors tested these countries' competitiveness according to these two nations' restrictive trade policies (Beaton Kimberly et al. 2017). The increasing interest in improving the regions' competitiveness has driven attention to the examination of clusters as ecosystems of productivity and innovation. Viewing these concentrations of industrial activity as a formula for attaining higher levels of economic development as discussed before. Although clusters are no new to Latin America economies, and these agglomerations are of economic importance in countries such as Brazil, Chile, Colombia, and Mexico. The writings by Ketels, Lindqvist, and

Sölvell 2006, uncovered the limitations and challenges for cluster development in the region. These challenges point to government centralization as a key hindering the adoption of cluster-based initiatives (Ketels et al. 2013). The authors' literature further reinforces the need to close the gap between national-level economic policy and activities essential to support clusters.

The study addresses the differences in the rate of adoption and the actors promoting the cluster-based initiative in developing economies. In emerging economies lobbying activities are more prone to push for change. while in developing economies, governments are much more disconnected from the processes around cluster-based initiatives (Ketels, Lindqvist, and Sölvell 2006). According to the literature in transition economies, the more significant share of these initiatives sees the involvement of the business and different industry groups. In contrast, developing economies show that private sponsors financially drive these activities. Another significant finding of Ketels, Lindqvist, and Sölvell 2006 is that innovation is not within the three main tiers of activities relating to the advancement of cluster-based initiatives (Ketels, Lindqvist, and Sölvell 2006). Under this context, it need it to view a cluster-based policy as the formula to decentralize national level economic policies in Latin America. A policy change triggering more sustainable development. As Martin 2005, posited competitiveness needs to find its way to regional, urban and local levels thus, fostering more regionally based policies to foster competitiveness (Martin 2005). In, Latin America especially these regionally based policies must look at the enhancements of local systems through the improvement of knowledge-based activities and creativity through clusters or networks. Aspects which not only bring forward a much more inclusive development in the region but make the region more responsive to changes in global manufacturing practices and new technologies. Making these nations more competitive and integrated into the global economy (Hallward-Driemeier and Nayyar 2017; Porter 1998).

The state of Latin America competitiveness touched upon the region's institutional challenges and the lack of investment in key development areas such as the infrastructure, and education. These two aspects combined with the region's inability to adapt to rapid changes fuels the regions' underdevelopment. Latin America has advanced as the region's economies transitioned from exporters of raw materials to destinations of increased manufacturing activity. The latter a phenomenon allowing knowledge spillovers to take place and increasing these economies' level of technical capability. Also, the agglomeration of manufacturing activity as mentioned earlier has contributed to boost the productivity of unskilled workers. An event that has also seen recent manufacturing activity in some high-tech sectors like the aerospace industry.

The region still lacks appropriate levels of R & D activities compared to advanced industrialized economies. A fact, that limits the transfer of knowledge at the national and regional (Sanna-Randaccio & Veugelers 2007). MNEs with operations in the region are often contributors to the limiting knowledge spillovers as these companies maintain R&D activities centralized. The centralization of R&D prevents spillovers from market competitors at the subsidiary level while also accounting for institutional weaknesses in these economies (Sanna-Randaccio & Veugelers 2007). Last, the lack of equitable investment in infrastructure across regions concentrates industrial development in more developed areas. This phenomenon not only perpetuates regional inequalities, it also hinders the level in which less developed regions respond to the national level policy aim. The latter a circumstance that hinders the intraregional transfer of industrial development and knowledge in these less developed areas (Davies 2001b)).

Latin America competitiveness is of great importance because of the current changes in the global economy. These changes are in technology-led manufacturing development as mentioned by the World Bank. The regions need to invest more in education and infrastructure to move forward toward more knowledge-driven economies. Although these economies have opened to trade and

increased exports, the literature implies they based this growth on industrial activity in the lower end of value-added production. A reality that calls for the need of a more knowledge-intensive industrial activity to promote higher levels of economic growth. In this context, the need in the region for knowledge-intensive industrial growth is clear. In promoting human capital development through social programs in coordination with an augmented industrial policy framework. A framework that can move the region towards the possibility of higher levels of knowledge spillovers because of a well-trained workforce. Therefore, supporting clusters as institutions of social, economic regional change for Latin America and Mexico. Industrial agglomerations acting as formal or informal institutions not only can facilitate a more homogenous response to national level policies. But, also allow economies such as Mexico and others transition towards becoming fully developed. Last, as it is our intent as part of these research a much more active promotion of industrial clusters in less developed regions could facilitate a batter regional response to national-level policy objectives. The next section concentrates on the state of Mexico's competitiveness, this section of the literature review expands on the section from Chapter two touching on the country's economic and location advantages.

3.5 The State of Mexico's Competitiveness

The last three decades have seen advances in Mexico's industry and economy. The country has increased its levels of economic activity in diverse industrial sector as previously addressed in this thesis. This section will inspect the factors making of Mexico's economy a worth case to study. It will also aim to uncover the areas where Mexico's as an economy need further improvements and adjustments in policy if Mexico projects to increase its competitiveness in the global economy. Despite experiencing a severe economic shock because of the global financial crisis, its economy has recovered maintaining steady progress. An example of this is the region "El Bajío" which is a very competitive link in global value chains. It highlights this regional success in the comprehensive report on the state of Mexico's competitiveness named "Entre Dos Mexicos" published by the Mexican Institute of Competitiveness. Despite these signs of improvement, Mexico's economic reality reflects asymmetric patterns of economic development.

The 32 federal entities show marked regional disparities which translate into very divergent realities. The literature suggests a high concentration of knowledge intensive activity represented by an agglomeration of industrial activity in the state of Nuevo Leon and Jalisco. It shows poverty and marginalization in the south where incipient industrialization, high levels of informality and lack of education. States such as Queretaro has seen a growth in the technology-driven industries aerospace. In contrast Oaxaca remains stagnant and with challenges to show modest economic growth (IMCO 2016). Despite the observed growth and challenges there is a wide range of indicators driving Mexico's competitiveness, one of the main ones is the country's labour supply. An aspect where the country's population growth form part of a readily available labour force (see. Appendix 1.9).

The data from 1990 to 2015; it shows that even though the percentage of population growth has decreased since 1990, Mexico's growth in population terms has remained above the Latin America average. The literature suggests this phenomenon links to globalization and cultural dynamics globally which has shown a birth rate decline. Mexico's higher population growth translates into a more significant working age population in low value-added activities and a significant cost advantage for multinational companies with a presence in the country's regions (ProMexico 2017c). Mexico's population is surpassing 127,540,213 according to World Bank's figures and thus makes up an essential source of human capital. In trade terms, Mexico is one of the most prominent exporters of value-added products and it expects the exports of finished goods among Latin America nations to flourish until the year 2050 (IBRD 2017; ProMexico 2017c). Mexico's total exports of manufacture finished goods account for 73% of the total value of Latin America exports, and the total number of goods and services accounts for 399.5 billion in 2016. Besides these export figures, it valued the country's export per capita at 3,320.00 (USD) compared with 566.00 (USD) when NAFTA came into effect.

In the last two decades, Mexico has made significant strides in growing its service sectors with a percentage of services value-added standing at 63.6%, and a thriving financial service industry (IBRD 2017). Besides this Mexico has claimed its place within the global economic context as a nation well-integrated into the global value chains. The last two decades of close integration into the US global value chains is because of NAFTA. Since this treaty came into effect in the1990s, the country evidenced an increase in the country's performance of macro-economic indicators. A fact which gives the nation the distinction as a integrated manufacturing centre with most of its output linked to the broader global economy. Mexico evolved from low value-added three decades ago, to producing sophisticated products for domestic and international consumption (ProMexico 2017c). This evolution turned the country into one of the most robust exporters. In fact, 80% of the auto

mobiles manufactured in the country go to foreign markets such as the US and Canada (Deloitte 2015). The table below offers a snapshot summary of the most relevant data indicators described in the above paragraphs.

Table 14: Mexico's Key Competitive Indicators

Indicator	Value
Population Growth	1.25%
Population Growth	127,540,213
Goods & Services Combined	399.5 billion (USD)
Export Per Capita	3,320.00 (USD)
Percentage of services value-added standing	63.60%
Percentage of Automobile Exports bound for the U.S and Canada	80%
Mexico's Share of Exports in Latin America	73%

ProMexico

Mexico's economy thrives by the country's manufacturing sector coupled with the financial service sector, making up the two primary economic drivers. The country's economy is also thriving by other economic sectors such as commerce, mining, telecommunication and real estate in the country's second tier of economic activity. In the third tier, the country's economy has construction, professional services, and supporting industries as the primary drivers of activity (ProMexico 2017c). Although the country has struggled with the commodity crisis affecting oil-producing state-regions, the recent institutional reforms and a swift policy agenda advocating openness and liberalization under the leadership of President Enrique Peña Nieto has invigorated the country's economic direction (Pena Nieto 2016). Another important aspect linked to Mexico's improved competitiveness is the country's location advantages for the establishment and outsourcing of manufacturing activity, and this reflects the increased levels of FDI over the last two decades. In 1990 FDI inflows were 2.5 billion USD, and in 2016 this figure was 33.9 billion USD as per World Bank data (IBRD 2017). These numbers represent a 1256% increase, which accounts for the highest number of FDI inflows of any Latin America economy. Mexico's economic growth among Latin America economies is noteworthy, in GDP terms the country went from 503.9 billion in 1993 to 1.046 trillion USD in 2016. The country's growth in GDP terms accounts for 19.75% of the total 5.3 trillion for all Latin America economies, besides, industrial production figures being one of the strongest in Latin America (IBRD 2017). Figure 23: shows Mexico's growth in terms of GDP and FDI starting from 1970 until 2016. In, the Latin America context Mexico is one country exhibiting the highest growth in GDP and FDI terms.

The above bar chart shows Mexico's growth regarding GDP and FDI Inflows. The bar chart evidences the significant increase the country experienced in GDP after NAFTA in the early 1990s. This growth coincides with the growth in FDI inflows which signals the growth of the manufacturing sector and multinational corporate investment in the country. Also, the bar chart hints at the correlation that may exist between the declines in GDP growth and external economic shocks during recessionary periods. A point later analyzed as part of the thesis and the analysis of regional development patterns in Mexico. Over the last twenty years, the increase of multinational manufacturing activity in Mexico also has an increase in the country's industrial output and production capacity. This observes the industrial productivity average of a Mexican worker equating to 56,835 (USD). A statistic that is ranking Mexico as 46th in the world, and the leading producer in Latin America.

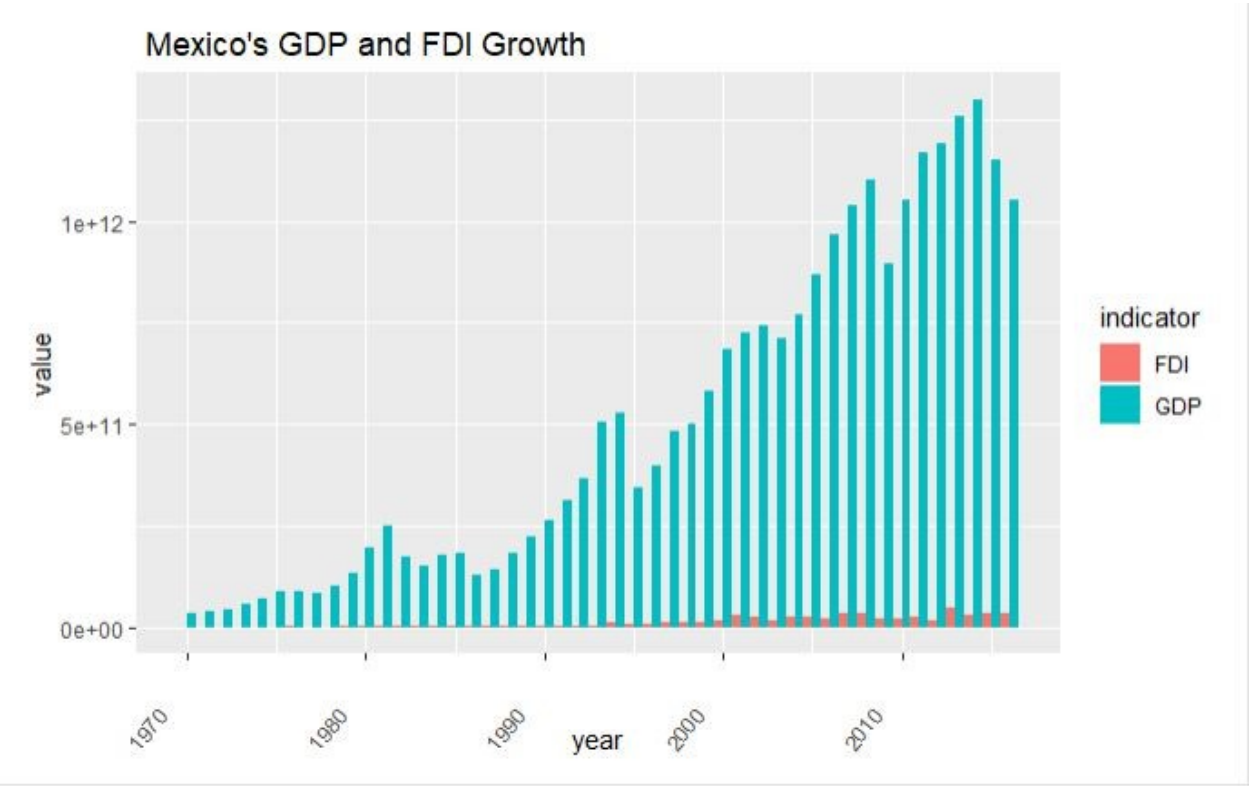

Figure 23: Mexico's GDP and FDI Growth

Another aspect of Mexico's competitiveness lies in the percentage of its inhabitants taking part in the labour market. The country shows 65.32% of the population is of working age, a number which in rate basis surpasses the percentage of working age population of its neighbours north. but, about social spending, the country stands at 1,143.00 (USD) lower than the OECD average of 7,769 (USD) (OECD 2017b). These numbers show the country's level of inequality when compared to other industrialized nations and its North American trading partners. It is the country's growing inequality a factor at the centre of marked regional disparities where regional champions benefit.

The level of unemployment in the country has declined from earlier highs in 2009 at around 5.4% (IBRD 2017). Education is another area where Mexico's has shown significant improvements, the percentage of graduates in Science-related fields is higher than in countries like Germany and Spain; this according to ProMéxico (ProMexico 2017c). However, regarding the country's overall investment in education, remains stagnant compared to other OECD countries. Despite the challenges, Mexico has undergone one of the most severe structural reforms in the country's history. These institutional reforms cover areas such as education, labour, telecommunications, energy, and justice while aiming to reduce informality in the country's economy. In, the telecommunication sector, competition has increased while consumer prices are 75% lower than what they were five years ago (OECD 2017b). Besides this, the liberalization of the country's energy sector with the privatization of the oil industry opened the industry to increased inflows of FDI (Seelke et al. 2015). The oil industry sector has traditionally been under government control and run by the state oil company PEMEX. This market opening allows PEMEX to welcome investment in exploration. An event which helps Mexico as the country will set up a partnership to gain better technology while allowing an efficient exploration of the country's offshore oil reserves (Seelke et al. 2015). In the last ten years, the government has pushed to increase its transparency in its judicial and bureaucratic processes; in the labour market. Despite the country's efforts to further improve its global environment to attract business and investment. Mexico remains a country with high levels of informal economic activity and poverty. The poverty rate in the country is 17% a figure that doubles the OECD average and places inequality as one of the major challenges the nation needs to overcome (OECD 2017b).

In Mexico, approximately 30 million people still lack access to proper pension programs, education, and skills training. The lack of a more socially inclusive safety net joined with high levels of crime are two of the most pressing challenges for Mexico in the 21st century. This also translates to public opinion with 60% of the Mexican people believing corruption and crime are widespread in the country, thus significantly impacting the lifestyle of millions of the country's citizens (OECD 2017b). Despite the challenges, the Mexican Government has also made significant improvements in designing programs to promote entrepreneurship, in the manufacturing sector. Beck and Demirguc-Kunt 2006, in a discussion on the challenges small and medium-size business face to access financing, highlights the proactive role of Mexico. Since the early 2000s, the country's government set up a reverse factoring program for small to mid-size companies. Providing entrepreneurs, a market-based infrastructure to facilitate factoring services thus trade (Beck and Demirguc-Kunt 2006). Under the current administration, Enrique Pena Nieto's government has placed a strong emphasis on promoting small- and medium-sized enterprises to democratize productivity (Beck and Demirguc-Kunt 2006).

To carry out this goal, the World Bank's report towards social inclusion in Mexico highlighted the National Institute of Entrepreneurship (INADEN) formation. An initiative to better coordinate government services while improving attention to the new small business. The government's number one goal with these improved levels of service and coordination across Mexican state-regions, thus being more responsive to the entrepreneur's financial needs. The emphasis on entrepreneurship is the reason the current administration has created 40 public-private venture capital funds for

business creation activities Besides further efforts broadening the Mexican entrepreneur's access to financing, the government has systematically reduced the time and cost required to create a business in Mexico (OECD 2017b; Bank 2018). Although, waiting times and regulatory challenges still in part depend on the state-regions' legislative framework. The current reforms reflected in the World Bank's figures show a movement towards a more efficient business environment. Mexico's ranking has improved from 84.74 on a scale of 100 in 2016 two 90 points for 2018 according to the World Bank (Bank 2018). Recent reforms towards greater openness in trade integration has seen the signing of a trade agreement with over 40 countries. This export market expansion along with programs to encourage exports to important economies like Japan, Spain, and Germany attest to the country's efforts to position itself in the global markets better (Bank 2018).

With Mexico, the country's position as a lead world exporter has scaled mainly by industrial activity in the northern part of the country. This reality brings questions as of the drivers of high levels of specialization and productivity in this region. Cota and Pereyra 2014, examine these drivers of economic growth looking at 53 different sub-sectors of economic activity in Mexico's northern region. The authors aimed to prove a connection between skilled labour, specialization and increased productivity with regional economies in the north (Cota and Pereyra 2014). The northern part of the country and primarily those state-regions near the US border over the last two decades experienced a well-orchestrated integration in the global value chains of US companies. A fact, which has led not only the urban expansion of these areas but the development of critical economic sectors such as the one in the electronics industry (Cota and Pereyra 2014). The development of critical economic sectors around manufacturing activities primarily for the export market has also led to industrial agglomerations. Over time, these agglomerations have transformed into critical ecosystems, of value-added scale economies as drivers of regional and national competitiveness (Cota and Pereyra 2014).

In the regional analysis, the author's literature suggests that higher education levels have a direct impact on productivity and income levels of workers within these industrialized areas. It links higher levels of skilled labour and education as a primordial factor in maintaining a continuous flow of investment in critical areas such as the infrastructure. All of which is very relevant as it establishes a direct link between education and the economic growth of the country, region or cities. It validates the dependence of economic growth as it relates to the maximization of critical abilities and skills set as factors of production (Cota and Pereyra 2014). All primordial facts which in this research call for higher education training, and technical expertise as the chief drivers of the improved regional capital, higher industrial activity, and the process to the formation of clusters as ecosystems of regional-national growth. Still, it advocates for a knowledge-driven industrial policy within an augmented national-regional competitive framework calling for the positioning of clusters as institutions of social, economic change. Promoting efficiency, innovation while better positioning the countries, regions, and cities for the adoption of new technologies (Acemoglu 2002).

The adoption of new technologies is one of the main challenges facing developing, emerging, and middle-income economies mainly in the manufacturing sector. According to the World Bank's book "The future of Manufacturing Led Development," the competitive landscape is changing now more than ever because of technology-driven manufacturing practices. This new reality is posing a challenge to emerging, developing, and middle-income economies like Mexico and other Latin America countries. The distribution of global portions of manufacturing regarding value-added, employment and productivity will remain an essential aspect of each locations' comparative advantage. Global changes in automation, robotics, and the internet at the intersection of globalization call for even more specialization in the manufacturing sector (Hallward-Driemeier and Nayyar 2017). A new

reality, which brings the topics of regional - national competitiveness to the ever-pressing need for higher levels of education and skilled labour as mentioned. Critical elements in providing not only more labour market flexibility but also contributing to mitigate the impact and implementation of new technologies (Schwab 2017).

The literature by Hallward-Driemeier and Nayyar 2017 provides an analytical framework for what the authors coined as the four stages of the industrial revolution. The fourth stage is marking the beginning of an industrial age dominated by novel technologies such as 3D printing, the internet of things, and higher automation because of artificial intelligence and robotics (Hallward-Driemeier and Nayyar 2017). All areas, where Mexico needs further improvements to attain higher levels of regional-national competitiveness thus moving the country to higher innovation activities. Although the literature suggests, Mexico is a high skill global innovator ranking seventh place among the top ten global exporters. It only regards its position as being driven by ordinary skills implemented to innovation activities, so, showing a gap in the country's innovative capacity (Hallward-Driemeier and Nayyar 2017). All above-mentioned is of great importance as Cota & Pereyra 2014, also brings knowledge and skills from a macro context into the new reality of regions' and cities' competitiveness in the global context. A new paradigm shift that in Mexico's case could set an example to other Latin America economies, if Mexico implements further set of policies to adjust to this new ever-present industrial reality. A change that for Mexico signifies improvements in the country's human capital as a chief driver to combat inequality in the cross-regional context. The cross-regional realities leading the disparities among Mexican regions justify why the highest levels of scholarly are in the most developed regions. In brief, the localization of a highly skilled labour force across Mexico's regions not only attract industries while creating new ones but it will help mitigate external shocks outside of the regions' control (Acemoglu 2002; Hallward-Driemeier and Nayyar 2017).

The country's clusters also shape Mexico's competitiveness as localized ecosystems of productivity, efficiency, and innovation (Porter 1998). These agglomerations of manufacturing and industrial activity have developed over time and are an important driver of economic growth mainly in state-regions within proximity to the US. Therefore, providing these ecosystems and SMEs in these regions with an upgraded path to compete in the global value chains (Pietrobelli and Rabellotti 2010). However, in Mexico's context, not all localized activity within a specific industrial defines itself as clusters; it defines these as mentioned above by efficiency and collective output as posited by Nadvi and Schmitz in their work on industrial clusters in less developed economies (Nadvi and Schmitz 1994). The literature suggests clusters in Mexico emerged with the regional specialization and enhanced knowledge in traditional manufacturing practices. This phenomenon coupled with the establishment of local industry leaders and a good industry outlook fostered the agglomeration of industrial activity fostering efficiency and innovation (Nadvi and Schmitz 1994).

In the last four decades, the "Maquiladora" system to foster cross-border trade propelled Mexico's industrial landscape while benefiting American companies with cheap low value-added labour (Carrillo and Hualde 2002). NAFTA propelled the agglomeration of industrial activity intensified into more value-added activities in industries like the electronics and automotive. All of which have facilitated the technical progress of Mexico's human capital because of knowledge and technology transfers contributing to improving the country's competitiveness (Barragán and Usher 2009). In the last twenty years aside from the attained high income of the Chinese economy, Mexico positioned itself as one of the leading emerging economies. The country has benefited by capturing efficiency seeking pattern of FDI which have further promoted the country's export orientation while reducing production cost. Efficiency-seeking FDI has also contributed to improve local production factors, improve local managerial skills set, improve distribution networks and sources of financing (Hallward-

Driemeier and Nayyar 2017). The country attained levels of technical know-how and technology triggering a shift towards service-oriented FDI. The latter positively impacting the growth of service value-added activities as reflected by Mexico's economic indicators (Hallward-Driemeier and Nayyar 2017).

To conclude, the lessons drawn from this section assert Mexico's position as an economic powerhouse in Latin America. It uncovered challenges that need discussion if the country projects to transition from an emerging economy to an advanced economy in the global context. Although, significant improvements took place in the last in the last two decades thus showing an improvement in Macro-economic indicators, trade and global value chain integration. Policy centralization and the lack of coordination as posited by Stiglitz 2008, still create adverse regional outcomes and translate into marked regional disparities. In this context and based on the literature covered a push towards a more coordinated agenda where education and technical training takes centre stage is of great importance. A fact, supporting the approach taken for this thesis in placing a reform ALP framework within the country's industrial policy the vehicle to achieve education goals. The latter where Mexico's industrial cluster could benefit in the institutional role advocated as part of this thesis thus facilitating cluster formation in less developed regions. At the same time supporting the role of existing clusters in facilitating a better regional response to national level policies. Section 3.6 of this literature review builds on the importance of education and skills as drivers of innovation activities as set out in the introduction. The latter link here represented by discussing ALPs as social programs and the economic impact of these "active" employment measures have within the national competitive debate.

3.6 Active Labour Programs, Employment & Human Capital

This section of this thesis literature review delves into Active Labour Programs and the different perspectives on the topic. The aim to uncover the origins of these programs, elaborate on features and the different approaches depending on the country of implementation. It touches on the different experiences among European economies and how these programs have been in the tool kit of governments to combat unemployment. This section of the literature review aims to build on these programs' original purpose to substantiate the call to include these programs as part of a broader industrial policy framework. One which joint with clusters as institutions within our augmented competitive model can carry out the following; (1) improve education and human capital development in less industrialized areas; (2) contribute to promote industrial agglomerations in a more regionally distributed manner and; (3) support existing clusters while encountering the creation of new ones as formal and informal institutions. The past decade has showed the adoption by several OECD members of these programs to "Activate" unemployment. Although these programs vary in outcomes based on labour market conditions, traditionally these programs have been as part of the country's social policy framework. so, its governance rules with strict guidelines for benefits recipients coupled with provisions for effective re-employment services (Immervoll and Scarpetta 2012). It is this social part which in cases of an over-generous social safety-net that has been responsible for limiting the effectiveness of these programs in improving labour market outcomes (Almeida et al. 2012; Immervoll and Scarpetta 2012).

The literature suggests that aside from the fiscal allocation element, the countries' structures and policy design supports labour market activities. The literature by Almeida et al. 2012, affirms the effectiveness of these programs as having more success in middle-income countries than developing ones. His writings motivated this research to inspect the effectiveness of these programs in Mexico, an economy it perceives that as a middle-income economy. It propels this research to examine the impact of ALPs in the broader Mexico, and in the most industrialized regions. so, delving in the positive or not enough impact of these " active" programs as social initiatives on Mexico's clusters. Primarily using two types of industrial agglomeration Triple Helix and Traded Clusters. The analysis by Almeida 2012, is of significance to this thesis as he points to the positive impact of these programs in this middle-income economy because of the incipient levels of skilled labour, the wider knowledge gaps, and the countries' allocation of public funding (Almeida et al. 2012). The literature suggests that in middle-income countries these programs play an essential part connecting individuals to jobs and enhancing worker's long-term productivity. The outcomes of these initiatives in middle-income economies often translate into enhanced skills for employees and job seekers. Therefore, giving employees and employers the ability to respond better to labour market demands (Almeida et al. 2012). An essential element open-handed labour market flexibility while attracting business investment activities to regions where skilled labour can fill labour market needs.

Increased competition now more than ever is crucial in creating uncertainty in markets, technologies, and methods of business organization. Forcing companies to rely more on the high-quality human element as one of the essential considerations driving companies' strategic decisions (Camagni and Capello 2013). Under this context, ALPs can be of great importance as a tool to help improve national, regional and local human capital thus enhancing "local assets" to promote industrial agglomeration (Camagni and Capello 2013). Under this set of circumstances, the need for skilled human capital collides with business interests and regional competitiveness thus placing ALPs as a tool to promote local economic growth. Active Labour Market programs have been a significant policy instrument of advanced industrial economies. The Nordic countries and the European Union

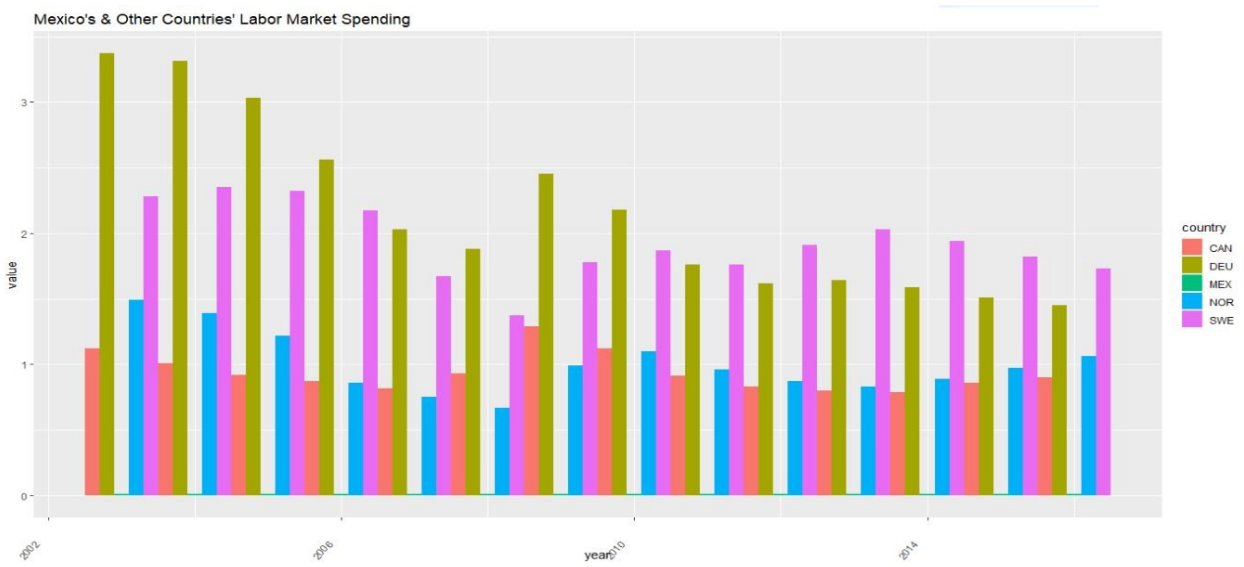

Figure 24: Source: OECD data, Mexico's & Other Countries' Labor Spending

have taken the lead widely adopting these programs. In fact, since 1997, it has committed many European countries and other OECD member state-regions to introduce new active labour initiatives and expand existing labour market programs.

According to the literature these initiatives aim to promote youth employment, improving working conditions, and institutionalize work practice programs with the goal of providing technical training. Hence, promoting job market flexibility to decrease long-term unemployment levels (Sianesi 2008). With Europe, these OECD initiatives played an essential part in the adoption of these programs as instruments to promote employment and cut passive social spending in European countries. Likewise, active labour policies in the EU have been a central part of the Euro zone's strategy to reduce unemployment and promote human development among the working-age population. ALPs in the Euro region has also been pivotal in providing the working age population with a social safety and forming part of the regions' standardized economic policy (Kluve 2010). A dataset gathered from the OECD shows Nordic and European as the most prominent investors in ALPs in GDP terms. For example, it ranks seven European countries among the top ten in the world in implementing ALPs. Denmark and Sweden occupy the first and second place respectively among the countries distributing the most public funding towards these programs. Denmark and Sweden divide 2.05% and 1.27% of their GDP respectively in sharp contrast to Latin America where funding for these programs is very incipient. In fact, Mexico as a middle-income country and a global exporter only distributes 0.01% of its GDP to related employment programs (OECD 2017b). A budgetary allocation that might contradict the findings by Almeida 2012, in the effectiveness of these initiatives. Another, supporting element giving this thesis's close analysis of ALPs in Mexico much more relevance. Figure 24: shows according to data from the OECD the level of investment in ALP initiatives in Latin America compared to the European Union.

Another case worthy of analyses is Germany. In the first decade of the millennium, the country experienced high levels of unemployment and a meagre rate of job creation. These concerns were because of a rigid labour system and an over-generous system of unemployment benefits. To tackle

this problem, the German government advanced a set of active labour policy reforms aimed to make the labour market more flexible. The case of Germany makes up a successful implementation of ALPs in combination with improved controls to curtail long-term unemployment spending. Today, according to the literature, job creation in Germany is at its highest, and long-term unemployment recipients had decreased from 5 million in 2010-2011 to 1 million in 2015 (Spermann 2015). The literature considers the German recovery from the economic recession to have the highest levels of unemployment in Europe remarkable. Germany's success has turned its labour policy and labour market reforms into policy programs to showcase. Germany's labour market reforms as later discuss are an alleged contributor to improving the country the country's competitiveness. Likewise, to giving Germany a perceived advantage in coping with exogenous economic shocks more efficient.

The literature by Rinne and Zimmermann 2013, assess Germany's experience as a model for effective policy design and implementation. It links these policy reforms as critical factors in improving the country's national competitiveness (Rinne and Zimmermann 2013). Germany's unemployment problem accumulated in the 1970s and worsened with the country's reunification. In the 1990s few economic recessions, high levels of long terms unemployment and generous employment benefits contributed to deteriorating the delicate situation. According to the literature, Germany's high levels of unemployment were because of the high levels of employment protection, high labour cost, and the labour market regulated (Rinne and Zimmermann 2013). Because of Germany's labour market inefficiencies, the country introduced reforms in 2003 and 2005 to tackle high levels of long-term unemployment the country was facing because of economic recessions. The Hartz reforms' primary objectives were the targeting of three key areas affecting the functioning of the country's labour market. The literature suggests the first set of improvements reorganized existing employment services and social aid programs, giving welfare and unemployment benefit recipients access to labour programs and training (Rinne and Zimmermann 2013).

According to the literature, the traditional flat rate for unemployment benefits changed to earnings related long term unemployment benefits (Rinne and Zimmermann 2013). It also put stricter regulatory oversight in place to check recipients' activities. Second, a reduction of long term unemployment benefits altered the benefits amounts and duration period. A policy move oriented to promoting the labour supply by pressuring the unemployed to find employment. According to the literature, the third wave of reforms promoted the deregulation of first term employment contracts, employment agencies, and part-time work guidelines. This third wave also promoted a better more flexible understanding of the country's labour unions and trade associations. All the above with the goal of increasing labour market demand while making the country less susceptible to economic shocks affecting employment levels and people' employability (Rinne and Zimmermann 2013). In, Germany's case, the implemented labour market reforms proved to help with the recovery of the country's international competitiveness. A fact which according to the literature, reflects the reduction of the country's unit labour cost compared to pre-policy figures when unemployment was at its highest.

In brief, the reforms gave improvement to the functioning of the German labour market thus promoting internal market flexibility across industry sectors. An event which allowed the country to better respond to external economic downturns in the export sector during the 2009-2010 recessionary periods (Neubäumer 2012; Rinne and Zimmermann 2013). Despite the clear success of Germany's labour policy reorientation, Spemann 2015, asserts that long-term unemployment persists. The author contends that since 2011 long-term unemployment figures in the country have not decreased below one million marks. According to the author, the instituted changes of the Hartz IV round of reforms triggered a misrepresentation of the long-term unemployment figures (Spermann 2015). To

substantiate his claim, the author referred to those participants receiving benefits for over twelve months but enrolled in a temporary work incentive program. According to the author, it should include this segment of the German labour force in the estimation of long-term unemployment.

Under the German reform plan, it would exclude participants working an average of three hours a day while receiving unemployment from being part of the government's official long-term unemployment figures. According to the author, the above-stated facts further question the alleged effectiveness of this set of labour market reforms and implementing ALPs as a solution for long-term unemployment (Spermann 2015). In contrast, to Spermann's view, Sweden has also considered a case to highlight where ALP policies prevent long-term unemployment. At the same time giving a way to integrate unemployed and disadvantaged individuals into the labour force. According to the literature, Sweden is a country with a long-standing tradition of an Active Labour Market Policy. The Swedish government tradition in implementing Active Labour Market programs dates to the early 20th century. At, the time the Swedish government built municipal employment offices to promote employment. During the inter-war period, these offices gained relevance in organizing relief work and jobs for the youth. The country's first efforts followed the formation of the National Labour Market Board in 1948 to achieve higher employment mobility thus promoting higher efficiency and productivity in the industrial sector (Calmfors, Forslund, and Hemstrom 2002).

In the 1960s and 1970s, Sweden's labour policy aimed at reducing unemployment during recessionary economic periods. In, the 1990s these programs paved the way into a general sentiment for lowering widespread unemployment through active engagement and an open-door policy (Calmfors, Forslund, and Hemstrom 2002). The literature by Sianesi 2008, analyzed the differential effects of ALPs in the Swedish system as a policy interlinked between two main components. One active which the primary aim was to promote labour demand and the other as a passive advancing an unemployment benefits system. The active part instituted employment services ranging from work search aid, job introduction schemes, trained placements and work relief. The Swedish systems established labour market training programs and business subsidies geared to create new employment by providing incentives to the private sector (Sianesi 2008). The authors' findings show the more regular the job, the more effective the employment outcomes were for the programs' participants in Sweden.

It also proved that employment subsidies were the most effective part of the policy program in the short term. The findings also suggest that the country's generous employment benefits have a negative impact on the participants' short-term employability because of the high levels of passive benefits coverage (Sianesi 2008). It says the generosity of employment benefit disbursement in advanced economies alter the need or sense of urgency for which participants fully engage in job search activities in the short-term. The study also concluded that labour market training, work practice, and relief training programs seemed to be the best performing features of Swedish ALPs long-term. A program feature that, with Mexico, can contribute to enhance mid to long-term human capital development outcomes. A projected reality which based on earlier literature not only reduce inequalities, but it will promote industrial agglomeration outcomes.

Another, relevant feature of the Swedish programs, is the openness of the programs to everyone thus allowing people to be active participants in the various components of the country's active labour policies. The interactive institutional arrangement of the Swedish system is of importance because of the interdependence between the active and the passive program components in place. By this means, Sweden mitigates the morals hazard associated with program entitlements which might delay integration into the workforce. The Swedish model provides, through direct engagement, regular skills training related to industry-specific sectors. This industry training has proven to be useful in the promotion of human capital development and job skills in the country's general labour

force. That given the open-ended nature of the programs brings tangible benefits to productivity and knowledge, thus maintaining and expanding the labour force knowledge base (Strandh and Nordlund 2008). According to the literature, enhanced expertise and productivity increases job market flexibility and allows a better response of the labour force to employment shifts. Key aspects which translate into macro-economic benefits as countries taking this approach would mitigate better external economic shocks as claimed by Germany.

In Sweden's case, outcomes derived from ALPs have been like the German outcomes, in which it has addressed long-term unemployment issues while helping mitigate the effects of external economic shocks on the countries' rate of employment (Rinne and Zimmermann 2013). The benefits of ALPs as observed with Germany and Sweden have brought these two advanced nations long-term success in the development of these nations' human capital and competitive terms. The lessons learned from the outcomes of these two countries combined with existing labour programs and policy approaches in Latin America. Could serve as a foundation to place ALP initiatives as the basis of an augmented industrial policy framework. One that not only can enhance the countries' and regions' human capital thus local assets but also help further ignite the formation of clusters as formal or informal. Thus, triggering economic and social change while promoting a fairer regional development. Fundamental facts, that not only would offer regional industrial competitiveness stimulating industrial activity based on localized capabilities but also would provide upgraded geographical location advantages (Maskell and Malmberg 1999).

The literature suggests there is relatively a positive correlation between ALPs and the effects on improving regional competitiveness. With Sweden, Fredriksson 1999, shows that patterns of unemployment, wage disparities, and net employment migration because of high unemployment are much less across Swedish regions than in Western Europe or the US. The author suggests that the factors mentioned above are less pertinent because of implementing Active Labour Market Programs promoting better regional employment outcomes (Fredriksson 1999). The author also points to institutional disparities as factors determining these program's limited or extensive success at the regional level. In the context, the literature suggests that a more similar implementation of these programs in Sweden helps the country better deal with adverse employment shocks across its regions. The high level of ALPs' activity targeting regional disparities has shown to reduce unemployment numbers. Implementing these programs suggests to reduced employment net migration during recessionary periods. It has also optimized a more homogeneous regional-level response to national economic shocks; this compared to Western European countries and the United States' regions.

The "Locking Effect" suggests that people who would otherwise migrate to find better opportunities in other regions, stay hoping to improve opportunities (Calmfors 1993). Because of factors such as the upward pressure, labour programs assert regional wages and skills training opportunities. In Sweden's case, the literature suggests ALPs have had a considerable impact on reducing joblessness, wages disparities while also improving re-employment probabilities. All positive outcomes that according to the author place ALPs as a substitute for employment migration during adverse employment periods. The findings conclude that the high-level program activity at the regional level has influenced the rate of regular regional unemployment. Vital, aspects not only contributing to enhancing worker's competitiveness but also increasing the workforce labour market mobility because of sustained employment opportunities across Sweden's regions (Fredriksson 1999). The long-term approach taking by Sweden and the country's special effort to training programs as the cornerstone of its regional capital development strategy. Suggest the if implemented in Mexico and other Latin America economies with higher policy coordination and more government resources might yield better policy and human development outcomes.

The literature also suggests the merits and drawbacks of ALPs as living in various understandings. The different programs' interpretations range from a micro-economic assessment on the impact of these programs and the programs' components on the various labour markets. Likewise, it measures the efficiency of different training programs and offers an analysis of country-specific initiatives within the wider ALMP framework. Calmfors 1993, stresses on the benefits of Active Labour Market initiatives as opposed to those based on unemployment benefits payouts. In a micro-economic analysis of the panel data outlined in his writings. The author shows the positive impact of ALPs in enhancing re-employment opportunities and the program participants' future earning potential (Calmfors 1993). The author also concurs with the postulated by Fredriksson 1999, on the way ALPs mitigate better the downward pressure on wages as opposed to open regular unemployment. Validating the effects of ALPs on preventing wage disparities also at the regional level while addressing the participants' motivation for higher expected wages (Calmfors 1993).

ALPs in New Zealand and Switzerland are two other cases worth of analysis according to the literature. With New Zealand, implementing the country's ALP yielded mixed outcomes. Perry and Maloney 2007, suggest that work experience programs are the most effective. It found the authors to have a positive long-term impact but negative regarding short-term employability (Perry and Maloney 2007). Perry and Maloney 2008, examined the economic effects of the country's training programs. The literature findings suggest the higher education component and classroom instruction of New Zealand's system did not yield the expected results. The author's conclusions point out that labour training programs in New Zealand's case could have had a better short-term impact if these programs would have had an orientation towards practical work-related training (Perry and Maloney 2008). In Switzerland's case, the effectiveness of these programs had concerned its economic impact on the labour market. Gerfin and Lechner 2002, described the effect of the Swiss system on facilitating re-entry into the job market.

The authors show that while employment programs in Switzerland's case performed poorly, vocational training programs showed moderated success in areas like professional training and job-specific training courses. The author's findings suggest that the program with the most success is unique to the Swiss system but resembles features of the German plan of temporary-work subsidies. The Swiss government designed a program of temporary work subsidies where the participants get government payments for taking part in the programs. These unemployment benefits are in the form of a grant and exchange for a negotiated reduced payment from the employers. The literature suggests the success of the program live on the joint compensation of employment earned income with the subsidy higher than only getting unemployment disbursements (Gerfin and Lechner 2002). Therefore, creating a higher economic incentive to take part in this market labour activity rather than remaining in long-term unemployment.

In contrast to support given to ALPs in advanced markets like in the US, in Scandinavian nations, and among the EU member states. The literature suggests the adoption of such programs and anti-poverty measures made up a volatile mixture in Latin America. Countries in the region typically embroiled in a repetitive cycle of inequality and poverty during the 1980s and 1990s. According to the literature, the so-called improvements promoted by "the Washington Consensus" in Latin America were detrimental to the promotion of human development. These reforms emphasized microeconomic reforms, austerity measures, privatization, and trade liberalization (Fraile 2009). Although these reforms advocated for the right set of standards to promote labour market activity, these measures did not deliver better employment opportunities. In divergence, these reforms have triggered a rise in job informality and unemployment. A circumstance that combined with early levels of social spending, augments the income gap while increasing poverty and marginalization in

the region.

Latin America countries could not pay attention to employment programs and social equity issues due to scarce monetary resources. It attributed to the short-sighted approach based on one fits all strategy where the lack of market labour enforcement is a commonplace (Fraile 2009). This grim outlook changed in the first decade of the millennium with the improvements in the economic situation of many Latin America economies. The commodity boom of the early part of the millennium helped these economies grow at an average GDP growth rate of 5.7% and 4.2% on the per capita basis. These improved economic indicators resulted in an overall better labour market performance and introducing social measures aimed to help reduce the regions' social gap. Hence, resulting in higher employment rates, a reduction of the informality in the job sector, and moderate wage gains (Fraile 2009). However, are these perceived improvements sustainable over the time and conducive of industrial agglomerations, i.e. clusters? Are these improved conditions a sign of stronger institutions represented in effective public programs? This thesis dissects these questions while placing ALPs and clusters as pillars of increase competitiveness, the higher development of human capital and more equitable regional development.

The late adoption of policies addressing social and human capital development in the region bring ALPs beyond the previous view of these programs as taking part in the "stratification" of formal employment. What this refers is to implementing features of these programs within the formal labour market in economies where most of the employment is informal (Barrientos 2009). The literature suggests the outcomes of ALPs in Latin America showed certain signs of success. In previous evaluations on the impact of these policy initiatives, the findings signal an increase in women's employment and an overall positive impact on wages. It determines the rate of employment increase among program participants from 0% to 10% on average while also at the same time impacting the quality of jobs (Ibarrarán and Rosas Shady 2009). Chile pioneered early signs of implementing ALPs in Latin America in the 1990s with its program "Chile Joven." The primary aim of this ALP initiative in Chile was to facilitate employment access while improving performance among disenfranchised groups of the labour market. The most successful part of this training model was the combination of lectures with real-life job training at the firms subscribed to the program. Chile's plans worked because there was a high level of coordination between public and private stakeholders and well-organized planning that accounted for both current and future labour demands.

It replicated the success of Chile's initiative in other Latin America countries marking the commencement of ALPs in the region. At the same time providing a social agenda outside of the traditional job market segment. These initiatives in Latin America took the primary aim of offering short-term semi-skill training in specific job-related occupations demanded by the private sector (Ibarrarán and Rosas Shady 2009). These sorts of training initiatives are not abnormal to some Latin America countries. During the import substitution era, centralized government-sponsored training centres oversaw providing technical job training. In Colombia (El SENA), in Brazil, the (SENAI), in Paraguay the (SNPP), and in the Dominican Republic the (INFOTEP) were institutions in the region in charge of this labour supply-driven model (Ibarrarán and Rosas Shady 2009). The adoption of Labour Market Training Programs in the region was outside of the centralized model of labour market intervention which originated during the time of Latin America's import substitution model. They were all designed with the Chilean programs serving as a basic model and thus had similar objectives.

However, the common characteristic among these programs was that all are demand-driven, providing a basic stipend to participants. In all these programs the training component was publicly funded

and had private sector involvement in provisioning employment training. The main program's aim was to increase employment or the employability of its beneficiaries and to develop a private market for employment training services. The programs of Mexico, Chile, and Argentina were large-scale operations while in the other countries these programs were smaller in scale (Ibarrarán and Rosas Shady 2009). These labour market initiatives' evolution varied from country to country. In Colombia Attanasio, Kugler, and Meghir 2011 suggest the Colombian program "Jovenes en Accion" had a significant positive impact among young women, but less relevance among males. Through participation in the program, the literature suggests women increased their propensity for being placed in the formal labour market (Attanasio, Kugler, and Meghir 2011).

It proved the group of women selected for the study to have attained a higher earning potential and longer-term employability. In Colombia, it measured the potential earnings derived from these programs to increase by 18.1% for women and 8.3% for men (Attanasio, Kugler, and Meghir 2011). The literature suggests that in Panama, PROCAJOVEN, the government's initiative oriented to the promotion of employment among the population's youth, increased employment by 5%. This program, the same as with Colombia, displayed a positive impact on women's employability. The most significant impact took place within the female segment found living in the metropolitan area of Panama City (Ibarrarán and Rosas-Shady 2006; Ibarrarán and Rosas Shady 2009). Peru's program showed a positive impact in reducing informality in the labour market while increasing the total number of jobs created. In Peru, the population segment benefiting the most from the program was the age group 16-20 years of age. This segment increased the propensity of finding regular paid jobs with higher earning potential (Diaz 2006). In Argentina, one of the countries with the most extensive scale of training programs the findings were also positive. The Argentine model primary aim is to improve the employability of the poor and the unemployed segments of the population. Among the different population segments, the youth and women are the primary beneficiaries of these initiatives (Alzuá and Brassiolo 2006).

This section of the literature review examined the different perspectives of implementing ALPs in various economies, and the findings revealed mixed results. It has set it clear that the different outcomes depend on implementing these programs with various economic and regional objectives in mind. The experiences of Germany and Sweden point to the benefits of implementing these programs with two objectives in mind; (1) as a measure to tackle unemployment, but; (2) as a policy initiative to enhance labour mobility while promoting regional growth. The latter where these two economies approach to an ongoing training platform, and human development strategy. It has contributed not only make these two countries less constraint to exogenous economic shocks but also enhanced these economies industrial outlook. It is these observed advantages according to the literature which support this thesis aim of viewing these programs as a national industrial policy element. An event that with an economy centralized with marked levels of regional disparity it would enhance Mexico's locations advantages as it relates to industrial agglomerations. Therefore, not only fostering industrial agglomerations in less developed regions but also fostering a better regional response to national level policies. The next section of this literature review discusses Mexicos' ALPs as these programs within the Mexican context. Make-up the proxy for social programs selected to test the institutional supporting role of clusters.

3.7 Mexico's Active Labour Programs

This part of this thesis report builds on the previous literature inspecting ALPs in Mexico's case. It will discuss in broad terms the trajectory of ALPs and divide them between two time-periods. The first one before the structural adjustments of the early 2000s, and the second after the structural reforms of 2003. Reforms which marked the government's push towards higher coordination with the private sector (Delajara, Freije, and Soloaga 2006). According to the literature, Mexico's ALPs date back to the 1970s, however, the practical implementation, i.e., execution of these programs yielded less favourable results, as opposed to the results of other economies in Latin America such as Chile. The lack of flexible contractual arrangements, the high level of informality, and the lack of formal job opportunities for the youth, make up some of the most preponderant factors affecting ALPs in Mexico (Delajara, Freije, and Soloaga 2006). Mexican ALPs are initiatives tailored to create formal employment; however, one of the main barriers for adoption is because of the high cost of hiring and firing. It points to the cost of firing employees, the paternalistic legal framework, and the lack of alternative wage setting mechanisms. Despite the country's efforts to promote ALPs with the establishment of "Probecat" the Federal Labour Training Program in the 1980s, the success of these programs was limited until the reforms adopted in the early 2000s(Delajara, Freije, and Soloaga 2006).

These initiatives were less than adequate because of contractual, bureaucratic, and social issues as addressed. Mexico's Active Labour Programs have undergone throughout the years' several reforms. After the start of the "Probecat" program, in 1988 the government instituted " El Programa de Calidad Integral para la Modernization". It geared to offer job training to employees in small- and medium-sized business (Delajara, Freije, and Soloaga 2006). At the time of this new policy,"it renamed Probecat" into "BECATE" (Bacas de Capacitacion de Trabajo) awarding scholarship programs to participants for short-term training programs lasting three months. The reformed programmed under the administration of the SNE (Sistema Nacional de Empleo) has been attributed with the training of five hundred and thirty thousand employees. Despite, these numbers the real expenditure per employee over time has displayed a contrary tendency (Delajara, Freije, and Soloaga 2006). A fact, which in Mexico's case, has translated into a labour training program of mediocre quality and a lack of emphasis on employee productivity. but, the last ten years brought to Mexico, a further liberalization agenda push toward more productive industries. Where? employees capabilities and training have taken centre stage as a way of improving the countries' competitiveness. A fact which brings relevance to the analysis of ALPs in Mexico by assessing the impact of the reforms in the last 10 years as these relates to ALPs.

The literature suggests although the purpose of Mexico's training programs was to tackle long-term unemployment and to increase the supply of labour to potential employers (Delajara, Freije, and Soloaga 2006). High levels of unemployment, informality and low productivity connect to the implications of the low level of human capital in the Mexican labour market. Facts that in Mexico called for structural reforms in the labour market to increase productivity among workers (Delajara, Freije, and Soloaga 2006). In 2002, the first reform took place with the institution of on-site training programs at small to large size business. This approach to on-site training had an as primary aim to phase out the traditional classroom instruction and providing more job related technical training (Ibarrarán and Rosas Shady 2009). Despite the structural changes to Mexico's labour training programs, the country still registers the lowest level of labour productivity among OECD member states. Mexico's productivity is 60% lower and 70% lower than the U.S. Despite the country's trade openness and the increase in the levels of industrial activity driven by US multinationals (OECD

2015). The latter, a pressing reality proposing a re-evaluation of the country ALPs not only as a measure to tackle unemployment but a component of the country's industrial policy. In fact, the literature suggests that, in Mexico's case, the productivity gap over the last two decades has increased and that the levels of productivity growth in the country are slower than in other OECD member states.

According to the OECD while the average OECD member saw productivity growth in an average of 1.6% per year, in Mexico this indicator was 0.7% (OECD 2015). Mexico's poor performance in productivity terms lives in the poor skill-level of its workforce. A reality prompted by the lack of a comprehensive long-term training program where technology and innovation take centre stage (OECD 2015). According to the OECD the level of education in Mexico is below the OECD average, and often companies claim employees with the right set capabilities are hard to find (OECD 2015). To overcome these pressing challenges the most recent changes to Mexico's labour programs took place in 2013. These reforms under the leadership of President Enrique Pena Nieto instructed all companies to form productivity committees. It propelled active engagement in full coordination with the department of labour and provide employees with training programs in an ongoing basis. The law calls for the constant reporting of the private sector on employees' participation and on the improvement of capabilities in industry-specific jobs. It instituted penalties for companies non-compliant with the new system to ensure compliance (Garria Angel and Torres Carlos 2017). Evidence of the effectiveness of ALPs in Mexico yields mixed results. The programs instituted under the management of the SNE (Sistema Nacional de Empleo) show satisfactory results for salaried employees but a moderate effect on overall wages (Delajara, Freije, and Soloaga 2006).

The lack of substantial results always points to the high level of informality, the lack of technology-driven labour market programs. It touches on innovation activities centred on job-related actions. These two factors, showcase the disconnect that exists between skills forged in a school setting and those required to meet the demand of the labour market. It says the country's high-level of informality to hinder productivity and economic growth while also represents a significant barrier to the development of skills in the job market. Although, Mexico's tax and labour market reforms in 2012 are one step further towards increasing productivity and industrial activities (Delajara, Freije, and Soloaga 2006). Results from these reforms are not yet quantifiable, an aspect which this thesis aim to shed light on the assessment of Active Labour Programs on Industrial agglomeration.

Further, structural adjustments on a universal pension plan and unemployment insurance benefits need integration within the broader employment protection legislative framework (OECD 2015). In brief, the creation of Mexico's knowledge-based economy through the institutions of laws promoting investment to improve skills and opportunities for its citizens 'is vital for furthering the country's development. These pieces of knowledge driven investment and activities need coherence between national-level programs and regional policy to help local innovation. According to the OECD, national-level policies in Mexico should avoid "picking winners" but promote sustained levels of local investment. Working with existing centers of activity to promote linkages with universities and support organization thus strengthening each region competitive environment (OECD 2015). A positive outcome that if attained further foster the agglomeration of industrial activity in the country, i.e. clusters. Hence, promoting a much more similar regional development in Mexico. The OECD policy suggestions further validate this thesis purpose as it alludes to this thesis regional champions hypotheses and leads this study to inspect the impact of ALPs in Mexico and its industrialized regions.

The section in Mexico's ALPs showed the different transitions of these programs in Mexico, also the Mexican government push towards promoting productivity among the country's labour force.

However, it also showed the country's limitations and challenges gave the country's labour force realities where low-skills and high levels of informality take center stage. The next of this literature review builds on the paradigm shift inspired on Michael Porter's literature, the empirical debate on clusters, and how important these ecosystems are in removing global value chain integration barriers. It does this by the proposed literature inspired competitive models proposing two augmented competitive dimensions to accomplish higher levels of national competitiveness regional in scope. It points to the relevance of the two hypotheses governing this master's thesis. (1) advocating for industrial clusters as institutions in promoting a better response to national level policies. (2) setting the country's institutional weakness as living in the fluctuations of GDP.

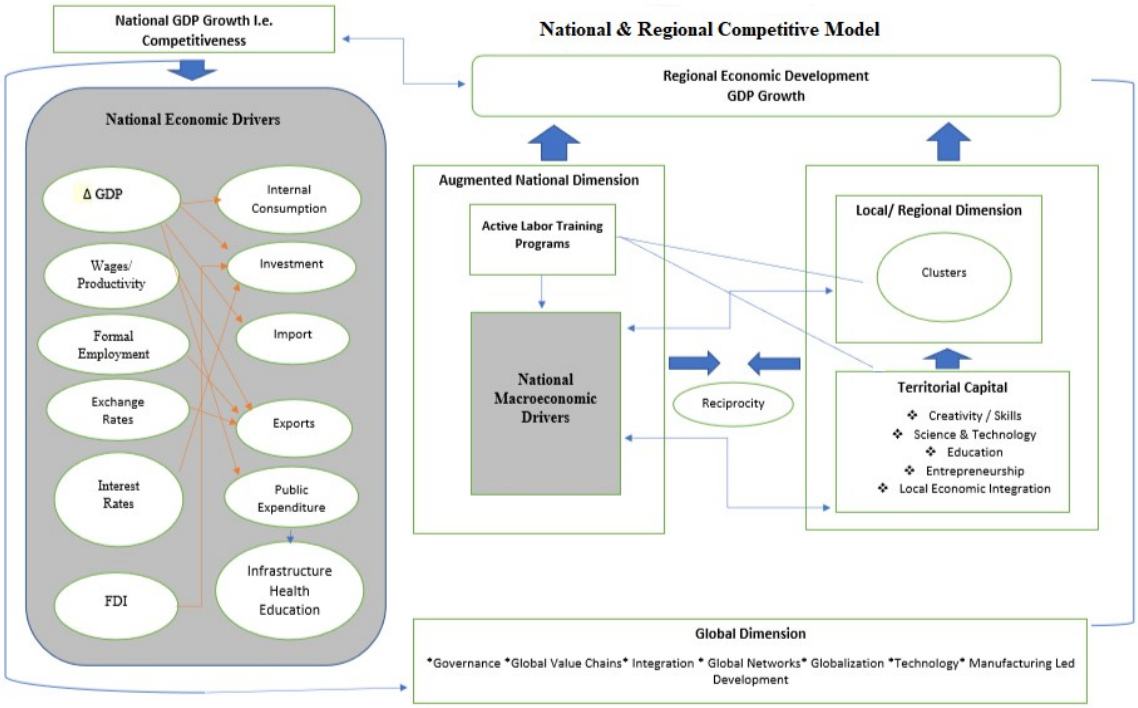

Figure 25: The Proposed National & Regional Augmented Dimensions Based on Our Literary Inquiry

3.8 Our Literature Inspired Model: Two Augmented Dimensions

The research model inspired by the literature covered for this study helps explain the relevance of ALPs in enhancing regional assets. It provides a compelling rationale of important factors enabling the research to set the context on existing literary evidence in the international competitive debate. Highlighting important theoretical aspects of Michael Porter's paradigm shift where the industrial cluster is very important in the regional development context. It lays our practical recommendations as it proposes, for Mexico, an augmented dimension suggesting a national and regional expansion in the approach to competitiveness and clusters. This approach sets the basis for testing the institutional role of clusters in supporting the role of government social programs which in this research uses ALPs as a proxy. An aim which not only would help further support this thesis argument of industrial clusters as institutions but also makes up the principal aim of this study. It contextualizes this study while opening the debate for further areas of scholarly research in other Latin America economies with high levels of inequality and the same context of regional disparities. Last, it observes the fluctuations of GDP as a chief cause of institutional weakness, where the suggested augmented dimension proposed by the model. It could help bring alignment between national, regional and global governance structures thus aiding mitigate the problems caused by exogenous economic shocks, see, also figure 25.

The following table presents the key scholarly research which served as inspiration for the national and regional competitive model shown above. The model aims to capture key fundamental contributions from these scholars which guided this thesis argument of clusters as institutions of regional-national

development and examine these geographical units institutional role.

Table 15: Relevant Topics & Authors Guiding the Literature Derived Model

Topic	Authors
Regional Capital & Terrotorial Assests	Camagni & Capello, 2013
Firms Competitiveness	Ajitabh & Momaya, 2003
Upgrading to compete in value chains	Giuliani, Pietrobelli, & Rabellotti, 2005
Clusters and Global Value Chains in Latin America	Giuliani, 2005
Governance: Linking Cluster to GVCs	Humphrey & Schmitz, 2000
Value Chain Integration and Global Economic Triangle	Messner, 2004
Industrial clusters in Less Developed Countries	Nadvi & & Schmitz, 1994

The Rational and Scholarly Objectives

The proposed Regional-National Competitive Model holds as a primary goal the alignment between the three different dimensions of competitiveness; the regional, national and global levels, thus making GDP growth as the dependent variable for our study. According to the literature, GDP growth relates its key drivers of national and regional level competitiveness to the nation's variations of GDP (Camagni and Capello 2013; Stiglitz and Ocampo 2008; Stiglitz 2000). With Mexico and Latin America, this variance in GDP makes up an integral part for the patterns of uneven regional development. The GDP variation which leads to scarcity of resources in periods of economic recession is a fundamental factor, making emerging economies like Mexico concentrate more resources in regions where the higher industrial activity takes place thus in regional champions. Variation in GDP can have a positive or adverse relationship to economic drivers such as wages-productivity, formal employment exchange rates, FDI (Foreign Direct Investment), and public expenditure among others (Camagni and Capello 2013). The proposed model builds on key aspects of economic development literature, calling for better economic integration and policy alignment between regional, national and global realities. Therefore, making of regional economic growth the main driver of national level competitiveness and better regional-national integration into the global value chains (Schmitz 2004). The proposed model integrates two levels of analysis and four dimensions; two national and two regional into a wider framework to promote regional economic growth thus national level competitiveness i. e. GDP growth.

The first level of analysis calls for an augmented national dimension because of demands for incorporating Active Labour Training programs as a critical element of national level policy to improve wages, productivity and formal employment as national economic drivers. It also emphasizes what Camagni and Capello call "Territorial Capital" through a more technology-driven approach to ALPs where entrepreneurship and technology play a key role in promoting regional economic integration. All key aspects, which will drive industrial agglomerations and clusters' creation as institutions of regional economic growth. Thus, revised Active Labour Training programs could form the basis of centralized well integrated cluster driven national industrial policy framework regional in scope. One where the institutional role of clusters can strengthen the supporting role of government programs thus helping close the institutional void in emerging economies like Mexico. The assumption on the institutional role cluster that led this research to assess their interaction in the absence of an augmented competitive dimension like the one proposed in this model.

The suggested model proposes a revised Active Labour Policy framework, incorporated into a national-regional industrial driven approach to enhance human capital and improve regional assets. This revision could facilitate the reciprocity or interaction between the augmented national dimension and the local-regional dimensions where clusters could be an institutional, economic driver. As it strengthens the regional economies, national competitiveness will improve. Therefore, leading to a more equitable regional development and removing challenges of global value chain integration within a global production context. If this research finds an institutional role for clusters in the absence of the two proposed dimensions, this will make up a further validation in favor of this thesis argument of clusters as institutions. Hence, setting a foundation for further scholarly inquiries in other emerging economies and Latin America.

The lessons drawn as part of this literature review evidenced the modern evolution of competitive debate as this relates to clusters. Also, how important the paradigm shift entering the national competitive debate around the regions' economic growth and the factors curtailing this development. All of that in Mexico's case represents the regional institutional voids hindering the effectiveness of social programs and the regional level of response to national-level policy objectives. The lessons from the literature review section showed the conceptual evolution of the literature on competitiveness, how important are industrial clusters and the necessity to bring alignment to policy objectives. Guided by the literature on competitiveness, this literary review touched upon Latin America and Mexico's competitiveness incorporating a discussion on the benefits of ALPs Active Labour Programs. Last, the lessons drawn across the literary findings provided support to the conceptual models guiding this research, and under which it crafts this thesis argument of clusters as institutions.

Chapter 4 of this master's thesis provides a descriptive statistics section, first by looking at the variables in the two datasets used to conduct this inquiry. In the descriptive statistics, this study will provide observations pointing to the context of regional disparities in Mexico. Also, test the volatility of key indicators in the data panel and draws a connection to the geographical units here under analysis in the different states and regions. The heterogeneity tests of the variables in the panel provide further empirical validation to the assumed patterns of regional development across Mexico's regions as these relate to the hypotheses governing this research.

Chepter 4: Descriptive Statistics & Heterogeniety of Indicators

In the analysis of Mexico's patterns of regional development as these relate to the geogrpahical units Traded Clusters and Triple Helix. The descriptive statistics section describes what the data shows by relating these descriptive findings to the context of our research as previously explained. The Heterogeneity tests provide observations of the variations in the different variables in the dataset. Heterogeneity, arise in describing the properties of a dataset, or several datasets. They relate to the validity of the convenient assumption that the statistical properties of any one part of an overall dataset are the same as any other part.

4.1 Descriptive Statistics: Mexico's Economy & Industrial Agglomerations

The descriptive statistics section of this enquiry assesses the data panel used to validate this research main hypotheses. It observes the statistical properties from the data as it pertains to Mexico's pattern of regional development and the two geographical units of analysis stated in this study. This section builds upon the literary findings in our effort to argue industrial clusters as institutions of regional, national economic development. The TSCS (Time-Series-Cross-Section) dataset describes variables' mean or the average data values, thus helping us draw inferences in relation to the state of the Mexican economy based on the variables selected. About GDP index, the average index stands at 3.12% over the period of analysis. However, the Min and the Max suggest a range from 0.51% to 17.47% in GDP index thus suggesting to the heterogeneity or marked levels of economic disparities across the Mexican states. The wide spread in GDP index overtime also points to each states' contribution in GDP terms. The heterogeneity of GDP index prompted this thesis to quantify each states' contribution in monetary terms. The latter led us to look at each states' contribution to the country's GDP in Mexican pesos terms.

The mean of the variable "gdppesos" tells us the average in states' contribution stand at 373 billion. However, the Min and the Max corroborate similar findings to the ones from Mexico's GDP index. It observes the wealthiest states in the country contributed almost three trillion in monetary terms and the poorest states only twenty-three points five billion to the national level economy. These findings reaffirm the basis for this study as they point to the disparity in Mexico in economic terms. Also serves to the impact of GDP across critical economic indicators in our dataset. Likewise, it would help unveil how GDP changes influence the central governments' ability to finance and promote GDP growth through social programs across all state-regions. Let us look at the variables "contributions" and " allocations" these two variables speak to the way states get funding from Mexico's federal government. It points to the way states receive incentives from the federal government based on each states' economic performance which relates to the variable "contributions". The variable contribution attests for this thesis' regional champions assumption while " allocations" speak to the funding in critical development areas such as health, education, and infrastructure.

The data tells us the Mean for the variable "contributions" stand at 13.6 billion while the Max is 89.9 billion, and the Min at 1.5 billion in Mexican currency. Regarding the variable "allocations" the data tells as the Mean stands at close to 16.6 billion while the Max and the Min stands at 104 billion and almost 24 billion. The following table provides a summary of the above values from our Time-Series-Cross-Section dataset. These figures not only speak to the variables' distribution but also to the regional disparities present in Mexico.

Table 16: Summary of Key Variables in the Time-Series-Cross-Section data.

Min.	1st Qu.	Median	Mean	3rd Qu	Max.	
GDP	0.51	1.25	2.14	3.12	3.43	17.47
GDP pesos	2346000000	62235000000	2.14E+11	3.73094E+11	4.565E+11	2.97E+12
Contributions	1527138894	5665987029	9355473640	13581906964	16188035853	89919967000
Allocations	2363970727	9577816734	15434764732	19575752173	24795010878	1.04E+11

The findings from the summary table describing the above variables tell us similar patterns to the ones observed when examining Mexico's GDP indicators. The Mean, Max and Min attest to Mexico's perceived reality of marked regional disparities while validating this thesis assumption of regional economic champions. All important findings that this thesis will test further in the empirical section measuring the heterogeneity of these and other economic indicators in the dataset. A result that according to the literature reflects the disconnect in industrial policy and economic objectives at the national and regional levels.

Two other fundamental aspects of this thesis speak to the industrial activity concentration across Mexico's regions. An activity in this thesis report represented by the analysis of the number of Triple Helix and Traded Clusters in the country's regions. The following table summarises these two variables to explain the country's concentration of these two types of ecosystems. These two types of geographical units this study look further at the heterogeneity of these two types of agglomeration across Mexico's regions and their economic impact. The concentration of these two geographical units across Mexico's regions. It shall allow this thesis to test the institutional supporting role of these units on Mexico's Active Labour Programs and its impact on GDP growth.

Table 17: Key Values from the Two Geographical Units under Analysis.

Min.	1st Qu.	Median	Mean	3rd Qu	Max.	
tHelix	0	0.75	1	2.31	2	12
tradedClusters	54	58	62	61.2	64	65

The variable Triple-Helix shows a mean of 2.31 clusters of this type across Mexico's regions compared with 61.2 for Traded Clusters. Besides this the maximum number of Triple-Helix agglomerations is 12 compared to 65 for Traded clusters, a fact, that speaks to Mexico's economy as one mainly export-driven where innovation, technology, and the advance of knowledge needs further improvement. These findings are significant as they speak to previous data shown from the OECD on Mexico's level of skills and education vis-à-vis other industrialized nations. It also sets the pillars of this thesis main proposal and the basis for choosing ALPs as the proxy for social programs. Figure 26, provides a more detailed summary data table of the variables within our Time-Series-Cross-Section dataset. The following summary data table provides a brief snapshot of the data on Mexico's traded clusters at the same time highlighting key industrial sectors for these geographical units.

Dr Mendoza's data on Traded clusters looks at 6101 entries across 20 industrial sectors and 94 industrial sub-sectors. Besides, displays traded cluster related employment data for three periods within the prescribed period of analysis, the years 2003,2008 and 2013. The employment figures in the dataset display a Mean of 18,989 employees Min of 1 and the Max of 2,836,451 employees in Mexico's traded clusters. The wide-ranging gap in these employment numbers require further

```
       X          regionCode                 regionName        year       clusterCode
 Min.   :   1   Min.   : 1.00   Nacional          : 200   Min.   :2003   Min.   :  1.00
 1st Qu.:1526   1st Qu.: 9.00   Coahuila          : 195   1st Qu.:2003   1st Qu.: 18.00
 Median :3051   Median :17.00   Nuevo León        : 195   Median :2008   Median : 36.00
 Mean   :3051   Mean   :17.02   Sonora            : 194   Mean   :2008   Mean   : 47.81
 3rd Qu.:4576   3rd Qu.:25.00   Distrito Federal: 193   3rd Qu.:2013   3rd Qu.:101.00
 Max.   :6101   Max.   :33.00   Puebla            : 193   Max.   :2013   Max.   :116.00
                                (Other)           :4931
                                clusterName     employees
 Apparel                                :  99   Min.   :      1
 Automotive                             :  99   1st Qu.:    445
 Business Services                      :  99   Median :   2861
 Communications Equipment and Services:  99   Mean   :  18989
 Construction Products and Services     :  99   3rd Qu.:  11025
 Distribution and Electronic Commerce :  99   Max.   :2836451
 (Other)                                :5507
```

Figure 26: Data Summary Traded Clusters

consideration by looking at the number of employees across the clusters code classification and states. The latter as to have a much better picture of the employment patterns across industries in these types of clusters throughout Mexico's states. According to the data the key industrial segments among Mexico's Traded clusters are Apparel, Automotive, Business Services, Communication, construction and Electronics.

Performance Plot of Key Variables in the TCSC Panel

The set of plots on performing key variables within the TSCS data look at the variables "gdppesos", "contributions", "allocations", "funding", and "subsidies". The variable "gdppesos" refers to the contribution of each Mexican state to the country's GDP in monetary terms, while the other variables above-stated observe the transfers of funds from the central government to each Mexican state during the prescribed period of analysis, see figure 27.

The plotted graphs shown above evidence the ascending pattern of the set of variables stated earlier. It not only shows the country's ascending pattern in economic growth terms, but, also suggests the positive relationship between GDP growth and the ascending trajectory of the variables signifying the transfers of funds from the Federal government to each Mexican state during the prescribed period. The graphs show that as the variable "gdppesos" has increased in an ascending form, the other variables have increased also hastily. These observations suggest to the correlation that might exist between the country's GDP pesos and the funding from the central government that is transferred to each Mexican state during the prescribed period.

Correlation Matrix of Key Variables in the TSCS Panel

This correlation matrix takes as reference the variables shown in the performance plots linking the growth of the variables "gdppesos" to the variables signifying the transfers of central government funding to each Mexican state during the prescribed period of analysis. The correlation matrix shows the correlation coefficients between sets of variables across our Time-Series-Cross-Section data.

The correlation matrix below uses the "Pearson" method to measure the correlation coefficient

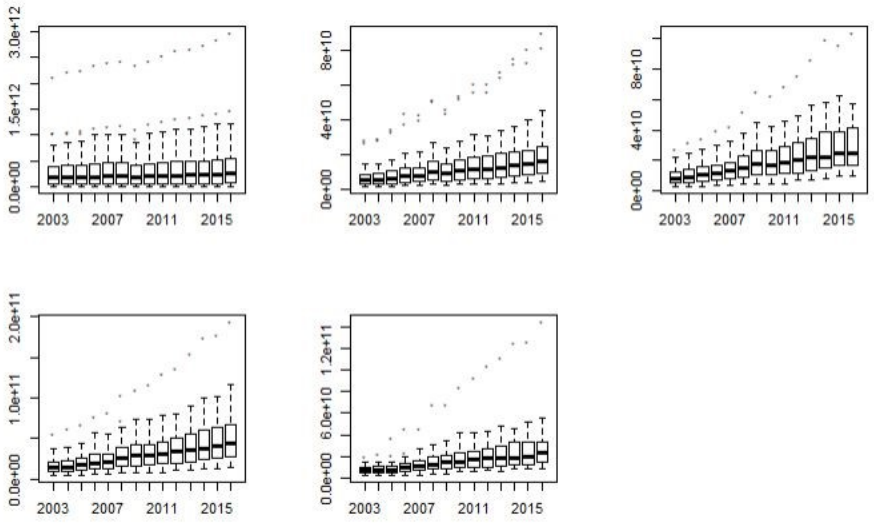

Figure 27: Source: TSCS data, Performance Plot on Key Variables

	gdppesos	contributions	allocations	funding	subsidies
gdppesos	1.0000000	0.7520758	0.3191346	0.5563917	0.5047697
contributions	0.7520758	1.0000000	0.7710553	0.9341408	0.8498111
allocations	0.3191346	0.7710553	1.0000000	0.9475398	0.8679239
funding	0.5563917	0.9341408	0.9475398	1.0000000	0.9130448
subsidies	0.5047697	0.8498111	0.8679239	0.9130448	1.0000000

Figure 28: Source: TSCS data, Pearson Correlation Matrix

between the variable “gdppesos” and the variables shown in the previously stated performance plots. The Pearson’s correlation definition is the covariance of two variables devised by the product of the two variables’ standard deviation. This method measures the linear correlation between two variables X and Y, and it has a value between +1 and -1(Crewson 2006). The matrix below was created using R Statistical Software and measures the values of variables obtained from the TSCS data used in this study, see figure 28.

The results from Pearson product-moment correlation coefficient assessed the relationship of the variable “gdppesos” and the described variables assessing the Federal levels of funding for key areas of development. The correlation matrix found a positive correlation between the variable “gdppesos”, and the variables “contributions”," funding " and “subsidies”. The relationship between these variables displays a coefficient represented by > 0.5 which is significant with the highest significance being between " gdppesos" and “contributions represented by $r = 0.752$”. These findings are important as they validate the relationship between “gdp” and the federal governments’ ability to sustain funding in key areas of development as Stiglitz postulated (Stiglitz 2000; Stiglitz and Ocampo 2008). The relationship between variable “contribution” and “gdppesos” validates the relationship between strong financial performance and GDP growth. A dynamic that with Mexico

has instead benefited regional champions with high levels of industrial concentrations. Here, the latter represented by Triple Helix and Traded Clusters.

The above- displayed matrix also shows the positive relationship between the variable “contributions” and the variables " allocations" The relationship between these two variables displays coefficients superior to > 0.5 which are significant with the highest significance being between the variables “contributions” and “allocations” represented by $r = 0.7.71$. A result, which connects the state’s strong financial performance with regular government funding for crucial development areas across Mexico. A reality, which puts regional champions in a much better position to capture federal funds more than other states less developed. Therefore, validating why more affluent states have the better education, health and infrastructure that can support better industrial activities. Likewise, capture higher levels of foreign direct investment as to be tested in the empirical analysis section of this research.

Triple Helix and Traded Clusters Across Mexico’s Regions

The following table looks at the Triple Helix clusters concentration across all the regions established for this study. The table aims to validate one of this thesis’ assumptions in that; the influence of US Global value chains plays an important role in the patterns of industrial agglomeration in Mexico.

Table 18: Summary of the number of Triple Helix Agglomerations Across Mexico’s Regions

idSectoral	Number of Thelix	year
1a	20	2016
2a	31	2016
3a	8	2016
4a	9	2016
5a	5	2016

The observations from the table show the highest concentrations of Triple Helix clusters are in regions 1a and 2a. The total number of ecosystems in these two regions is 51 Triple Helix clusters, while, regions 3a, 4a and 5a only show a combined total of 22 ecosystems. The table findings suggest validating our assumption ratifying the important role of US value chains in the pattern of industrial agglomeration in Mexico. But, also points to the role of knowledge intensive industrial activity in these areas which led to the knowledge infused ecosystems formation. The following table shows the regional concentration of traded clusters across the regions selected for this study. The table aims to validate the previously mentioned assumption which dictated a higher number of industrial agglomeration in the northern regions.

Table 19: Summary of the number of Traded Clusters Agglomerations Across Mexico’s Regions

idSectoral	Number of Traded Cluster	year
1a	493	2016
2a	496	2016
3a	424	2016
4a	305	2016
5a	243	2016

The table above thus validate the assumption which suggested a higher number of industrial concentration in the two northern regions. It shows that in these two regions there are 989 traded clusters, a total number which is higher than the three other regions in Mexico with the combined total of 972 traded clusters. Although, the difference in terms of the regional distribution of the industrial cluster is much less than the one observed with Triple Helix ecosystems. It is clear the northern regions still prevail in the number of traded clusters agglomerations. A fact, which according to the literature is attributed to the high concentration of outsourcing activity mainly in the low value added manufacturing sector.

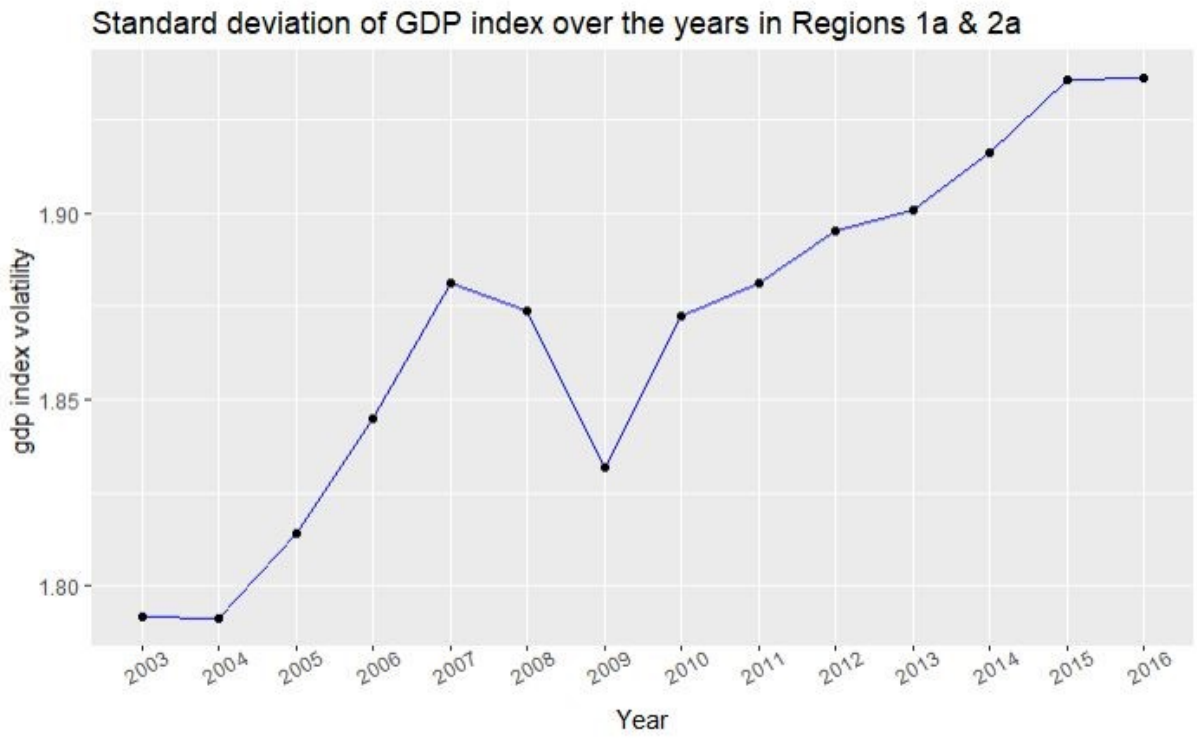

Figure 29: Standard Deviation of Mexico's GDP Index Over Time

The Volatility of GDP Index and Other Indicators Across

The following graph observes the volatility of the GDP index in the northern regions by grouping "idSectoral" 1a and 2a. These two regions are the most industrialised in Mexico validated by the highest concentration of the geographical units here under analysis, see figure 29.

The graph measuring the volatility of GDP index in regions 1a and 2a show little deviation thus speaking to the economic stability of these industrialised areas in northern Mexico. These regions when compared to the national level showed fewer contractions of GDP and an ascending growth pattern. It proved that GDP variations when compared to the national level over time is less which evidences much more sustained patterns of economic growth. The period of 2003 - 2007 showed a positive growth pattern, one which we see being impacted by the global economic crisis of 2009, but it reassured its growth trajectory in 2010 continuing to 2016. It showed no impact as it pertains the collapse in the oil prices in 2014, which accounts for the strength of industrial growth in lessening the impact of the country's resource wealth dependence in industrialised regions.

The over all assessment is this industrialised region showed less volatility of GDP compared to the country's average thus showing us the following two lessons; (1) The ability of industrialised regions to mitigate exogenous economic shocks and; (2) the advantages of industrial agglomerations in high technology sectors provide a much more sustained growth economic growth trajectory. The following graphs show the Mexican states with the least volatility in GDP index during the prescribed period of analysis. The states showing the least variation in GDP growth over time, thus validates aim to provide a link between industrial development and economic stability, see figura 30.

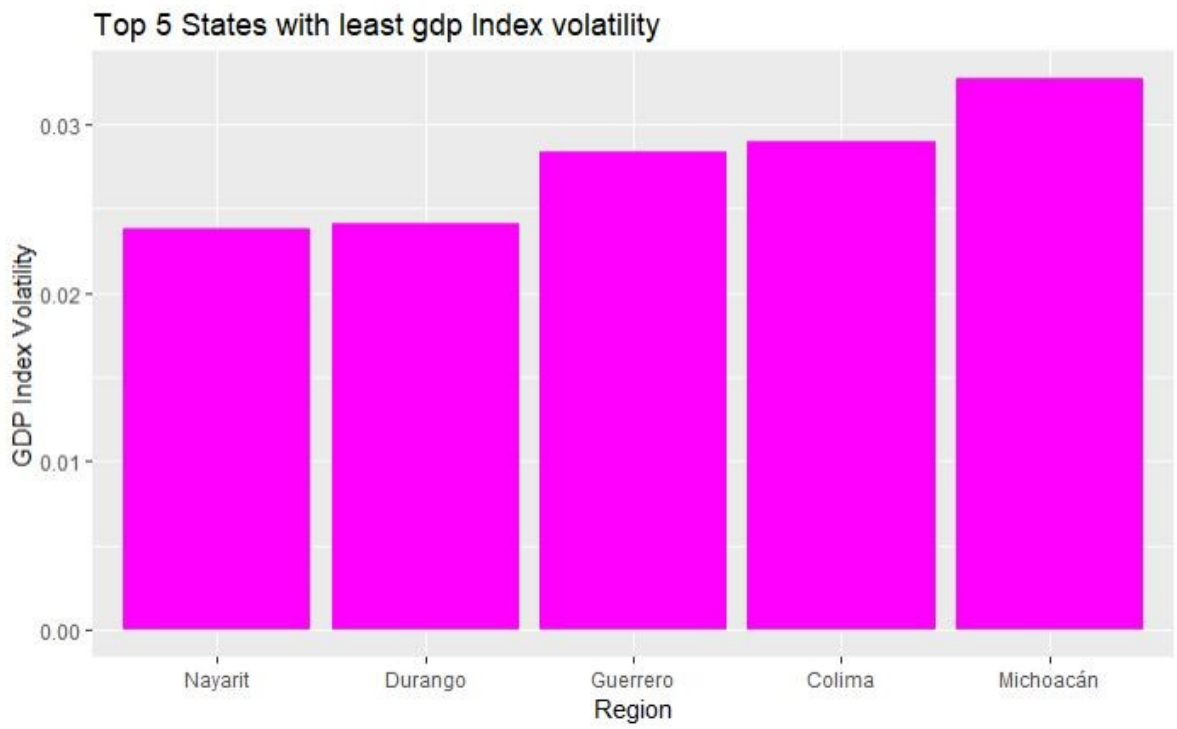

Figure 30: Five States with the Least GDP Volatility

The bar chart above looks at the states with the least volatility in GDP. The findings showed the presence of Traded clusters in all the states and Triple Helix clusters in the states of Durango, Colima, likewise Michoacan. The latter finding showing the highest number of Triple Helix with three clusters and 62 Traded clusters in the state of Michoacan . The regional distribution shows two states locating in the northern region 1a which exhibit the lowest volatility of GDP over the prescribed time period. The states of Guerrero, and Colima are located in the central part in regions 4a and 5a. The findings show two key observations; (1) the influence of centralization in Mexico's economy, and; (2) industrial development as a driver of economic stability in these states' regions. It also points to the heterogeneity of economic development indicators across Mexico's regions which marks an important aspect of the country's regional disparities.

The lessons learned from the previous graphs established a connection between GDP growth and industrial activity. It showed the linked between industrial agglomerations here represented by the two geographical units under analysis and economic stability. The next few graphs will observe the volatility of other variables in the data panel such as "contributions" and "allocations". As previously mentioned these two variables represent the levels of central government funding transfer to each Mexican state over the prescribed period, see figure 31.

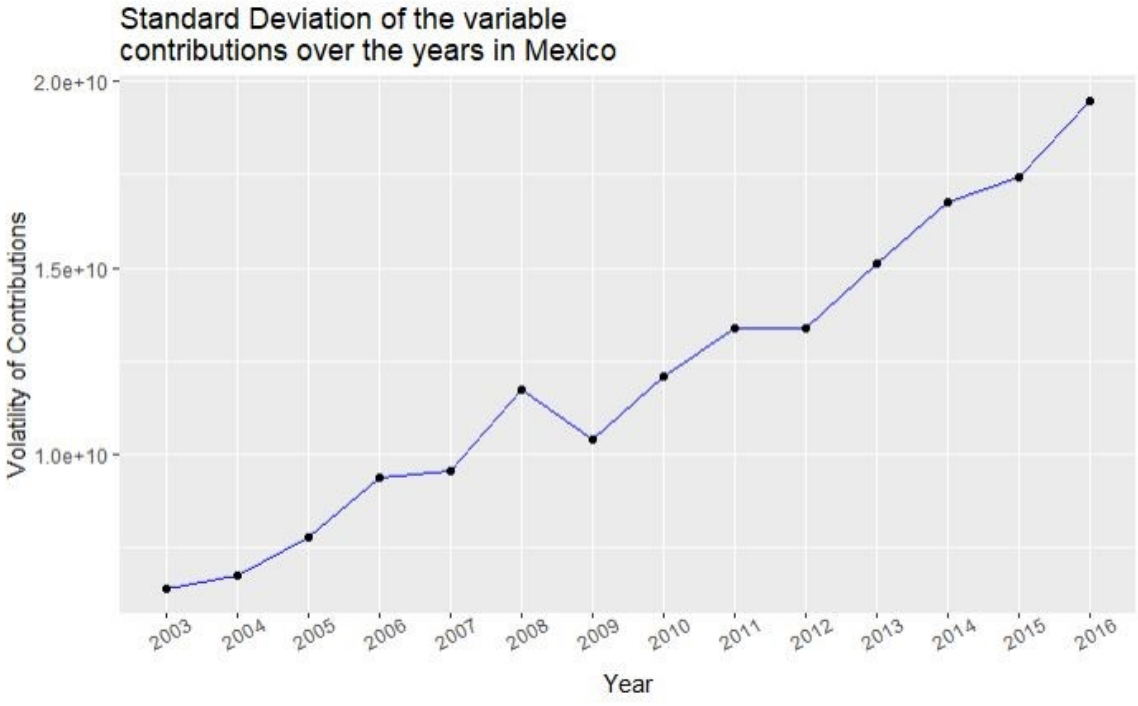

Figure 31: Volatility of Contributions Over Time

The graph above shows the increase in the volatility of the variable contributions. An ascending trajectory which means the positive growth over the years of the prescribed time period. The ascending line states the level of central government funding given to all estates is positive. This is an incentive to the states economic contribution to the GDP grew from 2003 to the end in 2016. This ascending line also implies an overall positive economic growth in GDP pesos terms during this time; a fact referring to the overall performance of the Mexican economy due to its structural change programs instituted in the early 2000s. This strong growth does not translate into a more homogeneous or equitable regional development as this thesis elaborates on the heterogeneity of indicators across regions. An observation which aims to frame industrial agglomerations with the higher economic performance of indicators over the years.

The following chart looks at regions 1a and 2a which as mentioned earlier are the regions with the highest concentration of industrial clusters represented by the concentration of Triple Helix and Traded Clusters. As mentioned in this regions we find Nuevo Leon as the most industrialized state in Mexico with the concentration of 12 knowledge infused ecosystems and 65 traded clusters, see figure 32.

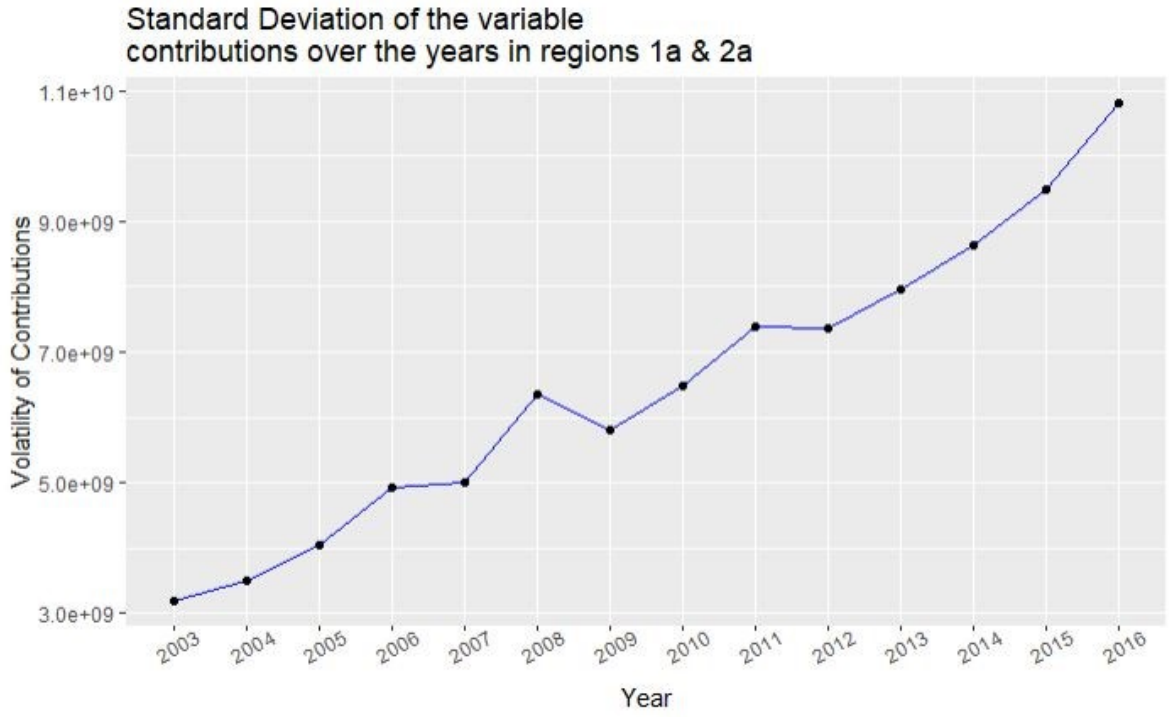

Figure 32: Volatility of the Variable Contributions

The graph shows an ascending line beginning in 2003 and ending in 2016 thus suggesting an increase in amount of funding transferred as incentives for this region's contribution to the national economy. The line chart shows a growth trajectory which more than double during the prescribed period thus validating Mexico's economic growth in this region in GDP terms. The comparison of this graph in relation to the same graph looking at Mexico as a whole gives us the following two lessons. It shows a lesser impact of GDP contraction and the effects in transferring funding from the central government to the states in industrialised regions. It validates higher industrial development with more sustained levels of government funding which speaks to the regional champions assumption governing this research. The latter being an observation which can help this research validate why some regions continue to show economic and industrial growth while other remain stagnant. All findings which support this thesis model of an augmented competitive dimension as posited by the model presented here. The next graph observes the variations in the variable "contributions" as in the previous graphs but looks at a group of states where there are at least two Triple Helix and fifty-five Traded Clusters, see figure 33.

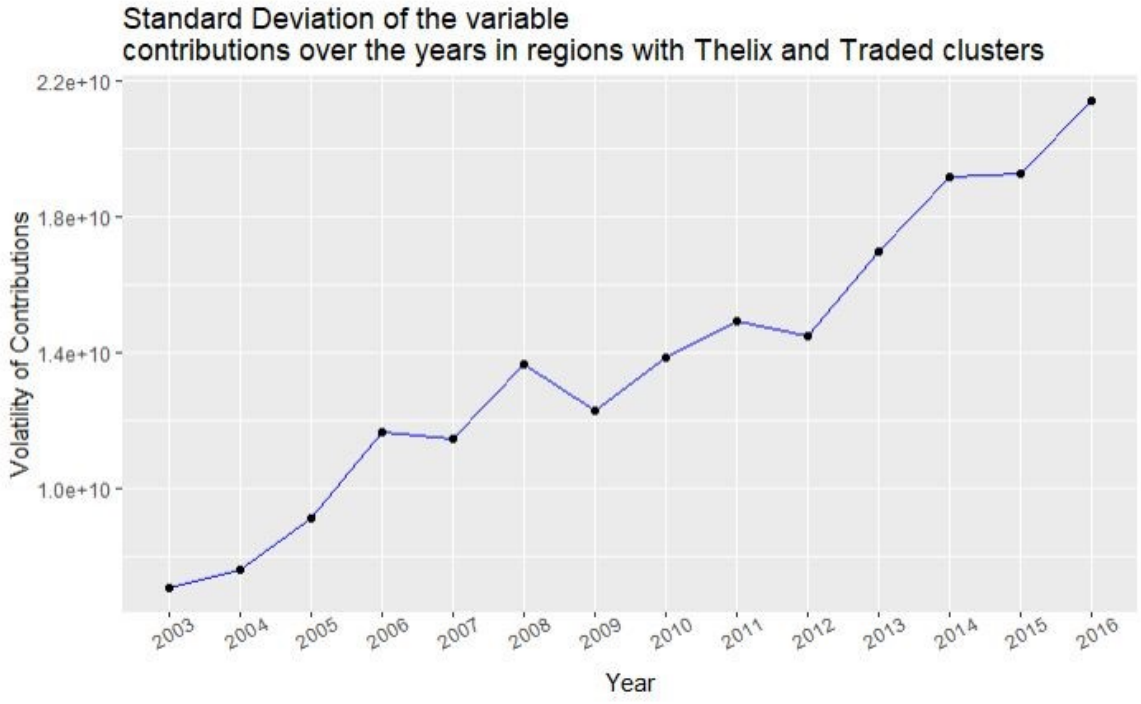

Figure 33: Volatility of Contributions in Thelix & Traded Clusters Regions

The previous graph shows the highest ascending trend of the group of states selected where there are at least two Triple Helix and fifty-five traded clusters. The total combined in "contributions" transferred from the federal government to these states during the prescribed period double the total contributions transferred to Mexico's regions 1a and 2a combined. This finding proves even more the assumption of sustained and superior levels of government funding in industrialized regions. Hence, validating as mentioned earlier the regional champions assumption leading this enquiry. The following graphs show the states with the highest and lowest volatility of the variable "contributions". The aim is to link the findings with the presence of the proxies for industrial clusters. Hence, furthering establishing the link between economic growth, industrialization and the relationship with funding from the federal government to the regions,see figure 34.

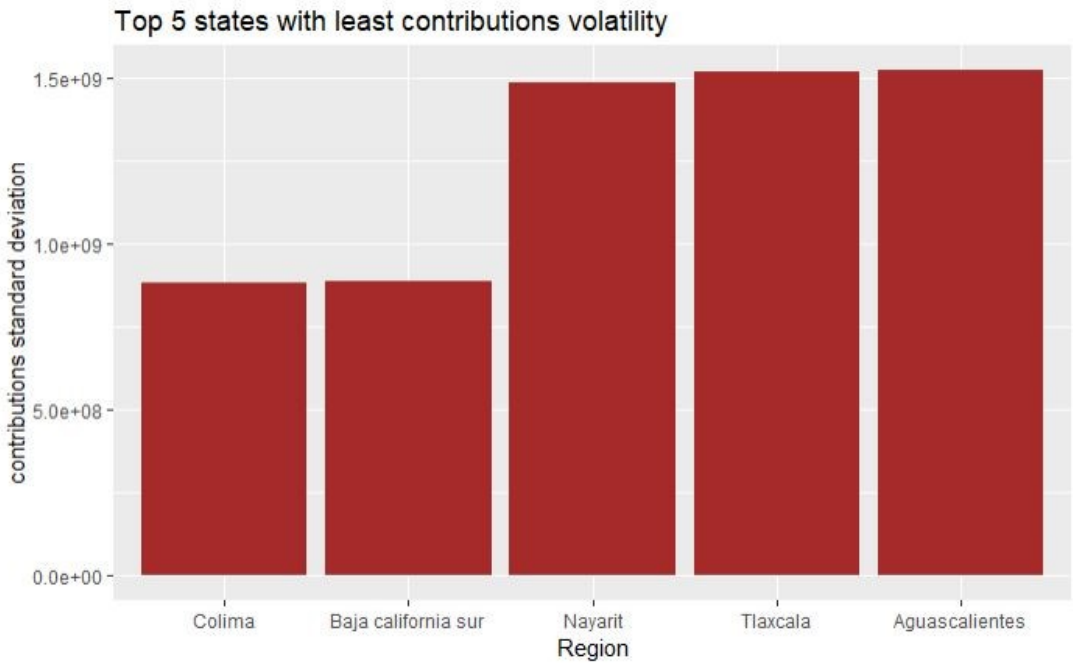

Figure 34: Top 5 States with the Least Volatitlity in Contributions

The bar chart shows the states with the lowest volatility of the variable "contributions" during the prescribed period. Although, in the states shown in the graph we observe traded clusters in each state, we also find a few Triple Helix clusters in these states. A finding which suggest the primary role of manufacturing activity in these states' economic sector, and the lack of technology-driven innovation activities. In the graph the state of Aguascalientes shows the highest variation on the level of "contributions" during the prescribed period. This coincide with the fact Aguascalientes grew in the number of Triple Helix agglomerations with seven industrial clusters of this type. A finding which validates to gain higher economic incentives to regions where technology driven innovation has developed. The next graph looks at the variable "contributions" in the states showing the highest volatility of this variable. The aim is to observe if in these states we can observe a higher number of Triple Helix or knowledge infused clusters, see figure 35.

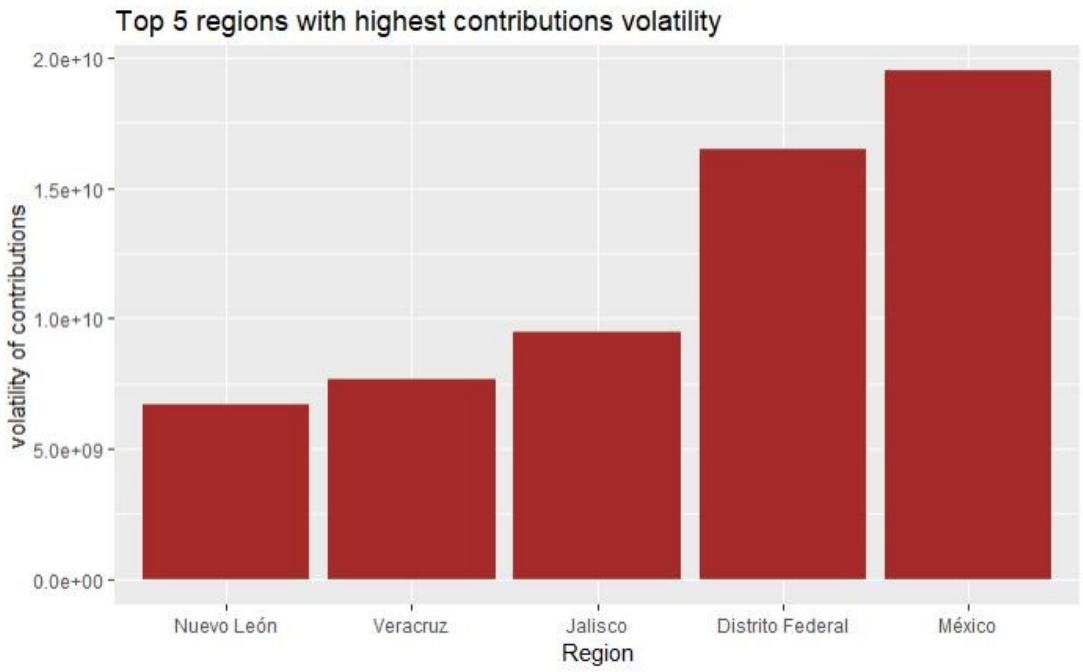

Figure 35: Top 5 States with the Highest Volatility in Contributions

The bar-chart looking at the states with the highest volatility of contributions shows a higher presence of Triple Helix clusters than those showing the lowest levels of volatility. The states of Nuevo Leon, Veracruz, Jalisco, DF, and Mexico, confirm the centralization of Mexico's economy and the link to industrial growth. Two facts which also observe the link of the higher levels of growth in central government funding and technology-driven industrialization patterns in the country. Patterns exemplified by the presence of knowledge-infused industrial clusters in these states. The following graph shows the states with the highest volatility of the variable "allocations". This variable represents the finding transferred from the federal government to the states for health, education and basic infrastructure as key development factors, see, figure 36.

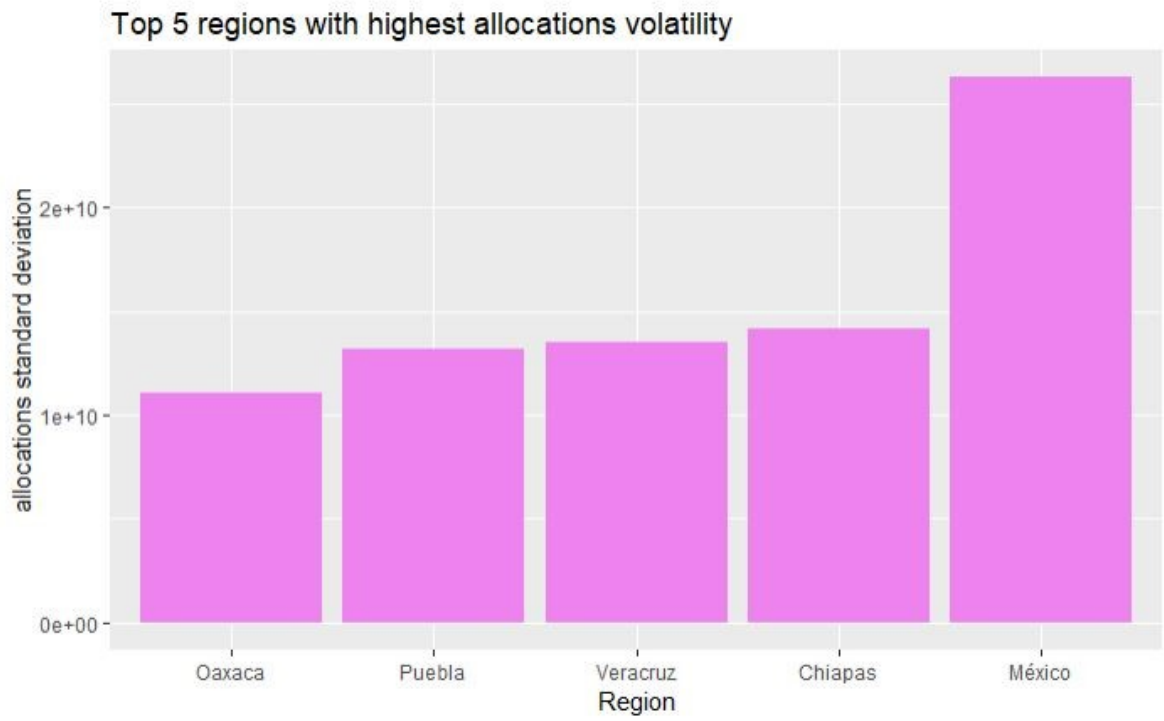

Figure 36: Top 5 States with the Highest Volatility in Allocations

The graphs show the states of Oaxaca, Puebla, Veracruz, Chiapas, and Mexico as the ones showing the highest volatility of the variable " allocations" during the prescribed time period. It is important to mention the presence Triple Helix clusters in all the states shown in the graph. It is also relevant to highlight these are states where Triple Helix clusters are relatively a recent development.This finding leads us to link the increase in the levels of central funding in the mentioned areas of development to the support of technology and knowledge-infused industrial activity. The latter represented by Triple Helix ecosystems as agglomerations where innovation, research, and development are an important part of the knowledge-infused activities within these ecosystems. The following graph shows the states with the lowest volatility of the variable “allocations”. This variable represents the finding transferred from the federal government to the states for health, education and basic infrastructure as key development factors, see, figure 37.

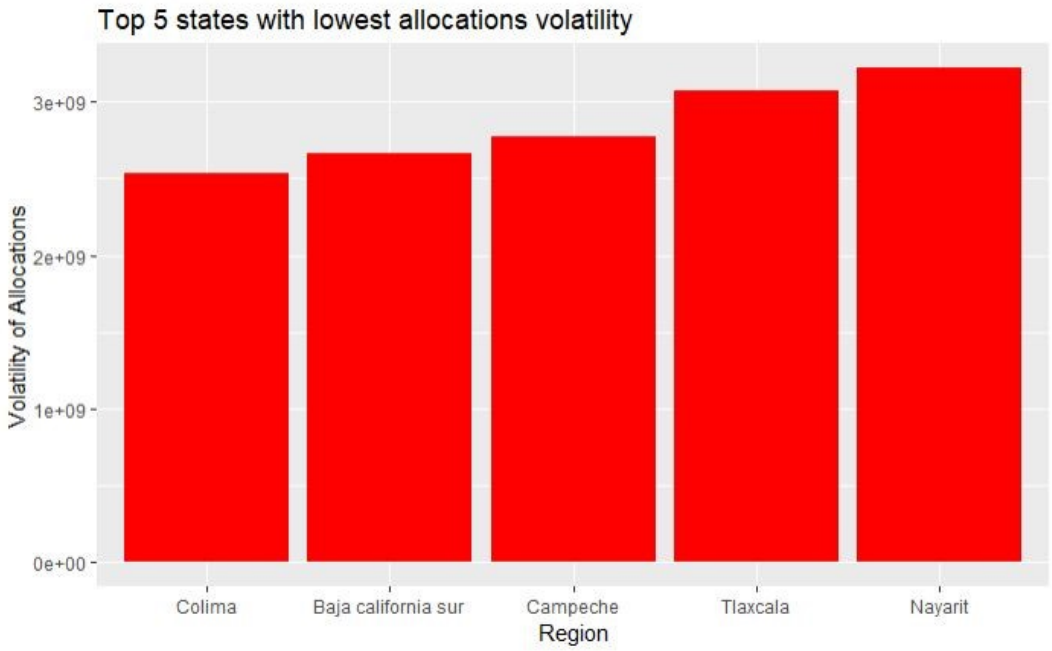

Figure 37: Five States with the Lowest Allocations

The graphs shows the five states showing the lowest volatility in the variable allocation during the prescribed period of analysis. The states shown in the graph display the presence of lesser knowledge-infused ecosystems in comparison to the previous graph showing the highest volatility in this type of central government funding. These findings also reaffirm our regional champions assumption represented in the funding these states received from the federal government for key development areas like education, health and infrastructure development. The next few charts examine the variables FDI (Foreign Direct Investment), and employment. These graphs concentrate on the best performing states by choosing the top five states. It also draws a connection to industrial activity represented by the two geographical units chosen for this analysis, see, graph 38.

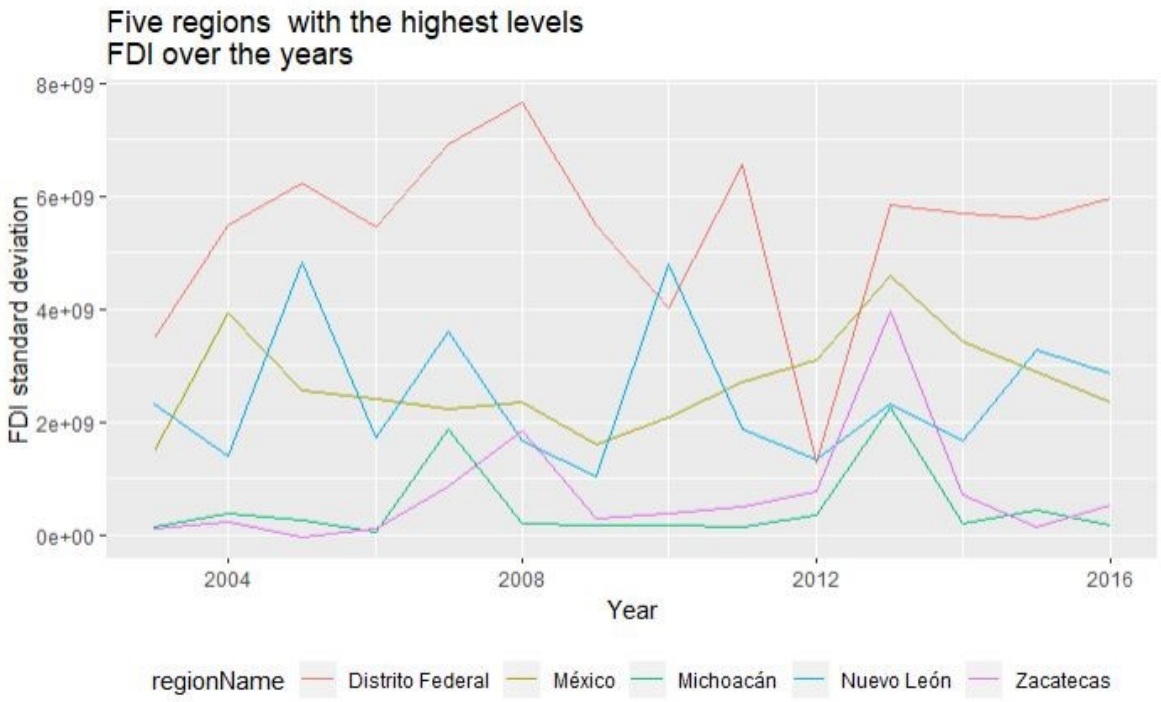

Figure 38: Five States with the Highest Volatility of FDI over Time

The graph above shows the five states with the highest volatility in the levels of FDI. The graph shows the fluctuations in the levels of FDI in these states are subjected to the country's economic contraction, a by-product of exogenous factors such as the global financial crisis. The graph affirms the stated in the publication labelled "Entre Dos Mexicos". A competitive report on the state of Mexico's economy which positions the regions of DF, Mexico, and Nuevo Leon as the ones capturing close to 60% of the country's FDI influx. A fact which directly establishes a link between agglomerated industrial activity exemplified by industrial clusters and FDI. It is also relevant to highlight that in all the states showing the highest levels of FDI are states where the two types of proxies for industrial clusters concentrate. This further supports the argument that industrial clusters are institutions of regional economic development, see, figure 39.

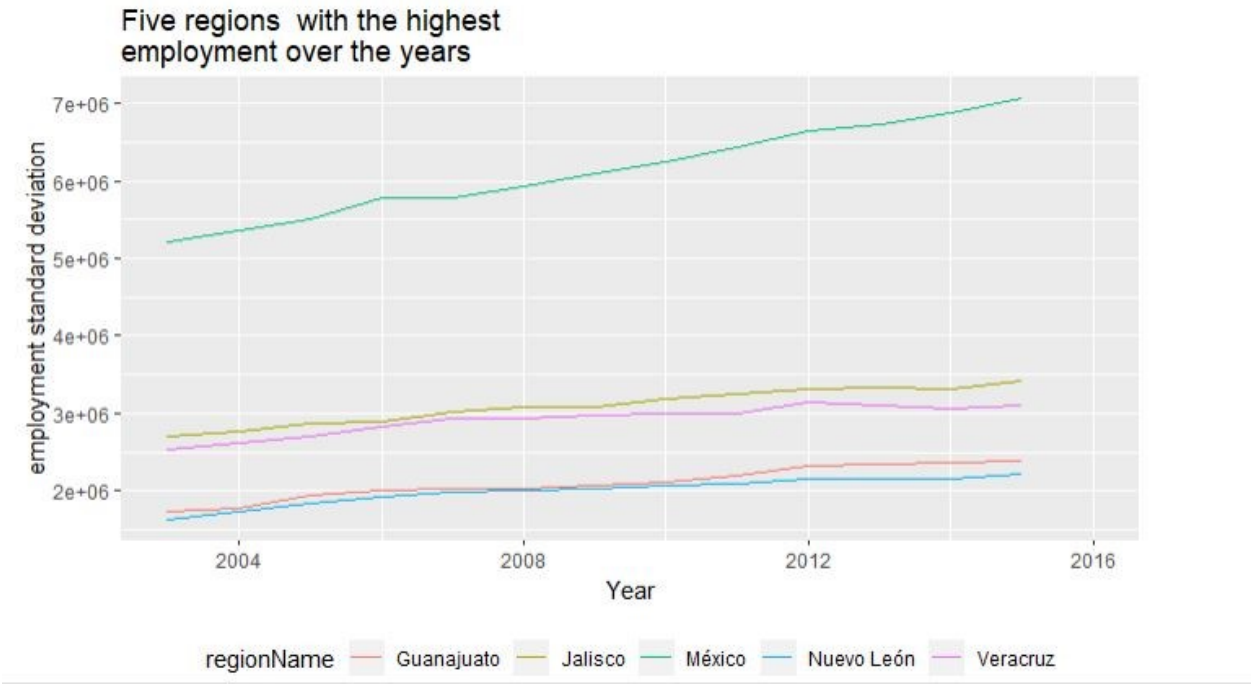

Figure 39: Five Regions with the Highest Volatility of Employment Over Time

The line chart shows the states of Guanajuato, Jalisco, Mexico, Nuevo Leon, and Veracruz as the states with the highest volatility in total employment numbers. The terms total employment means the total number of people used accounting for formal and informal employment activities. The geographical location of these states is in the central part of the country and within the industrialized regions except for the state of Veracruz in the South. The state of Veracruz is one of the most developed in the south having one Triple Helix agglomerations. Also, this state has sixty-three Traded clusters in the manufacturing sector, catering to the export markets. The findings from the line chart validates the link between population growth, GDP, industry clusters and employment growth. One which we see as validated in the growth of the total employment numbers shown in the above-stated graph. The next graph examines the variable "municipalities" this variable represents the transfers from the states' government to municipalities in the state. The aim is to validate if states where the industrial activity concentrate are in a better position to provide their municipalities higher levels of funding, see, figure 40.

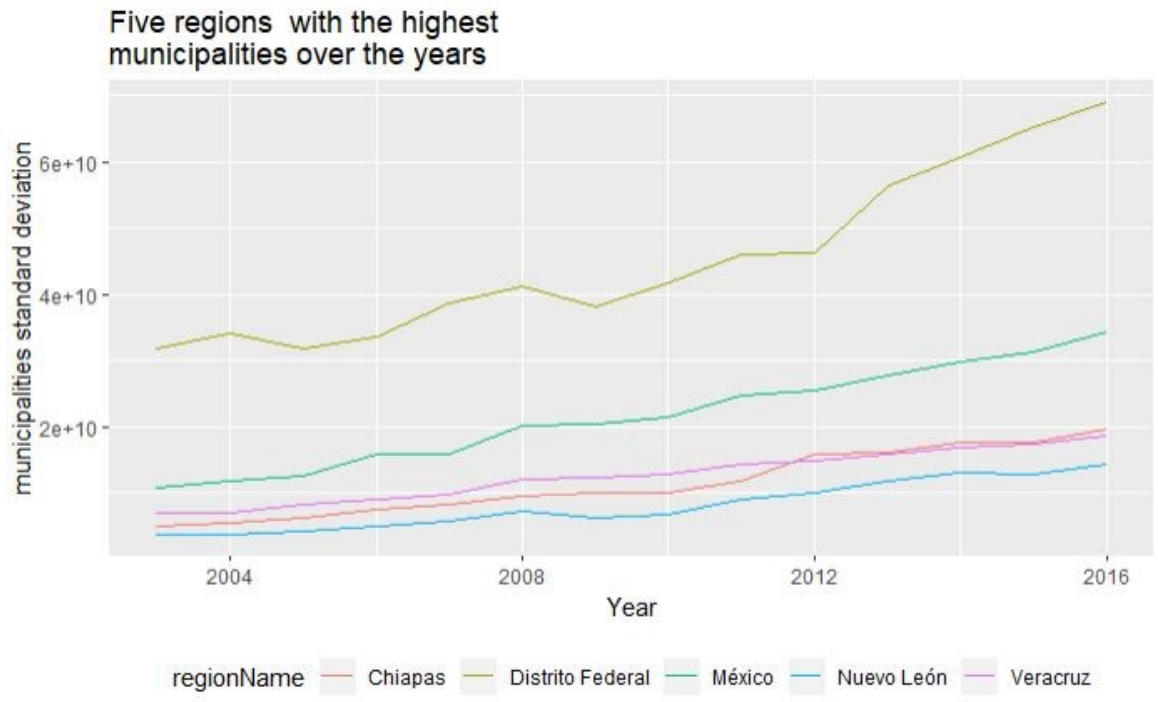

Figure 40: Five States with the Highest Volatility in the Variable "municipalities"

The graphs above shows the link between industrial concentrations in Mexico represented by the geographical units here under analysis and higher levels of central government funding at the state and municipality level. This finding speaks to the necessity for Mexico to have an augmented competitive dimension as postulated by this research model. One, where industrial clusters, mainly Triple Helix agglomerations are the centre of Mexico's economic policy which would be regional in scope.The following graph shows the states with the highest levels of volatility in the variable "cScholarships". This variable represents the number of scholarships granted with federal monies to individuals seeking to attain basic job competences. This program is part of the BECATE component of Mexico's ALPs. The aim of this active labour scheme is to promote employment through training people in basic job skills. Then helping these individuals find a job through the programs' job placement service and engagement with the private sector, see, figure 41.

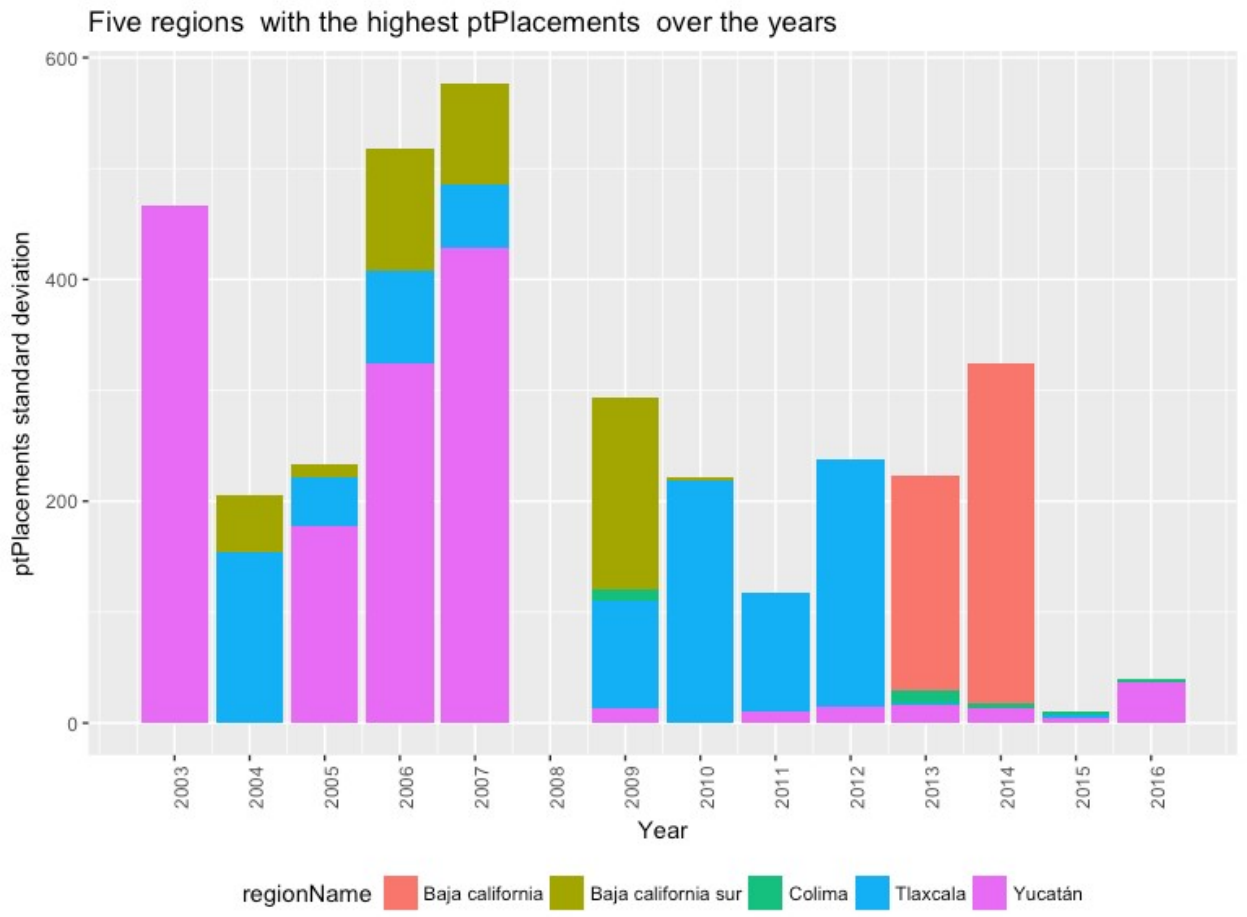

Figure 41: Five Regions with the Highest Volatility of "ptPlacements" Over Time

The graph shows the states where over the years the higher volatility in the number of "cScholarships" takes place. The graphs show an ascending trend from 2009 to 2014, one which coincides with the central government's push for higher levels of employee productivity and engagement with the private sector. The graph also suggests that the number of scholarships granted with federal funds for this specific training area is sensitive to the fluctuation in the levels of central government funding. The latter finding shows the low periods in the number of scholarships from the year 2005 to 2009 and their decline in the years 2015-2016. The graph shows that Baja California, Colima, Tlaxcala, and Yucatan are states where we find the two proxies for industrial clusters. This scholarship program in these mentioned states saw significant growth during the stated periods of 2009-2014 observing the highest growth in the state of Baja California. This state is one of the most industrialized in the country second to Nuevo Leon. The relative higher number of scholarships in Baja California could relate to the states active manufacturing sector or maquiladoras in the low value added segment of industrial activity, see, figure 42.

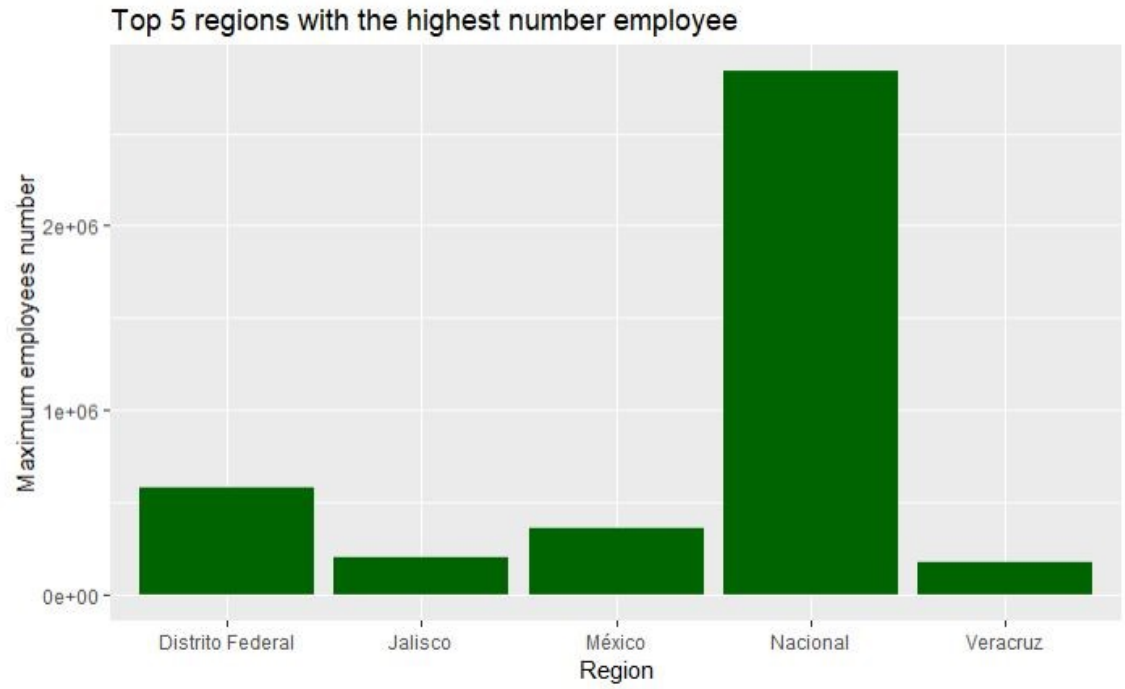

Figure 42: Five States with the Highest Number of Employees in Traded Clusters

4.2 Key Observations on Traded Clusters

The next four graphs show key facts about traded clusters across Mexico's regions from our dataset. These facts speak to the states with the highest employment numbers among Traded clusters. This section also observes the states with the lowest employment numbers among Traded clusters. The other two graphs show the highest and the lowest employee numbers in terms of Traded clusters by their industrial classification,see, figure 43.

The graph above shows the highest number of employees among Traded clusters taking place of the central and central northern states. All the states in the graphs are in regions where there is a high concentration of industrial activity marked by the technology-driven clusters and knowledge infused activities represented here by Triple Helix agglomerations. It is also relevant to mention the central regions are the ones with the highest growth in GDP and population terms during the prescribed period of analysis.The graph above showing the lowest number of employees among Traded clusters place four out of the five states as regions lacking industrial development. The exception here is Aguascalientes, a state with the presence of the two geographical units here under analysis, see, figure 44.

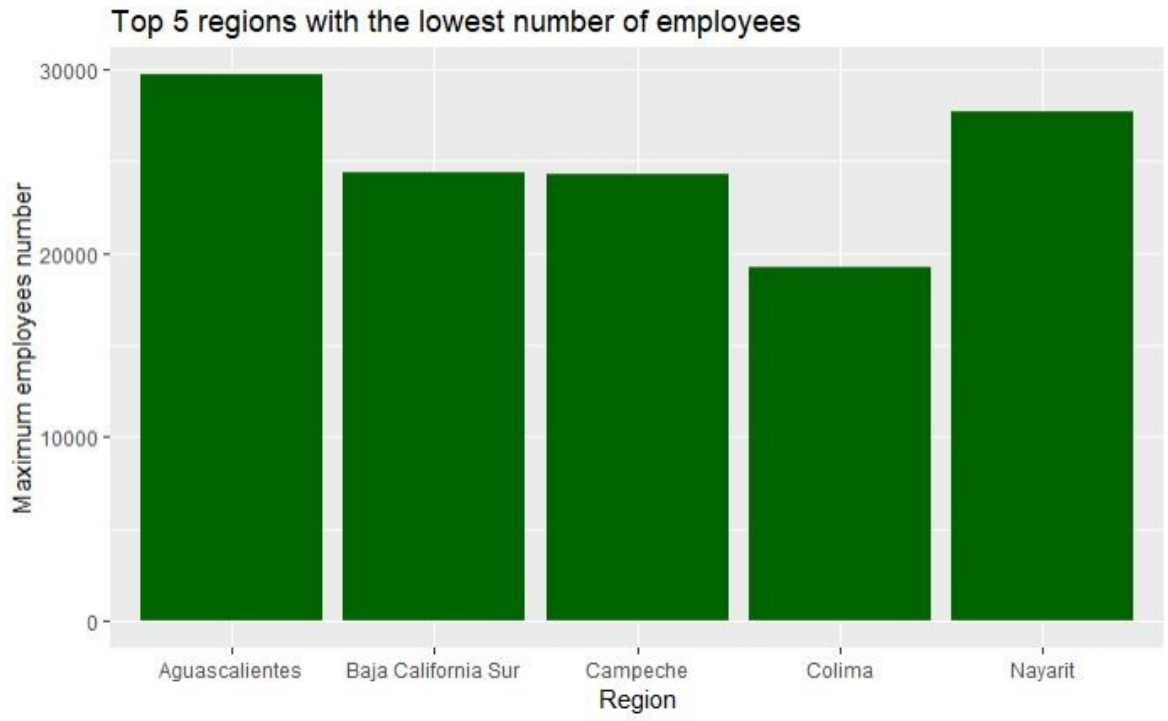

Figure 43: Five States with the Lowest Number of Employees

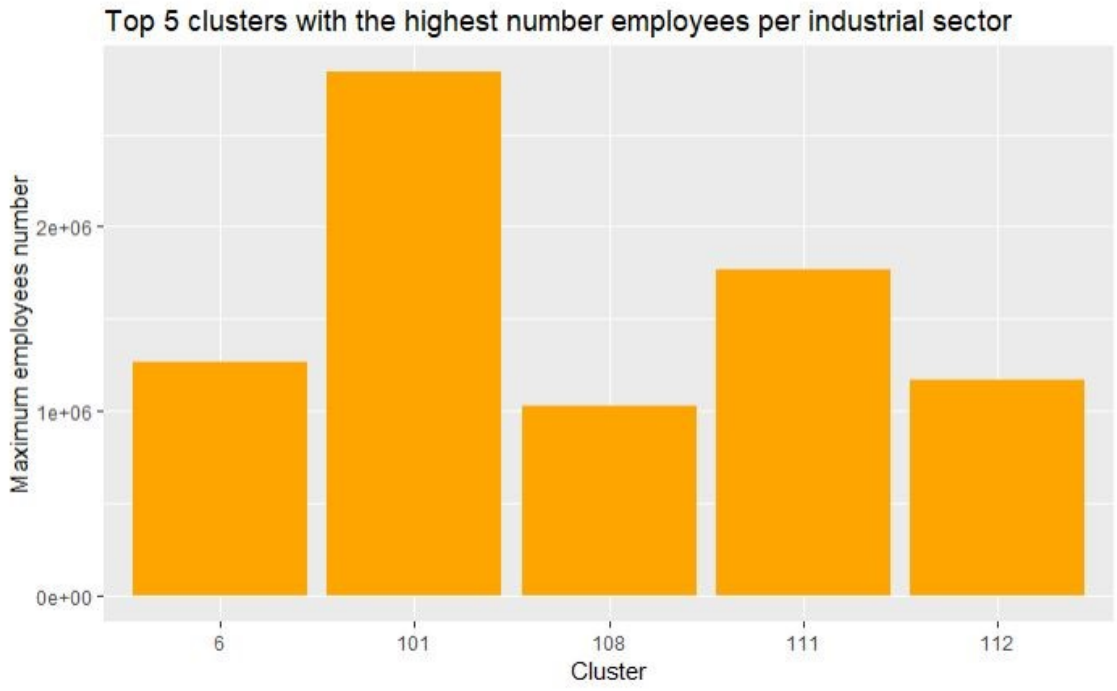

Figure 44: Top Five Cluster Types with the Highest Number of Employees

The following two bar-charts show the top five industries with the highest, and lowest employment numbers among traded clusters. The industry codes displayed in the bar charts conform with the North American Industry classification codes (see, Appendix 2.0). The North American Industry Classification System or NAICS is used by business and government to classify business establishments according to the economic activity (process of production) in Canada, Mexico, and the United States of America, see figure 45 & 46.

Table 20: Cluster Code & Cluster Name with the Highest Number of Employees per Industrial Sector

Cluster Code	Cluster Name
6	Business Services
101	Local Food and Beverage Processing and Distribution
108	Local Motor Vehicle Products and Services
111	Local Hospitality Establishments
112	Local Commercial Services

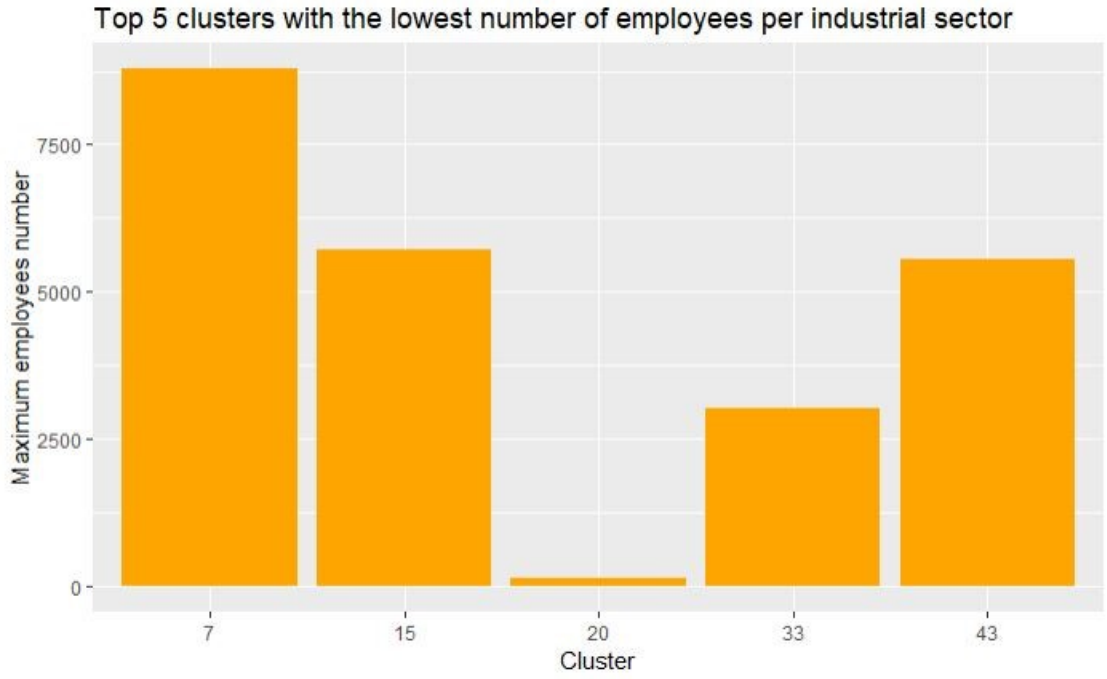

Figure 45: Five Industrial Sectors with the Lowest Number of Employees

Table 21: Cluster Code & Cluster Name with the Lowest Number of Employees per Industrial Sector, see, Appendix 2.0.

Cluster Code	Cluster Name
7	Coal Mining
15	Environmental Services
20	Forestry
33	Music and Sound Recording
43	Tobacco

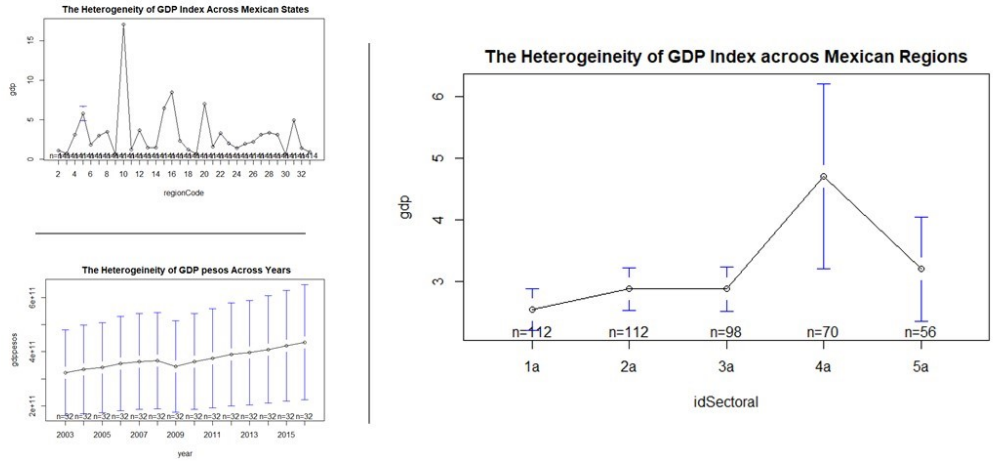

Figure 46: GDP Heterogeneity Plots Across Mexican States & Regions

4.3 TSCS Empirical Strategy: Data Wrangling

The data wrangling section examines the heterogeneity across variables in our dataset. The purpose is to describe the properties of different variables across our data panel. It aims to provide empirically validations to the assumptions about the patterns of regional development in Mexico while explaining and observing the differences of a variable to any other variable in our dataset. Testing the heterogeneity of the most critical variables in our dataset across time and place facilitates the linkage of indicators. It will also reaffirm the assumptions of regional disparities while also uncovering other relevant observations contributing to the depth and breadth of this thesis. Last, it will reinforce the regional champions assumptions while proving the inequitable regional development that exists in Mexico (Porter and Ketels 2003; @ Ketels 2003).

Testing the heterogeneity of GDP across Mexican states aims to validate the relationship between this indicator as the primary driver of economic growth in Mexico. Testing the heterogeneity of GDP across time and place help us validate assumptions in the following three key areas. First, it sets the relationship between GDP growth and the central and northern part of the country as the areas with the highest GDP growth. Second, it links GDP growth over the prescribed period to the industrial agglomerations represented by the proxies used "Triple Helix" and "Traded Clusters". Third, it confirms the influence of US value chains on the patterns of industrial agglomeration in Mexico's regions in relation to economic growth. The following plots show the heterogeniety of these indicators across states and regions in Mexico, see figure 47.

The heterogeneity of Mexico's GDP index as a principal economic driver across all the Mexican states yielded the following lessons. The findings show Mexico City is the country area where GDP grew the most, followed by the state of Campeche, Jalisco, Mexico, and Nuevo Leon. During

the prescribed period the state of Campeche showed the highest variation of GDP vis-à-vis other states, and Veracruz likewise Baja California showed moderate GDP growth during the period. The findings establish the positive relationship between the assumption pointing to the central and north wealth and the growth in the state's GDP. The graph also points to the positive relationship that exists between industrial agglomerations and GDP growth. The latter reference by the number of Triple-Helix agglomeration in the northern regions 1a and 2a as established by the regional distribution map taken as the reference for this study, see Appendix 1.1. The findings also reveal the lowest levels of GDP during the prescribed period located in the southern regions of the country. Therefore, showing those latter observations as key factors fostering Mexico's inequitable patterns of regional development and marked regional disparities (Porter and Ketels 2003). The higher concentration of Triple Helix clusters in the central and northern regions is represented by Mexico City and Nuevo Leon with six and twelve Triple Helix ecosystems.

The above heterogeneity plots yield the following lessons. One, it establishes a link between Triple Helix clusters and higher GDP growth in the central to northern regions with 38 agglomerations. Two, it shows the highest growth of GDP in regions 1a and 2a based on Mexico's electoral map (Appendix 1.1). Three, it leads this study to test other variables in our dataset and their contribution to GDP growth. Four, it leads this study to test the statistical significance of Triple Helix ecosystems on Mexico's GDP. Last, the findings suggest to the role of clusters not only in promoting GDP growth but also in positioning the core of Triple Helix activity within reach of the US global value chains. Out of the thirty-eight agglomerations on the central to northern regions, twenty-three find themselves in the northern part of the country within proximity of the US border. Six clusters locate in the Central-Northern region, and seven in the central part of the country near Mexico City. The findings show that although US Value Chains is an influencer for GDP growth and the agglomeration of clusters within reach of the US border. Factors such as the population at the centre region of the country make up a vital driver promoting GDP growth at the state and regional level, see, figure 47.

The heterogeneity of GDP index across Mexico's regions shows that during the prescribed period the growth using the variable GDP index in sectors 1a (north-west) and 2a (north east) showed a moderate increase with minimal variation. While the areas 4a (southern central), and 5a (central) displayed the highest growth and the most top variations of GDP index. The graph shows steady growth with minimal alteration of the variable over time in the regions 1a and 2a. These regions show higher levels of industrialization based on the agglomeration presence of Triple Helix clusters in these regions. A fact which may signal a sustained and already matured stage of development within the national-regional context. Therefore, showing a fairer distribution of resources among these two northern regions as postulated by (LeGallo & Ertur, 2000). The findings comparing regions 4a and 5a which over the prescribed period displayed a substantial growth in GDP exhibit the highest variation. A finding, suggesting to the increase of industrial activity in Mexico's central regions. It also points to the emergence of industrial clusters, and population growth as potential drivers of regional development. Last, the graph tests, and proves, our assumption of the southern regions as being underdeveloped and exhibiting a decline in GDP growth with minimal variation over time in the region 3a (southern).

Examining the fluctuation or volatility of GDP and other variable indicators in the dataset is very significant. It links key aspects of the literature on regional and national economic development to GDP growth as a primary driver of development across Mexico's states and sectors. Observing the heterogeneity of GDP across the years in our dataset call for an evaluation as to better observe GDP contractions. This outlook provides this study with the time dynamics in the growth and

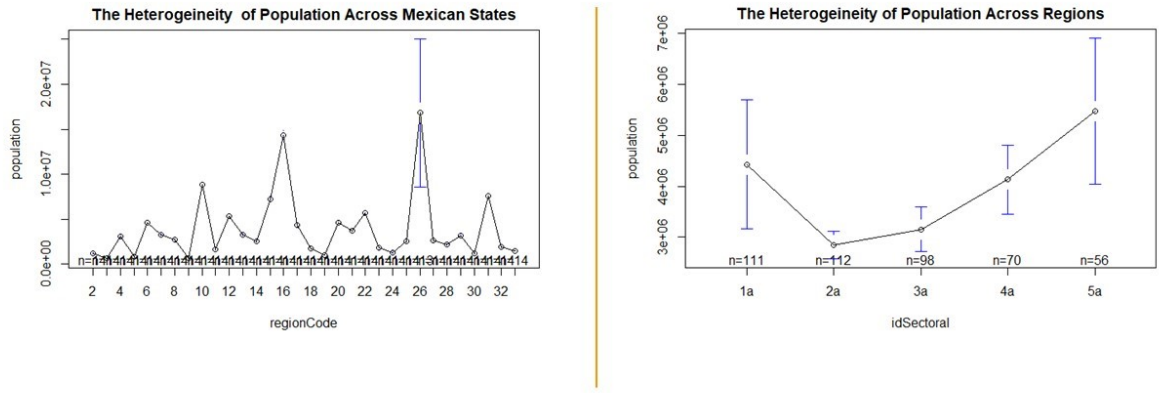

Figure 47: Heterogeneity Plots on Mexico's Population

distribution of GDP over the years in the dataset while also accounting for fluctuations. All facts which lead us to look at the levels of GDP variance overtime as the cause of regional and states' disparities. The in contrast to more sustained levels of national, regional economic growth and a fairer distribution of resources as posited by (LeGallo & Ertur, 2000). This observation over the years might help us see the impact of external economic shocks on GDP and the overall economy. Thus, showing these fluctuations affecting the country's and regions' level of competitiveness. In measuring the Heterogeneity of GDP pesos across the years, this aims to find a more notable pattern of growth and fluctuations of GDP across time, it also helps us related how the observed fluctuations relate to periods of economic downturn or external economic shocks (Stiglitz 2003; Stiglitz and Ocampo 2008), see, figure 47. The graph shows a moderate variation and a growth trajectory overall. However, it is also noticeable that in the period 2008 there is a contraction in GDP growth. A period which coincides with the onset of the global financial crisis thus echoing the arguments put forward by (Stiglitz 2000; Stiglitz 2003; Stiglitz and Ocampo 2008). These arguments relate the necessity for a more balanced fiscal policy regarding regional development. A macroeconomic reform platform aimed to push market liberalization efforts that are more sensitive to variations in economic growth at the national level.

Testing the heterogeneity of the different variables in our dataset looks at the variations of important economic variables such as exports, added value, population and the levels of central findings across time. It complies with the objective to unveiling the patterns of Mexico's regional development in marked regional disparities. It also facilitates the linkage of these variables to industrial clusters thus establishing the assumption of these indicators' higher performance in areas where clusters concentrate, see, figure 48.

Population growth is a factor impacting national and regional level economic development. This

measurement of economic development is alleged to be responsible for higher levels of inequality and marginalization(Kentor 2001). National and regional factors affecting underdevelopment live within the different dimensions of globalization such as international trade. The literature on the topic suggests this is true for not developed economies, economies that do not open global trade, and that depend on foreign capital stand to have higher levels of inequality as the population grows. Under, this context literature on the topic suggest population growth slows economic growth (Kentor 2001). In contrast, other writings on the subject postulate that in developed economies, population growth can influence economic development. It also incentives investment capital flows signaling a skilled growing labour force (Coale and Hoover 2015). Let's take a closer look at the heterogeneity of Mexico's population across the states and regions, see figure 48.

The heterogeneity of population growth across all Mexican states during the prescribed period yield the following observations. It notes the highest increase in the population with the highest variation took place in the state of Sinaloa (26). Important population growth also took place in Mexico City (10), the State of Mexico (16), and Veracruz (31). The graph shows moderate population growth in states such as Chiapas, Guanajuato, Jalisco (15), and Nuevo Leon (20). It highlights from these observations (1) the presence of structured clusters in all states showing population growth except Sinaloa. The total number of Triple Helix clusters across the states with higher population total twenty-nine except in Sinaloa. (3) It seems the graph finds a positive relationship between the GDP growth in Mexican Pesos with factors such as the increase of population, and areas where clusters are present. Industrial groups are ecosystems of efficiency and productivity embedded within the networks of international trade and global value chains(Gereffi and Fernandez-Stark 2016). A fact which suggests validating the scholarly research done on the positive relationship between GDP, trade openness, and population growth [Coale and Hoover (2015);], see figure 48.

The heterogeneity of population across Mexican regions shows the two regions with the highest growth in population over the years, the north-west (1a), and the central area (5a). In region 1a (north-west) the graph shows an increase in population growth with a high variation. These phenomena might infer that population growth in this region grew consistently with the increase in industrial activity, clusters, and trade. It also suggests the influence of external factors in the variance such as migration, labour mobility, and recessionary economic periods, likewise violence(Penanieto, 2016). Region 5a (central) corroborates the assumptions postulated in the first graph measuring the heterogeneity of GDP across regions. This graph showed Mexico and Mexico city as the two regions with the highest growth in GDP. A finding which links population growth as a factor of GDP growth over the prescribed period. It is also worth to note that in Mexico City there is seven Triple Helix organized promoting GDP and driving population growth in this region. Thus, inferring to the positive relationship that might exist between GDP, population and industrial agglomeration growth, see figure 48.

Testing the Heterogeneity of Exports

International trade has driven country's policy objectives and has also been part of the country's international agenda in the last four decades. Mexico's strategic location and proximity to the US border in some states have promoted industrial development and cluster formation. The previous heterogeneity test in Mexico the relationship between GDP, population and clusters is notable. Let us see if the assumptions about regional disparities translate to each state's levels of exports. It further ratifies our assumption of superior economic development in the northern state-regions vis-à-vis other state-regions in the south, see figure 49.

The two graphs in figure 49, validate Mexico's economy as export driven. The heterogeniety of

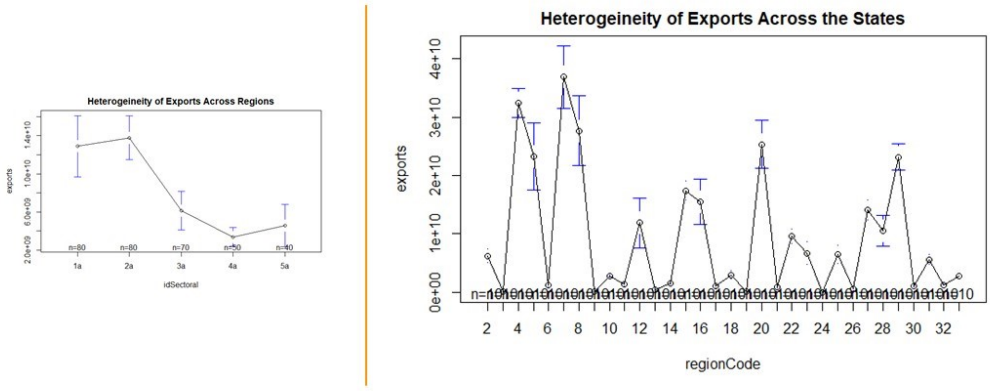

Figure 48: Heterogeneity Plots on Mexico's Exports

exports across the Mexican states show high peaks of exports thus showing an active international trade segment in some states and regions. The summary table below outlines these observations by listings the states with the highest levels of exports. The table also explains Triple-Helix ecosystems in these states. Therefore, establishing a connection between organized industrial clusters and higher export activity in these states. It also establishes a link between Traded Clusters as export driven agglomerations and the Mexican states' level of exports. This section concentrated on Triple Helix as the aim is to observe the relationship between exports and states known for its tech driven industries. Let us take a look at the Heterogeneity of Mexico's exports growth across all the states. The objective of this heterogeneity test is to evaluate the trajectory of Mexico's exports' growth in comparison to GDP as the central development indicator.

Table 22: Summary of States with the Highest Levels of Exports & Triple Helix Ecosystems.

States' Name	States' Code	Triple Helix
Chihuahua	07	2
Coahuila	08	2
Guanajuato	12	2
Jalisco	15	6
Mexico	16	1
Nuevo Leon	20	12
Tamaulipas	29	1
Baja California	04	11

The observations from the Heterogeneity test on exports across the states find 37 organized clusters in the states exhibiting the highest peaks in export activity. Industrial clusters as the industrial agglomeration of companies in innovative and productive sectors as posited by Michael Porter provides a critical avenue for enterprise participation in the global markets. Regarding the latter, (Pietrobelli and Rabellotti 2010), frame clusters in Latin America as the path for SMEs to upgrade and compete in the global value chains. Therefore, promoting higher production efficiency and innovation. A finding that shows an increase in wages rather than squeezing them and cutting cost. In this context pushing for a more comprehensive value chain upgrading through clusters' formation and increase levels of international trade thus makes up a crucial role in productive economic activity. It validates the proposed assumption connecting high levels of exports with cluster industrial activity in Mexico's regions with concentrated industrial activity. In addition, the chart looking at the regional concentration of exports show the regions within proximity to the US border or within reach of the US global value chains. It shows region 1a (north-west), and 2b (north-east) exhibiting the highest regional levels of exports in the prescribed period. It also speaks to the assumed patterns of local development in Mexico not only regarding trade. It points to growth in GDP, industrial activity and population growth, while likewise showing clusters as a focus of productivity and global value chain integration, see figure 49 and table 22.

Testing the Heterogeneity of Employment

Employment forms an essential aspect of this study on regional competitiveness. According to the literature sustained levels of local employment is a significant factor allowing regions to mitigate macro-level economic shocks better (Fredriksson 1999). It points to constant regional levels of employment as a driver of industrial activity, productivity, and economic growth, i.e., regional competitiveness (Heckman, LaLonde, and Smith 1999). In the examination of active employment initiatives in advanced European economies Fredickson 1999, points to sustained employment levels as factors limiting domestic labour migration and improved levels of industrial investment initiatives. Let us examine the Heterogeneity of Mexico's total employment figures across all states. The variable employment comprises the total number of people employed in formal and informal economic activities,see figure 50.

The heterogeneity of the total employment figures across all states in Mexico shows five states with the highest levels of employment and economic activity. The state of Mexico (16) and Mexico City (10) are the two locations with the highest levels of employment, it points to people engaged in either formal or informal economic activities. The state of Nuevo Leon, Veracruz and Hidalgo follow these locations regarding the number of employed people. The findings reveal that concerning

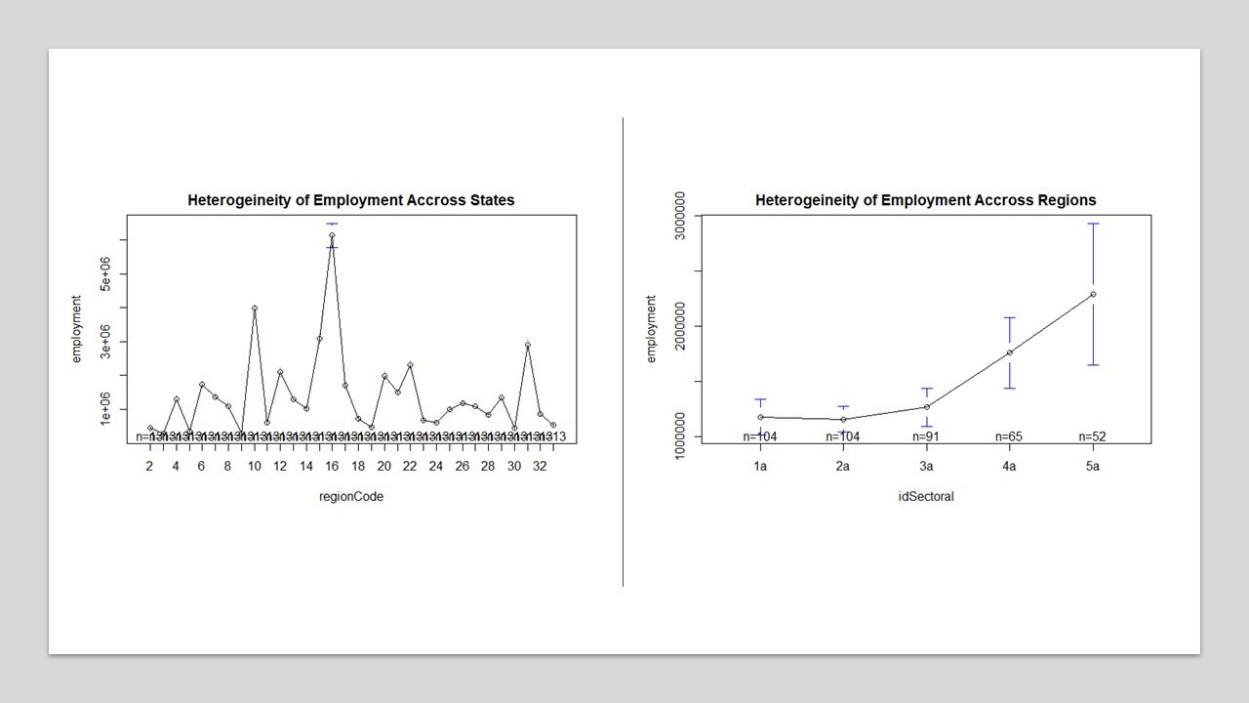

Figure 49: Heterogeneity Plots on Mexico's Employment

employment activity, the two regions with the highest levels of employment are the central and the northern regions. It is also notable to mention that in these two regions there is a significant number of Triple Helix and Traded clusters. The heterogeneity of total employment numbers across Mexico's regions shows the highest growth in the central regions. A pattern which aligns with these regions' growth in population, GDP and employment informality. In, regions 1a and 2a the graph doest not shows much growth and little variation which might be indicative to lesser levels of total unemployment during in the prescribed period. The latter, due to higher levels of total employment over time, linked to higher industry activity,see figure 50.

Testing the Heterogeineity of Formal & Informal Employment in Mexico's Regions

Let us examine how the heterogeneity test of formal and informal employment across Mexico's states translate to regional realities. Mainly to the levels of formality in areas where clusters and industrial activity concentrate, see figure 51. The findings from the above graph speaks to the regional assumptions about the central and northern regions as having the highest levels of formal employment. Also, validates the southern region under development as this region shows the lowest levels growth of formal employment. The highest heterogeneity of employment in regions 4a and 5a also speaks to previous assumptions of GDP, industry activity and clusters in these areas. It places the latter indicators as possible drivers of employment and speaks to the centralization of Mexico's economy. A reality which in regional disparities only benefits regional champions. The Heterogeneity test of informal employment across Mexico's states translate to regional realities. Mainly about the growth of informality in established areas where industry activity concentrates. Given the lessons learned so far regarding Mexico's level of industrial development across its various regions. It is suspected the lowest levels of informality would be found in the most industrialized sector-regions 1a and 2a.

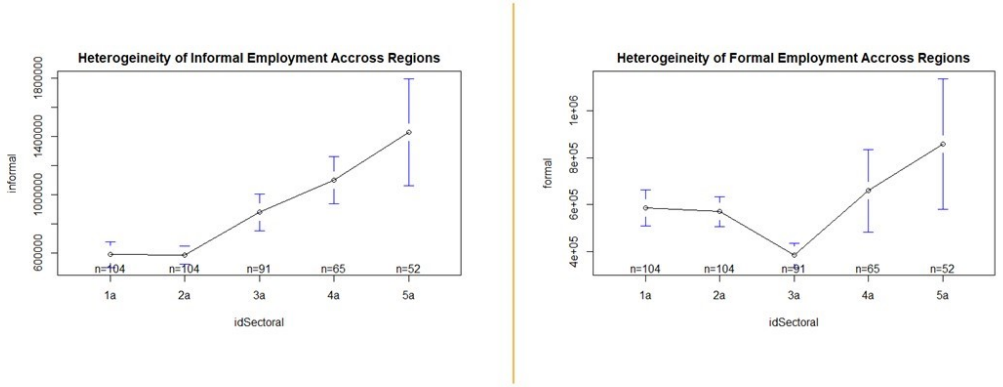

Figure 50: Heterogeneity Plots on Mexico's Formal & Informal Employment

The graph in figure 51 offers a link to higher industrial activity and low levels of employment informality. The graph shows the most industrialized regions as having lower levels of informality than the rest of the country. It proves the connection between higher levels of industrial activity, industrial growth and clusters as drivers of formal employment. It also shows that informality in Mexico as suggested concentrates in the central regions and the southern region. The increase of informality in the central regions during the prescribed period could speak to the increase in population during the period. A situation which yields higher levels of social inequality according to the literature. Last, the graph speaks to the levels of informality in the southern regions with minimum variation during the period. A finding suggesting sustained levels of social inequality and a lack of industrialisation. The employment examination of the heterogeneity of informal employment speaks to the higher levels of informality in the central and southern regions. The findings show the highest levels live in Mexico, Jalisco, Puebla, Veracruz, Chiapas, and Mexico City. The findings affirmed the world bank's and the OECD postulates in saying that informality in Mexico is one of the biggest challenges to further equality and GDP growth across its regions (Deloitte 2015; Pattinson and Duran 2016).

Testing the Heterogeneity of FDI (Foreign Direct Investment)

Mexico's economy has been the primary recipient of FDI since NAFTA. FDI has been the power affecting regional economic growth and during the past few decades in some Mexican regions. The increase in FDI influx began with the Maquiladora System and continued with more advanced industries in Mexico such as the IT and Clean Energy segments (Helpman, Melitz, and Yeaple 2003). Testing the heterogeneity of FDI across Mexico's regions can further test the influence of factors such as the adequate levels of human capital, the well-developed financial markets, the complementarity between domestic and foreign investment and the open trade regimes (Foreign Direct Investment and

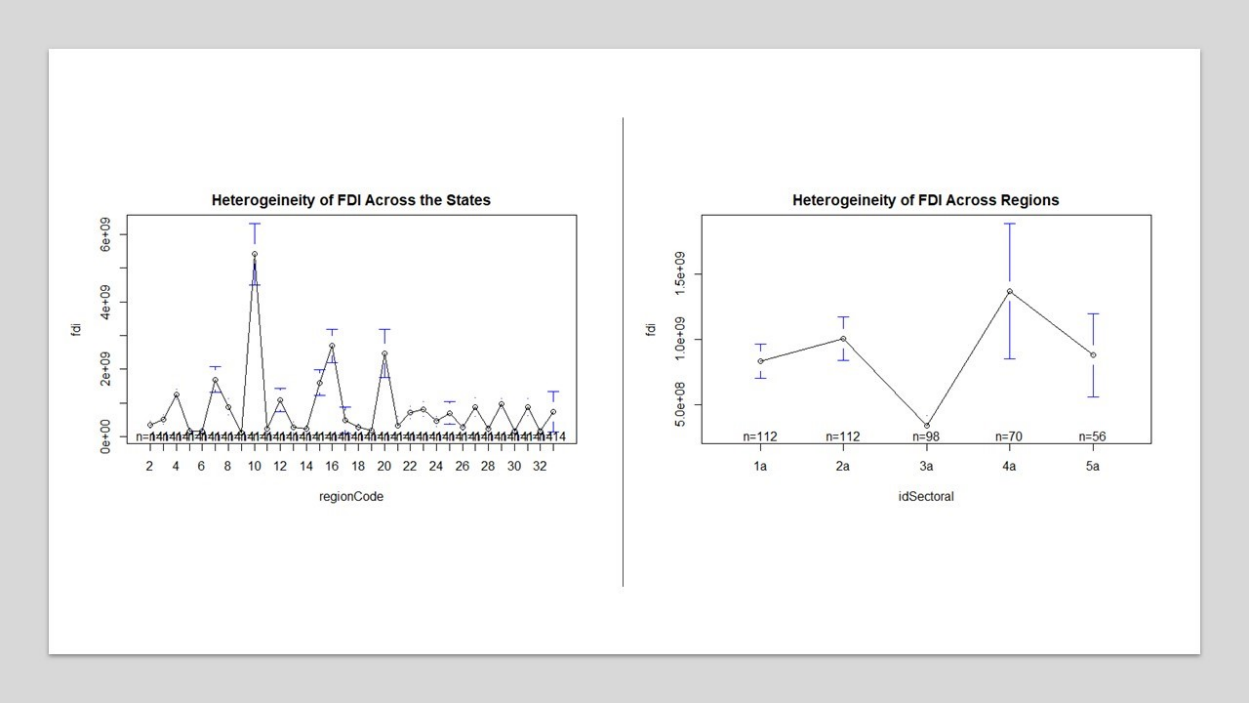

Figure 51: Heterogeneity Plots on Mexico's FDI(Foreign Direct Investment)

Economic Growth Literature Review from 1994 to 2012). It likewise, strengthens the relationship between higher levels of FDI as a precursor for higher levels of industrial activity. It also validates the role of clusters as ecosystems of productivity efficiency and growth while positioning the roles of clusters as magnets of FDI, see figure 51 (Porter 1998).

The heterogeneity of FDI across the Mexican states shows the core of the FDI across regional champions like the state of Mexico, Nuevo Leon and Mexico City. In fact, these findings corroborate the findings in the report issued by the Mexican Institute on Competitiveness named "Entre Dos Mexicos" The report affirms that close to sixty per cent of the total combined FDI takes place in the above states. Making of these states drivers of industrial and economic growth in these areas. Last, the detected regional patterns of FDI also suggest the positive connection that exists with human capital, and current industrial infrastructure as local assets. It ratifies the strong connection that exists between the states existing industrial capacity as an important precursor in attracting foreign capital. Therefore, maintaining higher competitiveness than other regions and perpetuating regional disparities. Let us examine if the findings at the state level concerning FDI translate into sectoral-regional realities across Mexico's five regions. The expectation is to see high levels of FDI concentration around the regions with the most top GDP growth, higher population and the highest industrial activity.

The heterogeneity of FDI across the five Mexican regions selected for this thesis further validated the first heterogeneity test examining the levels of FDI across the states. The graph shows the north and the central regions capturing the bulk of the country's FDI. It positions regions 2a and 4a as the ones with the highest levels of FDI across the prescribed period of analysis. A finding which by the first heterogeneity test is because the state of Mexico, Nuevo Leon and Mexico city are the locations capturing the bulk of the country's FDI. These states are the ones showing the highest

levels of industrial activity represented by industry agglomerations, GDP and population growth over the same period. Therefore, validating the symbiotic relationship between these mentioned drivers of economic growth,see figure 51.

Testing the Heterogeneity Central and State Government Funding

This subsection will test the heterogeneity of the key variables exemplifying the levels of central and state's government funding over the prescribed period. Variables like "contribution", "allocations" and " investment" show the central government's ability to sustain funding in key development areas such as education, health infrastructure and public work. As covered in the literature review maintaining proper levels of funding across all states and regions. Makes up primary importance in ensuring less regional disparities across Mexico's states (Porter and Ketels 2003; Storper 1997). One of the main aim of testing the heterogeneity of these variables is to test the regional champions hypothesis an argument found as part of the literary review. One that in this thesis provides one of the basis for measuring the interaction of clusters with ALPs, and the further proposal of this thesis augmented competitive model.Let's inspect the variable "contributions" across the states during the prescribed period of analysis. The variable "contributions" are monies transfer from the federal government to each state based on the states financial performance. This financial performance measures the states' contribution to Mexico's GDP.

Heterogeneity of Contributions

The data findings also speak to the already mentioned high level of Mexico's centralization. The data reflect Mexico city and Mexico state as the two locations in the central regions of the country with the highest levels of transfers type of government funding. Followed by other states such as Veracruz, Chiapas, Oaxaca, Puebla and Nuevo Leon. The latter state is where the data finds the highest concentration of Triple Helix and Traded Clusters. This figure accounts for twelve Triple Helix and sixty-five Traded industry agglomerations. The case of Nuevo León as Mexico's industrial champion validates the argument that regional champions are better positioned to capture more resources. The latter argument stood in the heterogeneity test looking at the levels of "allocations" and in the capacity to capture superior levels of FDI.

The heterogeneity test on the variable "contributions" across Mexico's regions reaffirms the aforementioned by further substantiating the level of Mexico's centralization. The data in regions 4a and 5a showed the highest growth in "contributions" with the highest variation. The latter finding attest to Mexico's economic fluctuations but also its speaks to the growth these regions experienced in GDP, population and industry agglomerations. The graph in regions 1a and 2a speak to the regional disparities within wealthier more advance regions like regions 2a where Nuevo León locates. The latter, bringing the analysis of regional disparities from the national level debate to one that is intra-regional where the most industrialized regions carry most of the weight regarding economic performance.

** Heterogeneity of Allocations Across Mexico's States**

Let's inspect the distribution of the variable "allocations" in the dataset. This variable speaks to the levels of central government funding in primary development areas like health care, education and infrastructure, see figure 52.

The data shows nine states out of the thirty-two federal entities in Mexico showing the highest increase in federal allocation during the prescribed period. The findings reveal that eight out of the nine states with the highest increase in allowances have agglomerations of industrial activity defined as clusters. Across these states, there are 27 formally structured industrial clusters thus

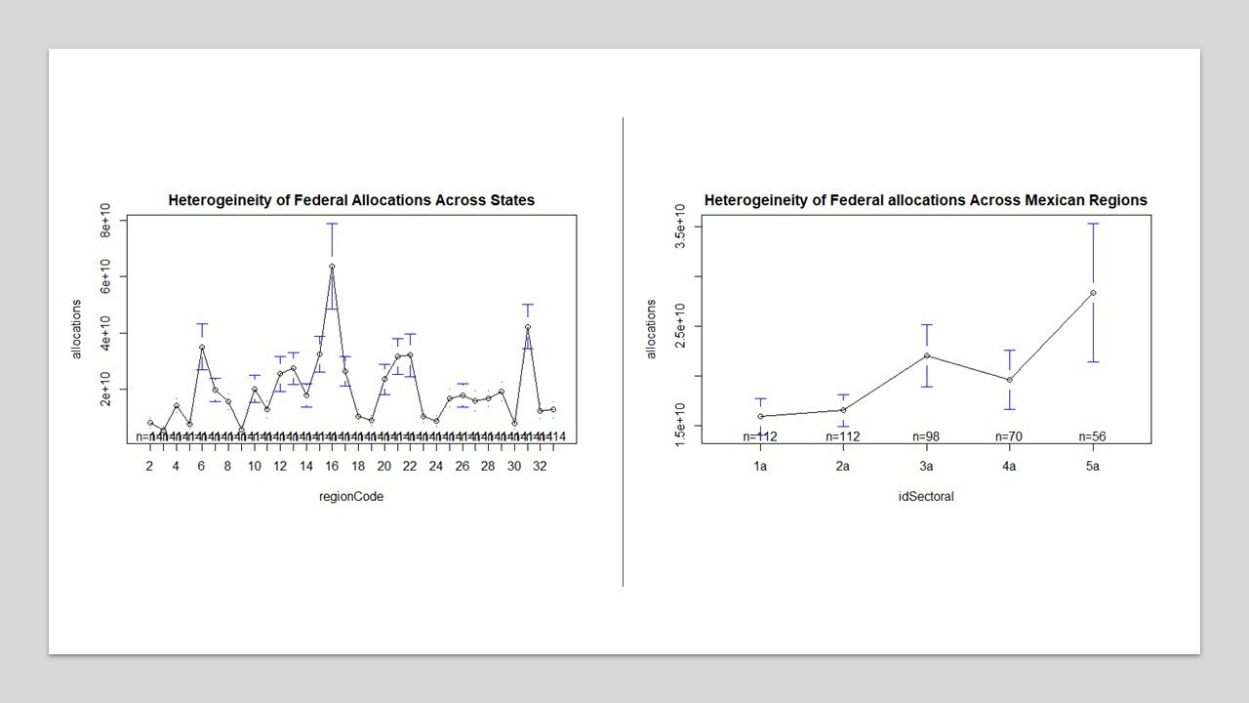

Figure 52: Heterogeneity of Allocations Across Mexican States

partially validating the link between localized industrial action and the state's ability to capture more resources for critical development areas such as education, healthcare, and infrastructure. The table below will provide a summary of the findings observed in the graph above by naming the states showing an increase in Federal allowances and the number of clusters present in these states. Appendix 2.1, shows a table of the states mentioned in the previous heterogeneity graph and the number of Triple Helix ecosystems in these states. The heterogeneity test of the variable "allocations" across Mexico's regions can provide the following lessons. (1) It will show the earlier mentioned patterns of Mexico's centralization. (2) it might assert region 5a where Mexico city locates as the one with the highest growth and highest variation. Therefore, emulating the observations on GDP and population growth during the prescribed period, see figure 52.

The data from figure 52 shows the southern region (3a), and the central region (5a) are the ones showing the highest increase in federal allocations during the prescribed period. These two regions also show the highest variation over the same period which as mentioned earlier might show the fiscal changes Mexico's economy has encountered during the prescribed period. In the north-west (1a) and north-east (2a) regions, the graph suggests patterns of economic inequality within these regions as the previous figures looking at the heterogeneity of allocations across all the states shows Nuevo Leon in the north-east as an active recipient of federal resources. A reality which in part substantiate the assumption driven by the literature sources in that regional and state champions are better suited to capture more central government funding for critical development areas such as infrastructure, healthcare, and education.

Another critical aspect in the study of regional development is the level of investment in public work and infrastructure at the local level. This economic driver postulated by scholars like Ketels and Porter, 2003, Stiglitz and Ocampo, 2008, and in several empirical studies looking at China's

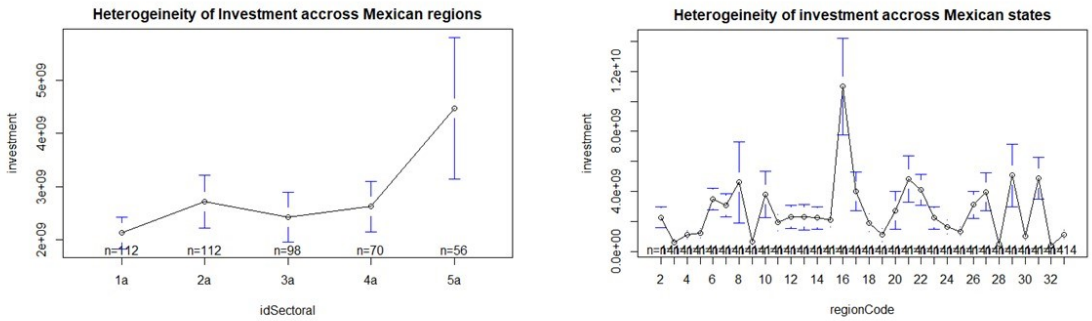

Figure 53: Heterogeneity of Investments Across Mexican States & Regions

development links this indicators to industrial growth (Jimenez 1995). Let's take a look at the Heterogeneity of Investment for public work and infrastructure across the Mexican states,see figure 53.

The findings show that the state of Mexico shows the highest figure of investment in public works and infrastructure, followed by other states like Oaxaca, Puebla, Coahuila, Tamaulipas, and Veracruz. The findings stipulate that all the states showing higher numbers in investment correspond to states where exports are essential economic drivers, and clusters are driving this exports growth. Out of the six states showing an increase in the states' funding for areas of public work and infrastructure, there is at least one organized cluster. The total of clusters across these states is nine thus pointing to clusters as a driver of demand for upgrading existing infrastructure at the state level. Let's see if these findings at the state level translate into the five different regions selected for this study. The heterogeneity of the variable "investment" is tested across Mexico's regions, see figure 53.

The line chart from figure 53 shows the highest levels of public work and infrastructure investment over the prescribed period concentrated in the central region where the state of Mexico and Mexico city are located. It also shows the central area as having the highest levels of variation during the prescribed period thus being indicative of the region's fiscal constraints, and intermittent level of funding as postulated by Stiglitz and Ocampo 2008. Also, the level of public investment in public works and infrastructure showed an increase in the north-east region (2a) where the state of Nuevo Leon exhibits the highest concentration of formally structure industrial clusters. Therefore, partially corroborating the findings from the previous Heterogeneity test done to this variable.

Lastly, the chart shows that region (3a) in the southern part of the country shows a decline in the levels of public work and infrastructure investment. A fact which could be explained by the following

factors; (1) a decline in GDP growth over the prescribed period and; (2) the lack of agglomerated industrial activity represented by the absence of formally structured clusters vis-vis other regions in the country. In brief, the heterogeneity tests of the variables "allocations" and "funding" speak to the regional champions hypothesis. It also attest for the significant degree of Mexico's centralization that calls for a higher coordination of national objectives with regional realities to close the gap of regional disparities. Last, it shows the very engrained

Testing the Heterogeneity of ALPs' Indicators

One of the primary objectives of this thesis, as stated, is to measure the level of Mexico institutional strength by assessing the central government's social programs. To accomplish the latter this thesis used ALPs as a proxy for social programs across Mexico's states and regions. Given the extensive literature on the topic among the European economies, and the benefits attained by economies like the German. The analysis of Mexico's ALPs calls for a closer examination. In the impact assessment, these programs have across Mexico's states and regions on the following aspects: One, the effect of Mexico's ALPs in areas known for high levels of industrial concentration. Two, the impact of these programs in marginalized regions like Mexico's southern region. Third, the impact of social programs on the cluster types selected for this thesis and GDP growth.

Active Labour Programs as mentioned in the literature review not only constitute part of the OECD's policy recommendations to prevent unemployment. But, these programs have had an impactful presence on critical aspects like (1) employee engagement (2) employees long-term productivity (3) promoting formality of employment by creating labour market flexibility and (4) by enhancing the overall national competitiveness. In this context, this research analysis of the different Active Labour Programs in Mexico requires a closer descriptive study. Let us look at the heterogeneity of job placements across states in our data set. In, terms of the number of people placed in jobs after taking part in the Becate program.The Bacate programs aimed to provide job seekers with basic job training competencies across all Mexican states and regions. The programs make up a bridge between private industry sectors and individuals trying to find labour opportunities through training and gaining a basic skill-set.

The analysis of the chart showing the heterogeneity of Mexico's Becate job placement programs and its effectiveness across the state-regions show the following results.

- (1) A higher number of jobs placements taking place in areas with higher industrial activity.
- (2) a lower impact in states with lower levels of industrial activity and the southern region.
- (3) the regions where this ALP is noticeable to be more effective is in sector-regions 1a and 2a.

The regions in point three are the ones with the highest number of Triple-Helix agglomerations and Traded-Clusters as defined by our TSCS and Trade Clusters dataset. The following tables below summarizes these findings outlining each state according to its region name, its sectoral id, and the number of agglomerations defined as Triple-Helix and Traded Clusters. These tables divide the findings by the region-states with the highest and lowest impact in terms of Becate Job Placement Success, see figure 54 .

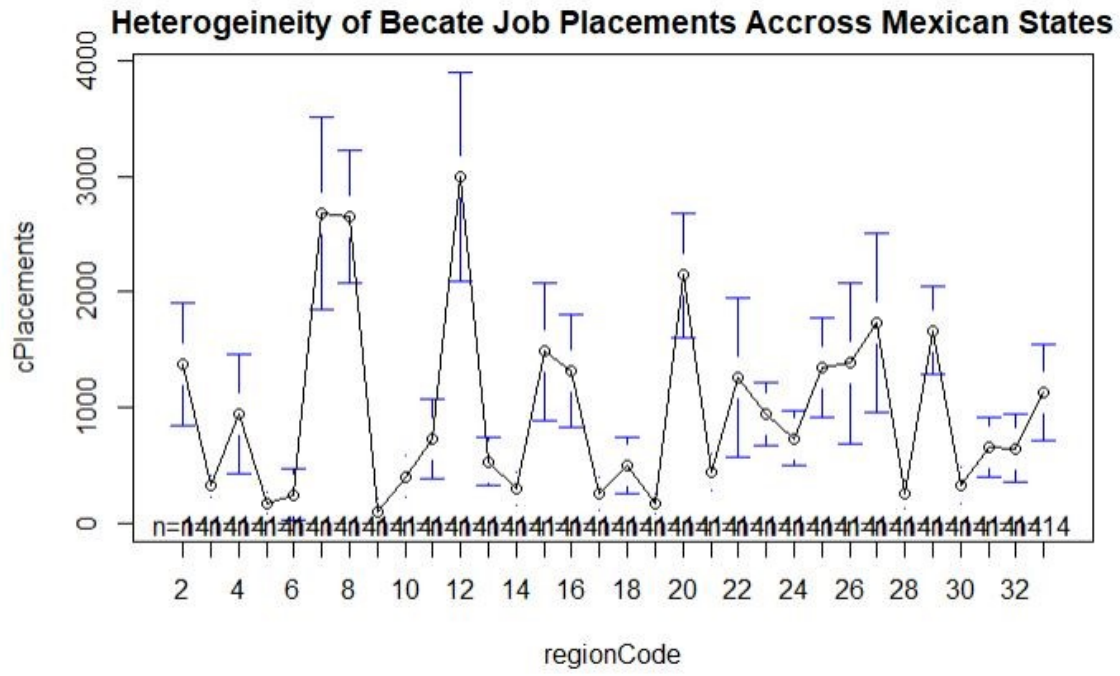

Figure 54: Heterogeneity of Becate Job Placements Across Mexican States

Table 23:States where BACATE Placements have the Highest Impact

Region	States'Name	Triple-Helix	Traded Clusters
2a	Guanajuato~	2	64
1a	Chihuahua	2	63
2a	Coahuila~	2	65
2a	Nuevo Leon	12	65
1a	Sonora	2	64
2a	Tamaulipas	1	62

Table 24: States where BACATE Placements have the Lowest Impact

Region	States' Name	Triple-Helix	Traded Clusters
1a	Baja California Sur~	0	54
3a	Campeche~	0	62
3a	Chiapas	0	62
5a	Hidalgo~	1	61
1a~	Nayarit	0	58
2a~	Tamaulipas~	1	62

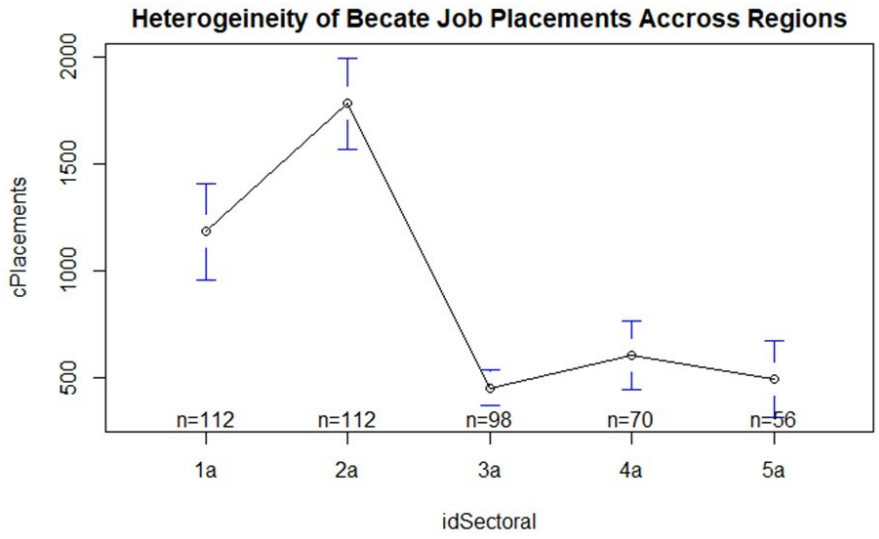

Figure 55: Heterogeneity of Becate Job Placements Across Mexican Regions

Observing the two above tables, it is clear the while the number of Traded Clusters in the highest and lowest impact regions does not show much divergence. The number of Triple Helix clusters across industrialized and less industrialized regions does not diverge as much. These figures imply the following lessons in Mexico's selected types of industrial agglomerations:

- 1 the role of the manufacturing sector and traditional industries in Mexico's export driven economy

- 2 the void of industries knowledge-driven and education in Mexico's lowest impact regions. A fact calling for better promotion of skills where Active Labour Programs could play a primary role.
- 3 industrialization and the higher development of human capital in affluent regions attract the creation of Triple Helix ecosystems.

In brief, these lessons speak to the need of change towards promoting higher standards of education, skill-set, and technology through training. A proposal that would allow Mexico to remain competitive, increase its competitiveness and close the gap of regional disparities. The following graph further validates these findings by testing the heterogeneity of the Becate program by the number of job placements looking at the five different regions determined for this study, see figure 55.

The graph testing the heterogeneity of the Becate job placement program across Mexico regions validates the assumptions from the heterogeneity findings at the state and regional level. The regional findings suggest the effectiveness of this government program is acuter in regions where there is a high concentration of industrial activity. Here, it defines the concentration of industrial activity by the two agglomeration types. One Triple Helix, and the other one Traded Clusters as

per the European Union and Professor Michael Porter's definition. Through this research, we have validated it the assumed patterns of regional development thus placing sector-region 1a and 2a as the wealthiest or Mexico's regional champions. The graph shows regions 1a and 2a taking the lead among the three other regions with the highest number of people placed in jobs after participation in the Becate Active Labour Scheme. It is notable that with sector region 2a this region shows the highest number of placements, and the highest numbers in industrial agglomerations as represented by the two clusters defined in this study, see figure 55. The latter established an essential connection between cluster presence, industrial activity and suspected higher levels of formal employment creation. However, the further analysis required to establish if these results equate to cluster related job placements.

Testing the Heterogeneity of Professional Placements

Mexico's has pushed for a liberalized market economy where trade, foreign direct investment, efficiency and innovation make up fundamentals for higher levels of competitiveness. This effort, calls for an emphasis to create human capital and in this context promote professional training programs. Programs such as the: **(Programa de Apoyo al Empleo)**. This segment within the wider Mexican ALP framework promotes scholarships, training and job training activities to promote professional training. The data on professional job placements across the states validates the positive relationship between economic growth as drivers of professional training activities. The data shows that the effectiveness of ALPs professional training activities is more in states with industrial activity. As covered in earlier empirical tests higher levels of industry activity in Mexico connect to industry clusters. The heterogeneity of professional placements in states like Mexico, Mexico City, Coahuila, Nuevo Leon, Jalisco and Guanajuato attest to those factors above mentioned. At the same time that refers to the areas where there is a higher demand for professional human capital regions 1a, 2a, 4a and 5a. Therefore, speaking for the south lack of development and Mexico's regional disparities as assumed as part of this thesis project. The graph in Appendix 2.2, shows the heterogeneity of "ptPlecements" across Mexico's regions.

Chapter 4 validated the context of regional disparities in Mexico while establishing a link between the volatility of key indicators in the data set to the two geographical units for industrial clusters here under analysis. It also observed the relationship between our dependent variable "gdppesos" and key variables signifying levels of central government funding. The heterogeneity of key variables across time and place pointed to the centralisation of the Mexican economy while validating the regional champions assumption when looking at variables such as, FDI (Foreign Direct Investment). In addition, the heterogeneity of some proxies for ALPs showed a significant effect in regions where industrial clusters concentrate, thus validating even more scholarly aim set in the robustness check testing the interaction of clusters with Active Labour Programs in industrialised regions. An aim, that if proven positive would validate the institutional supporting role of clusters as institutions, and it will show how clusters can facilitate a better regional response to national level policies. Chapter 5 of this master's thesis describes the methods used to test the institutional role of the geographical units here under analysis. It also provides the rationale behind the section of variables, data structure, and steps taken to select the estimation techniques here used. At, the same time provide the rationale for the robustness check set as a further step to test the institutional role of our two units in regions and groups of industrialised states. The aim, to see if a higher level of industrialisation and clusters in these regions and states facilitate a better response to national level policies.

Chapter 5: Methodology & Estimation Models

5.1 Research Design

This master's thesis method section agrees with the empirical focus framed at the outset of this thesis report. It fits with this thesis scholarly objectives by making direct and indirect observations from Mexico's economic data and the two geographical units of analysis for industrial clusters. This method section focuses on the main research agenda by testing this study's research questions through a quantitative approach using a Time-Series-Cross-Section data panel. It analyzes the period of choice of 2003 to 2016 a period during which Mexico underwent substantial economic prosperity and extensive structural adjustments in calls of policy. These structural adjustments saw an aggressive liberalization agenda aimed to position the country as the gateway to the North American market because of the country's NAFTA membership. The panel data covers the 32 Mexican states over the prescribed period and the proxy of choice for a national level policy will be ALPs (Active Labour Programs).

The institutional measure for this enquiry will inspect two datasets; (1) in Traded clusters provided by Dr. Mendoza's research centre and; (2) the European Commission through its cluster collaboration platform. This study comes from a similar inspection of the past and present international competitive research looking at industrial clusters as primal in national and regional development. A paradigm shift where the work of Michael Porter and other scholars here mentioned frame these ecosystems as epicentres of efficiency, growth and innovation. This literary inspection of past and current international competitive literature let us believe to the best of our knowledge that the study of economic development in the thirty-two Mexican states examining the interaction of clusters and ALPs is a unique contribution in terms of scholarly research (Pattinson and Duran 2016).

The Literature & Data Collection

We base the motivation to collect the data samples for this study on Michael Porter's literature on clusters and other scholars' contribution on the topic. We also base it on international development and the impact of neo-liberal reforms in Latin America likewise the role of value chains in the international competitive debate (Humphrey and Schmitz 2000; Humphrey and Schmitz 2002; Porter 1990; Porter 1998; Michael E Porter 2008; Stiglitz 2003; Stiglitz and Ocampo 2008; Stiglitz 2000). In addition, it also frames the factors discussed as part of the World Economic Forum's definition of competitiveness as fundamental elements driving the data collection for this thesis. The choice of the period of analysis for this thesis looks at Mexico's economy and its impact at the regional level during a time of profound attempts by Mexico's government to promote structural reforms. These structural reforms have had the primary intent to open the Mexican economy to the global markets aiming to promote a higher value chain integration. These reforms have led the government to promote new industries, institute new human capital development strategies, and institute reforms to push for higher levels of skill and productivity in the industrial sector (Euromonitor 2018; Pena Nieto 2016; Solleiro and Castañón 2005; Stiglitz 2003)

The dependent variable for this thesis analysis is the log of the variable "gdppesos" which equates to the growth rate of this GDP indicator. Measuring the interaction of clusters with the selected ALPs proxies aims to establish the role of clusters in supporting the different segments of ALPs. It also aims to examine the impact of this supporting role on the growth of the variable "gdppesos" as the dependent variable. It bases the growth rate of GDP used for this analysis on each Mexican states' contribution in Mexican peso's value per year during the prescribed period to the country's

total GDP. The log of GDP has been a level of measurement used in economic development studies, in testing human capital and growth, and in the analysis of trade agreements likewise its economic impact (Baltagi, Egger, and Pfaffermayr 2003; Barro 2001; CLASEN, CLEGG, and GOERNE 2016; Toya and Skidmore 2007).

The theorist had used the log of GDP as a level of measurement in the convergence and divergence evolutionary economic debate as an explanatory variable. It has also used this scope of analysis in the comparison of GDP economic data comprising a great number of countries over a specific period. Scholars in economic development had called this standard of measurement and its application to economic analysis the "classical approach" because it uses the traditional techniques of classical econometrics (Sala-i-Martin 1996)

Having explained the reasons for the use of our dependent variable, other data indicators in our TSCS dataset such as the variables "added value", "investment", "allocations", "contributions" and "fdi" stemmed from the economic liberalization literature covered for this thesis. For example, Stiglitz, 2000, 2003; Stiglitz & Ocampo, 2008 speak to the impact of liberalization reforms in Latin America economies while pointing to some of the above-stated economic indicators. Stiglitz and Ocampo, observe the cause of these economies under development living in the volatility of GDP. A fact which leads these economies to face intermittent levels of funding from the central government. The variables "funding", "allocations", "contributions" speak to this literary element. It also aims to identify fiscal allocation patterns across Mexico's regions. Mainly, as this research references the variations of the above-stated variables with observed patterns of industrial concentrations represented by industrial clusters and the proxies chosen. In addition, the variable "exports" represents the global value chain integration of the different states in Mexico, and this variable's variation over time not only links clusters with observed higher levels of exports. But, also speaks to the role clusters play in promoting higher levels of global value chain integration as posited by (Gereffi, Humphrey, and Sturgeon 2005; Gereffi and Sturgeon 2013; Hess 2005; Nadvi and Schmitz 1994).

The variables used as proxies for ALPs within our Time-Series-Cross-Section panel data stemmed from Literary sources on the experience of European nations have had implementing these active employment measures (Calmfors 1993; Calmfors, Forslund, and Hemstrom 2002; Rinne and Zimmermann 2013). The data also reflects references made in the literary sources addressing ALPs in Mexico and on the BECATE program evolution. This program has been the main social programs in charge of developing human capital since the 1970s within the wider active labour policy framework in Mexico. However, reform to this policy programs had taken place seeking a much more active collaboration of companies with an emphasis on labour productivity (Delajara, Freije, and Soloaga 2006; Garria Angel and Torres Carlos 2017; Ibarrarán and Rosas Shady 2009). The literary evidence suggesting to the moderate impact of these programs in Mexico's regions referred to the country's high levels of informality. A recurring theme not only present in the literature relating ALPs but also the world bank literature on Mexico's current challenges (Bank 2018). The latter a key finding which led this research to include data of the estimated number of people used in informal job activities during the prescribed period. It also obtained this data from the National Institute for Geography and Statistics (INEGI) in the section referencing employment data which covers employment records related data since the 1980s. The following table describes the variables used within our TSCS data panel., the table references the source from the data compilation and how they relate to Mexico's economic drivers applied to this research, see figure 56.

Upon collecting the data inspired on the literature visited for this inquiry, this thesis used data manipulation using a data science approach using R statistical software within the RStudio working

Variable	Description	Data Source
regionCode	The code assigned to each of the thirty-two mexican states	INEG National Institute of Statistics and Geography
idSectoral	The code assigned to each of the five regions based on Mexico's electoral distribution map	INEG National Institute of Statistics and Geography
proximity	Code assigned to account for US value chain influence	INEG National Institute of Statistics and Geography
Triple Helix & Traded Clusters	The Geographical units selected for this analysis	Promexico , and the European cluster observatory
GDP	GDP index per each Mexican state during the prescribed time period	INEG National Institute of Statistics and Geography (State and National Accounts)
Population	Data on the growth of Mexico's population over time	INEG National Institute of Statistics and Geography (Population and Demographic Data)
fdi	Foreign Direct Investment for each Mexican state during the period of analysis in USD	INEG National Institute of Statistics and Geography (State and National Accounts)
addedValue	Added-value manufacturing activity expressed as a % of GDP	INEG National Institute of Statistics and Geography (State and National Accounts)
GDP in MXP	The contribution to the GDP of each Mexican state for each year during the prescribed period	INEG National Institute of Statistics and Geography (State and National Accounts)
Formal	The estimated number of people formally employed for each of the 32 states during the prescribed time period (Formal means people contributing to social security)	INEG National Institute of Statistics and Geography (employment)
Informal	The estimated number of people informally employed for each of the 32 states during the prescribed time period (informal means people no contributing to social security)	INEG National Institute of Statistics and Geography (employment)
employment	The estimated total number of people employed in each of the 32 Mexican states. This figure includes all estimated individuals in formal and informal economic activities	INEG National Institute of Statistics and Geography (employment)
contributions	Federal funding disbursed to the different states as compensation or incentives for the states' contribution to the overall economic outlook of the country	INEG National Institute of Statistics and Geography (Fiscal Spending and Finance by Federal Entity)
allocations	The variable identifies federal resources allocated to all the states for the purpose of education, health and basic infrastructure at the state level	INEG National Institute of Statistics and Geography (Fiscal Spending and Finance by Federal Entity)
subsidies	These are fiscal spending measures at the state level geared to provide housing, consumption, and education subsidies, scholarship programs and aid programs at the municipal level. It also involves social spending to educational institutions, and training programs.	INEG National Institute of Statistics and Geography (Fiscal Spending and Finance by Federal Entity)
investment	spending at the state level in public works and infrastructure	INEG National Institute of Statistics and Geography (Fiscal Spending and Finance by Federal Entity)
municipalities	the fiscal allocation at the state level to the different state municipalities in each state	INEG National Institute of Statistics and Geography (Fiscal Spending and Finance by Federal Entity)
exports	the levels of exports of each Mexican state in US dollar terms during the prescribed period	INEG National Institute of Statistics and Geography (Exports by Federal Entity and International Trade)
cCourses	This variable measures the number of "courses"or labour training for basic job competences	Mexican Ministry of Labor
cScholarships	The total number of participants recieving federally funded scholarship for basic labour training	Mexican Ministry of Labor
cPlacements	The total number of jobs created stemming from the direct participation in basic job training	Mexican Ministry of Labor
eScholarships	Entreprenourial driven scholarships to promote new business creation	Mexican Ministry of Labor
ePlacements	The number of self-employment opportunities created after participating in the entreprenourial segment of ALPs	Mexican Ministry of Labor
aRegister	Number of participants registered for Agricultural training programs	Mexican Ministry of Labor
aPlacements	Number of participants placed in Agricultural sector employment activities	Mexican Ministry of Labor
ptScholarhips	Number of federally funded scholarships for professional training	Mexican Ministry of Labor
ptPlacements	Number of professional job placements after participating in a professional training program	Mexican Ministry of Labor
year		2003-2016

Figure 56: Description of Data Variables

environment. It also used R language designed packages to comply with good data management practices. R is a programming language and opened sourced software environment for statistical computing and graphics by the R Foundation for Statistical Computing. The R-Studio working environment combines the best of both world as it enables users to work on Scientific reports, and documents by incorporating R for statistical analysis with the R Markdown language for word processing. The R language is widely used among statisticians and data miners for developing statistical software, in data analysis, surveys of data miners, studies of scholarly literature, and scholarly work. This thesis performed all tasks related to graphics, mapping, regression models, and time-series-cross-section analysis using R version 3.51 and Stata version 14 for the robustness checks the dynamic panel models here explained.

$RQ1$ in the Time-Series-Cross-Section analysis to test the relationship between x and y. x representing industrial clusters by the two geographical units of analysis selected for this study, and y social programs represented by ALPs and its proxies. This study assesses the interaction between x and y and the impact on the growth rate of our variable "gdppesos" over the prescribed period of analysis. $H01$ as the null hypothesis declares that; Industrial clusters as geographical units play an institutional role in enhancing federal social programs in Mexico. $HA1$ as the alternative hypothesis would reject $HO1$ thus suggesting the negative institutional role industrial clusters play in supporting Mexico's social programs. The latter here represented by ALPs as a social program in Mexico aimed to incentives employment and promote human capital development throughout Mexico's regions.

$RQ2$ test the relationship between x and y. x representing the volatility of GDP, and y Mexico's institutional weakness. The null hypothesis for H02 declares that there is a correlation between the volatility of GDP and Mexico's institutional weaknesses. The alternative hypothesis or $HA2$ in contrast statistically suggests a negative correlation between the volatility of GDP and Mexico's institutional weakness in regional disparities. In this research, Mexico's institutional weaknesses point the variables representing central levels of government funding and their volatility measured by these funding variables standard deviation.

$H01$ stemmed from the analysis of Mexico's institutional complexities and the discussed literature on international competitiveness and the relevance of regional assets. All of which highlights how important Michael Porter's paradigm shift, the role of education as it relates to industrial activity in the current global context. $H02$ stemmed from the literature by Joseph Stiglitz inspecting the impact of liberal reforms on GDP volatility and its relation to inequality, development and institutional strength in emerging economies. Literature which highlighted the fluctuations of central government funding as one of the key components affecting development areas and institutional components such as social programs (Stiglitz 2000).

$H01$ further stress the need for an increase in education, and technical training in a country with high levels of inequality and not a deep-rooted high-technology sector. The lack of deep-rooted technology sectors is representative in the few numbers of knowledge-infused ecosystems defined here as Triple Helix clusters. Also in the lack of a widespread technology integration among all the country's Traded clusters and regions in Mexico. Recent studies conducted by Dr. Alfonso Mendoza, a contributor to this thesis inspected the effects of industrial clusters on Mexico's unemployment. Dr. Mendoza's analysis did not yield significant results thus providing further motivation for the analysis and formulation of this thesis' main hypothesis. H02 stress the country's propensity to experience harder GDP contractions by exogenous economic shocks. A phenomenon which according to the previous literature by Stiglitz not only disrupts central government funding but pertains to the following factors:

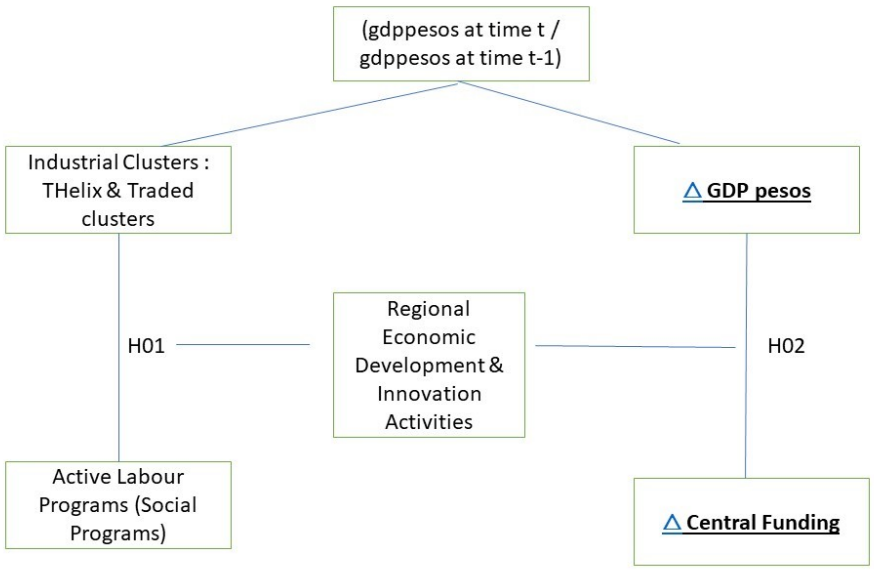

Figure 57: This Study's Hypotheses in Relation to Economic Development and Innovation Activities.

- (1) the country's resource wealth dependence;
- (2) the lack of more knowledge and innovation-driven activities;
- (3) the country's sharp regional disparities where regional champions are in a better position to capture central government funding.

The following graph captures the interaction between H01 and H02 and how these two hypotheses impact Mexico's capacity to attain higher levels of regional economic development and innovation activities, see figure 57:

The graph showing the interaction between $H01$ and $H02$ as relates to regional economic development and innovation activities show the relevance of the topics explored by this thesis. The institutional role of a cluster in supporting active Labour programs as shown in the graph supports the growth rate of GDP at the regional and national level. A fact, which as argued by this thesis can help Mexico's mitigate fluctuation in (GDP) that would allow Mexico's central government to have much more sustainable levels of central government funding. All fact that not only would translate into stronger institutional support but would lead to higher levels of support for Mexico's human capital development strategies, thus knowledge and innovation activities.

The data evaluation part of this method section deals with all aspects where our panel data provided in observing Mexico's economic indicators. All which observe the variations of data panel variables over time and across states. First, this section outlines the tests and process involved leading this research to establish the estimation methods testing the two hypotheses governing this research.

This thesis runs tests using our TSCS data panel by testing for heteroscedasticity. It requires this testing to make sure the estimation techniques being used fit the characteristics in our panel data.

At, the same time it provides the basis to account for biases or inefficiencies in the estimation methods. The first test checking for heteroskedasticity using the Breusch-Pagan Test. It rejected the null hypothesis does finding heteroscedasticity in our data panel. If the P - value of the test is less or equal to n 0.05, we reject the null hypothesis. The test highlighting heteroscedasticity suggest to the variance of the errors across observations (Long and Ervin 2000). The following shows the results:

$$BP = 2234.6, df = 36, p - value < 2.2e - 16$$

Having rejected the null hypothesis from the BP test, the next step is to control for the heteroscedasticity by running our second test. This test reveals if we need to account for random effects or fixed-effects models. The Hausman Test for Panel Models does help in determining the aforementioned by validating or rejecting this test null hypothesis. This one states all models are consistent, in this case, the test rejected the null hypothesis so $b1$ is inconsistent. It determined the need to use fixed-effects models for the estimations used for the hypothesis testing and "pooled" regressions. The following shows the results from this second test:

$$chisq = 18.977, df = 5, p - value = 0.001941$$

Once this thesis accounted for Fixed-Effects as a third step we need to account for individual and/or time effects. The Lagrange Multiplier test for Cross-Sectional dependence in a Fixed Effects Panel Data Model it assumes there are no significant time-effects. The alternative hypothesis states there are significant time effects and the aforementioned can be established by the tests significance level of 0.05.If P-value of the test is less or equal to 0.05, we reject the null hypothesis, otherwise, do not reject. From the Lagrange Multiplier Tests, we have a p-value which is less than 0.05, hence we reject the null hypothesis and conclude that there are significant time effects. The following shows the results from this second test:

$$chisq = 130.04, df = 1, p - value < 2.2e - 16$$

Upon running the Langrage Multiplier test determining if we need to account for individual and/or time affects the conclusion is we need to account for time effects. This thesis corroborated further these findings by running an F Test For Individual And/Or Time Effects running a "pFtest". This test of individual and/or time effects based on the comparison of the within and the pooling model and the effects tested are the individual, time or two-ways. The p-value obtained was < 0.05 thus ratifying the need to account for time-fixed effects in the models testing this thesis's main hypothesis or $H01$. The test run and the results obtained served the intentions of this thesis in finding the appropriate estimation methods to test $H01$ advocating for the institutional role of clusters in supporting Mexico's ALPs at the national level. It also guided the estimation techniques used in the analysis checking for robustness at the national level and the two other subsets of data which are "northerndata" and "tHelixregions". The first subset of data compiles information from the data panel on the states within regions 1a and 2a. The second one, groups a number of states across Mexico with a minimum of two Triple Helix and fifty-five traded clusters.

In the hypothesis testing phase, this thesis begins by testing the statistical significance of various random variables in the panel running univariate and multivariate OLS regressions. This inquiry will test for perceived biases in the OLS models by running the multivariate models and adjusting

using "Cluster Robust Standard Errors" and then comparing for output differences (Hsiao 2007; Hsiao 2014; Zeileis and Koenker 2008). To test $H02$ this thesis aims to regress the standard deviation of the funding variables in the dataset on the standard deviation of our dependent variable "gdppesos". The Time-Series-Cross-Section analysis addressing the main hypothesis $H01$ uses a "Panel-Corrected Standard Errors" & "Robust Covariance Matrix" as estimation techniques to address the main hypothesis looking at Mexico as a whole. As a Robustness Check, this thesis considers the dynamic nature of the panel by comparing the "Robust Covariance Matrix" method with variants to the "Generalized Method of Moments" (GMM) in the whole data panel. The (GMM) estimators used in the previously mentioned data panels used the command "xtabond2" in Stata statistical software(Roodman 2006).

5.1.2 Testing Hypothesis & Assumptions: An OLS Linear Regression Approach**

The Ordinary Least Square estimation test the statistical association between two or various quantitative variables. A square regression is more informative than a correlation because it uses the original units of measurement of x and y. Therefore, testing an association between them, that is equivalent where at least the linear regression of y *on* x compares to the correlation of x *and* y. It provides an estimate of the best straight line thus providing a summary of the association between two quantitative variables in any specific regression model. The basic model is shown as the following:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \tag{1}$$

Where y is the dependent variable, x is the independent variable, α is the constant, β is the regression coefficient, and ε is the error term. The symbols i *and* t in the equation account for the number of variables in the dataset and their variance over time. The number of variables and time period within the univariate OLS model chosen for this first step expresses as follows $i = 1, ..., 35$ and $t = 1, ..., 15$.

The Ordinary Least Square univariate models as part of this thesis helped validate the statistical significance of various assumptions concerning individual random variables in our data panel. It measures the statistical significance of key economic indicators such as GDP pesos, population, employment, central funding variables and the economic impact of the two geographical units for industrial clusters under analysis. The most relevant assumptions validated by these regression models will be revisited in the presentation of findings of these thesis report and for a detailed description of the equation terms, regression results and equations, see (Appendix 2.3 & 2.4). The next section will discuss key results from the set of univariate regression models shown in Appendix 2.4, at the same time explaining how some of these univariate models tested $H01$ as the null hypothesis guiding this thesis.

Relevant Results

The observations from the Least Square Regressions OLS univariate models speak to the impact of Triple Helix and Traded Clusters as geographical units on employment. The findings from the regression dictated Mexico's traded clusters have a higher impact on the country's overall formal employment numbers than Triple Helix agglomerations. These finding spoke to the relevance of the country's manufacturing sector and the influence of traditional industries demanding low value-added labour. Therefore, explaining higher numbers of employment formality among traded clusters than

among knowledge infused agglomerations or Triple Helix ecosystems across Mexican regions. What these findings show is how relevant would be for Mexico to create policies geared to promote knowledge-infused employment activities. By, having a better implementation of professional technology-driven training programs. These reformed set of initiatives can help Mexico's transition towards more knowledge driven industrial activities while increasing the levels of formal employment in the country. Concerning, the proxies for ALPs, the univariate models speak to the positive relationship between the variables "cCourses" in relation to the variable "cPlacements". This finding confirms the institutional strength of Mexico's ALPs in promoting low skill-labour while evidencing the country's lack of education and as mentioned earlier further policy reforms.

It shows another relevant finding when looking at Model 11. These findings inspect the institutional strength of traded clusters in relation to ALPs promoting a basic level employment, and the findings point to the weak interaction of traded clusters with this segment of ALPs in Mexico. This finding it is important to highlight as it points to this ecosystems lack of interaction with Federal employment policies at the national level. What this means is that when we observe Traded Clusters looking at all the regions in Mexico. These ecosystems do not enhance the regional level of response to national-level policy objectives.

In brief, it suggests the need to have a much deeper integration of the government and its programs as it relates to clustering activities across Mexico's states. Model 12, from these univariate regressions, also tested the variable "ptPlecements" in relation to our geographical units "tradedClusters", and the finding reflects the observations from model 11 here discussed. All pointing at this stage in our analysis rejects our null hypothesis $H01$ in favour of $HA1$ pointing to the non-significant institutional role of clusters in supporting a nationwide response to ALPs as a national level policy.

Multivariate Ordinary Least Square Regressions

The Ordinary Least Square multivariate regression analysis attempts to model the relationship between two or more explanatory variables and a response variable by fitting a linear equation to observed data. Every value of the independent variable x is associated with a value of the dependent variable y. The population regression line for p explanatory variables $x1, x2, ..., xp$ is defined to be $y = 0 + 1x1 + 2x2 + ... + pxp$. This line describes how the mean response y changes with the explanatory variables.

Since the observed values for y vary about their means y, the multiple regression model includes a term for this variation. In words, the model is expressed as $DATA = FIT + RESIDUAL$, where the "FIT" term represents the expression $0 + 1x1 + 2x2 + ...pxp$. The "RESIDUAL" term represents the deviations of the observed values y from their means y, which are normally distributed with mean 0 and variance . The notation for the model deviations is as follows:

$$y_{it} = \alpha + \alpha_1.gdppesos + \alpha_2.exports + \alpha_3.thelix \ + \alpha_4.formal\epsilon_{it} \tag{2}$$

$i = 1, ..., 32$ and $t = 1, ..., 15$.

The Ordinary Least Square multivariate models as part of this thesis helped validate the statistical significance of various assumptions concerning different random variables in our data panel in relation to one dependent variable. It measures the statistical significance of key economic indicators such as GDP pesos, population, employment, central funding variables and the economic impact of the two geographical units for industrial clusters under analysis. This inquiry will revisit the most relevant assumptions validated by these multivariate regression models in findings of this thesis

report and for a detailed description of the equation terms, regression results and equations, see (Appendix 2.3 & 2.5). The next section will discuss key results from the set of multivariate regression models shown in Appendix 2.5, at the same time explaining how some of these multivariate models tested $H01$ as the null hypothesis guiding this thesis.

Relevant Results

The findings from the Least Square Multivariate Models 1 to 7 of this thesis confirm key observations rejecting H01 in favour of $HA1$. A fact reaffirming the non-impactful institutional role of the two geographical units this study undertakes. The findings point to the weak institutional role that industrial clusters display in supporting Active Labour programs as a national level social policy in Mexico. The interaction of Traded clusters in relation to the variable "ptPlacements" or the number of professional jobs created as part of this segment of Mexico's ALPs. It is evidence of the non-relevant results stating that the two geographical units here under analysis could not provide a better regional response to these federal programs. All facts, pointing to show that at least at the national level the interaction of the professional ALP segment with the geographical units for industrial clusters do not have a significant impact on the country's GDP in monetary terms.

The positive statistical significance but the negative coefficient of the variable "ptPlacements" suggest to the following three points. First, it speaks to the high levels of informality across Mexico's regions and the shortage of jobs demanding higher levels of skill and professional training. Two, it validates the need for promoting more efficiency and professional training in Mexico's as an incentive, to promote industry and higher GDP growth. Third, it confirms that in Mexico GDP growth as it relates to employment lives in the low levels of skill and the widespread manufacturing sector. The latter are important findings showing the widespread lack of technology and knowledge infused activities. These regression findings also suggest that traded clusters help increase the total combined levels of central government funding transfers to the Mexican states. A fact, linking clustering regional activity with the region's potential to capture more resources from the central government. However, industrial clusters at least at the national level still show to be a non-contributing factor in enhancing the level of response to national level policies. Last, these models showed a disconnect between ALPs and these program's promotions of professional training vis-à-vis the institutional role of clusters in supporting ALPs activities. Another fact, which at this stage of this thesis' empirical analysis rejects $H01$ in favour of $HA1$.

Other lessons from these discussed models validate the following assumptions: It validates the positive correlation between FDI with GDP growth at the national level. Two, it validates assuming an increase in entrepreneurial activity as a driver of FDI. Third, it confirms assumptions about industrial clusters represented by "tHelix" in attracting higher levels of FDI. These multivariate regression models here discussed as mentioned adjust for "Cluster Robust Standard Errors" as to check for robustness. The comparison of the above-mentioned two sets of regressions does not show a relevant difference in terms of the coefficient and the findings from the Regular Least Square multivariate models. The only observation pertains to the dispersion of standard errors which sometimes has shown to affect the output of OLS regression models, see Appendix 2.6. The lessons learned from the univariate and multivariate regression models validated assumptions and tested the institutional strength of Mexico's ALPs and the institutional role of industrial clusters. All at this stage of this thesis empirical analysis showing a rejection of $H01$ in favour of $HA1$ at the national level. The next section will test $H02$ aiming to validate the correlation between transfers of funding from the federal government to the Mexican states and the country's institutional strength. This thesis aim is to validate or reject $H02$ in favour of $HA2$ by regressing the standard deviation of the variables signifying levels of federal funding and our dependent variable "gdppesos".

5.1.3 Regressing the Standard Deviation of GDP & Key Funding Variables

The linear models shown is build on the performance scatter plots and the correlations matrix discussed as part of the descriptive statistics to further test the statistical significance of the variables "gdppesos"," allocations","funding" and "contributions". These linear models will test the relevance of the volatility of GDP on impacting the central government's capacity to sustain adequate levels of funding to all the Mexican states. The aim of these linear models is to paint a general picture by looking at the whole dataset from top to bottom as to provide a general observation of the statistical significance. Helping us validate one hypothesis by looking at the volatility of GDP as contributing to irregular government funding on key development areas thus validating the country's institutional weakness.

The approach testing H02 stems from previous literature on macroeconomic volatility. It draws on the distinction between external forms of volatility such as exports, global prices and trade. In contrast, external volatility stems from economic policy and production-related factors. In addition, to domestic and socio-political conditions as postulated by (Cariolle 2012), also play a role. The mentioned author recounts various literature in economic volatility by (Guillaumont, 2007, 2009a, 2009b, 2010; Cariolle, 2011; Loayza and Raddatz, 2007; Combes and Guillaumont, 2002). These authors also point to the economic vulnerability of developing countries the magnitude and frequency of external and natural shocks to the structural vulnerability of developing countries and these economies development (Cariolle 2012).

According to scholars in the economic analysis, the definitions of volatility often refer to the notion of disequilibrium. Measuring economic volatility involves testing the deviation between the values of an economic variable and its equilibrium. This equilibrium value or reference value refers to a permanent trend. In statistical terms, economic volatility, measured by the standard deviation as postulated by (Rancière et al., 2008). This thesis builds on the above scholarly evidence to test the statistical correlation of the permanent trend of the variable GDP pesos, and the variables "allocations" "contribution" and "funding" (Cariolle 2012). We did the regressions testing the correlation between these variables standard of measurement using R-statistical software version 3.51. The following equations represent the linear models used to test the correlation of the above-stated variables as it relates to the standard deviation of these variables, see Appendix 2.4, for the abbreviation of terms used in the equations.

$$cont_s d_{it} = \alpha_1 + \beta_1 gdpp - sd_{it} + \varepsilon_{1,it} \tag{3}$$

$$alloc_s d_{it} = \alpha_2 + \beta_2 gdpp - sd_{it} + \varepsilon_{2,it} \tag{4}$$

$$fun_s d_{it} = \alpha_3 + \beta_3 gdpp - sd_{it} + \varepsilon_{3,it} \tag{5}$$

Relevant Results

The results from the four-linear models establish a positive correlation between the volatility of the variable "contributions" and GDP in pesos terms. This positive correlation is significant because of the positive sign and the three stars on the right of the estimate. The three stars on the right symbolize a 0.001 significance level which renders these results significant, and the Adjusted R-Square with the value 0.953 affirms this positive relationship. The results state that the

volatility in the variable "gdppesos" explains 95.3% of the volatility in the variable "contributions". What this means is that as GDP fluctuates or contracts because of internal and external economic shocks, the country's central government losses funding capacity that affects the level of monetary transfers to all the country's regions. An event that as mentioned in the literature can constraint infrastructure development, public investment in education and the regions' industrial development in less developed regions. In a country such as Mexico, this is significant as these fluctuations are a factor hindering a much more sustainable regional development where regional champions batter capture resources from the central government. A circumstance, that not only limits industrial development in some less affluent regions but hinders the ability of some regions to respond to national level policies.

The second regression as part of this analysis shows the results from model two showing there is a positive correlation between the volatility of variable "allocations" and GDP in pesos terms. This positive correlation is significant because of the positive sign and the three stars on the right of the estimate. The three stars on the right symbolize a 0.001 significance level which render these results as significant, and the Adjusted R-Square with the value 0.858 affirms this positive relationship. The results state that the volatility in the variable "gdppesos" explains 95.3% of the volatility in the variable "allocations". The variable "allocations" speak to the central government's capacity to transfer money to the regions for key development areas such as health, primary education and basic infrastructure. A reality, that as shown by this study and covered in the literature perpetuates the regional cycle of inequality in sharp regional disparities. The results from model three show there is a positive correlation between the volatility of the variable "funding" and GDP in pesos terms. This positive correlation is significant because of the positive sign and the three stars on the right the estimate. The three stars on the right symbolize a 0.001 significance level which render these results as significant, and the Adjusted R-Square with the value 0.909 affirms this positive relationship.

The results state that the volatility in the variable "gdppesos" explains 90.9% of the volatility in the variable "funding". These findings from these regression results validate the correlation between two important elements. (1) the effects of internal and external economic shocks on the country's GDP contractions and the country's ability to have sustained levels of central funding across all regions in Mexico. A key area if the country desires to attain further industrial growth that translates into higher levels of competitiveness. The lessons learned from this regression results validate the postulated by Stiglitz linking variations in the levels of central government findings to social programs, likewise their institutional strength (see Appendix 2.7). The results from the above-stated models provide validation to $H02$ as one hypothesis governing this thesis. At the same time highlights another area for economic policies that could further prevent this situation as a factor hindering the country's economic growth and regional development. The next section presents the approaches to further test $H01$ at the national levels and shows the estimation methods as well as results obtained in the robustness check outlined earlier in the method design section of this chapter. All methods and approaches used to assess the level in which the two geographical units for industrial clusters can facilitate a better regional response to national level policy objectives.

5.3 Time-Series-Cross-Section Analysis: "Panel-Corrected Standard Errors" & "Robust Covariance Matrix"

5.3.1 Testing the Institutional Role of Industrial Clusters at the National Level

Having tested for different methods to control for heteroscedasticity, and the need to account for time-fixed effects within the models. The findings led this research to account for standard errors within the Time-Series-Cross-Section analysis. It is for this reason the Beck and Katz approach using a "panel corrected standard errors (PCSE)" with time-fixed effects was chosen to test the institutional role of our proxies for industrial clusters at the national level (Beck and Katz 1995). This extimation, suggest relying on OLS coefficient estimates with **panel corrected standard errors (PCSE)**. This method convincingly demonstrates that their large T asymptotic based standard errors which correct for contemporaneous correlation between the subjects perform well in small panels. Nevertheless, it must be expected that the finite sample properties of the PCSE estimator are rather poor when the panels cross-sectional dimension N is large compared to the time dimension T (Beck and Katz 1995). The reason for this is that Beck and Katz PCSE method estimates the full cross-sectional covariance matrix and this estimate will be rather imprecise if the ratio T/N is small (Beck and Katz 1995). This estimation was run using transforming our TSCS panel to fit the panel function using R-statistical software version 3.51 in the R-studio working environment. The following shows a sample of the equation model using Beck & Katz to test the main hypothesis of this thesis, thus accounting for the institutional role of clusters. It notes:

$$\log(\frac{gdp_{it}}{gdp_{it-1}}) = \lambda_0 + \lambda_1 \log(gdp_{it-1}) + \lambda_2 clusters_{it} + \lambda_3 ALP_{it} + \lambda_4 ALP.clusters_{it} + \phi_j cont^i_{it} + \nu_{it} \tag{6}$$

To account for the perceived deficiencies according to the literature presented by Beck and Katz using a "panel corrected standard errors (PCSE)". As a second estimation method to test the institutional support of clusters on a wide range of ALPs proxies. This thesis opted for a covariance matrix by Driscoll and Kraay 1998. This model presents to be an improved option since it demonstrates that the standard nonparametric time series covariance matrix estimator is robust to very general forms of cross-sectional as well as temporal dependence (Driscoll and Kraay 1998). Cross-sectional or "spatial" dependence had been rendered as an issue when dealing with panel data sets in which the cross-sectional units are not randomly sampled (Driscoll and Kraay 1998). The following shows a sample of the equation model using Driscoll & Kraay to test the main hypothesis $H01$ of this thesis, thus accounting for the institutional role of clusters. It notes:

$$\log(\frac{gdp_{it}}{gdp_{it-1}}) = \lambda_1 \log(gdp_{it-1}) + \lambda_2 ALP_{it} + \lambda_3 ALP.clusters_{it} + \phi_j cont^i_{it} + \nu_{it} \tag{7}$$

The dependent variable selected to test $H01$ is the $log(GDP)$ of the rate of the variable "gdppesos". λ_0 is the constant in Beck & Katz , λ_1 is the coefficient of the lag of gdp, λ_2 the coefficient of the representative clusters in Beck & Katz and the coefficient of ALP in Driscoll & Kraay, λ_3 is the coefficient of a representative APL in Beck & Katz and the interaction between the clusters and the ALP in Driscoll & Kraay ,λ_4 is the coefficient of the interaction between ALP and the cluster Beck & Katz. And finally ϕ_j is the coefficient of j control variables. As convention ν_{it} is the error term. *cont* represents the control variables. The used of Beck & Katz likewise Driscoll

and Kraay as the two estimation methods testing $H01$ at the country level. Utilizes a Linear-Log Model where the term \$100x% \$ is the percentage change in x thus in the linear model we say a one percentage change in x leads to 100 units change in y. Section 5.3.2 of the present chapter presents the regression results using Beck & Katz and Driscoll & Kraay estimators testing $H01$. This next section presents the results of these sets of regressions on Triple Helix and Traded clusters.

5.3.2 Regression Results: Testing the Institutional Role at the National Level

The aim of the above-stated model is to test the supporting role of clusters on Mexico's Federal ALPs and the impact of this interaction by observing the effects on the growth rate of GDP pesos as a dependent variable. The regression models as part of the tables presenting the results' output is shown in the following way: (1) the regression output presents models 1ab-2ab, models 2cd-3cd, models 4ab-5ab, and models 5cd-6cd in six lines representing each model regressed. (2) The first model every first and third regression line used a panel linear model Implementing Panel-Corrected Standard Errors by Beck and Katz (1995). (3) the second model every second and fourth line applied a coefficient test implementing Driscoll and Kraay (1998) Robust Covariance Matrix Estimator. All models account for Time Fixed Effects in the linear regression output (see, figures 59 & 60).

Testing the Supporting Role of Triple Helix Clusters on Mexico's ALPs Regression Results from Models 1ab-2ab

The first and second regression tables testing the institutional role of industrial clusters used the geographical unit Triple Helix. This industrial agglomerations make up the independent variable and test the interaction between these ecosystems and the proxies for ALPs. The regression tables aim to show the impact of the above-stated interaction on the dependent variable the log or growth rate of GDP in pesos terms. The proxies for ALPs use in this analysis aim to measure how Triple Helix industrial clusters facilitate a better regional response to ALPs as a national level policy. The ALP proxies in question are the variables cScholarships, cPlacements, and eScholarships. This part of the analysis also looks at the growth rate of several control variables in the data to establish their impact on the main dependent variable, the growth rate of GDP in pesos as stated.

In terms of the interaction between the variable "tHelix" and "cScholarships" we can say the supporting role of these ecosystems does not yield significant results thus invalidating this study's main null hypothesis. What this means is that when observing Mexico at the country level the regional presence of knowledge-infused or Triple Helix ecosystems does not enhance the level of regional response to this segment of ALPs as a national policy. These findings also stand true when the supporting role of Triple Helix ecosystems is measured against the variables "cPlacements" and "cScholarships". The regression tables reflect all the models considering 411 and 408 observations in the data panel during the prescribed period. The Adjusted R Square shows the regressors chosen as independent and control variables and only account for a variance on the growth rate of GDP within a range of 6% to 7%.

Despite the none significant results in the way Triple Helix clusters facilitate a better regional response to ALPs at the regional level when looking at Mexico as a whole. The regression output yielded some consistent and significant results on the growth rate of formal and informal employment. It observes the most significant results on the growth rate of formal employment where we see that every time the growth rate of formal employment increases by 1% the growth rate of GDP in pesos increases by an average of 2.32 to 2.50%. The numerical proximity of the regression results across the two estimators labelled these findings as consistent and the two stars give a value of $p<0.05$

Beck and Katz and Driscoll & Kraay Estimation Models 1ab,1cd,2ab

	Dependent variable:					
	GDP (log)		depvar		depvar	
	panel linear	*coefficient test*	*panel linear*	*coefficient test*	*panel linear*	*coefficient test*
	Beck and Katz	Driscoll and Kraay				
	(1)	(2)	(3)	(4)	(5)	(6)
lag(depvar, 1)	-0.018 (-0.119, 0.082)	-0.127 (-0.314, 0.060)	-0.019 (-0.120, 0.081)	-0.128 (-0.315, 0.059)	-0.009 (-0.109, 0.092)	-0.123 (-0.303, 0.057)
tHelix	-0.009 (-0.036, 0.018)		-0.010 (-0.036, 0.017)		0.008 (-0.011, 0.027)	
cScholarships	-0.00004 (-0.0001, 0.00001)	-0.00003* (-0.0001, 0.00000)				
cPlacements			-0.0001* (-0.0001, 0.00001)	-0.0001* (-0.0001, 0.00001)		
eScholarships					-0.00001 (-0.0001, 0.0001)	-0.00002* (-0.00003, 0.00000)
log(funding)	0.441 (-0.832, 1.720)	0.658 (-1.270, 2.580)	0.426 (-0.845, 1.700)	0.628 (-1.260, 2.520)	0.514 (-0.747, 1.770)	0.865 (-1.270, 3.000)
log(contributions)	-0.254 (-0.883, 0.375)	0.321 (-0.615, 1.260)	-0.249 (-0.877, 0.379)	0.344 (-0.623, 1.310)	-0.254 (-0.883, 0.375)	0.247 (-0.594, 1.090)
log(allocations)	-0.295 (-0.945, 0.354)	-0.500 (-1.670, 0.665)	-0.287 (-0.935, 0.362)	-0.470 (-1.600, 0.658)	-0.366 (-1.000, 0.268)	-0.724 (-2.210, 0.759)
log(investment)	0.034 (-0.023, 0.091)	0.086 (-0.058, 0.231)	0.034 (-0.022, 0.091)	0.087 (-0.057, 0.231)	0.033 (-0.024, 0.091)	0.087 (-0.058, 0.231)
log(informal)	0.224 (-0.635, 1.080)	1.460* (-0.270, 3.180)	0.224 (-0.634, 1.080)	1.470* (-0.253, 3.190)	0.193 (-0.667, 1.050)	1.230* (-0.214, 2.680)
log(formal)	0.232 (-0.358, 0.821)	2.440** (0.110, 4.780)	0.234 (-0.354, 0.823)	2.460** (0.107, 4.810)	0.157 (-0.432, 0.746)	2.360** (0.172, 4.550)
log(employment)						

Figure 58: Regression Results 1ab-2ab

	-0.351 (-1.840, 1.140)	-3.720** (-7.230, -0.211)	-0.351 (-1.840, 1.130)	-3.730** (-7.220, -0.239)	-0.253 (-1.740, 1.240)	-3.420** (-6.360, -0.475)
log(fdi)	-0.025 (-0.087, 0.038)	-0.004 (-0.033, 0.026)	-0.024 (-0.087, 0.038)	-0.003 (-0.032, 0.026)	-0.035 (-0.098, 0.028)	-0.014 (-0.057, 0.030)
tHelix:cScholarships	0.00001 (-0.00000, 0.00002)	0.00001 (-0.00000, 0.00001)				
tHelix:cPlacements			0.00001 (-0.00000, 0.00002)	0.00001* (-0.00000, 0.00002)		
tHelix:eScholarships					-0.00002 (-0.00004, 0.00001)	-0.00002 (-0.00004, 0.00001)
Constant	0.579 (-3.210, 4.370)		0.570 (-3.220, 4.360)		0.684 (-3.170, 4.540)	
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	411		411		408	
R^2	0.064		0.066		0.066	
Adjusted R^2	0.006		0.007		0.007	
F Statistic	1.100 (df = 24; 386)		1.130 (df = 24; 386)		1.130 (df = 24; 383)	

Note: *p<0.1; **p<0.05; ***p<0.01

Beck and Katz and Driscoll and Kraay,
with serial correlation, contemporenous correlation and heteroskedasticity.
All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 59: Regression Results 1ab-2ab

rendering them significant. This finding is important as it confirms one the key areas according to the literature where Mexico needs to concentrate further policy reforms. All of which can provide further economic growth through growing the percentage of formal employment while reducing informality rates.

These regression results affirm how important is formal employment in promoting economic growth, a fact which according to Stiglitz is one of the main challenges facing emerging economies in Latin America. The observations from the regressed models provide the following lessons (1) It validates the weak supporting role of Triple Helix ecosystems; (2) it suggest the need to implement a further policy reform to promote an increase in the growth of formal in the technology-driven sector and; (3) It also points to the role informal employment plays in the promoting inequality in the Mexican economy (see, figures 61 & 62).

Regression Results from Models 2cd-3cd

The interaction between the variable "tHelix" and the proxies for ALPs "ePlacements", "ptScholarhips", and "ptPlacements" in the regression results presented earlier do not yield significant results. What this means is that at the national level Triple Helix ecosystems do not facilitate a wider regional response to these segments of Mexico's ALPs as national level policy objectives. The regression models for these results used the same log control variables as the ones used for models 1ab-2ab. The only aspect of the models that changed were the proxies for ALPs which in these results tested the supporting role of knowledge-driven ecosystems. These regression models observed 408 and 403 observations across the data panel during the prescribed period. The results in terms of Adjusted R-Squared only provide an explanation ranging from 5% to 23% of the variance in GDP growth in monetary terms (see, figures 63 & 64). These findings are significant because they confirmed the institutional weakness of these segments of Mexico's ALPs as national level policies. Also, reject this study's null hypothesis H01 by confirming the non-significant institutional role of knowledge-driven ecosystems in facilitating a wider regional response to national policy objectives. Last, it confirms Mexico's need for introducing further reforms which could increase the number of professional jobs created and training activities.

Testing the Supporting Role of Traded Clusters on Mexico's ALPs Regression Results from Models 4ab-5ab

This set of regression results showing models 4ab-5ab used the same sequence used in the previously discussed models with the same log control variables. In this analysis the proxy for industrial clusters changed from Triple Helix to Traded Clusters as the independent variable. The aim was to test the supporting role of these ecosystems on the proxies for federally funded ALPs. The aim of this approach is to assess if Traded Clusters as geographical units facilitate a better regional response to centrally funded segments of ALPs as national level policy objectives. The results tested these ecosystem's interaction with the proxies "cScholarships" "cPlacements", and "eScholarships". These proxies account for basic competence employment services offered by Mexico's ALPs and entrepreneurship activities.

The results did not yield significant findings thus rejecting the leading hypothesis directing this inquiry at the national level. As described in the first table presenting the regression findings, the control variable with the highest impact on the growth of GDP in pesos is formal employment, and the second one is informal employment. The results for the log or growth rate of formal employment range from 2.36 to 2.56. These two figures show that every time there is an increase on formal employment of 1% the growth rate of GDP increases by en average of 236% to 256%. According to the regression models presented, it validates the positive relationship between the Log of formal employment and the Log of GDP in pesos by the two stars on the right of the estimate which show the relationship as significant. The log of informal employment figures also shows a significant relationship with the log of GDP in pesos and they validate it by one star on the right of the estimate. The Adjusted R-Square, only signifies that the models shown in the regression table explain roughly about 1% to 2% of the variance in the growth rate of GDP in pesos (see, figures 65 & 66).

Regression Results from Models 5cd to 6cd

The last set of regressions observing the interaction of the geographical unit traded clusters with the ALP proxies "eplacements", "ptscholarhips", and "ptplacements" do not yield significant results. Again, as observed on the previous regression models, this table shows the log of formal employment as the most significant variable explaining the variance of GDP in pesos. The relationship between the growth rate of formal employment and the growth of GDP in pesos is positive. The sign of

Beck and Katz and Driscoll & Kraay Estimation Models 2cd,3ab,3cd

	Dependent variable:					
	GDP (log)		depvar		depvar	
	panel linear	*coefficient test*	*panel linear*	*coefficient test*	*panel linear*	*coefficient test*
	Beck and Katz	Driscoll and Kraay				
	(1)	(2)	(3)	(4)	(5)	(6)
lag(depvar, 1)	-0.010 (-0.110, 0.091)	-0.124 (-0.306, 0.058)	-0.013 (-0.112, 0.087)	-0.126 (-0.308, 0.056)	-0.012 (-0.111, 0.087)	-0.125 (-0.304, 0.055)
tHelix	0.008 (-0.011, 0.028)		0.007 (-0.012, 0.026)		0.007 (-0.012, 0.026)	
ePlacements	-0.00000 (-0.0001, 0.0001)	-0.00002 (-0.00005, 0.00001)				
ptScholarhips			0.00002 (-0.0001, 0.0002)	0.00003 (-0.00004, 0.0001)		
ptPlacements					0.0001 (-0.0002, 0.0004)	0.0002 (-0.0001, 0.0004)
log(funding)	0.487 (-0.775, 1.750)	0.812 (-1.270, 2.890)	0.400 (-0.885, 1.680)	0.531 (-1.300, 2.360)	0.320 (-0.948, 1.590)	0.434 (-1.240, 2.100)
log(contributions)	-0.243 (-0.873, 0.386)	0.261 (-0.595, 1.120)	-0.208 (-0.837, 0.422)	0.449 (-0.636, 1.530)	-0.173 (-0.798, 0.453)	0.494 (-0.586, 1.570)
log(allocations)	-0.348 (-0.981, 0.285)	-0.677 (-2.100, 0.741)	-0.314 (-0.976, 0.347)	-0.547 (-1.760, 0.665)	-0.265 (-0.912, 0.381)	-0.479 (-1.590, 0.629)
log(investment)	0.032 (-0.026, 0.089)	0.086 (-0.057, 0.228)	0.042 (-0.015, 0.098)	0.103 (-0.065, 0.271)	0.042 (-0.015, 0.098)	0.103 (-0.064, 0.271)
log(informal)	0.192 (-0.669, 1.050)	1.210* (-0.223, 2.640)	0.301 (-0.541, 1.140)	0.754 (-0.355, 1.860)	0.300 (-0.543, 1.140)	0.708 (-0.422, 1.840)
log(formal)	0.157 (-0.433, 0.746)	2.340** (0.187, 4.500)	0.193 (-0.386, 0.772)	2.130** (0.205, 4.060)	0.183 (-0.397, 0.762)	2.110** (0.210, 4.000)
log(employment)	-0.254 (-1.750, 1.240)	-3.450** (-6.440, -0.451)	-0.394 (-1.860, 1.070)	-2.110** (-4.040, -0.171)	-0.391 (-1.850, 1.070)	-2.040** (-4.000, -0.076)

Figure 60: Regression Results Models 2cd-3cd

log(fdi)	-0.034 (-0.097, 0.029)	-0.013 (-0.054, 0.029)	-0.032 (-0.093, 0.029)	0.010 (-0.011, 0.030)	-0.033 (-0.094, 0.029)	0.009 (-0.012, 0.029)
tHelix:ePlacements	-0.00002 (-0.0001, 0.00001)	-0.00002 (-0.0001, 0.00002)				
tHelix:ptScholarhips			-0.00000 (-0.00004, 0.00003)	-0.00001 (-0.00003, 0.00001)		
tHelix:ptPlacements					-0.00000 (-0.0001, 0.0001)	-0.00002 (-0.0001, 0.00002)
Constant	0.694 (-3.160, 4.550)		0.843 (-2.890, 4.580)		0.899 (-2.830, 4.630)	
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	408		403		403	
R^2	0.063		0.081		0.082	
Adjusted R^2	0.005		0.023		0.024	
F Statistic	1.080 (df = 24; 383)		1.390 (df = 24; 378)		1.410^{*} (df = 24; 378)	

Note: *p<0.1; **p<0.05; ***p<0.01

Beck and Katz and Driscoll and Kraay,
with serial correlation, contemporenous correlation and heteroskedasticity.
All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 61: Regression Results Models 2cd-3cd

Beck & Katz and Driscoll & Kraay Estimation Models 4ab,4cd,5ab

	Dependent variable:					
	GDP (log)		depvar		depvar	
	panel linear	*coefficient test*	*panel linear*	*coefficient test*	*panel linear*	*coefficient test*
	Beck and Katz	Driscoll and Kraay				
	(1)	(2)	(3)	(4)	(5)	(6)
lag(depvar, 1)	-0.013 (-0.114, 0.088)	-0.124 (-0.304, 0.057)	-0.014 (-0.114, 0.087)	-0.124 (-0.304, 0.056)	-0.013 (-0.114, 0.089)	-0.127 (-0.313, 0.059)
tradedClusters	0.002 (-0.024, 0.028)		0.003 (-0.023, 0.029)		-0.004 (-0.028, 0.020)	
cScholarships	0.00003 (-0.001, 0.001)	0.001 (-0.001, 0.002)				
cPlacements			0.0001 (-0.001, 0.001)	0.001 (-0.001, 0.003)		
eScholarships					-0.0002 (-0.001, 0.001)	-0.00004 (-0.0002, 0.0002)
log(funding)	0.318 (-0.981, 1.620)	0.609 (-1.420, 2.630)	0.303 (-0.993, 1.600)	0.603 (-1.420, 2.630)	0.420 (-0.858, 1.700)	0.871 (-1.170, 2.910)
log(contributions)	-0.182 (-0.818, 0.453)	0.382 (-0.676, 1.440)	-0.176 (-0.810, 0.458)	0.390 (-0.684, 1.470)	-0.213 (-0.838, 0.412)	0.268 (-0.588, 1.120)
log(allocations)	-0.237 (-0.894, 0.420)	-0.531 (-1.780, 0.714)	-0.226 (-0.881, 0.430)	-0.518 (-1.750, 0.714)	-0.303 (-0.943, 0.337)	-0.699 (-2.090, 0.694)
log(investment)	0.032 (-0.025, 0.088)	0.089 (-0.063, 0.240)	0.033 (-0.024, 0.089)	0.089 (-0.064, 0.243)	0.033 (-0.024, 0.089)	0.089 (-0.060, 0.238)
log(informal)	0.104 (-0.708, 0.916)	1.550* (-0.191, 3.300)	0.099 (-0.710, 0.909)	1.560* (-0.139, 3.260)	0.133 (-0.663, 0.928)	1.300* (-0.213, 2.820)
log(formal)	0.143 (-0.427, 0.714)	2.560** (0.133, 4.990)	0.144 (-0.426, 0.713)	2.590** (0.149, 5.030)	0.124 (-0.436, 0.684)	2.360** (0.170, 4.550)
log(employment)	-0.155 (-1.590, 1.280)	-3.890** (-7.470, -0.317)	-0.154 (-1.580, 1.270)	-3.890** (-7.370, -0.409)	-0.160 (-1.570, 1.250)	-3.520** (-6.650, -0.393)

Figure 62: Regression Results Models 4ab-5ab

log(fdi)	-0.027 (-0.091, 0.038)	-0.005 (-0.035, 0.025)	-0.026 (-0.091, 0.038)	-0.005 (-0.034, 0.024)	-0.029 (-0.093, 0.035)	-0.007 (-0.042, 0.028)
tradedClusters:cScholarships	-0.00000 (-0.00002, 0.00001)	-0.00001 (-0.00003, 0.00001)				
tradedClusters:cPlacements			-0.00000 (-0.00002, 0.00002)	-0.00002 (-0.00004, 0.00001)		
tradedClusters:eScholarships					0.00000 (-0.00001, 0.00002)	0.00000 (-0.00000, 0.00000)
Constant	0.471 (-3.730, 4.670)		0.389 (-3.810, 4.590)		0.596 (-3.580, 4.770)	
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	411		411		408	
R^2	0.060		0.061		0.061	
Adjusted R^2	0.001		0.002		0.002	
F Statistic	1.020 (df = 24; 386)		1.040 (df = 24; 386)		1.040 (df = 24; 383)	

Note: *p<0.1; **p<0.05; ***p<0.01

Beck and Katz and Driscoll and Kraay,

with serial correlation, contemporenous correlation and heteroskedasticity.

All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 63: Regression Results Models 4ab-5ab

Beck & Katz and Driscoll & Kraay Estimation Models 5cd,6ab,6cd

	Dependent variable:					
	GDP (log)		depvar		depvar	
	panel linear	*coefficient test*	*panel linear*	*coefficient test*	*panel linear*	*coefficient test*
	Beck and Katz	Driscoll and Kraay				
	(1)	(2)	(3)	(4)	(5)	(6)
lag(depvar, 1)	-0.012 (-0.113, 0.089)	-0.127 (-0.313, 0.060)	-0.014 (-0.112, 0.085)	-0.130 (-0.317, 0.057)	-0.012 (-0.111, 0.086)	-0.128 (-0.311, 0.055)
tradedClusters	-0.003 (-0.027, 0.021)		0.005 (-0.020, 0.029)		0.004 (-0.020, 0.027)	
ePlacements	-0.0003 (-0.002, 0.001)	-0.0001 (-0.0003, 0.0002)				
ptScholarhips			0.0004 (-0.004, 0.005)	-0.0002 (-0.001, 0.001)		
ptPlacements					-0.00004 (-0.009, 0.009)	-0.0005 (-0.003, 0.002)
log(funding)	0.421 (-0.860, 1.700)	0.880 (-1.190, 2.950)	0.385 (-0.905, 1.680)	0.417 (-1.360, 2.200)	0.301 (-0.978, 1.580)	0.299 (-1.310, 1.910)
log(contributions)	-0.214 (-0.841, 0.412)	0.255 (-0.590, 1.100)	-0.183 (-0.807, 0.440)	0.491 (-0.588, 1.570)	-0.147 (-0.768, 0.474)	0.546 (-0.543, 1.630)
log(allocations)	-0.305 (-0.946, 0.337)	-0.695 (-2.090, 0.700)	-0.315 (-0.968, 0.338)	-0.469 (-1.620, 0.685)	-0.267 (-0.911, 0.377)	-0.389 (-1.420, 0.642)
log(investment)	0.032 (-0.025, 0.089)	0.089 (-0.060, 0.237)	0.039 (-0.017, 0.095)	0.100 (-0.064, 0.264)	0.039 (-0.017, 0.095)	0.101 (-0.064, 0.266)
log(informal)	0.136 (-0.661, 0.933)	1.300* (-0.197, 2.810)	0.209 (-0.575, 0.992)	0.770 (-0.369, 1.910)	0.201 (-0.581, 0.983)	0.737 (-0.418, 1.890)
log(formal)	0.125 (-0.435, 0.686)	2.370** (0.176, 4.570)	0.136 (-0.415, 0.688)	2.140** (0.221, 4.050)	0.121 (-0.430, 0.673)	2.120** (0.229, 4.000)
log(employment)	-0.167 (-1.570, 1.240)	-3.580** (-6.760, -0.386)	-0.261 (-1.640, 1.120)	-2.130** (-4.090, -0.166)	-0.242 (-1.620, 1.140)	-2.090** (-4.080, -0.098)

Figure 64: Regression Results Models 5cd-6cd

log(fdi)	-0.029 (-0.093, 0.036)	-0.006 (-0.041, 0.028)	-0.029 (-0.091, 0.034)	0.010 (-0.010, 0.030)	-0.029 (-0.092, 0.033)	0.009 (-0.011, 0.029)
tradedClusters:ePlacements	0.00000 (-0.00002, 0.00003)	0.00000 (-0.00000, 0.00001)				
tradedClusters:ptScholarhips			-0.00001 (-0.0001, 0.0001)	0.00000 (-0.00001, 0.00002)		
tradedClusters:ptPlacements					0.00000 (-0.0001, 0.0001)	0.00001 (-0.00003, 0.0001)
Constant	0.633 (-3.550, 4.810)		0.500 (-3.660, 4.670)		0.643 (-3.510, 4.790)	
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	408		403		403	
R^2	0.059		0.080		0.081	
Adjusted R^2	0.001		0.022		0.023	
F Statistic	1.010 (df = 24; 383)		1.380 (df = 24; 378)		1.390 (df = 24; 378)	

Note: *p<0.1; **p<0.05; ***p<0.01

Beck and Katz and Driscoll and Kraay,

with serial correlation, contemporenous correlation and heteroskedasticity.

All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 65: Regression Results Models 5cd-6cd

the estimate and the two stars on the right of the estimate validate this relationship; A finding that reaffirms the need to foster formal employment to promote higher GDP growth. The Adjusted R-Squared using "eplacements" as a proxy variable for ALPs, only shows a 1% influence in the growth's variance rate of GDP in terms of pesos. The following models using the ALP proxies "ptscholarhips" and "ptplacements" show a higher influence on the variance of GDP growth in pesos terms. This represents 22% and 23%, an element highlighting how important professional training as a policy is to promote GDP growth i.e. economic growth.

In all the regression models shown, testing the interaction of the two proxies for industrial clusters with the ALP proxies. The models show two important elements: (1) The models testing the interaction of Triple Helix and Traded clusters with the proxies for professional training explain a higher variation in GDP growth. (2) The growth rate of total employment in Mexico shows a negative sign but an estimate that is significant. These two highlighted lessons show that knowledge-driven activities are better positioned to promote professional training, thus having a higher impact on GDP growth in pesos terms. The negative relationship between the growth rate of total employment on the growth rate of GDP. It shows how important are the levels of informality in constraining the Mexican economy's growth. A situation that constrains formal employment, thus reinforcing the circle of inequality. Additionally, it also limits the supporting institutional role of industrial agglomerations in enhancing professional training activities within the current ALP framework in Mexico.

The findings above, observing and validating the potential impact of professional active Labour training programs. Led this research to concentrate only on testing the interaction of the proxies for industrial agglomerations and the professional training components of Mexico's ALPs. The results inspecting the supporting role of the two geographical units for clusters at the national level did not yield significant results. What this means is that $H01$ it rejects in favour of $HA1$, thus suggesting that clusters do not facilitate a wider regional response to the different segments of ALPs as national level policy objectives. Given the results from the first level of analysis looking at Mexico as a whole, this thesis explores to further the analysis checking for robustness. This robustness check inspects the institutional role of our two units of analysis in Mexico's industrial regions. At the same time runs this robustness check in a group sample of states where there are at least two Triple Helix clusters and fifty-five traded clusters concentrated.

The next section of this master's thesis expands on the first set of regression results discussing testing the impact Triple Helix and Traded Clusters have in facilitating a better response to national policies. This section builds on the consistency and robustness shown by the Robust Covariance Matrix Estimator presented by Driscoll and Kraay. It presents three variants to the General Method of Moments (GMM) estimations as postulated by (Roodman 2006). The General Method of Moments estimators GMM and the different variants discussed as part of this study present a more robust approach than linear based models when using lags for the dependent variable (Roodman 2006). The next set of results as a "Robustness" check aims to see if by using what we perceive to be more robust methods to test the null hypothesis H01. The results from this approach can further provide insights as of the impact of clusters in relations to the regional level response to national policies in industrialised regions.

5.4 Checking for Robustness Using "Robust Covariance Matrix" & "Generalized Method of Moments"

The first step as part of the above-mentioned "Robustness" check concentrates on the whole data panel, meaning Mexico as a whole. In addition, it expands this robustness check on two data subsets from the main panel data where we test only regions considered industrialised. These subsets of data are "northern" and "Thelixregions", the first subsets group region 1a and 2a into one area. These areas cover the entire northern part of the country from central Mexico to the border with the US. Testing for robustness is a frequent practice in applied economics, and political economy analysis, therefore being in line with this thesis's scholarly intentions. Given the above-stated, not very significant results got from testing the interaction of our two geographical units of analysis for industrial agglomerations Triple Helix and Traded Clusters on the whole data panel.

This analysis checking for robustness opted for reducing the number of ALP proxies by only concentrating on the above-stated geographical units of analysis and the proxy variable "ptplacements". This section combines the stated "Robust Covariance Matrix" approach to cross-sectional analysis by Driscoll & Kraay, 1998 with the "Difference" and "System" GMM using Stata according to Holtz Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) posited by (Roodman 2006). In dynamic panels, the "difference" and the "system" (GMM) have gained increasing popularity in economic research. Using dynamic panel data structures often presents a much more efficient method to linear estimators involving lags to the dependent variable (Roodman 2006). The GMM estimators used in this section are One-step difference GMM, One-step system GMM and the Two-step system GMM.

Dynamic Panel Data Models & The Method of Moments Estimators

The General Method of Moments estimator and the variants here discussed are an appealing alternative to the methods in our first set of analyses. The reason for this is the first set of regressions as part of our analysis testing clusters and the level of response to ALP policies at the national level. All present a limited set of assumptions in relation to the data while the GMM estimators start by hypothesizing properties about parameters of the population. All which translate into equations on means, variances and correlations between variables (Roodman 2006; Windmeijer 2000). These parameters are what we plan as moment conditions and the sample equivalents of these properties planned with the data. In most cases, the number of moment conditions is much larger than the number of parameters, hence there are more equations than parameters being estimated. This is the substance of the GMM approach as it seeks to minimize the difference between sample statistics and parameters of interests in the various equations, using a weighting scheme. It does this because of the possibility of closed form solutions that supplements other exact relations between parameters, to help for the estimations: it calls these over-identifying restrictions (Blundell, Bond, and Windmeijer 2001).

The Generalized Method of Moment is a popular panel data estimation method because of its robustness to distributional assumptions, namely heteroscedasticity. We will concern this thesis with dynamic panel GMM models, which are those that contain a lag of the dependent variables in the equation. Because of the endogeneity problem caused by introducing the lag we use the dependent variable, instrumental variables in the regressions (Roodman 2006). It applies the difference GMM, not on the original variables of regression but on the first difference of all variables. Using the first difference allows getting rid of the individual fixed effects as a component of the error term. We estimate the weighting scheme, but this needs a second step using the parameter estimates of a first

step. The first step then posits that the weighting scheme is an identity matrix. Hence the terms one-step and two-step difference GMM. We have used this dynamic panel data estimation method from the paper of Arellano and Bond (1991). System GMM is an augmented difference GMM. In addition to the first difference equations, the corresponding equations in level are added. This larger system of regression equations has most times yield better estimates than the difference GMM., similarities in the estimation's methods translate into a one-step GMM that yield the inputs for a two-step GMM (Roodman 2006). Estimation of dynamic panel data models by system GMM has been originally sketched by Arellano and Bover (1995) and developed by Blundell and Bond (1998).

5.4.1 Robustness Check Regression Results: Observing Mexico as a Whole

Section 5.4.1 from Table 1 in our robustness check observes the level in which the two units of analysis for industrial cluster facilitate a wider national response to federal policy programs. The following set of regressions cover models 1 through 8 compiling the four estimators above stated, and the GMM bootstrapped results. The bootstrap results from the GMM models provide this study with an additional level of robustness considering for the small nature of our panel. The general observations from table 01 show Mexico's positive economic growth during the prescribed time. This positive economic growth shown by the positive sign of β_1 or coefficient across the different estimations signifying Lag 1 and Lag 2 of our dependent variables Log (GDPpesos). Lag 1 and Lag 2 are autoregressive time series techniques used to measure the rate of economic growth. The p-value from these two autoregressive indicators are positive, thus showing a level of significance below the 5% threshold.

Models 1 to 4 show our variable Triple Helix showing a positive sign of β_1 and a p-value of 0.033 using Driscoll and Kraay Robust Covariance estimator. These two values show the positive correlations between Triple Helix as a geographical unit and Mexico's GDP growth in pesos. What this results show are the following; (1) the positive economic impact of knowledge infused ecosystems on the economy at the national level; (2) the still dominant role of low value-added manufacturing activities across the states and; (3) the need to promote more education and technology-driven training that could further promote these ecosystems. The low value of the coefficient shows these ecosystems early stage of development across all Mexican states. These findings still corroborate the still incipient level of contribution of knowledge-driven activities to the country's GDP. It also attests for the knowledge-infused activities concentrated in a handful of states that have posited in this research validates Mexico's state of inequitable regional development.

The results from the GMM estimators considering Mexico's Triple Helix ecosystems validate further this early stage of development while no showing levels of significance below the 5% threshold. The interaction between our geographical unit Triple Helix and our ALP proxy variable "ptplacements" showed promising but could not lead this research to validate this study null hypothesis H01. What this means is the at the national level the institutional role of Triple Helix clusters geographical units does not facilitate a better response to professional ALP activities as a national level policy initiative. The p-values from the above-stated interaction ranged from 0.062 to 0.142 thus pointing to the potentially positive role of clusters in supporting ALPs. However, the findings are not conclusive as per the threshold set for this analysis. Also, the low values of the coefficient across the GMM estimators further attest these findings.

Models 5-8 looking at Traded clusters as one of the geographical units here under analysis finds the interaction with the ALP variable ptplacements to be positive but not significant. The coefficients

or β_1 is positive across GMM estimators but the p-value or significance levels ranged from 0.092 to 0.172. These findings lack consistency across indicators while also falling short from being within the 5% levels of significance set to validate $H01$. As stated earlier the non-conclusive results point to the need to institute better policies promoting education and technology-driven training. At the same time speak to the low institutional role of the two geographical units in facilitating a better national level response to ptplacements as a federally driven policy aim.

5.4.2 Robustness Check: Observing Mexico's Northern Regions

Section 5.4.2 of this thesis report exhibits the findings from Table 2 of the subset of data labeled "northern". As mentioned earlier in this report the data comprises regions 1a and 2a which form part of the northern central and northern regions bordering the US. The table findings cover models 9 -12 looking at Triple Helix as geographical units and models 13-16 looking at Traded clusters. These models compile the stated four estimators while also showing the bootstrapped results from the GMM models as earlier explained. The general observations from table 2 across the various estimators used affirmed Mexico's positive economic growth during the prescribed time period. This positive economic growth shows a positive sign of β_1 or coefficient across the different estimations signifying Lag 1 and Lag 2 of our dependent variables Log (GDPpesos). The p-values validate this relationship as positive at levels of significance not exceeding the 5% threshold established by this study to validate our null hypothesis H01. These findings show a higher level of economic growth in these two regions over time, a finding congruent with the concentrated industrial activity in this part of Mexico.

The variable Triple Helix in Models 9-12 shows a positive sign of β_1 and a significant p-value of p-0.001 using Driscoll and Kraay Robust Covariance. The latter although a positive sign that could open the door for future research on this topic, it also shows the lack consistency across the different GMM estimators used in terms of β_1. The variable "ptPlacements" does not show a relevant level of significance in the two northern regions comprised in the above-stated data subset. What this means is that although these northern regions concentrate a great deal of industry activity, these results highlight the following key aspects. One, pointing the levels of regional inequality even in areas with packets of concentrated industrial activity. Two, the institutional weakness of this segment of Mexico's ALPs even in areas where this programs supposed to have an economic impact in GDP terms. However, the indicator in the mentioned models showing the interaction of Triple Helix with "ptplacements" showed positive signs. A finding that could make up a sign that could lead this research to say knowledge-infused ecosystems could play an institutional role providing a better regional response to this segment of ALPs as a national policy. The findings obtained from the above-stated regression models are not as significant as to validate our null hypothesis H01.

Other relevant findings from these regression results checking for robustness point to the control variables the Log of FDI, Log of Investments, and Log of Funding within our Robust Covariance Matrix model. In these variables we find a positive impact on the growth rate of our variable GDP pesos, thus pointing to the positive correlation of higher industrial activity with the key development drivers represented by the stated control variables. Models 13- 16 looking at Traded clusters as one of the geographical units find the interaction with the ALP variable "ptplacement" to be positive but not significant. The coefficients or β_1 showed to be positive across GMM estimators but the p-value or significance levels ranged from 0.078 to 0.586 which fall short from being within the 5% levels of significance set to validate H01. In these four models the control variables Log of FDI, Log of Investments, and Log of Funding within our Robust Covariance Matrix model showed also a

positive correlation to the growth rate of GDP. In brief, what the results from the robustness check show up to this point with the positive coefficients and low R-Squared value is the following. One, the coefficients show the correlation from the interaction of the two geographical units with the models' dependent variable. Two, the low R-Squared shows that the interaction does not explain much of the variability of the dependent variable in the model. A fact, that as stated earlier in this study further corroborates the rejecting H01. At the same time, it calls on further research on the topic where a set more meaningful conclusions could be found. All that could attain clearer findings to what this study believe could be promising signs of industrial clusters facilitating a better regional response to national level policies.

5.4.3 Robustness Check: Observing Mexico's States with Triple Helix & Traded Clusters.

Section 5.4.3 from Table 3, showing models 17-20 looking at Triple Helix and models 21-24 looking at Traded clusters provide the following key observations; (1) the results show a stronger institutional role of Triple Helix clusters in supporting professional ALPs in states where Triple Helix are present and; (2) It shows how relevant knowledge-infused industrial activities compares to our other geographical unit Traded Clusters. Triple Helix and Traded clusters states exemplify the highest levels in the growth rate of GDP by the Lags of our dependent variable Log (GDP pesos).

Observing the institutional supporting role of Triple Helix, the one-step difference GMM, the one-step system GMM, and the two-step system GMM yielded significant results. The positive sign of the β_1 or coefficient across all these estimators showed consistency, a finding which also reflects in the p-value displayed by these estimators. The p-values for these estimation methods showed to be significant as they fall within the 5% levels of significance established as a threshold to validate our null hypothesis H01. The positive institutional supporting role of Triple Helix clusters on professional ALPs in states where Triple Helix and Traded clusters are present. It shows our intentions of promoting knowledge driven regional assets to allow Mexico to maintain and upgrade the country's macro-economic progress. It calls for Mexico to place more emphasis on Triple Helix or knowledge infused ecosystems by adopting key policy changes later discuss. The table for these three levels of analysis using the above-stated estimators as part of the robustness check. It locates in the appendix section of the present report (Please see Appendix 2.9).

The findings from the robustness check confirmed this research scholarly objectives as it tested the institutional role of clusters in industrialised regions. Thus, aiming to establish if industrial clusters acting as institutions could provide a better regional response to national level policies represented by the proxy "ptplacements". The results isolating the states where the two geographical units show a stronger connection between clusters and a better regional response to ALPs as national level policy objectives. It makes up an important step forward in the way we view industrial clusters. While also pointing to the set of possible policies in emerging markets like Mexico that could bring higher levels of national level competitiveness. One, that is regional in focus but global in scope as mentioned earlier in this report. The results from the system GMM looking at the group of states where the two geographical units concentrate. All signal to the institutional features of clusters but do not show more variability in the model's dependent variable. The results speak to the relevance of this scholarly research in advocating for clusters as institutions in supporting professional Active Labour Programs. Also, opening the door for further areas of research on how clusters can better help respond to national level policy objectives at the regional level. Although the last set of results from our robustness check are congruent with this research intentions, the findings are not

conclusive as to validate H01 with Mexico. However, the findings bring further awareness to one theme presented as part of this research. This theme relates to the wide spread policy alignment that according to the literature could project ideal competitive outcomes. Therefore, allowing national-level policies to have a better impact across regions, and even more in states where active industrial cluster initiatives develop.

Chapter 6 of this thesis report summarises the main lessons learned from the literature and the data gathered to conduct this scholarly inquiry. This section highlights the main findings while also acknowledging the limitations this inquiry faced as an introductory study. It also provides a brief policy debate on how Mexico can institute better policy objectives geared to increase the country's competitiveness. The aforementioned, considering the regional dynamics of clusters and the two augmented competitive dimensions proposed by this study. Last, it will provide the closing arguments and conclusion bringing this research full circle on positioning clusters as institutions of regional economic development.

Chapter 6: Presentation of Findings and Closing Arguments

6.1 Findings

This scholarly enquiry has addressed whether the two geographical units for industrial clusters selected for this study can serve as institutions of regional development. From the outset in Chapter 1, this thesis showed how relevant is the rationale for this research based on past and current scholarly literature. To ground this study around the concept of competitiveness, this research centred on Michael Porter's and the World Economic Forum's conception of competitiveness. The latter serving as the framework to showcase the relevance of education in the regional competitive debate. While the former serves to evidence the paradigm shift from a national level debate to one of the regional dimensions in scope. This study has evidenced how globalisation and changes in industrial technology are demanding higher levels of skills and education. A pressing reality that in Mexico's case presents a competitive challenge in a changing industrial landscape. Mexico's liberalisation policies aimed to have a widespread economic impact showed a disconnect between national level policies and regional realities. This research shows how some organisations and regions are better organised to respond to the demands of the central government. A fact, that results in inequality and the marginalisation of some regions while promoting progress and industrial agglomerations in others. The research results from the empirical analysis in Chapter 5, showed to be inconclusive to validate this study's null hypothesis across all Mexican States. Instead, it rejected this hypothesis in favour of $HA1$ as the alternative hypothesis, showing the non-significant role industrial clusters play in facilitating a better regional response to national policies at the time in Mexico. Although the results show positive institutional features for industrial clusters in areas where there is a concentration of the two geographical units in question. These findings call for further research on this topic while calling for more policy reforms. All reforms that could promote the creation of clusters through the enhancement of regional assets and the two augmented competitive dimensions proposed in the literature review section. In brief, the interaction of clusters and Mexico's wider ALP framework at least at the national level do not help the states' wider response to national level policies. Nonetheless, this empirical analysis found evidence that industrial clusters can play an institutional role in supporting social programs in regions where industrial clusters concentrate. The latter finding is significant as it opens the door for further areas of research beyond this introductory study. It points to policy implications suggesting the organisation of a cluster in less developed regions. As a possible solution that could allow these areas to better respond to the differences often created by Mexico's national level policies. The latter suggesting that clusters as institutions can create two augmented regional-national competitive dimensions thus enhancing competitiveness while mitigating the impact of GDP fluctuations. An event that has covered in the literature is a key factor correlated to the country's institutional weakness and the basis for the second hypothesis governing this research $H02$. The latter null hypothesis validated as part of this thesis by the linear models in Chapter 5, section 5.1.3.

As mentioned this thesis explored how Michael Porter's paradigm shift on international competitiveness and argued that clusters can act as institutions of regional and national competitiveness. A scholarly aim, which set this analysis on the path of looking at the institutional role of our two geographical units, Triple Helix and Traded clusters, in supporting social programs. In addition, it led this research to look at GDP fluctuations as a key driver in upholding Mexico's lack of institutional strength and variations in the central government's ability to sustain levels of funding to all states (BenDavid-Hadar 2013; Stiglitz 2000). Hence, bringing this research to examine Mexico's GDP volatility and the impact of irregular government funding and the country's lack of institutional

strength. A key aspect which has proven to be significant in key development areas such as social programs, thus corroborating Mexico's institutional weakness. The lessons learned throughout this research are far more than these two areas serving as the foundation for this research's null hypotheses $H01$ and $H02$. This section presents all relevant lessons based on literature data-driven observations and the empirical statistical analysis. In addition, findings encompassing the linear models in the hypothesis testing, and Time-Series-Cross-Section analysis developed to test our two stated hypotheses.

The lessons learned from the analysis of the World Economic Forum's definition of competitiveness highlights how important are education and the relationship to innovation activities. It showed important aspects present in Michael Porter's definition of competitiveness and the strong relationship with industrial clusters formation. It also portrayed how education at the core of innovation activities influence institutional factors. All of which are shaping the ability of nations and regions to create strong regional "assets" as highlighted by Camagni and Capello 2013. In fostering the growth of regional "assets" this research has shown through our literary inquiry how education and professional knowledge in technology, robotics, and information systems are important. A postulation based on relevant literary findings, how emerging economies like Mexico stand to see their economic progress eroded. If Mexico's Labour force continues to lack adequate levels of education and technical training in innovation-driven industrial sectors. As shown in this research, the link between education, professional training, and ALPs are elements which demand consideration as a priority within Mexico's industrial framework. It bases these links on the model guiding this research, one that could see the following key outcomes; (1) an increasing number of industrial agglomerations; (2) a better positioning of clusters as institutions; and; (3) stronger interaction of clusters and Mexico's ALPs.

All these elements as postulated here would contribute create a better alignment of national, regional and global objectives within the proposed augmented competitive dimensions as posited by our model. The graphs showing the increased role of knowledge, the increase of R&D activities in the manufacturing sector coupled with the data on education from the OECD. Not only validated Mexico's incipient levels of investment in tertiary education compared to advanced economies. It also suggests a policy change about education as a focal point for Mexico to maintain and upgrade the country's gained competitive advantage. Hence, ensuring the country's ability to avoid losing competitiveness while aiming to attain higher levels of integration into the global value chains. An aim that could help the country achieve a fair regional development in marked regional disparities. In addition, higher levels of value chain integration could contribute to bringing Mexico's labour force to adequate levels of labour market efficiency in terms of knowledge and industrial output (BenDavid-Hadar 2013; Ramoniene and Lanskoronskis 2011). Achieving higher levels of knowledge and industrial output in a more centralised industrial policy could provide Mexico with higher levels of GDP per capita. All which could further improve performance levels showed during the prescribed period of analysis while also promoting more sustained levels of GDP growth.

Through our literary analysis, this enquiry showed how exogenous shocks hinder GDP growth. The graph looking at Mexico's GDP index and its volatility during the prescribed period. It showed how the country's liberalisation and reforms lowered the volatility of the country's GDP during the first half of our period of analysis. However, it also showed how this relative economic stability is susceptible to external factors. Which with Mexico could be the link to the following; (1) high levels of informality (2) a very rigid labour market; (3) industrial policy decentralisation; (4) the country's resource wealth dependence; and; (5) lack of education and training. We learned that just as volatility signals risk, inequalities, and labour market inefficiencies when looking at GDP hinder

the country's competitive outlook. A better regional response to Mexico's development could also mean economic growth supported by increased levels of central government funding in some states where industrial clusters developed. A finding linking clusters as a driver for central institutional support thus linking these ecosystems with increased levels of institutional strength in areas where clusters are present. The graph showed this looking at five states with the highest levels of funding showing all the states having the two industrial agglomerations considered for this study.

The findings in Chapter 4, section 4.3 from the empirical section of our analysis spoke to the two following aspects; (1) GDP growth in Mexico grew the most in areas where industrial activity concentrates; (2) it speaks to the country's strong centralisation thus showing a disconnect between national and regional level objectives. The latter points to aspects discussed sustaining Mexico's marked regional disparities and a wider institutional gap in less developed regions. At the same time favouring regional economic champions as shown in this analysis. The empirical findings showing that industrial development and the centralisation of the Mexican economy also translated to indicators such as FDI. Additionally, this study showed how FDI concentrates in the central and northern regions where industrial development concentrates the most. While also showing the southern region as the one with the lowest level of FDI over the years. The latter reality combined with no much growth in the levels of central government funding in the southern region. Make up essential elements contributing to sustaining the southern region's lack of development and inequality.

One, that as shown in the empirical section represents the variable "allocations", this variable account for an investment in basic infrastructure, health care and education. All three key development areas which compared to the central regions do not show the same growth trajectory. As posited in the literature covered in this analysis, the mentioned development areas are key to further promote industrial growth, attract foreign direct investment, and fostered the growth of industrial agglomerations. The findings from the observations on variable "allocations" also coincide with the one from the variable" investment" which reflects the states' ability to invest in public work and infrastructure. These empirical findings also speak to the centralisation of Mexico's economy. One, showing the central region 5a where Mexico City locates as the one spending most in public work and development. It also reflects the ability of industrialised regions to have higher levels of investment in this area, represented by region 2a. One region where the state of Nuevo Leon as the wealthiest state, and the most industrialised with agglomerations in major industrial segments. Nuevo Leon is the Mexican state with the highest concentration of Triple Helix and Traded Clusters with twelve and sixty-five agglomerations.

The observations testing the heterogeneity of the two units for industrial agglomerations mentioned. Showed that regions 1a and 2a are the ones showing the highest concentration of industrial clusters in our analysis. These findings coupled with the higher level of exports in these two regions compared to other regions. It does provide validation to our assumption claiming the influence of US value chains as a key for Mexico's industrial development and agglomeration patterns., as it relates to the creation and concentration of industrial clusters here represented by the two geographical units Triple Helix and Traded industrial clusters. The highest number of industrial clusters in these northern regions as validated by our analysis, led this research to look at performing our variable "cplacements" in these two industrialised regions. These regions house not only the highest number of Triple Helix and Trade clusters. These also showed to concentrate most of the industrial activity in the industry segments discussed as part of this report. A finding leading this research to examine the effect of federally financed ALPs in these regions and the institutional strength of such programs.

The findings showed that in terms of jobs demanding basic job competencies. This segment of

Mexico's ALPs placed the highest number of participants in the regions with the highest level of industrial activity here presented by regions 1a and 2a. These empirical finding showed to be relevant for this research as the main scope of this study is to test the institutional role of clusters. A role measured the interaction of the two geographical units with Mexico's ALPs. The heterogeneity of professional placements in states like Mexico, Mexico City, Coahuila, Nuevo Leon, Jalisco and Guanajuato attest for the better performance of ALPs in the segment "ptPlacements". A fact, which links states with high industrial activity and clusters to offer placement opportunities to participants in Mexico's ALP related to professional job creation. A principal finding it also guides our analysis measuring the interaction of our geographical units for industrial clusters with the proxy variable "ptPlacements". This approach provides a further robustness check in our analysis. The latter led to determine these research findings as non-conclusive, thus rejecting H01 for HA1. A conclusion that in Mexico's case states that industrial clusters do not facilitate a better response to national level policy objectives. In section 5.1.2 in Chapter 5, this thesis tested the statistical significance of some random variables in our TSCS panel. As mentioned in the method section this approach measures the correlation from top to bottom and not across sections. This beginning approach to Ordinary Least Square univariate regression analysis showed a strong correlation between our dependent variable "gdppesos" and population growth. A key finding lining the population growth in Mexico's central regions with the growth of GDP during the prescribed period.

The findings also proved the correlation of Triple Helix, and Traded clusters as showing a positive correlation with the growth of this study's dependent variable "gdppesos". While showing Triple Helix cluster as having a better impact in promoting GDP growth. In terms of exports from these two mentioned ecosystems, the results showed a positive correlation in promoting higher export growth. The findings reveal Triple Helix showed the highest correlation in fostering higher exports in terms of USD value. This finding coupled with the strong correlation of Triple Helix in promoting higher GDP growth figures validates Mexico's necessity to adopt stronger policy reforms to promote an increase in knowledge-driven activities. When measuring the impact of the Triple Helix cluster on the country's total employment, these findings showed little correlation of these ecosystems on improving Mexico's overall employment. These findings speak to the following two situations; (1) the country's high levels of informality; (2) the lack of education in Mexico's labour force and; (3) the beginning state of Mexico's knowledge-driven ecosystems. However, the findings observing the correlation of Traded clusters and Mexico's total employment showed better results. A more positive correlation which based on this research findings suggests living in the following factors; (1) the demand for lower levels of education (2) low value-added manufacturing activities among Mexico's traded clusters, (3) the lack of technology and training. In terms of formal employment, the correlation between formal employment and traded clusters showed to be stronger than with the triple helix. These findings corroborate Mexico's manufacturing sector dominance as the biggest source of formal employment in the country. An industrial sector that despite technological advances and high-tech clusters, thrives by outsourcing and low-value-added industrial activities throughout all regions.

Concerning the effectiveness of ALPs using this OLS approach the most successful segment of these "active" employment initiatives relates to basic level job competencies. The correlation between the variables "ccourses" and "cplacements" showed to be the strongest among all ALPs' segments. It meant that participants getting basic job training in entry-level competencies through Mexico's BACATE program. Have a high probability of being placed in jobs at an entry level or in low value-added manufacturing activities. The above-stated findings led our initial OLS analysis to see the correlation of some proxies for Active Labor programs with Traded clusters. The findings showed not a significant correlation between industrial clusters and the proxies for ALPs. The variables

“ccourses” and “ptPlacements” suggested at this stage not a significant relationship between cluster and ALPs. However, this section of the linear analysis found a correlation between the variable “allocations” representing central government funding in key development areas such as the basic infrastructure, education, and training and Mexico’s GDP. A finding which seemed to validate our second hypothesis linking changes in GDP with increased levels of federal funding. It points to the country’s propensity to experience intermittent levels of government funding due to adverse changes in GDP. This latter finding suggests a positive correlation between GDP fluctuations and the country’s institutional weakness.

The multivariate OLS approach in section 5.1.2 pooling different random variables from our TSCS data validated the positive correlation between GDP and Triple Helix clusters. At the same showing that “ptPlacements” as part of Mexico’s professional “active” Labour measures do not carry a significant impact on GDP growth at the national level. A finding which speaks to the institutional weakness of this segment of Mexico’s ALPs and calls for a stronger human capital development strategy to promote higher levels of employment and economic growth. Using the variable “funding” in function to the ALP proxy “ptPlacements” the findings also showed a negative relationship which shows the country’s lack of sustain levels of central government funding in further promoting stronger ALP initiatives. The last step in the multivariate OLS regression analysis used the variables “cplacements” and “ptPlacements” as dependent variables testing for the impact of FDI, GDP, and formal employment on these two ALPs proxies. The results showed no significance or positive correlation between FDI, GDP, formal employment and the mentioned ALPs segments. All which speak to Mexico’s institutional weakness as it relates to these programs and the significant promotion of economic growth derived from “Active” employment activities.

The next step in the hypothesis testing used an OLS linear approach measuring the standard deviation of variables representing levels of central government funding during the prescribed period. We regressed the variables “contributions” “funding” and “allocations on our dependent variable”GDP" pesos. The findings showed a very significant correlation between our dependent variable “gdppesos” and the different funding variables. Hence, validating the impact of GDP volatility on the government’s ability to sustain adequate levels of funding. This finding points to the assumption that Mexico’s GDP volatility contributes to irregular government funding on key development areas thus validating the country’s institutional weakness. Hence, validating the second hypothesis H02 governing this research.

The Time-Series-Cross-Section analysis in Chapter 5, using Beck and Katz “panel corrected standard errors”, and Driscoll and Kraay “Robust covariance matrix”. It tested the interaction of the two proxies for industrial clusters Triple Helix and Traded clusters with all the proxies for ALPs. The aim was to measure the impact of this interaction on the growth rate of GDP using the variable Log “gdppesos” as the dependent variable. Besides test the impact of a wide range of control variables on the growth rate of GDP. This first analysis using the above-stated estimation methods did not yield significant results on the interaction of clusters with ALPs. A finding which at this stage could not validate the institutional role of clusters in supporting ALPs at the national level. Therefore, rejecting H01 as the null hypothesis governing this research inquiry in favour of $HA1$.

Section 5.3.2 of the present chapter showing the cross-section analysis only showed the positive impact of the growth rate of employment variables on the growth rate of GDP during the period of analysis. It highlighted the relevance of formal employment in promoting GDP growth. A finding, which with Mexico bring the following key suggestions. (1) stronger ALPs to promote higher levels of formal employment; (2) including ALP within the wider industrial framework; (3) the need for higher levels of education and; (4) an augmented competitive dimension. The latter a key element

that in this analysis presents the model guiding this scholarly enquiry. Step-three in section 5.4 as a final step checking for robustness in our analysis. It examined the supporting role of our two geographical units for industrial clusters with the variable "ptPlacements". The first set of findings observing the above-mentioned interaction at the national level yielded much more significant results. However, these findings showed inconsistency across the coefficients from the different estimators and the p-values did not be within the 5% levels of significance set as a threshold for this study. Therefore, at the national, and northern regional level rejecting our null hypothesis H01 as part of this study. In the northern regions, the geographical unit Traded clusters showed to have a higher level of significance in the support of "ptPlacements" than Triple Helix clusters. However, these findings also showed inconsistencies of the coefficients across the different estimators used and the p-values were outside the threshold governing this research. A fact, which also declares H01 as it pertains to Traded clusters rejected.

Although, the latter findings showed to be inconclusive to validate H01 using our two geographical units under analysis. These findings are relevant because they speak to the Traded clusters' dominance in the northern regions. This strong position is influenced by US value chains and guided by low value-added activities. It also speaks to the manufacturing sector dominance in this region represented by the higher number of Traded clusters in relations to Triple Helix agglomerations. However, in the grouping of states where there are at least two Triple Helix clusters and fifty-five Traded clusters. The findings showed knowledge-driven ecosystem having a better supporting role when interacting with "ptplacements" as a proxy for professional placement activities. The findings from the Robustness check looking at the group of states where the two geographical units for industrial clusters are present showed significant results. These results spoke to Triple Helix agglomerations in helping bridge the institutional void in Mexico's social programs. These findings looking at Triple Helix and "ptPlacements" showed consistency across three of the GMM estimators used. It also showed levels of significance within the 5% level set for this study. Therefore, hinting to validate H01 as the null hypothesis when examining only states where the two geographical units are present. However, the low R-Squared in these models and our previous findings lead this research to reject H01 in favour of HA1. The findings from our empirical analysis testing the interaction of industrial clusters with ALPs show signs that might validate this thesis's argument of clusters as institutions of regional economic development. In what pertains to Mexico's case, the data findings dictate that although this research found some promising findings, these are not conclusive as to validate the institutional role of clusters in facilitating a wider regional policy response at the country level. The findings from the robustness check performed by this study demand further research beyond this introductory analysis. However, these findings present a unique combination in terms of the analysis used while showing promising signs for the institutional role of the geographical units in question. Last, the institutional role of industrial clusters could bring synergy to national and regional competitive objectives.

The lessons learned as part of this study spoke to the factors limiting economic and regional development in an emerging economy like Mexico. An economy that although exhibits features of an advanced economy at the macro level of analysis, it also experience sharp regional disparities that hinder the country's national level competitiveness. Also, limits the country's ability to further integrate into the global value chains, create a better policy alignment, and have national level policies with a broader and more homogeneous regional response. The latter, an area where industrial clusters as seen in this study exhibited promising institutional features that call for further research around this topic. At the same time suggesting that industrial clusters could act as institutions of regional economic development in providing a better regional response to national level policy objectives. The next section as part of this thesis presents the limitations faced in undertaking this

introductory research analysis. It will present challenges faced when collecting the data and some institutional concerns related to the accuracy of the data and reporting.

6.2 Research Limitations

The limitations of this analysis are a few and some relate to what this research considers as the nuance of this topic. Nuance within the debate of industrial clusters and these ecosystems' institutional role in supporting government social programs. Also, in the way, industrial clusters as institutions could as previously stated facilitate a better regional response to differences created by national level policies. The last twenty-five years of the scholarly debate around international competitiveness has seen a wide body of literature on the supporting role of institutions in supporting clustering activities. The role of institutions whether public or private have played a key role in supporting industrial agglomerations activities and also to promote knowledge and technology-driven activities in diverse industrial sectors. The debate has also extended to the institutional role academia play in supporting knowledge-driven activities within clusters and the impact these activities have had in the area ranging from the firm's capabilities, recruiting to knowledge transfers(Braunerhjelm and Carlsson 2003; Dahms 2003; Parto 2008; Perez-Aleman 2005; Porter 1998). However, this study did not find much literature on the role clusters could play as institutions in emerging economies like Mexico as the focal point of our analysis.

The lack of scientific scholarly enquiries observing the interaction of industrial clusters with government programs presented challenges related to data selection. Concerning the data, this research intended to collect financial information pertaining to the different proxies for ALPs in Mexico across all the states and over time. This research undertook a close examination of the different governmental archives from various agencies such as the INEGI, and the Ministry of Labour in Mexico. This research determined financial data over the prescribed period was not available as a currency value. The only information available pertained to the different proxies or segments of Mexico's ALPs related the number of scholarships, and placement activities across the different "Active Labour" segments. On the total number of scholarships paid with federal funding for each program segment and across each state over the prescribed period. In addition, this research also collected data on the total number of job seekers placed after taking part in the different ALPs segments. Another area which this research sees as a possible limitation relates to data reliability and reporting. It is important to keep in mind that Mexico's institutional environment lacks transparency or the right institutional checks and balances which to an unknown extent might have permeated the data collection and reporting process.

Considering the encouraging but no conclusive results obtained from this introductory inquiry on the institutional role of clusters. This research considers the time constraints a limiting factor which to an unknown extent might have affected the quality of the data obtained for this study. A more extensive data collection process with more active involvement from a PhD researcher from Mexico's industrial sector could have allowed this study to be more granular about the data collection. The latter limitation not only opens the door for further research on this topic at the doctoral level but also encourage future researchers to be more granular about the data collection process. Another, limitation of this study relates to the wide distribution of the variables across time within a dynamic panel data structure. A fact, which might have yielded significance levels represented by positive p-values and a negative coefficient in the model regression output. This research substantiated why a dynamic panel model makes the right choice as the main data structure for this inquiry's robustness check. However, data panels also present issues when economic data do not generate

from control experiments where variances in the random variables' distribution are accounted for. All which at time s might lead to a "heterogeneity bias". Last, another relevant limitation pertains to how this study measure clusters; here represented by the two geographical units selected for this inquiry. Industrial clusters have a wide-ranging latitude of definitions all which vary across industries, regions and countries. Although, this study based its analysis on the importance of knowledge-infused activities, and the institutional role of clusters considering the chosen geographical units. Future research can observe the institutional role of industry agglomerations using more than two geographical units to measure agglomeration activity. Moreover, a closer inspection of the different types and industrial agglomeration activity and these concentrations' institutional features. It will provide more in-depth knowledge of how these various ecosystems by definition facilitate a level of regional response to national- level policy objectives. The next section of this thesis will touch the areas where this scholarly inquiry can set the basis for further areas of research around clusters, regional development, policy responses and emerging markets.

6.3 Further Areas of Research

The literary evidence and the empirical analysis conducted by this research spoke to the disconnect between national and regional policy objectives. It has also validated the impact of GDP fluctuations on the country's institutional strength. The latter a correlation affecting the institutional strength of social programs related to human capital development strategies here represented by Active Labour Programs. This introductory inquiry has shown positive but have not yielded conclusive signs of the role of clusters as institutions facilitating a better response to wider national level policies across Mexico. The observations from the results observed as part of the robustness check showed a positive interaction of the geographical units with the ALP proxy for professional placements. The findings from the system GMM show that clusters as institutions could fit the institutional role proclaimed in this study thus facilitating a better response to national level policies. The above results opening the door to further inquiries on the topic in other emerging economies while also calling for further research inspecting the same scope of analysis. The call for further research could evaluate the interaction of ALPs or other government programs with industrial clusters in other emerging economies like Brazil or Chile. The relevance of Brazil and Chile could expand on this thesis unique contribution as these nations also show high levels of industrialisation that as Mexico also exhibit features of developed economies (Sarturi and França Vargas 2014). In fact, Chile is a pioneer in implementing Active Labour programs as a social program to reduced unemployment and develop human capital (Ibarrarán and Rosas Shady 2009). The analysis of Chile's industrial clusters and their institutional capabilities in helping improve the regional response to wider national level policies is worthy of analysis because:

- The country's market liberalisation trajectory
- The country's economic progress is like Mexico's trajectory
- The country's regional disparities in a national context that exhibit economic growth in certain regions with higher levels of industrial activity.

This thesis has evidenced how within industrialised regions intra-regional disparities reflect the reality at the national level. A further area of research can assess how less developed states within industrial regions with the regional presence of regional Triple Helix clusters can have better response outcomes. The latter is improving these less developed states' responses to national policies when compared with regions without Triple Helix clusters. This last proposed area of research could see a cross-regional, multi-country inspection collecting regional data from various countries and

their regions with and without clusters agglomerations. All to assess how these countries' regional responses measuring the interaction of clusters with government programs vary across different emerging economies during the same period of analysis. The relevance of this expanded approach could further yield more policy insights in the supporting role of clusters as institutions. It could also link the design and implementation of ALPs as a human capital development strategy. With, a better regional response from the interaction of clusters and government programs in less developed regions. Last, but not least, previous research in international development has linked the success of liberalisation policies to higher levels of foreign direct investment. The latter and the former linked to pre-existing levels of industrialisation as a factor of success. Another area of research can inspect how the emerging country's pre-existing industrial capacity before implementing structural economic reforms shaped the country's approach to ALPs. Last, the analysis put forward by this introductory contribution could further tests to the institutional role of industrial clusters in supporting other types of government programs. The relevance of this approach could expand on this introductory analysis by expanding the knowledge on the degree industrial clusters can provide institutional support to other areas of national level policy. The next section will highlight important areas in terms of policy implications and considerations around the topic of industrial clusters and regional economic development.

6.4 Policy Implications and Recommendations

The topic of clusters and industrial specialisation as a driver of economic growth has been an area of debate since the early 19th century. Michael Porter and other academics have positioned the debate around clusters as one resulting in many policy deliberations (Hernandez and Montalvo 2012). These policies have been categorised by a push toward the liberalisation of markets, improving the business environment, higher engagement of business sectors in matters of industrial policy and adopting macroeconomic stabilisation policies. Likewise, encouraging tax policies, savings and basic R&D combined with the support of colleges and universities (Porter 2007). However, these policies are merely designed to enhance competitiveness at the federal level whilst not promoting inclusive regional economic change. This lack of inclusiveness constricts the development of human capital. This reality leads to the concentration of industrial activity around the wealth and output of regional champions. In Mexico's case, we have seen these policies benefiting the economic performance of certain regions, firms, and key industrial segments.

The literary evidence within this analysis of Mexico's industrial agglomeration patterns found the need to place key importance on the development of regional assets, industrial clusters and stronger human capital development strategies. All the previous elements are a key necessity for Mexico in adopting a stronger institutional policy response around the notion of social programs that could be industrially driven in scope. In fact, the weak institutional role ALPs play as social programs in Mexico's regions is confirmed in this research and implies that these programs in the Mexican context could improve if they have dual intent. If designed with dual-intent, this would bring these initiatives into the realm of what could be defined as "industrial active policies". This fact allows this thesis to advocate for the inclusion of ALPs as part of the country's wider industrial policy framework. An augmented dimension that could foster regional assets in industrialised regions while creating "regional assets" in less developed ones. This fostering of regional assets would help a more proactive policy engagement in promoting higher levels of education, technical training, technology-driven activities, and stronger market labour policies with a long-term vision need to be central in Mexico's economic growth policy. This research posits that only through

policy improvements in the previously stated areas Mexico could see positive competitive outcomes in the following areas; (1) a more knowledge-driven labour force; (2) an increase in industrial agglomerations; (3) higher levels of regional growth and; (4) a stronger institutional role of clusters in supporting government programs. All combined aspects which have suggested in our competitive model would result in higher levels of national level competition and less regional disparities.

Sustaining and upgrading "regional assets" need to be a policy priority for Mexico if the country aims to sustain and upgrade its competitive advantage in an ever-changing industrial landscape (Hallward-Driemeier and Nayyar 2017). The world bank's report discussing the need for emerging economies like the Mexican to migrate into higher level technical activities. Calls for Mexico to adopt a centralised policy regionally in scope which could facilitate better policy coordination at the central and state level. Higher levels of coordination in matters of economic, education and industrial policy could see benefits ranging in a higher allocation of resources from the federal government to a more unified policy approach in terms of economic policy. Other benefits could be the engagement and participation of international organisation and key multinational conglomerates. The participation from international organisations and the multinational business sector could lead to institutional initiatives aimed to facilitate the transfer of knowledge. The latter aspect facilitating the transfer of pieces of information across the different structures of governance the global, the state and the regional. The previously key discussed aspects are something that Mexico is lacking primarily due to the following factors; (1) a decentralised industrial policy; (2) the absence of sustain levels of central funding; (3) the regional champions effect where wealthier states are better positioned to capture more federal resources and; the lack of deeper integrations into the global value chains.

This thesis has evidenced Mexico's regions obtaining part of their central funding through a federal incentive transferred to the states based on the state's economic performance. This thesis' empirical findings showed the highest variation regarding this type of central funding during the prescribed period taking place in the central regions. All areas where economic performance has been strong in terms of industrial activity and industry agglomerations, GDP growth and population. A fact, which not only speaks to the regional champions effect as discussed by Michel Porter when analysing industrial development in the context of regional disparities. It also suggests that Mexico could benefit from having a much more redistributive approach in terms of fiscal policy to promote more sustained levels of economic growth in less industrialized regions. A similar policy approach has been in place in countries like Canada which have a federal equalization payment policy. In Mexico, a similar approach could see the central government making payments to the less developed states as to equalize the state's fiscal capacity. Less industrialized regions have a constrain capacity to received money from taxation, and a similar policy initiative could help less developed Mexican states reach higher investment capacity in critical development areas such as education, health and infrastructure. All these three areas addressed by the literature and this thesis as key drivers of regional development and ecosystems of industrial agglomerations.

As posited by the Organization for Economic-Cooperation and Development (OECD), Mexico needs to attain higher levels of funding in areas of tertiary education (OECD, 2015). The data collected for this thesis showed the country lacking investment in this area compared to other advanced European like the Nordic countries (OECD, 2017). Spending more in education could allow Mexico to have a more solid foundation for a stronger more knowledge-driven labour forced. A more inclusive approach to education could provide workers in low-value-added manufacturing activity the possibility to migrate into higher value-added industrial activities. A situation which could further increase the agglomeration of more knowledge-driven industrial activity thus creating

more employment opportunities for Mexican in all regions. An increase in the funding of tertiary education needs to be accompanied by stronger primary education policies, vocational programs and research and development activities with higher involvement from the central government (IMCO 2016). This thesis has noted the disconnect that exists between the national level policy objectives and Mexico's regional realities. More specifically the regional realities of less industrialized regions in the South. The macro-economic measures adopted by the federal government has concentrated federal resources in the central and northern regions, an event which has translated into higher levels of foreign direct investment in these areas. In fact, the central and northern regions concentrate an average of 60% of all the FDI influx in the country as per the literature viewed for this analysis.

In Mexico's case, we have seen that economic policy has enhanced the country competitiveness at the macro-level. All aspects which for Mexico has brought rising levels of foreign direct investment, rapid growth in GDP, and increased levels of industrial activity. All led by an increasing liberalized economic policy agenda (IMCO, 2016). One, where market openness and structural reforms dominated our prescribed period of analysis. However, as covered in this research with progress Mexico also experiences high levels of inequality and marginalization due to very limited industrialization. It is also challenged by the country's lack of education, infrastructure, and high levels of informality across all regions. Employment informality is one of the elements more present in regions that are less industrialized due to the lack of effective capital development strategies. In addressing employment informality, Mexico should promote reform its labour market making it more flexible and less bureaucratic. A fact, which combined with further reforms to the country's ALPs to be more industrially driven. It could reduce the levels of informality thus helping to reduce income inequality at the same time promoting higher wages (IMCO, 2016). The reforms to Mexico's ALPs could have as a principal objective longer training periods, a much more defined management system, and constant training programs to update worker's knowledge and skills in technology-driven industrial activities. In brief, a long-term strategy for Mexico it would be having longer training periods, more labour market flexibility, combined with moderate packages of assistance to workers (Marklund and Rollnik-Sadowska 2016).

The literature review touched upon the seven pillars where industrial agglomerations have had a positive impact. Some of these pillars relate to agglomeration economies, knowledge, productivity, efficiency, competitiveness and socio-political dynamics (Hernandez and Montalvo 2012). An example of the socio-political dynamics can be observed in some industrialized states in the north such as Nuevo Leon. This state pursues its own industrial policy agenda, creating government incentives to promote industry creation. Also, enacting knowledge driven policy initiatives which seek coordination and integration across public, private and academic institutional actors. (RVCNL 2018). These policy positions have given the state higher levels of competitive advantage over less industrialized regions. It has also as shown in this report given this state the highest levels of economic growth during the period while concentrating the highest numbers of industrial clusters here represented by the geographical units of analysis Triple Helix and Traded clusters.

Mexico could benefit from having a centralized regionally driven industrial policy one which promotes coordination by having a state and federal government in a partnership to seek integration across public, private as well as academic institutional actors. The previously mentioned as part of an augmented dimension which at the national level would have ALPs as an industrial but also social program. One which could help improve "regional assets" across all states while having the institutional support of existing and growing clusters in the country. All which could lead to better education, higher levels of skill, better infrastructure, increase productivity and less regional disparities in Mexico. Last, the promising signs provided by the robustness check using the System

(GMM) in relation to Triple Helix clusters in cluster regions. It shows that a set of policies related to the promotion of knowledge, skills and innovation around clusters in less developed regions. All might serve as policy instruments to mitigate in these regions the difference created by national level policies. Hence, promoting a more homogeneous regional development while promoting higher levels of national level competitiveness regional in scope and global in outreach. In the next two sections, the closing arguments and conclusion. This master's thesis summarises the course of this research as we described it at the outset of this inquiry in Chapter 1. Likewise, at the same time outlining the different steps taken as part of this enquiry to conform with the scholarly intentions and objectives set by this research.

6.5 Closing Arguments

To close these research objectives of testing the institutional role of industrial clusters facilitating a better level of regional response to national level policy objectives. It was an scholarly intention designed to build on the literature covered as part of this inquiry, also to bring nuance to Michael Porter's definition of international competitiveness. It not only ratified the place of industrial clusters as fundamental elements of economic growth and regional economic competitiveness. It also partially validated our argument advocating for the institutional features of industrial clusters in contributing to close the institutional void present in emerging economies through social programs. Key important findings that as an introductory inquiry opens the door for further research on the topic using other Latin America economies as an example. This study showed how Michael Porter's analysis has contributed to placing industrial clusters at the centre of a new regional competitive reality. One which has centred the debate along regional dimensions where regional disparities showed to be a hindrance for economic growth and increase competitiveness. (Keefer and Knack 2008; Ketels 2003; Porter 1990; Porter 1994; Porter 1998; Porter 2000). As it was set in the scholarly intentions of this thesis covering further literary contributions on international competitiveness and clusters in the regional context. It highlighted important elements such as the necessity to bring alignment between national level policy objective and regional realities thus promoting higher levels of competitiveness and a more inclusive regional development (Ketels 2003).

The above-mentioned with the purpose of setting the foundation to inspect Mexico's forms of regional economic development and the country's industrial agglomeration patterns; All of which have been determined by this study to take place in a context of marked regional disparities where we observe regions highly industrialised while others disenfranchised and marginalised. Through the literary inquiry, the lessons learned highlighted how important industrial clusters are in facilitating GVC linkages. We learned important lessons about the role of clusters in less developed nations, and the liberal reforms upholding economic instability in Latin America. More specifically, the challenges Mexico as a focal point of this study faces in sustaining the country's economic growth in times where knowledge-driven industrial activity form a key aspect of the ever-changing competitive landscape. Furthermore, this research has shown how in the Mexican context the literature by Stiglitz presents the volatility of GDP as a chief cause promoting marked regional disparities, and the country's institutional weaknesses (Stiglitz 2003; Stiglitz and Ocampo 2008; Stiglitz 2000). An institutional dynamic represented in the country's weak social programs and policy objectives. A reality where not all regions have the same level of response to nationally centred policy objectives as it has been inspected throughout this research.

The paradigm shift guided by Michael Porter's work on industrial clusters observed within the Mexican context led this research to inspect further regional competitiveness literature. This literary

evidence called for an alignment between GVCs, national level policy, and regional necessities to strengthen the countries' growth potential (Humphrey & Schmitz, 2000, 2002; Messner,2004; Nadvi & Schmitz,1994; Stiglitz, 2000). A proposed reality that in Mexico faces key challenges like the lack of skills training, education, and high levels of informality, Not to mention a fragmented industrial policy evident in the disconnect between Mexico's national industrial objectives and the country's regional industrial policies. This truth is validated by this research with a higher level of accuracy in southern regions than in the northern states where we find higher levels of economic growth and industrial agglomerations. These northern regions as validated by our study are better positioned to capture more funding from the central government. Transfers which go to these industrialised regions as a contribution incentive for these states' contribution to the nation's economy.

Michael Porter's work on clusters and the impact these ecosystems have on fostering national-regional competitiveness as well as other literature sources cited-above led this research to consider the World Economic Forum conceptual framework on competitiveness as one divided by two fundamental forces; one institutional driven and the second by development factors. All these elements according to our analysis have had a direct and indirect impact on the country's level of education, thus limiting or fostering Mexico's capacity to innovate. Moreover, having a direct impact on the countries' ability to maintain a high level of technological readiness (Ramoniene and Lanskoronskis 2011). This thesis showed the World Economic Forum's definition of competitiveness pointing at education, training, and labour market efficiency as factors impacted by institutional elements; all serving as the departing point to frame this research in the context of clusters as institutions of regional development and the interaction with policy elements such as Mexico's social programs. In addition, key literature sources like the one by Camagni and Capello 2013, setting territorial capital as being knowledge-driven and the key precursor of industrial agglomerations in the regional context further validates the main scope of this analysis.

The importance of regional assets driven by knowledge, skills and education led this thesis to look at ALPs as part of Mexico's social plans which resulted in this research main scope of measuring the impact industrial clusters have had on supporting the role of active labour initiatives in Mexico's regions. This scope of analysis is guided by the previously stated literary sources placing education as a key factor in the promotion of industrial agglomerations. However, it was also inspired by the Japanese approach to the industrial policy where the inclusion of active labour initiatives within the broader industrial context is central to the country's competitiveness (@ Martin and Grubb 2001). A key finding further providing inspiration for our scope of analysis and the literature driven model which framed the basis for this research and further contributions. To the aforementioned is relevant to add the literary inspection of how ALPs have contributed to advanced the human capital development strategies in key European economies. Hence, pointing to the institutional elements of these programs in countries such as Germany and the Nordic region. In fact, as previously covered in the literary review these countries have reduced unemployment through these programs, promoted industry growth in moments of exogenous economic shocks, and promoted higher wages in areas where these programs are implemented (Calmfors 1993; Fredriksson 1999; Neubäumer 2012; Rinne and Zimmermann 2013; Spermann 2015)

This research explored how globally interconnected the world is today, a reality driven by improvements in communication, transportation and logistics. A paradigm shift leading economies to be more liberal and interdependent while fostering new industries in less developed economies (De Grauwe 2010; Moon 2000; Porter and Advantage 1985). All of which with Mexico increased in cross-border transactions, foreign direct investment, and the formation of industrial agglomeration as ecosystems of productivity, efficiency and innovation. Ecosystems that in this research were

represented by the proxies "Triple Helix" and "Traded" clusters as geographical units in their role of supporting ALPs as a proxy for social programs. In this highly interconnected world, this research has covered how competition creates winners and losers. Two dynamics which are not only at the firm levels but also among competing regions and nations in the global economy, thus creating threats and opportunities due to exogenous factors (De Grauwe 2010). These threats and opportunities are of primary importance as two factors placing the regional debate as one of chief position in addressing the impact of globalisation. Mainly on development areas such as population, inequality, and economic growth where the competitive debate has gained a social connotation. An ever pressing reality, posing economic challenges while limiting levels of competitiveness and industrial growth at the national and regional level (BenDavid-Hadar 2013; De Grauwe 2010; Nissanke and Thorbecke 2010).

Another aspect which guided this research was the World Bank's report on "The Future of Manufacturing Led Development". The report covered essential aspects of productivity and innovation in the manufacturing sector in a world of rapid technological changes. These changes reinforcing the need to have a better policy response to education, skills and innovation. One, that can play a fundamental role in helping countries like Mexico cope with what has been named "The Fourth Industrial Revolution" (Nissanke and Thorbecke 2010). An industrial wave where Robotics, Artificial Intelligence, and systematisation is set to dominate the industrial landscape thus pushing industries even more towards knowledge-driven activities. This is important as emerging economies like Mexico that experienced economic growth due to the country's manufacturing activities. However, given the context of marked regional disparities, concentrated industrial activity, and lack of education and training fostering knowledge driven innovation activities, the country's gained progress and competitive advantage stand to erode if there is not a cohesive industrial policy which can promote further human capital improvements around knowledge-intensive activities.

This research has shown how this thesis path was set on Michael Porter's literature, the contribution of other scholars, and the necessity to view clusters as playing an institutional role. One, which in the context of Mexico as an emerging economy can be the formula to help this nation sustain and upgrade its competitive advantage in the context of an ever-changing industrial landscape. This research yielded positive but not statistically conclusive signs pointing to the institutional role of clusters in Mexico. At the same time, it opened the opportunity for further areas of research on this topic in other Latin America economies. This research report also provided the rationale substantiating Mexico as a focal point of analysis based on the following factors; (1) the importance of Mexico given the current political landscape; (2) its role in NAFTA; (3) the country's stellar industrial growth in the Latin America context; (3) and; (4) the need of emerging economies like Mexico to further promote education, training and skills to better adapt to industrial changes. It established the link between clusters, education, and institutional elements that are set to improve labour market efficiency. Therefore, substantiating the use of ALPs to measure how the role of clusters as formal and informal institutions can strengthen the role of these programs in Mexico and the country's industrialised regions.

What we have seen throughout this study is how the road map set in the introduction validates this thesis' intentions in the following key aspects: (1) it has uncovered Mexico's patterns of regional development (2) It has validated our assumptions on Mexico's regional inequality (3) proved the importance of the geographical units selected based on Mexico's increase of manufacturing practices and economic progress over the prescribed period of analysis (4) It has validated that volatility of GDP correlates the assumption of weak institutions in regional disparities. Last, despite positive signs pointing to the institutional role of the geographical units in supporting ALPs in

areas where these ecosystems are present. This research rejected $H01$ as the main null hypothesis governing this research at the same time that it validated H02 as the second null hypothesis linking GDP fluctuations as a source of the country's institutional weakness. To sum up, the first and second hypotheses bring the argument of clusters as institutions of regional development under the literature-derived model presented in this thesis. One, as a proposed framework which might help Mexico in the following ways; attained higher levels of competitiveness regional in focus and; experience more sustained levels of economic growth while mitigating the future impact of exogenous economic shocks. All outcomes which could lead Mexico other emerging economies to be better prepared to better cope the ongoing rapid industrial changes as postulated by the world bank in its report "The future of manufacturing led development" (Nissanke and Thorbecke 2010).

6.6 Conclusion

The roadmap for this master's thesis began by looking at Mexico's description of the factors fueling the country's progress in the analysis in Chapter 2. It not only further validated Mexico as a focal point of this study but also led us to look at the two geographical units "Traded Clusters" and "Triple Helix". Two industrial agglomerations which as mentioned depicted the importance of Mexico's manufacturing and technology sectors. In addition, to the new emergence of knowledge infused technology driven ecosystems. The description of Mexico's most critical industrial segments summarized the composition of the Mexican economy as a mixture of traditional industries and technology-driven ones. It confirmed the influence of US value chains in the patterns of industrial agglomeration primarily in the northern regions. An industrial agglomeration pattern which intensified since the signing of NAFTA with increase activities in the Automotive, Electronic and Aviation sectors. The findings show that Mexico's automotive sector has grown to account for roughly 3% of the country's GDP. The description of the country's industrial sectors highlighted the importance of the technology-driven industry segments that according to ProMéxico has enhanced the country's location advantages. Clustering activity is linked to the two chosen geographical units, and this link helps explain the increased economic growth in the central regions because of the development of technology clusters in the Aerospace industry.

The literature review in Chapter 3, concentrated on eight key sections validating the evolution and shift in competitive thinking. A paradigm as mentioned earlier in which the work of Michael Porter has helped to position clusters at the forefront of economic growth and regional development. Besides helping this research position the argument of industrial clusters as institutions for regional economic growth and improved national level competitiveness. The theoretical review of competitiveness showed the ideological tenets influencing the evolution of this contentious debate. It also unveiled the implications these tenets have had concerning policy design and implementation that according to scholars such as Stiglitz have led to wrong economic outcomes. The theoretical background also highlighted fundamental principles which led to significant contributions to precepts like the entrepreneurship, comparative advantage, and trade theory. These foundations permeated Porter's work on essential elements like the Resource-Based View, the Five Forces Framework, and Porter's Diamond. Porter's Diamond not only shaped the firm's strategic management but shed light on the internal and external factors that fostered industrial agglomerations.

The sections reviewing the empirical literature on clusters, and the importance of global value chains in the international competitive debate provided two lessons: First, it viewed competitiveness and clusters as the firm's engine in highly technical sectors. A precept which after Michael Porter's work on clusters, has guided the application of theory-driven models as seen in the literary review.

Second, it has placed the global value chains debate as one where improvements in communications, technology and logistics allowed better external linkages and deeper market penetration. The former and the latter factors where industrial clusters play a preponderant role in furthering the market as mentioned earlier pointing to the integration within the global value chains structures. A fact that according to the literature covered, it gave this study the foundation to position the argument of clusters as institutions of regional-national development. All as this research aimed to build on recent literature measuring the impact of Mexican industrial clusters on employment levels by measuring the supporting role of these ecosystems on the country's social programs. Primarily, in the programs promoting human capital development strategies across the various Mexican regions.

These factors are changing the paradigm on the global competitiveness debate along with the philosophical underpinnings for the development of industrial clusters in former undeveloped economies like China. This research brought this inquiry to inspect the state of competitiveness in Latin America. The literature implies that despite positive changes which have led to an increase in multinational industrial activity in the region, Latin America economies and the liberal reforms adopted by most of the region's economies have created a recession period marked by economic instability and stagnation. This local reality has limited the ability for these economies to foster investment in human capital, create knowledge-based economies, infrastructure, and innovation activities. This lack of fostering these vital elements is then further exacerbated by concurrent factors such as the high levels of informality, crime and corruption. Finally, regional development is furthered hampered by the disconnect between regional, national and global economic objectives, which creates and sustained the cycles of inequality.

The analysis of the progress and factors limiting higher levels of competitiveness in Latin America brought our analysis to Mexico as the focal point of this research. The literary findings affirmed Mexico's selection as the primary focus of our analysis. It unveiled Mexico's macroeconomic performance and the dominance of the country's manufacturing sector in its economy. An industrial segment of activity that since the signing of NAFTA has seen a surge in cross-border trade and industrial activity. This section highlighted the progress of Mexico's economy and the role of industrial clusters in supporting the country's economic growth in locations close to the US border and in the central regions. It also touched in the country's aggressive economic liberal approach from the onset of the 21st century until now. Several rounds of reforms have brought an increase in Mexico's location advantages and appeal as a place that provides substantial cost advantages for the US and other countries' multinationals.

The last two sections of the literature review touched upon ALPs; first, as a development tool in advanced European countries, Germany as an example and; second, in Latin America and Mexico where the approaches have varied. With Advanced European economies, it has attributed the implementation of these "Active" labour initiatives with making these economies more competitive while helping reduce unemployment. In Latin America, Chile is the most successful case and the pioneer in the institutionalization of these programs according to the literature. Whereas, in Mexico, these programs have undergone several reforms albeit existing since the 1970s. In Mexico, it transformed these ALPs initiatives to seek higher levels of engagement from the private business sector in the early 2000s. However, the most recent round of reforms adopted in 2014 with a push toward attaining higher levels of efficiency and productivity in the Mexican labour force. The latter an area where we thought the growing presence of clusters in the country could have had a positive impact in supporting these active labour initiatives throughout the country's regions. As mentioned earlier, the literary review of ALPs, these initiatives stemmed from the motivation taken from scholars like Stiglitz, and Camagni and Capello 2013. However, at the same time substantiate the

focus of these active labour initiatives as a critical element in answering the central hypothesis governing this research $H01$. A reality that also speaks in the literature derived model as ALPs can lead to regional economic change through institutionally stronger ALPs and two augmented national regional dimensions.

In brief, what evidenced through the literary sections of this thesis, is how sections one to three discuss the following two key aspects: One, the evolution in the international competitive thought which led to the paradigm shift in the competitive debate where clusters gained fundamental regional importance. Two, it covers the relevance of clusters not only at the firm level but also in the promotion of national, regional competitiveness. A dynamic which results according to the literature an alignment between regional, national and global value chains' structures. The latter and the former allowed this thesis to view clusters as formal and informal institutions of regional-national competitiveness. Section four and five framed the debate on Latin America and Mexico's factors limiting economic development despite attained progress. A reality where industrial clusters can play a primal role in not only fostering policy changes but also helping these economies support institutional human capital development initiatives through government programs. In addition, the institutional role advocated by this research as these ecosystems can exhibit institutional features allowing a better regional response to national policy objectives. Last, in sections six and seven, this thesis' literature review covered ALPs by building on the impact of these active initiatives in Europe. It touched on how these programs have helped these economies better mitigate external economic shocks. It also touched upon the various approaches and strategies as a policy part of the country's welfare and capital development strategy.

The descriptive statistics section in Chapter 4 described the two sets of data guiding the research. It also validated the volatility of indicators such as GDP and other indicators as the chief contributing factors to Mexico's inequality. While helping to answer this thesis second hypothesis. The TCSC practical strategy section examined the heterogeneity of various random indicators in the data panel across time and place. The findings helped validate assumptions guiding this research while uncovering the patterns of Mexico regional development as it pertains to clusters as industrial agglomerations. The hypothesis testing section began by using an ordinary linear square univariate and multivariate approach to test the statistical significance of the variables at play looking at the data panel from top to bottom. It then adjusted these linear models by using a "Cluster Robust Standard Errors" to account for perceived deficiencies in the ordinary linear models when applied to a dynamic data panel.

The method section in Chapter 5, used a quantitative approach using a Time-Series-Cross-Section data panel. A data structure approach which helped gather economic indicators for each Mexican state during the prescribed period of analysis of 2003 to 2016. It also gathered data on the proxies' concentration for industrial clusters as of 2016 across all the Mexican states. It gathered information on the proxies established for ALPs during the same prescribed period to validate or rejecting H01 governing this research. Also, to test the volatility of Mexico's GDP, and its impact on Mexico's institutional strength as posited by H02 the second hypothesis guiding this research. The method section covered the background, the methodological objectives, the data samples used, the analysis and procedures involved in testing the above-stated hypotheses. The literature derived model puts forward how changes in policy could provide an augmented national dimension where ALPs could play as an industrial policy element. Hence, helping to better improve regional assets and facilitating the supporting role of clusters on ALPs at the regional levels. A proposed reality that could have the following two benefits; One, the creation of industrial agglomerations in previous undeveloped regions as regional assets improved with the strength of ALPs and; two an increment of knowledge

infused industrial clusters across Mexico. Hence, resulting in a more similar regional development and having a strengthened capacity to mitigate better external economic shocks.

The Time-Series Cross-Section Analysis showed two estimation methods testing H01 at the national level. It measured the interaction of Triple Helix and Traded Clusters and the data proxies for ALPs likewise the impact on the growth rate of GDP. It showed these findings not being statistically significant, thus leading this research to refine the analysis and use other estimators perceived to be more robust. It concentrated this step in our Time-Series- cross-sectional analysis examining the interaction of Triple Helix and Traded clusters on the ALP proxy "ptPlacements". Testing the supporting role of Triple Helix and Traded clusters on professional placements activities as part of Mexico's ALPs. This approach narrower in scope tested the mentioned interaction at the national level and in two other data subsets. The subsets of data gathered are for the industrialized northern regions 1a and 2a, and for a sample group of states where there are at least two Triple Helix and fifty-five traded clusters. The estimation techniques used were Driscoll and Kraay and the generalized method of moments estimator: Arellano-Bond (1991); Holtz-Eakin, Newey, and Rosen 1988, likewise Blundell and Bond (1998) called "the system GMM". The aim of this approach was to test if the two proxies for clusters better support professional ALP initiatives in regions where clusters are more heavily concentrated. The regression output on the second step using the GMM estimators was adjusted by bootstrapping the output results to account to perceived deficiencies in the two's application above-mentioned estimators as the number of observations decreased across the different panel data subsets.

The conclusion of this master's thesis shows how this inquiry began as an exploration wanting to uncover the patterns of Mexico's regional development in industrial clusters. It led this research to examine closely the factors fuelling the country's progress but also revealed the challenges limiting industrial growth in increasing more industrial agglomerations or clusters. The latter a key driver that as postulated by this research can have a significant impact in promoting a more homogeneous regional development where all regions in Mexico and the country can have better integration into global value chains. We have seen throughout this analysis how the literature guided the research by leading us toward looking at international competitiveness as a paradigm constantly in motion. One, where the work of Michael Porter and other scholars cited have touched on the importance of industrial clusters as ecosystems bringing synergy to regional, national and global economic growth objectives. The literature also led to the inspection of different notions of competitiveness where education and skills training take primary importance on improving regions' industry agglomeration factors. The previous literature on the impact of GDP volatility on government social programs led this research to look at the role of ALPs in promoting human capital development. A theme which not also served as a foundation for this study, but it was also partially validated by recent research examining the impact of the industrial cluster on Mexican employment levels. Hence, leading this inquiry to examine the support of clusters on ALP initiatives in Mexico and then in the country's industrialized regions. The latter an important and novel contribution to the debate around clusters in emerging economies. Also, in the position, this scholarly enquiry has taken of looking at clusters as institutions facilitating a better regional response to national level policies in less developed areas.

The presentation of findings, limitations, further areas of research, and policy sections in Chapter 6. It first presented an overview of the findings from the quantitative methods used to test this thesis main hypothesis. Second, it presented a broad analysis of this thesis's main literary findings, and, observations from the TSCS empirical section and the descriptive statistics. It highlighted key observations from the results of the linear models, the Time-Series-Cross-Section analysis and robustness checks as part of this study. The limitations highlighted the challenges faced by this

research pertaining to the lack of consistent data availability pertaining to some data indicators. It also pointed to the possible changes in this analysis since the lapse of the prescribed period of analysis. It also touched upon the areas where possible scholarly analysis might serve the purpose of deepening our understanding of clusters in the Latin America regional context. Besides suggesting how a multilateral policy framework where ALPs as part of an augmented national and regional dimensions can help other economies in the regions close the gap of regional disparities. At the same time promoting a more homogeneous industrial and economic growth as postulated in the literature derived model presented as part of this research.

The policy implications in section 6.4 and the recommendations built on the broad analysis of this thesis' findings. It touched on key literature sources which served as a pillar of motivation to create the research questions and hypotheses. It also presented and highlighted the relevance of the literature-derived model presented while bringing other relevant findings observed during this inquiry. The policy section commented on how these observations relate to policy implications and possible recommendations which might lead to improved economic outcomes. All of which might help Mexico and other economies in Latin America fulfil their institutional void while helping clusters play a stronger role as institutions of regional development. It also suggests for Mexico and other Latin America economies to undergo further institutional change and reforms which could facilitate a better more centralized and regional in focus industrial policy. A suggestion which just as with Japan could see the including ALPs in the country's industrial policy to improve skills, promote innovation and attract new industries. All factors which not only would strengthen the role of clusters in areas where industrial agglomeration concentrates in these ecosystems, but also contribute to the agglomeration of industries in regions devoid of these industry agglomeration patterns.

What this enquiry has shown is how the literature inspected helped frame this research argument of clusters as institutions of regional-national economic growth and competitiveness. The databases used for this study facilitated uncovering the regional dynamics governing Mexico's economic growth as it pertained to clusters, regional champions, ALPs, and the country's regional disparities. The model proposed derived from the literature postulated in section 3.9 set a framework that can help improve the interaction between clusters and ALPs by improving regional assets and suggesting two augmented dimensions as earlier mentioned. It also explains why this thesis rejected H01 in favour of HA1 thus opening the door for future studies testing the institutional role of clusters in supporting social programs. Last, this research validated H02 as the null hypothesis governing our second research question. A second finding dictating that Mexico's GDP volatility contributes to irregular government funding on key development areas, and social programs thus pointing the country's institutional weakness.

Last, Mexico's institutions are strengthening, but the regional disparities, the disconnect between the national and regional policies remain an issue creating a lack of response to wider national level policies in less developed regions. These regional developmental issues as showed by this master's thesis could see in industrial clusters organisations the potential to act as institutions of regional development. Therefore, improving the level of response to wider national level policies in less developed regions. Clusters are institutions that promote regional growth may be a way for Mexico to escape the poverty trap that other less robust economies often experience. Should national and regional policymakers use industrial clusters to bridge the gap between their policy goals and develop better coherence, sustainable and stable growth should be easier to achieve. Mexico is on the cusp of becoming a more stable country, a goal possible to achieve by using industrial clusters to promote industrial development and institutional strength in less developed regions. Aligning

national, regional and global Aligning national, regional and global realities to create sustainable growth through industrially driven human capital strategies, industrial agglomerations, and two augmented competitive realities. All interrelated factors that propose the contributions postulated by this master thesis, thus conforming with the scholarly objectives set out at the outset of this scholarly inquiry. At the same time bringing relevance to the objectives and themes discussed in this thesis as an initial introductory inquiry within the international competitive debate in emerging economies.

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Figure 66: Appendix 1.1:The Following Map Frames Mexico's territory in Five Electoral Regions. Source: INGEI

Appendix

Graphs & Tables of Appendices 1.1 to 2.3

This research appendix contains supplementary material that is not an essential part of the text itself but which may be helpful in providing a more comprehensive understanding of the research problem or it is information that is too cumbersome to include in the paper's body.

The Map of Mexico's electoral regions shown in Appendix 1.1, provided this thesis with the framework to view the regional patterns of economic growth over the prescribed period of analysis. Also, the trends in the industrial agglomeration patterns as these relate to the two types of geographical units under analysis.

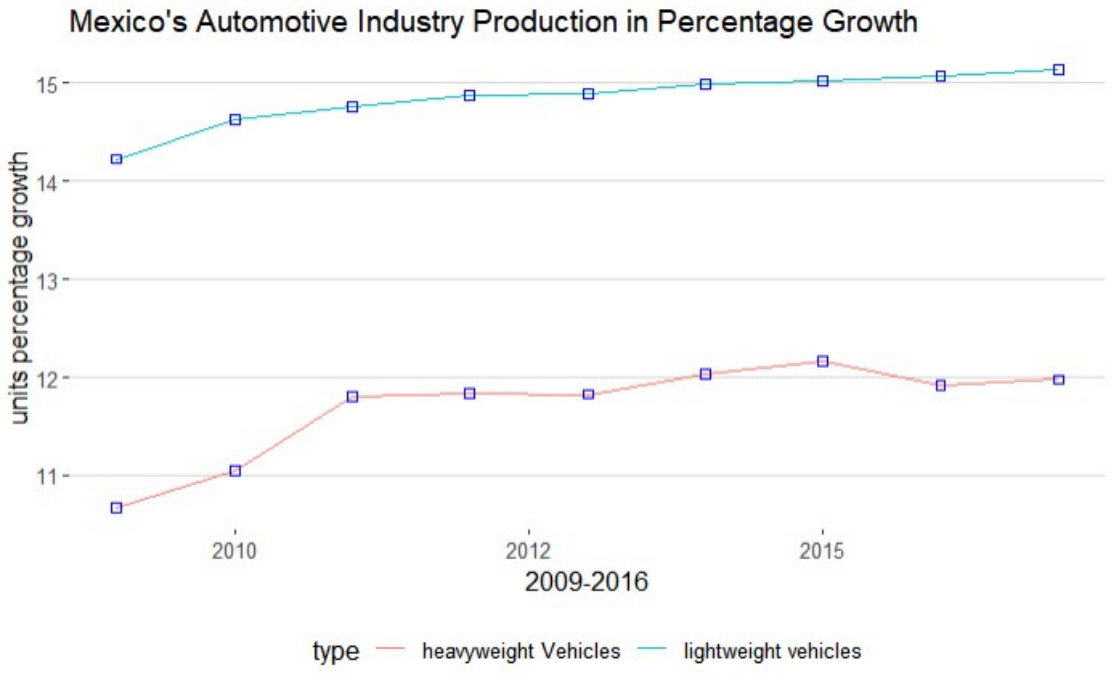

Figure 67: Appendix 1.2: Percentage Growth in Production of the Mexican Auto Segment

Table 25: Regional Concentration of Triple Helix Clusters per Region Code (Appendix 1.3).

State	idSectoral	Number of Triple Helix
Aguascalientes	2a	7
Guanajuato	2a	2
Nuevo Leon	2a	12
San Luis Potosi	2a	2
Queretaro	2a	4
Zacatezas	2a	1
Cohuila	2a	2
Tamaulipas	2a	1
Oaxaca	3a	2

Table 26: Key Automobile Clusters & Number of Member Companies (Appendix 1.4)

Nuevo Leon Auto Cluster (CLAUT)	92 member companies
Guanajuato Auto Cluster (CLAUGTO)	297 member companies
Mexico State Cluster	50 member companies
Chihuahua Cluster	120 member companies

The bar chart shown in Appendix 1.9,from the World bank's data on competitiveness show the degree in which Mexico's population growth has been higher compared to all Latin America economies, and the Caribbean combined.

Table 27: The North American Industry Classification System or NAICS (Appendix 2.0)

Cluster Code	Cluster Name

Cluster Code	Cluster Name
20	Forestry
21	Furniture
22	Hospitality and Tourism
23	Information Technology and Analytical Instruments
24	Insurance Services
25	Jewelry and Precious Metals
26	Leather and Related Products
27	Lighting and Electrical Equipment
28	Livestock Processing
29	Marketing, Design, and Publishing
30	Medical Devices
31	Metal Mining
32	Metalworking Technology
33	Music and Sound Recording
34	Nonmetal Mining
35	Oil and Gas Production and Transportation
36	Paper and Packaging
37	Performing Arts
38	Plastics
39	Printing Services
40	Production Technology and Heavy Machinery
41	Recreational and Small Electric Goods
42	Textile Manufacturing
43	Tobacco
44	Trailers, Motor Homes, and Appliances
45	Transportation and Logistics
46	Upstream Chemical Products
47	Upstream Metal Manufacturing
48	Video Production and Distribution
49	Vulcanized and Fired Materials
50	Water Transportation
51	Wood Products
101	Local Food and Beverage Processing and Distribution
102	Local Personal Services (Non-Medical)
103	Local Health Services
104	Local Utilities
105	Local Logistical Services
106	Local Household Goods and Services
107	Local Financial Services
108	Local Motor Vehicle Products and Services
109	Local Retailing of Clothing and General Merchandise
110	Local Entertainment and Media
111	Local Hospitality Establishments
112	Local Commercial Services
113	Local Education and Training
114	Local Community and Civic Organizations

Cluster Code	Cluster Name
115	Local Real Estate, Construction, and Development
116	Local Industrial Products and Services

Table 28:Federal Allocations across states & Triple Helix Clusters (Appendix 2.1)

State	T-Helix	State	T-Helix
Chiapas	1	Nuevo Leon	12
Guanajuato	2	Oaxaca	2
Guerrero	0	Puebla	2
Mexico	1	Veracruz	1
Jalisco	6		
Total			27

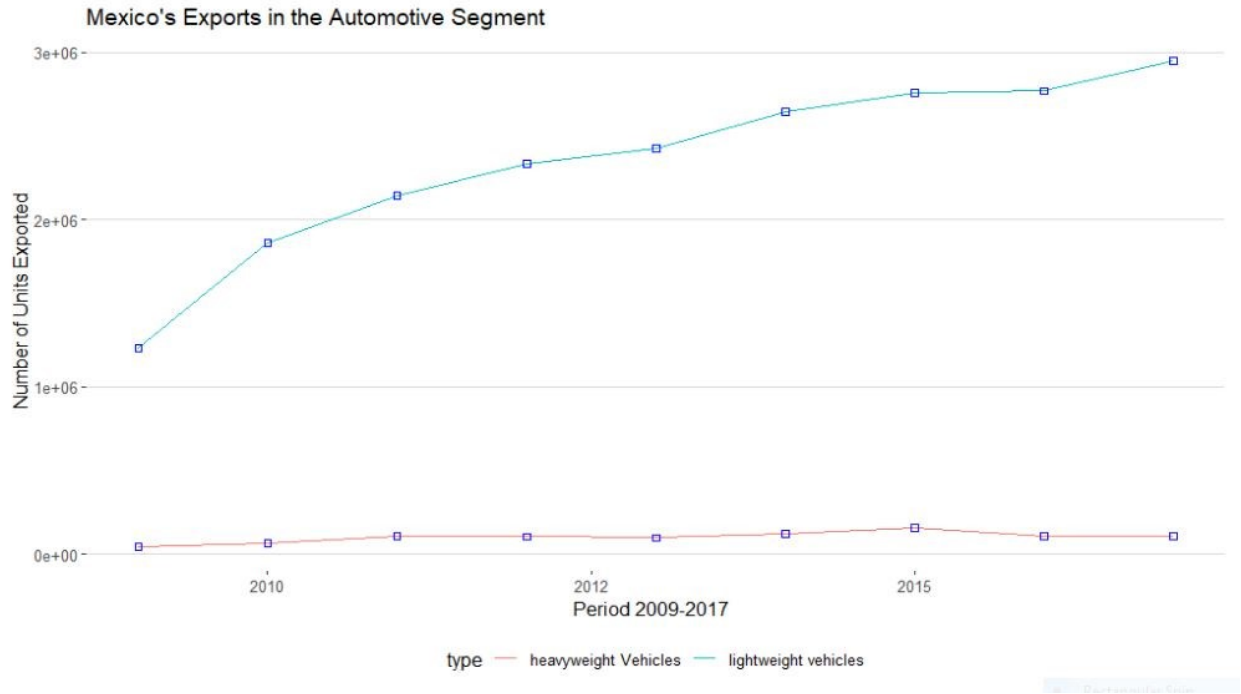

Figure 68: Appendix 1.5: Automotive Exports Main sub-segments

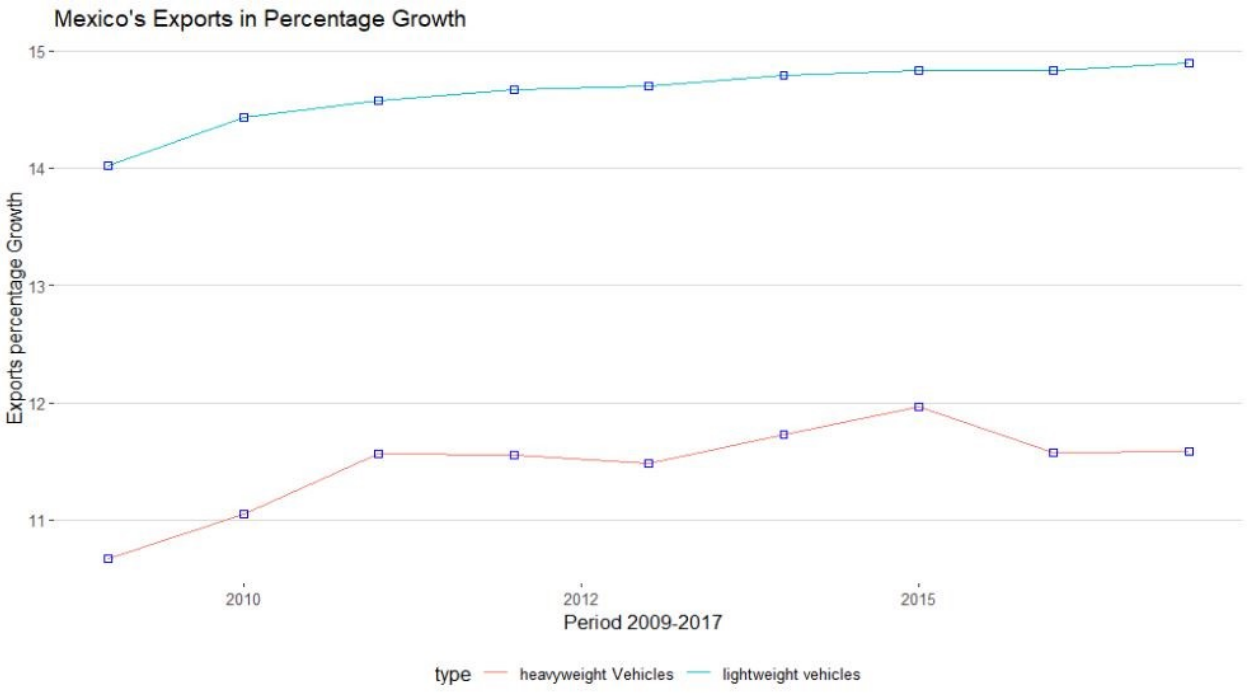

Figure 69: Appendix 1.6:Automotive Exports in Percentage Growth

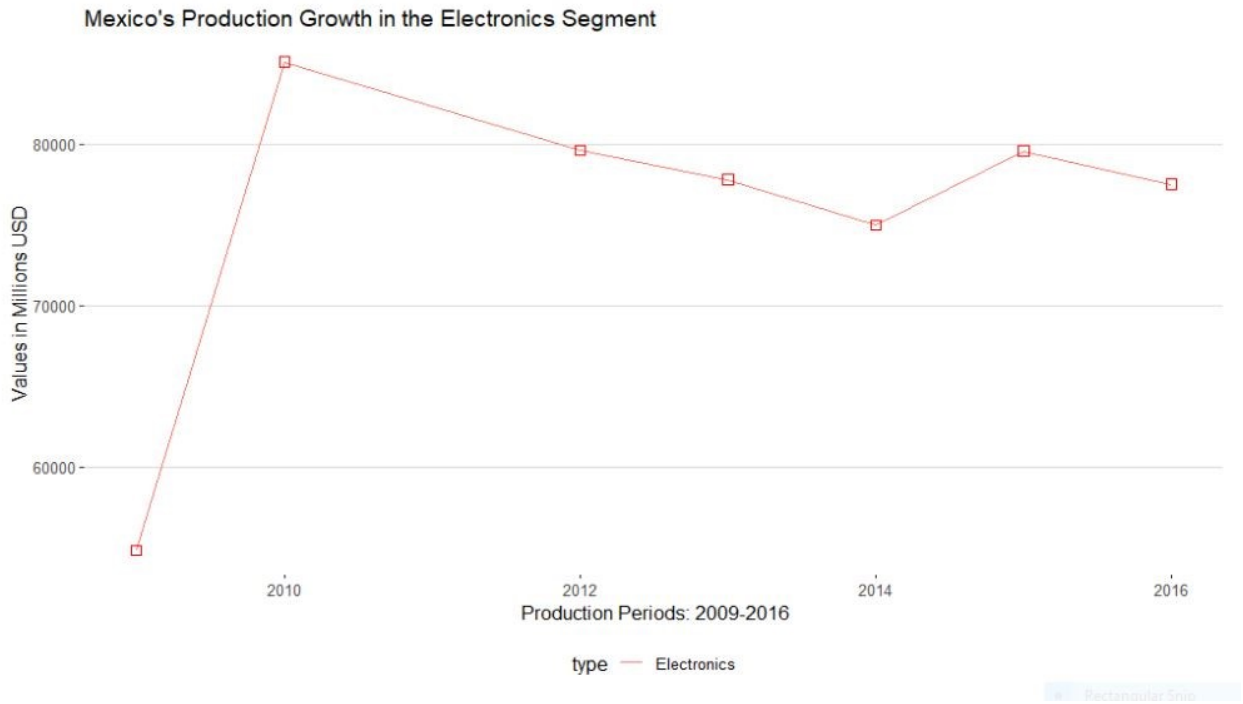

Figure 70: Appendix 1.7:ProMexico, the system of national accounts and INEGI

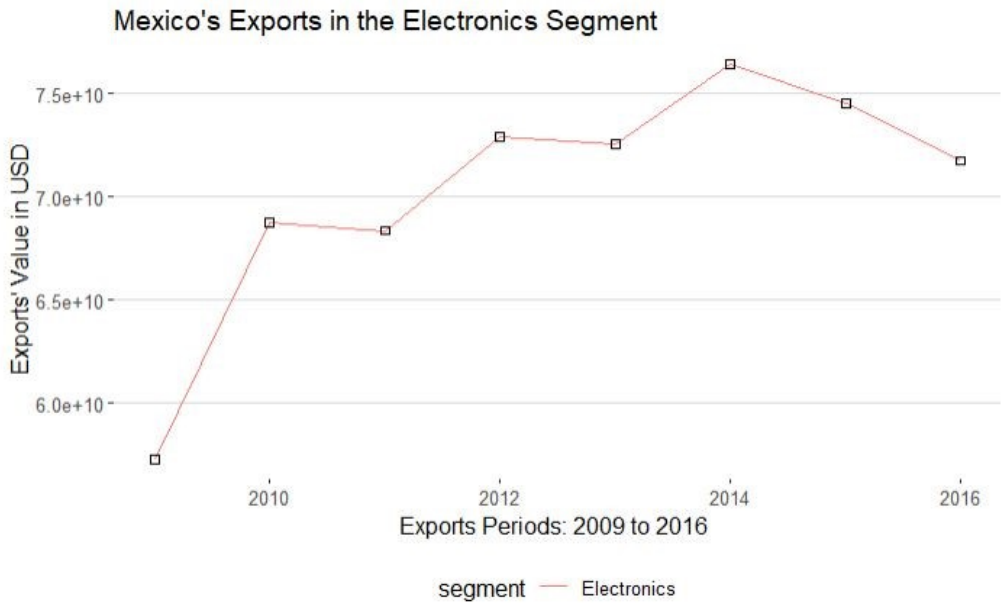

Figure 71: Appendixt 1.8: Mexico's Exports in the Electronics Segment

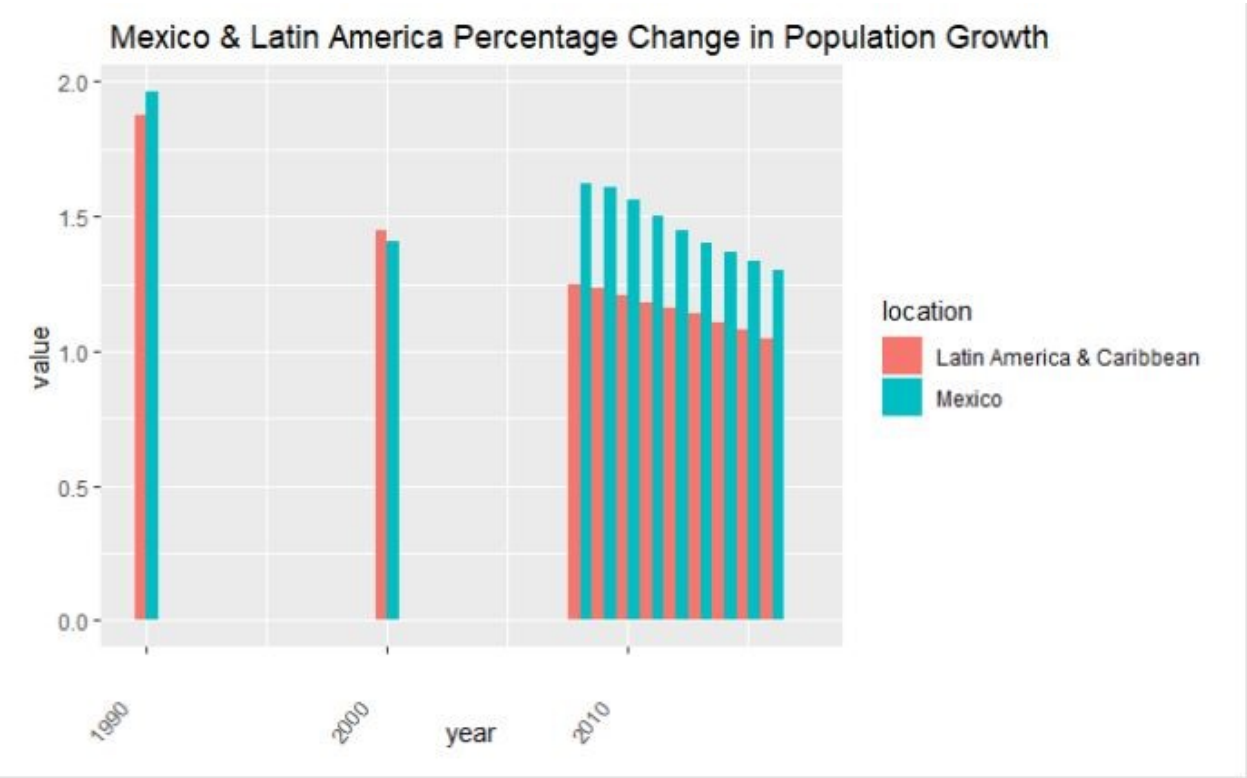

Figure 72: Appendix 1.9:Mexico and Latin America Percentage Change in Population Growth

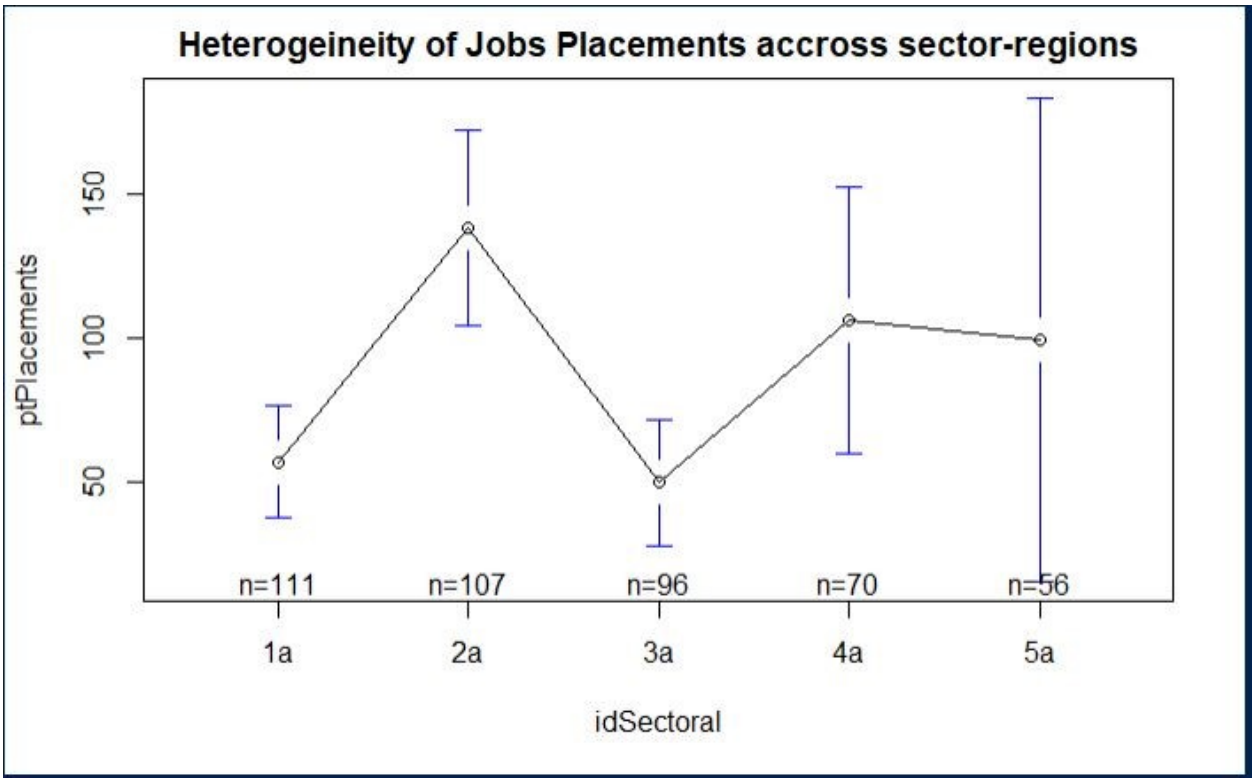

Figure 73: Appendix 2.2:Heterogeineity of Job Placements Across Regions

Table 29: Abbreviation of Terms in Equation Models (Appendix 2.3)

abbre	represents	variable
fun	represents	funding.
$invt$	represents	investment.
$ptsch$	represents	ptScholarhips.
$ptplace$	represents	ptPlacements.
TH	represents	tHelix.
TC	represents	tradedClusters.
$cont$	represents	contributions.
$alloc$	represents	allocations.
gdp	represents	GDP.
$form$	represents	formal
$inform$	represents	informal.
$ptplace$	represents	ptPlacements.
$csch$	represents	cScholarships.
$cplace$	represents	cPlacements.
$esch$	represents	eScholarships.
$eplace$	represents	ePlacements.
$ereg$	represents	aRegister.
$aplace$	represents	aPlacements.
$ex $	represents	Exports
fdi	represents	FDI
$gdpp$	represents	gdppesos

Detailed Description of OLS Univariate Models (Appendix 2.4)

- Model 1: This model examines 447 observations from the dataset testing the statistical significance of the variable "gdppesos" as (DV) on the variable "population" as (Iv). The results suggest every time population increases, gdp in pesos also increases by 42,954,000. The tested relationship is significant since there are three stars on the right of the variable "population" as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square is 0.042, only equating to explain 4.2% of the variance in the variable "gdppesos". Although tested statistically significant, the low R-square lead us to look for other variables as to better explain the variance of "gdppesos". However, the relationship thus accounts for the positive impact of population growth on GDP and the findings equate to the per capita contribution of the population on "gdppesos" growth.

$$gdpp_{it} = \alpha_1 + \beta_1 PoP_{it} + \varepsilon_{1,it} \tag{8}$$

- Model 2: This model examines 448 observations from the dataset testing the statistical significance of the variable "gdppesos" as (DV) on the variable "tHelix" as (Iv). The results suggest every time the number of "tHelix" increases, gdp in pesos also increases by 75,572,823,336.000. The tested relationship is significant since there are three stars on the right of the variable "tHelix" as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square 0.199, equating to explain 19.9% of the variance in the variable "gdppesos." This finding is statistically significant since the adjusted R-square account to explain close to 20% of the variance in "gdppesos." The finding is relevant since it partially validates one of the main assumptions guiding this study placing clusters and the selected geographical units as drivers of economic growth.

$$gdpp_{it} = \alpha_2 + \beta_2 TH_{it} + \varepsilon_{2,it} \tag{9}$$

-Model 3: This model examines 448 observations from the dataset testing the statistical significance of the variable "gdppesos" as(DV) on the variable "tradedClusters" as (Iv). The results suggest every time the number of "tradedClusters" increases, gdp in pesos also increases by 52,711,641,124.000. The tested relationship is significant since there are three stars on the right of the variable "tradedClusters" as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square 0.108, equating to explain 10.8% of the variance in the variable "gdppesos". The findings are not as significant as the ones reflected on the observations from "gdppesos" and "tHelix" ecosystems.

$$gdpp_{it} = \alpha_3 + \beta_3 TC_{it} + \varepsilon_{3,it} \tag{10}$$

- Model 4: This model examines 320 observations from the dataset testing the statistical significance of the variable "exports" as(DV) on the variable "tHelix" as (Iv). The results suggest every time the number of "tHelix" increases, exports also increase by 1,718,506,845.000. The tested relationship is significant since there are three stars on the right of the variable "tHelix" as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square of 0.213, equating to explain 21.3% of the variance in the variable "exports". The findings are significant since they speak

to the export-driven nature of clusters and these ecosystems integrations in the global value chains.

$$ex_{it} = \alpha_4 + \beta_4 TH_{it} + \varepsilon_{4,it} \tag{11}$$

Model 5: This model examines 320 observations from the dataset testing the statistical significance of the variable “exports” as (DV) on the variable “tradedClusters” as (Iv). The results suggest every time the number of “tradedClusters” increases, exports also increase by 1,220,460,091.000. The tested relationship is significant since there are three stars on the right of the variable “tradedClusters” as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square of 0.120, equating to explain 12.0% of the variance in the variable “exports”. The findings are significant since they speak to the export-driven nature of clusters and these ecosystems integrations in the global value chains.

$$ex_{it} = \alpha_5 + \beta_5 TC_{it} + \varepsilon_{5,it} \tag{12}$$

The following scatter plots show the linear regression in the second univariate regression model testing the correlation between the response variable “gdppesos” and “tHelix”.

- Model6: This regression analysis tests the statistical impact of Triple Helix on the variable " employment“. The model coefficient shows a positive relationship between the two random variables and the three stars on the right of the variable” tHelix" thus validate the positive relationship. The adjusted R Square shows 0.042 which suggest that Triple Helix only explain about 4.2% of the variance on the variable “employment” The finding suggests that more testing among the other variables of the dataset need to take place as to better explain the variance of the variable “employment”. The lessons from assessing this relationship and the small impact the variable “tHelix” have on the variance of employment speak to the following two aspects. One, it speaks to the low levels of skill and technical training in Mexico. Two, it speaks to the relatively new phenomenon of Triple Helix clusters in Mexico in sharp regional disparities.

$$emp_{it} = \alpha_6 + \beta_6 TH_{it} + \varepsilon_{6,it} \tag{13}$$

- Model7: The regression analysis tests the statistical impact of Traded clusters on the variable " employment“. The model coefficient shows a positive relationship between the two random variables and the three stars on the right of the variable”tradedClusters" thus validate the positive relationship between them. The adjusted R Square shows 0.272 which suggest that Traded clusters only explain about 27.2% of the variance on the variable “employment”. The results indicate one Traded cluster impacts positively total employment numbers in 201,821.000 jobs.

$$emp_{it} = \alpha_7 + \beta_7 TC + \varepsilon_{7,it} \tag{14}$$

- Model 8: The regression analysis test the statistical impact of Triple Helix clusters on the variable " formal“. The model coefficient shows a positive relationship between the two random variables and the three stars on the right of the variable”tHelix" thus validate the positive relationship between them. The adjusted R Square shows 0.134 suggest that Triple Helix

OLS Regression Results Models 1-5

	Dependent variable:				
	gdppesos			exports	
	(1)	(2)	(3)	(4)	(5)
	ols1	ols2	ols3	ols4	ols5
population	42,954.000***				
	(32,808.000, 53,100.000)				
tHelix		75,572,823,336.000***		1,718,506,845.000***	
		(61,597,018,169.000, 89,548,628,503.000)		(1,358,163,226.000, 2,078,850,464.000)	
tradedClusters			52,711,641,124.000***		1,220,460,091.000***
			(38,826,254,466.000, 66,597,027,782.000)		(861,677,945.000, 1,579,242,237.000)
Constant	209,096,215,502.000***	198,364,799,161.000***	-2,852,166,588,166.000***	5,129,013,566.000***	-65,573,841,163.000***
	(150,956,907,145.000, 267,235,523,859.000)	(145,839,193,860.000, 250,890,404,461.000)	(-3,702,901,520,459.000, -2,001,431,655,873.000)	(3,774,725,460.000, 6,483,301,671.000)	(-87,555,836,492.000, -43,591,845,833.000)
Observations	447	448	448	320	320
R^2	0.134	0.201	0.110	0.216	0.123
Adjusted R^2	0.132	0.199	0.108	0.213	0.120
Residual Std. Error	465,855,470,283.000 (df = 445)	447,145,955,826.000 (df = 446)	471,865,138,712.000 (df = 446)	9,743,731,042.000 (df = 318)	10,304,495,182.000 (df = 318)
F Statistic	68.800*** (df = 1; 445)	112.000*** (df = 1; 446)	55.400*** (df = 1; 446)	87.400*** (df = 1; 318)	44.500*** (df = 1; 318)

Note: *p<0.1; **p<0.05; ***p<0.01

ols models 1-5 using the varibale gdppesos, exports and employment as DVs.
All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 74: OLS Regression Models 1-5

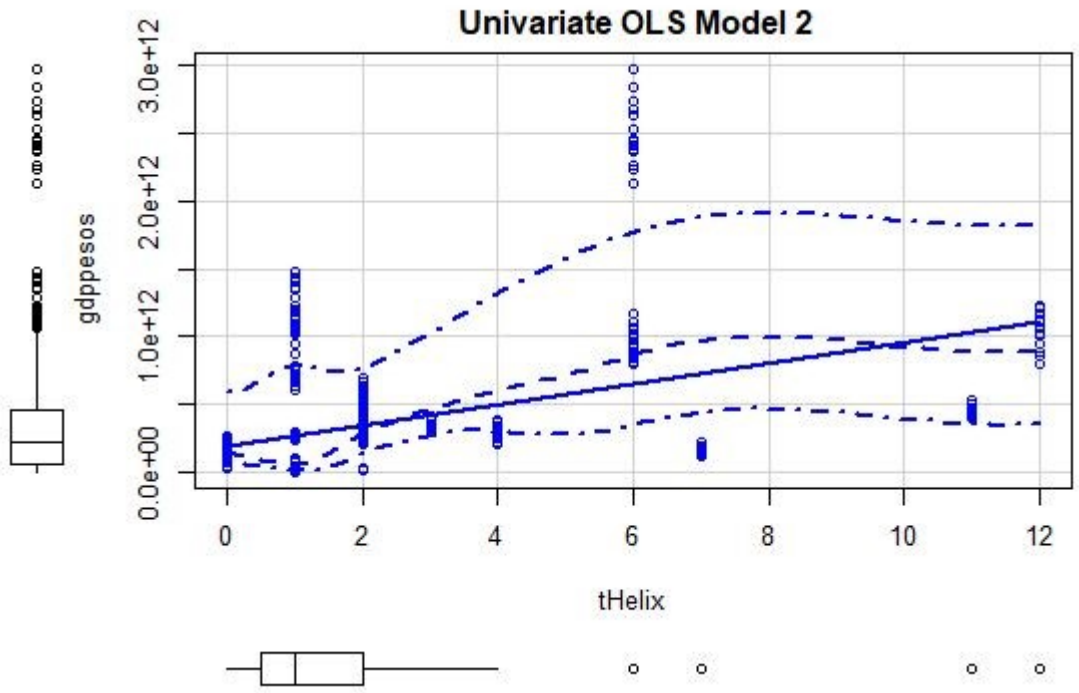

Figure 75: Regression Plot "gdppesos" and "tHelix".

clusters only explain about 13.4% of the variance on the variable "formal". The results show the presence of one Triple Helix impacts formal employment numbers in 68,071.000.new jobs. The assessment from this regression model thus assumes of clusters as being institutions which promote employment formality. However, the Adjusted R square speaks to the influence of other factors which serves as constraining elements to promote Mexico's employment formality.

$$form_{it} = \alpha_8 + \beta_8 TH_{it} + \varepsilon_{9,it} \tag{15}$$

-Model 9: The regression analysis test the statistical impact of Traded clusters on the variable " formal". The model coefficient shows a positive relationship between the two random variables and the three stars on the right of the variable"tradedClusters" thus validate the positive relationship between them. The adjusted R Square shows 0.302 which suggest that Traded clusters only explain about 30.2% of the variance on the variable "formal". The results indicate one Traded cluster impacts positively formal employment numbers in 95,770.000 new jobs.

$$form_{it} = \alpha_9 + \beta_9 TC_{it} + \varepsilon_{9,it} \tag{16}$$

- Model 10: The regression analysis test the statistical impact of the variable "cCourses" on "cPlacements". The model coefficient shows a positive relationship between the two random variables and the three stars on the right of the variable "cCourses" thus validate the positive relationship between them. The adjusted R Square shows 0.825 suggest that "cCourses" explain about 82.5% of the variance on the variable "cPlacements". The results indicate one "cCourse" offered impacts positively the number of "cPlacements" in 11.5 participants placed in jobs.

$$cplace_{it} = \alpha_{10} + \beta_{10} ccours_{it} + \varepsilon_{10,it} \tag{17}$$

- Model 11: The regression analysis test the statistical impact of Traded clusters on the variable "cPlacements". The model coefficient shows a positive relationship between the two random variables and the three stars on the right of the variable "tradedClusters" thus validate the positive relationship between them. The adjusted R Square shows 0.168 which suggest that Traded clusters only explain about 16.8% of the variance on the variable "cPlacements". The results indicate one Traded clusters have a limited impact on the promotion of "cPlacements" in this ALP segment with roughly 140 participants placed. The lessons from this regression model are twofold: One, partially test the weaker role of clusters as institutions supporting government programs in Mexico. Two, it suggests reaffirming the need to have a much deeper integration of the government and its programs as it relates to clustering activities across Mexico's states. The following regression table shows the univariate regression models 6-11 previously described.

$$cplace_{it} = \alpha_{11} + \beta_{11} TC_{it} + \varepsilon_{11,it} \tag{18}$$

- Model 12: This model examines 440 observations from the dataset testing the statistical significance of the variable "ptPlacements" as (DV) on the variable "tradedClusters" as (IV). The results suggest every time the number of "tradedClusters" increases, "ptPlacements" also increase by 14.2. The tested relationship is significant since there are three stars on the right of the variable "tradedClusters" as (Iv), and the sign of the estimate is positive. The coefficient thus explaining the correlation followed by the Adjusted R-square of 0.060, equating to explain 6% of the variance in the variable "ptPlacements". The above-stated findings although significant are not of much relevance since the variable "tradedClusters" only accounts for less than 10% of the variance in total ecosystems' employment. This finding at least at this stage in testing the statistical significance of these two variables. Makeup evidence speaking to the weak interaction of Mexico's Active labour initiatives with the proxies selected for industrial clusters.

$$ptplace_{it} = \alpha_{12} + \beta_{12} TC_{it} + \varepsilon_{12,it} \tag{19}$$

- Model 13: This model examines 448 observations from the dataset testing the statistical significance of the variable "allocations" as (DV) on the variable "gdp" index as (Iv). The results suggest every time the number of "gdp" increases, "allocations" also increases by 1,575,554,026.000. The tested relationship is significant since there are three stars on the right of the variable "gdp" as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square of 0.113, equating to explain 11.3% of the variance in the variable "allocations". The above-stated findings although statistically significant are not of much relevance since the variable "gdp" only accounts slightly over 10% of the variance in the gdp index. This finding in testing the statistical significance of these two variables speak other factors accounting for other drivers influencing the transfer of funding from the federal government to the states in Mexico.

$$alloc_{it} = \alpha_{13} + \beta_{13} gdp_{it} + \varepsilon_{13,it} \tag{20}$$

OLS Regression Results Models 1-5

	Dependent variable:				
	gdppesos			exports	
	(1)	(2)	(3)	(4)	(5)
	ols1	ols2	ols3	ols4	ols5
population	42,954.000***				
	(32,808.000, 53,100.000)				
tHelix		75,572,823,336.000***		1,718,506,845.000***	
		(61,597,018,169.000, 89,548,628,503.000)		(1,358,163,226.000, 2,078,850,464.000)	
tradedClusters			52,711,641,124.000***		1,220,460,091.000***
			(38,826,254,466.000, 66,597,027,782.000)		(861,677,945.000, 1,579,242,237.000)
Constant	209,096,215,502.000***	198,364,799,161.000***	-2,852,166,588,166.000***	5,129,013,566.000***	-65,573,841,163.000***
	(150,956,907,145.000, 267,235,523,859.000)	(145,839,193,860.000, 250,890,404,461.000)	(-3,702,901,520,459.000, -2,001,431,655,873.000)	(3,774,725,460.000, 6,483,301,671.000)	(-87,555,836,492.000, -43,591,845,833.000)
Observations	447	448	448	320	320
R^2	0.134	0.201	0.110	0.216	0.123
Adjusted R^2	0.132	0.199	0.108	0.213	0.120
Residual Std. Error	465,855,470,283.000 (df = 445)	447,145,955,826.000 (df = 446)	471,865,138,712.000 (df = 446)	9,743,731,042.000 (df = 318)	10,304,495,182.000 (df = 318)
F Statistic	68.800*** (df = 1; 445)	112.000*** (df = 1; 446)	55.400*** (df = 1; 446)	87.400*** (df = 1; 318)	44.500*** (df = 1; 318)

Note: *p<0.1; **p<0.05; ***p<0.01

ols models 1-5 using the varibale gdppesos, exports and employment as DVs.
All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 76: OLS Regression Models 6-11

- Model 14: This model examines 416 observations from the dataset testing the statistical significance of the variable “employment” as (DV) on the variable “gdp” index as (Iv). The results suggest every time the number of “gdp” increases, “employment” also increases by 277,744.000. The tested relationship is significant since there are three stars on the right of the variable “gdp” as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square of 0.530, equating to explain 53.0% of the variance in the variable “employment”. The above-stated findings are significant since the variable “gdp” accounts slightly for more than half of the variance in the variable “employment”. This finding in testing the statistical significance of these two variables speak to the importance of GDP growth as a development variable in creating employment across Mexico. The next model aims to test this statistical significance using only formal employment numbers to test its impact on gdp. An approach aimed to validate the importance of employment formality as one of the key drivers to promote economic growth and a more equitable regional development.

$$emp_{it} = \alpha_{14} + \beta_{14} gdp_{it} + \varepsilon_{14,it} \tag{21}$$

- Model 15: This model examines 416 observations from the dataset testing the statistical significance of the variable " formal" as (DV) on the variable “gdp” index as (Iv). The results suggest every time the number of “gdp” increases, the variable “formal;” also increases by 277,744.000. The tested relationship is significant since there are three stars on the right of the variable “gdp” as (Iv), and the sign of the estimate is positive. The coefficient is significant, thus explaining the correlation followed by the Adjusted R-square of 0.676, equating to explain 67.6% of the variance in the variable “formal”. The above-stated findings are significant since the variable “gdp” accounts for more than half of the variance in the variable “formal”. This finding in testing the statistical significance of these two variables speak to how GDP growth is important as a development variable in creating formal employment across Mexico. Hence, ratifying the observations made as part of the literature review in which; it relates high levels of informality to high levels of economic disparities while “formal” employment relates to economic growth.

$$form_{it} = \alpha_{15} + \beta_{15} gdp_{it} + \varepsilon_{15,it} \tag{22}$$

Detailed Description of OLS Multivariate Models (Appendix 2.5)

Model 01: This regression model test the statistical significance of the indicators “investment”, “subsidies”, “ptScholarship”, “ptplacements”, “tHelix” and “tradedClusters” as independent variables on the variables " gdppesos“. The adjusted R square shows the independent variables accounting for 56.26% of the variance in the variable”gdppesos“. This regression model looked at 440 observations in the dataset determining”ptPlacements" and “tHelix” as the most significant variables in the model. These two variables are significant since there are three stars on the right of the variables as (IV), and the sign of the estimate is positive, thus suggesting to the positive correlation with the variable “gdppesos” as (DV). A finding which asserts education and professional training as the most important in promoting knowledge infused activities and in the impact these have on GDP growth in monetary terms.

$$gdpp_{it} = \theta_1 + \delta_{11} fun_{it} + \delta_{12} invt_{it} + \delta_{13} sub_{it} + \delta_{14} ptsch_{it} + \delta_{15} ptplace_{it} + \delta_{16} TH_{it} + \delta_{17} TC_{it} + \epsilon_{1,it} \quad (23)$$

Multivariate Model 02: This regression model test the statistical significance of the indicators “gdppesos”, “investment”, “subsidies”, “ptScholarships”, “ptPlacements” “tHelix”, and “traded-Clusters” as independent variables on the variable " funding“. The adjusted R square shows the independent variables accounting for 87% of the variance in the variable”funding“. The variable funding shows the total number of funding transferred from Mexico’s central government to each Mexican state during the prescribed period of analysis. The variables” tradedClusters" according to the model is the most statistically significant. The significance of this variable is represented by the three stars on the right as (Iv), and the positive estimate sign. This finding suggesting the positive correlation with the variable “funding” as (DV).

$$fun_{it} = \theta_2 + \delta_{21} gdpp_{it} + \delta_{22} invt_{it} + \delta_{23} sub_{it} + \delta_{24} ptsch_{it} + \delta_{25} ptplace_{it} + \delta_{26} TH_{it} + \delta_{27} TC_{it} + \epsilon_{2,it} \quad (24)$$

It suggests also that as the number of “tradedClusters” increases the total combined levels of central government funding transferred to the states also increases. This regression model looks at 440 observations in the dataset and also determines that although the variables “ptPlacements, and” tHelix" are statistically significant, the variables show a negative estimate. The lessons learned from these model are fourfold: One, it shows the impact that industrial agglomerations mainly Traded clusters have in increasing each states’ level of central government funding. Two, it validates the weak role of Triple Helix clusters increasing central government funding, at least at the national level. Third, it speaks to the significant role the levels of central government funding have in the promotion of professional training activities in Mexico as a whole. Fourth, it affirms the negative role the creation of professional jobs has on increasing the level of central government funding assigned to the states.

Multivariate Model 03: This regression model test the statistical significance of the indicators " funding“”gdppesos“,”investment“,”subsidies“,”ptScholarships“,”ptPlacements" “tHelix”, and “tradedClusters” as independent variables on the variable " contributions“. The adjusted R square shows the independent variables accounting for 95.1% of the variance in the variable”contribution“. The variable”contribution" shows the total number of funding transferred from Mexico’s central government to each Mexican state during the prescribed period of analysis. It bases this central

OLS Regression Results Models 12-15

	Dependent variable:			
	ptPlacements	allocations	employment	formal
	(1)	(2)	(3)	(4)
	ols12	ols13	ols14	ols15
tradedClusters	14.200***			
	(9.070, 19.400)			
gdp		1,575,554,026.000***	277,744.000***	141,170.000***
		(1,170,146,026.000, 1,980,962,025.000)	(252,612.000, 302,876.000)	(131,769.000, 150,571.000)
Constant	-783.000***	14,652,418,199.000***	551,247.000***	142,143.000***
	(-1,100.000, -466.000)	(12,843,064,247.000, 16,461,772,152.000)	(439,114.000, 663,380.000)	(100,197.000, 184,090.000)
Observations	440	448	416	416
R^2	0.062	0.115	0.531	0.677
Adjusted R^2	0.060	0.113	0.530	0.676
Residual Std. Error	174.000 (df = 438)	13,950,296,905.000 (df = 446)	832,862.000 (df = 414)	311,555.000 (df = 414)
F Statistic	29.100*** (df = 1; 438)	58.000*** (df = 1; 446)	469.000*** (df = 1; 414)	866.000*** (df = 1; 414)

Note: *p<0.1; **p<0.05; ***p<0.01

ols models 12-15 using the variables ptPlacements, allocations, employments and formal as DVs.

All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 77: OLS Regression Models 12-15

government funding on each states' economic performance and contribution to Mexico's national economy. Looking at 440 observations from the dataset this multivariate regression model found the variable "ptScholarships" to be the most statistical significant. This variable represents significance by the three stars on the right as (IV), and the positive estimate sign. This finding suggesting the positive correlation with the variable "contributions" as (DV).

$$cont_{it} = \theta_3 + \delta_{31} fun_{it} + \delta_{32} gdpp_{it} + \delta_{33} invt_{it} + \delta_{34} sub_{it} + \delta_{35} ptsch_{it} + \delta_{36} ptplace_{it} + \delta_{37} TH_{it} + \delta_{38} TC_{it} + \epsilon_{3,it} \tag{25}$$

Multivariate Model 04: This regression model test the statistical significance of the indicators " funding""gdppesos","investment","subsidies","ptScholarships","ptPlacements" "tHelix", and "tradedClusters" as independent variables on the variable " allocations". The adjusted R square shows the independent variables accounting for 96.1% of the variance in the variable"allocations". The variable"allocations" shows the total number of funding transferred from Mexico's central government to each Mexican state during the prescribed period of analysis. It bases this central government funding on key development areas such as education, health care and basic infrastructure. This regression results looks at 440 observations from the dataset and found the variables "funding" "gdppesos" and "ptScholarships" as statistically significant. However, this size, sign of the estimates, and negative coefficients show nonconclusive results.

$$alloc_{it} = \theta_4 + \delta_{41} fun_{it} + \delta_{42} gdpp_{it} + \delta_{43} invt_{it} + \delta_{44} sub_{it} + \delta_{45} ptsch_{it} + \delta_{46} ptplace_{it} + \delta_{47} TH_{it} + \delta_{48} TC_{it} + \epsilon_{4,it} \tag{26}$$

Multivariate Model 5 & 6: These two multivariate regression models test the correlation and significance of the variables " cPlacements" and "ptPlacements as (Dvs) on the variables"FDI","gdp","formal", and"informal" as (Ivs).Model 5, looks at 416 observations in the dataset showing an adjusted R-square of 0.180 which accounts for 18% of the variance in the "cPlacements". Model 6, looks at 408 observations in the dataset showing an adjusted R-square of 0.146 which accounts for 14.6% of the variable "ptPlacements". The lessons from these two regression models are two-fold: One, it speaks to the weak role of these two segments of Mexico's ALPs in promoting formal employment when the whole dataset is observed. Two, it also speaks to the high levels of employment informality in the country which block a more active and better implementation of Active Employment initiatives in the country.

$$cplace_{it} = \theta_5 + \delta_{51} fdi_{it} + \delta_{52} gdp_{it} + \delta_{53} form_{it} + \delta_{54} \inf orm_{it} + \delta_{55} TH_{it} + \epsilon_{5,it} \tag{27}$$

$$ptplace_{it} = \theta_6 + \delta_{61} fdi_{it} + \delta_{62} gdp_{it} + \delta_{63} form_{it} + \delta_{64} \inf orm_{it} + \delta_{65} TH_{it} + \epsilon_{6,it} \tag{28}$$

Multivariate Model 7: This regression model takes the variable " FDI" in USD value during the prescribed time period as (DV), on the variables "gdp", "cScholarships", "ePlacements", and "tHelix". This regression model looks at 445 observations in the dataset showing an adjusted R-Square of 0.710 or accounting for 71.0% of the variance in the "FDI". The most significant variables in this model are the variables "gdp", "ePlacements", and "tHelix". These findings suggest that every time there is an increase in "gdp", the levels of "FDI" increase by 275,184,204 USD. It also states that entrepreneurial activity is a driver of "FDI" suggesting that every time "ePlacements" increase, "

Multiple Variables OLS Regression Results Models 1-4

	Dependent variable:			
	gdppesos	funding	contributions	allocations
	(1)	(2)	(3)	(4)
	mlols1	mlols2	mlols3	mlols4
funding	8.580***		0.380***	0.620***
	(5.270, 11.900)		(0.351, 0.409)	(0.591, 0.649)
gdppesos		0.007***	0.009***	-0.009***
		(0.004, 0.009)	(0.008, 0.010)	(-0.010, -0.008)
investment	-7.520	0.857***	-0.060	0.060
	(-23.700, 8.640)	(0.416, 1.300)	(-0.198, 0.078)	(-0.078, 0.198)
subsidies	2.550	1.200***	-0.003	0.003
	(-2.430, 7.540)	(1.120, 1.280)	(-0.045, 0.040)	(-0.040, 0.045)
ptScholarhips	632,810,293.000***	8,023,880.000**	3,660,014.000***	-3,660,058.000***
	(353,731,941.000, 911,888,645.000)	(161,842.000, 15,885,919.000)	(1,230,494.000, 6,089,533.000)	(-6,089,570.000, -1,230,546.000)
ptPlacements	-648,949,796.000**	-18,985,825.000**	-6,946,073.000**	6,946,158.000**
	(-1,269,483,550.000, -28,416,042.000)	(-36,149,904.000, -1,821,746.000)	(-12,254,350.000, -1,637,797.000)	(1,637,898.000, 12,254,418.000)
tHelix	65,076,673,534.000***	-551,949,605.000***	-47,872,835.000	47,871,474.000
	(52,818,557,824.000, 77,334,789,243.000)	(-927,755,777.000, -176,143,434.000)	(-164,573,382.000, 68,827,713.000)	(-68,828,713.000, 164,571,661.000)
tradedClusters	-14,824,137,475.000**	1,327,873,800.000***	690,168.000	-691,666.000
	(-28,111,104,009.000, -1,537,170,940.000)	(979,961,606.000, 1,675,785,995.000)	(-113,047,072.000, 114,427,409.000)	(-114,428,554.000, 113,045,223.000)
Constant	768,986,113,115.000*	-71,843,322,605.000***	-2,096,984,893.000	2,097,056,267.000
	(-8,046,831,486.000, 1,546,019,057,715.000)	(-92,351,920,244.000, -51,334,724,965.000)	(-8,740,667,646.000, 4,546,697,860.000)	(-4,546,605,954.000, 8,740,718,488.000)
Observations	440	440	440	440
R^2	0.534	0.872	0.952	0.962
Adjusted R^2	0.526	0.870	0.951	0.961
Residual Std. Error	345,964,816,402.000 (df = 432)	9,574,921,424.000 (df = 432)	2,945,224,676.000 (df = 431)	2,945,215,574.000 (df = 431)
F Statistic	70.700*** (df = 7; 432)	422.000*** (df = 7; 432)	1,075.000*** (df = 8; 431)	1,351.000*** (df = 8; 431)

Note: *p<0.1; **p<0.05; ***p<0.01

Multiple Variables OLS models 1-4 .

All the commands and algorithms are coded in R 3.4 using the plm package.

Figure 78: OLS Multivariate Regression Models1-4

FDI" also increases. Last, it points to Triple Helix clusters these ecosystems importance as it links FDI with these industrial ecosystems. The models show that every time these knowledge infused ecosystems increase, the level of FDI also increases by 40,603,440 USD.

$$fdi_{it} = \theta_7 + \delta_{71} gdp_{it} + \delta_{72} \csc h_{it} + \delta_{73} cplace_{it} + \delta_{74} esch_{it} + \delta_{75} eplace_{it} + \delta_{76} ereg_{it} + \delta_{77} aplace_{it} + \delta_{78} TH_{it} + \epsilon_{7,it} \tag{29}$$

Multiple Variables OLS Regression Results Models 5-7

	Dependent variable:		
	cPlacements	ptPlacements	fdi
	(1)	(2)	(3)
	mlols5	mlols6	mlols7
fdi	0.00000	0.00000*	
	(-0.00000, 0.00000)	(-0.000, 0.00000)	
gdp	-170.000***	4.890	275,184,204.000***
	(-229.000, -110.000)	(-5.570, 15.400)	(255,045,488.000, 295,322,919.000)
formal	0.002***	0.0001**	
	(0.001, 0.002)	(0.00002, 0.0002)	
informal	-0.001***	-0.00004	
	(-0.001, -0.0005)	(-0.0001, 0.00001)	
employment			
cScholarships			431,334.000**
			(68,198.000, 794,469.000)
cPlacements			-423,384.000*
			(-864,109.000, 17,341.000)
eScholarships			-289,124.000**
			(-529,926.000, -48,322.000)
ePlacements			530,145.000***
			(213,688.000, 846,603.000)
aRegister			-19,119.000
			(-44,920.000, 6,682.000)
aPlacements			13,111.000
			(-26,496.000, 52,719.000)
tHelix	23.200	-4.900	40,603,640.000***
	(-15.000, 61.400)	(-11.600, 1.840)	(17,951,264.000, 63,256,016.000)
Constant	907.000***	37.100**	-233,901,080.000***
	(746.000, 1,068.000)	(8.420, 65.800)	(-345,453,707.000, -122,348,453.000)
Observations	416	408	445
R^2	0.190	0.157	0.715
Adjusted R^2	0.180	0.146	0.710
Residual Std. Error	979.000 (df = 410)	171.000 (df = 402)	628,274,648.000 (df = 436)

Figure 79: OLS Multivariate Regression Models 5-7,All the commands and algorithms are coded in R 3.4 using the plm package

Linear regression

Number of obs	= 440
F(7, 31)	= 13.93
Prob > F	= 0.0000
R-squared	= 0.5340
Root MSE	= 3.5e+11

(Std. Err. adjusted for 32 clusters in regionCode)

gdppesos	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
funding	8.578371	7.363765	1.16	0.253	-6.440127	23.59687
investment	-7.518832	13.96478	-0.54	0.594	-36.00019	20.96253
subsidies	2.55365	8.467079	0.30	0.765	-14.71507	19.82237
ptScholarships	6.33e+08	2.66e+08	2.38	0.024	9.07e+07	1.17e+09
ptPlacements	-6.49e+08	2.99e+08	-2.17	0.038	-1.26e+09	-3.88e+07
tHelix	6.51e+10	2.21e+10	2.94	0.006	2.00e+10	1.10e+11
tradedClusters	-1.48e+10	2.36e+10	-0.63	0.535	-6.30e+10	3.34e+10
_cons	7.69e+11	1.40e+12	0.55	0.587	-2.09e+12	3.63e+12

Figure 80: Appendix 2.6:Multivariate Cluster Robust Model 1

This model 1 is set to test the statistical significance of the standard deviation from the variable "contributions" on the variable "gdppesos" and its standard deviation. The model takes the standard deviation of the variable contributions as the Dependent variable on the standard deviation of the variable "gdppesos" as the independent or explanatory variable. The aim is to validate statistically the impact of this measure of "gdppesos" in explaining the variance on the volatility of the variable "contributions"

The results from this linear model show there is a positive correlation between the volatility of variable "contributions" and GDP in pesos terms. This positive correlation is very statistically significant due to the positive sign and the three stars on the right the estimate. The three stars on the right symbolize a significance of 0.001 which render these result as statistically significant, and the Adjusted R-Square with the value 0.953 affirms this positive relationship. The results state that the volatility in the variable "gdppesos" explains 95.3% of the volatility in the variable "contributions".

This model 2 is set to test the statistical significance of the standard deviation from the variable "allocations" on the variable "gdppesos" and its standard deviation. The model takes the standard deviation of the variable "allocations" as the Dependent variable on the standard deviation of the variable "gdppesos" as the independent or explanatory variable. The aim is to validate statistically the impact of this measure of "gdppesos" in explaining the variance on the volatility of the variable "allocations"

The results from this linear model show there is a positive correlation between the volatility of variable "allocations" and GDP in pesos terms. This positive correlation is very statistically significant due to the positive sign and the three stars on the right the estimate. The three stars on the right symbolize a significance of 0.001 which render these result as statistically significant, and the Adjusted R-Square with the value 0.858 affirms this positive relationship. The results state that the volatility in the variable "gdppesos" explain 95.3% of the volatility in the variable "allocations"

Model 3: Funding & GDP pesos

Linear regression

Number of obs	= 440
F(7, 31)	= 174.78
Prob > F	= 0.0000
R-squared	= 0.8724
Root MSE	= 9.6e+09

(Std. Err. adjusted for 32 clusters in regionCode)

funding	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdppesos	.0065707	.0026874	2.44	0.020	.0010896	.0120518
investment	.8568657	.5654752	1.52	0.140	-.2964285	2.01016
subsidies	1.195856	.0980317	12.20	0.000	.9959191	1.395793
ptScholarships	8023880	3256175	2.46	0.019	1382869	1.47e+07
ptPlacements	-1.90e+07	7358780	-2.58	0.015	-3.40e+07	-3977494
tHelix	-5.52e+08	3.30e+08	-1.67	0.104	-1.22e+09	1.21e+08
tradedClusters	1.33e+09	4.12e+08	3.23	0.003	4.88e+08	2.17e+09
_cons	-7.18e+10	2.37e+10	-3.03	0.005	-1.20e+11	-2.34e+10

Figure 81: Appendix 2.6:Multivariate Cluster Robust Model 2

Linear regression

Number of obs	= 440
F(8, 31)	= 163.21
Prob > F	= 0.0000
R-squared	= 0.9523
Root MSE	= 2.9e+09

(Std. Err. adjusted for 32 clusters in regionCode)

contributions	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdppesos	.0088029	.0021398	4.11	0.000	.0044388	.013167
funding	.3804225	.0463975	8.20	0.000	.2857941	.4750509
investment	-.0599912	.1331646	-0.45	0.655	-.3315822	.2115998
subsidies	-.002557	.0635125	-0.04	0.968	-.1320916	.1269775
ptScholarships	3660014	1178477	3.11	0.004	1256494	6063534
ptPlacements	-6946073	2029519	-3.42	0.002	-1.11e+07	-2806842
tHelix	-4.79e+07	1.37e+08	-0.35	0.729	-3.27e+08	2.31e+08
tradedClusters	690168.2	2.03e+08	0.00	0.997	-4.13e+08	4.14e+08
_cons	-2.10e+09	1.22e+10	-0.17	0.865	-2.70e+10	2.28e+10

Figure 82: Appendix 2.6: Multivariate Cluster Robust Model 3

Linear regression

Number of obs	= 440
F(8, 31)	= 255.60
Prob > F	= 0.0000
R-squared	= 0.9616
Root MSE	= 2.9e+09

(Std. Err. adjusted for 32 clusters in regionCode)

allocations	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdppesos	-.0088029	.0021398	-4.11	0.000	-.013167	-.0044388
funding	.6195775	.0463975	13.35	0.000	.5249492	.7142057
investment	.0599934	.1331643	0.45	0.655	-.2115971	.3315838
subsidies	.0025578	.0635123	0.04	0.968	-.1269763	.1320919
ptScholarships	-3660058	1178452	-3.11	0.004	-6063526	-1256590
ptPlacements	6946158	2029484	3.42	0.002	2806999	1.11e+07
tHelix	4.79e+07	1.37e+08	0.35	0.729	-2.31e+08	3.27e+08
tradedClusters	-691665.6	2.03e+08	-0.00	0.997	-4.14e+08	4.13e+08
_cons	2.10e+09	1.22e+10	0.17	0.865	-2.28e+10	2.70e+10

Figure 83: Appendix 2.6:Multivariate Cluster Robust Model 4

Linear regression

Number of obs	= 416
F(5, 31)	= 4.94
Prob > F	= 0.0019
R-squared	= 0.1899
Root MSE	= 978.59

(Std. Err. adjusted for 32 clusters in regionCode)

cPlacements	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
fdi	4.88e-08	1.24e-07	0.39	0.697	-2.04e-07	3.02e-07
gdp	-169.5591	52.73717	-3.22	0.003	-277.1173	-62.0009
formal	.001959	.0006172	3.17	0.003	.0007001	.0032179
informal	-.0007393	.0003223	-2.29	0.029	-.0013967	-.0000819
tHelix	23.20892	42.92453	0.54	0.593	-64.33624	110.7541
_cons	906.9995	191.9586	4.72	0.000	515.4974	1298.502

Figure 84: Appendix 2.6:Multivariate Cluster Robust Model 5

Linear regression

Number of obs	= 408
F(5, 31)	= 30.99
Prob > F	= 0.0000
R-squared	= 0.1569
Root MSE	= 171.41

(Std. Err. adjusted for 32 clusters in regionCode)

ptPlacements	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
fdi	2.48e-08	2.06e-08	1.20	0.239	-1.73e-08	6.69e-08
gdp	4.893485	5.155243	0.95	0.350	-5.620702	15.40767
formal	.0001091	.0000532	2.05	0.049	6.96e-07	.0002175
informal	-.000039	.0000285	-1.37	0.181	-.0000972	.0000191
tHelix	-4.902702	3.632396	-1.35	0.187	-12.31102	2.505619
_cons	37.11625	16.53148	2.25	0.032	3.400083	70.83242

Figure 85: Appendix 2.6:Multivariate Cluster Robust Model 6

Linear regression

Number of obs	= 445
F(8, 31)	= 60.59
Prob > F	= 0.0000
R-squared	= 0.7152
Root MSE	= 6.3e+08

(Std. Err. adjusted for 32 clusters in regionCode)

fdi	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp	2.75e+08	3.50e+07	7.87	0.000	2.04e+08	3.46e+08
cScholarships	431333.6	161094.1	2.68	0.012	102779.9	759887.3
cPlacements	-423384.1	196470.3	-2.15	0.039	-824087.9	-22680.27
eScholarships	-289124.1	130619.6	-2.21	0.034	-555524.5	-22723.7
ePlacements	530145.2	211670.7	2.50	0.018	98440.04	961850.4
aRegister	-19118.83	11856.7	-1.61	0.117	-43300.72	5063.065
aPlacements	13111.36	18021.23	0.73	0.472	-23643.18	49865.9
tHelix	4.06e+07	1.80e+07	2.26	0.031	3950049	7.73e+07
_cons	-2.34e+08	1.10e+08	-2.13	0.041	-4.58e+08	-9999491

Figure 86: Appendix 2.6:Multivariate Cluster Robust Model 7

```
Call:
lm(formula = contributions_sd ~ gdppesos_sd, data = desmodel1_data)

Residuals:
        Min          1Q      Median          3Q         Max
-1162023073  -737513469  -128165413   655911317  1346729052

Coefficients:
                     Estimate         Std. Error t value     Pr(>|t|)
(Intercept) -32496356599.03923   2757087566.15705   -11.8 0.0000000591 ***
gdppesos_sd            0.08848            0.00545    16.2 0.0000000016 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 880000000 on 12 degrees of freedom
Multiple R-squared:  0.956,     Adjusted R-squared:  0.953
F-statistic:  264 on 1 and 12 DF,  p-value: 0.00000000156
```

Figure 87: Model 1:Contributions & GDP pesos(Appendix 2.7)

```
Call:
lm(formula = allocations_sd ~ gdppesos_sd, data = desmodel2_data)

Residuals:
        Min          1Q      Median          3Q         Max
-2287230086  -910851603  -158604604  1062397343  3919495538

Coefficients:
                     Estimate        Std. Error t value  Pr(>|t|)
(Intercept) -37687585487.6459   5653876457.8892   -6.67 0.0000231 ***
gdppesos_sd            0.0995            0.0112    8.90 0.0000012 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1810000000 on 12 degrees of freedom
Multiple R-squared:  0.869,     Adjusted R-squared:  0.858
F-statistic: 79.3 on 1 and 12 DF,  p-value: 0.00000124
```

Figure 88: Model 2: Allocations & GDP pesos (Appendix 2.7)

```
Call:
lm(formula = funding_sd ~ gdppesos_sd, data = desmodel3_data)

Residuals:
        Min          1Q      Median          3Q         Max
-3551108484 -1717148427  -375183901  1607585580  5256681300

Coefficients:
                    Estimate        Std. Error t value    Pr(>|t|)
(Intercept) -67000635854.6421   7893610889.3283   -8.49 0.000002040 ***
gdppesos_sd            0.1783            0.0156   11.43 0.000000083 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2520000000 on 12 degrees of freedom
Multiple R-squared:  0.916,     Adjusted R-squared:  0.909
F-statistic:  131 on 1 and 12 DF,  p-value: 0.0000000827
```

Figure 89: Model 3: Funding & GDP pesos (Appendix 2.7)

This model 3 is set to test the statistical significance of the standard deviation from the variable “funding” on the variable “gdppesos” and its standard deviation. The model takes the standard deviation of the variable “funding” as the Dependent variable on the standard deviation of the variable “gdppesos” as the independent or explanatory variable. The aim is to validate statistically the impact of this measure of “gdppesos” in explaining the variance on the volatility of the variable “funding”

The results from this linear model show there is a positive correlation between the volatility of variable “funding” and GDP in pesos terms. This positive correlation is very statistically significant due to the positive sign and the three stars on the right the estimate. The three stars on the right symbolize a significance of 0.001 which render these result as statistically significant, and the Adjusted R-Square with the value 0.909 affirms this positive relationship. The results state that the volatility in the variable “gdppesos” explain roughly 90.9% of the volatility in the variable “allocations”

This model 4 is set to test the statistical significance of the standard deviation from the variable “cCourses” on the variable “funding” and its standard deviation. The model takes the standard deviation of the variable “cCourses” as the Dependent variable on the standard deviation of the variable “funding” as the independent or explanatory variable. The aim is to validate statistically the impact of this measure of “funding” in explaining the variance on the volatility of the variable “cCourses”

The findings from this regression result validate the correlation between these two variables as significant. This positive relationship by the positive sign of the coefficient and the p-value of 0.035 is validated. The lessons learned from this regression results validate the postulated by Stiglitz linking variations in the levels of central government findings to social programs, likewise their institutional strength(see Appendix 20).

```
Call:
lm(formula = ccourses_sd ~ funding_sd, data = desmodel4_data)

Residuals:
   Min     1Q Median     3Q    Max
-25.10 -10.95  -3.98  15.72  33.22

Coefficients:
                  Estimate      Std. Error t value Pr(>|t|)
(Intercept) 35.431484285280 14.894262504657    2.38    0.035 *
funding_sd   0.000000001778  0.000000000613    2.90    0.013 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 18.5 on 12 degrees of freedom
Multiple R-squared:  0.412,     Adjusted R-squared:  0.363
F-statistic: 8.41 on 1 and 12 DF,  p-value: 0.0133
```

Figure 90: Model 4: “cCoursess” & Funding (Appendix 2.7)

Robustness Check Tables 1,2 & 3 (Appendix 2.8)

Regional analysis of tHelix and tradedClusters institutional support with the variable "ptPlecements"														
Table 01 Driscoll & Kraay Robust covariance matrix & GMM regression models Mexico														
Explanatory varibales		Dependent variable: Log **(GDPpesos)**												
Model	**1**		**2**				**3**				**4**			
	Driscoll& Kraay		**One-step diff GMM**		**Bootstrap**		**One-step sys GMM**		**Bootstrap**		**Tow-step sys GMM**		**Bootstrap**	
	coeff	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**
Lag**(GDPpesos)**														
L1	0.6814514	0.001	0.6243005	0.001	0.6243005	0.004	0.5547559	0.001	0.5547559	0.002	0.539831	0.000	0.539831	0.005
L2			0.4719406	0.001	0.4719406	0.013	0.4406291	0.002	0.4406291	0.007	0.4550226	0.002	0.4550226	0.021
tHelix	2.906425	0.033	0				-0.0199932	0.300	-0.0199932	0.120	-0.0194259	0.375	-0.0194259	0.362
ptPlacements	-7.21E-06	0.698	-0.0007085	0.018	-0.0007085	0.326	-0.0009424	0.011	-0.0009424	0.049	-0.0009469	0.038	-0.0009469	0.037
tHelix:ptPlecements	-1.76E-06	0.522	0.0002378	0.088	0.0002378	0.098	0.0002848	0.062	0.0002848	0.062	0.0002722	0.142	0.0002722	0.040
Log(fdi)	-0.0025078	0.518												
Log(investments)	0.0065484	0.126												
Log(funding)	0.0534673	0.144												
Model	**5**		**6**				**7**				**8**			
L1	0.6819898		0.5581469	0.001	0.5581469	0.007	0.4872558	0.046	0.4872558	0.060	0.5124445	0.015	0.5124445	0.034
L2			0.5650355	0.001	0.5650355	0.005	0.5515144	0.016	0.5515144	0.029	0.5288861	0.008	0.5288861	0.024
tradedClusters	0.1115101	0.024					-0.0294447	0.014	-0.0294447	0.135	-0.0223943	0.083	-0.0223943	0.030
ptPlacements	0.0001246	0.911	-0.0175713	0.0140	-0.0175713	0.114	-0.0240941	0.015	-0.0240941	0.173	-0.015036	0.096	-0.015036	0.290
tradedClusters:ptPlecements	-2.16E-06	0.902	0.0002803	0.0130	0.0002803	0.110	0.0003825	0.014	0.0003825	0.172	0.0002397	0.092	0.0002397	0.287
Log(fdi)	-0.0024722	0.521												
Log(investments)	0.0063456	0.133												
Log(funding)	0.0555102	0.134												
Observations	405		336		336		374			374	374		374	
R Square														
Within R-Square	0.7773													
Fixed-effects regression	yes													
Number of Group	32		32		32		32		32		32		32	
Number of Instruments			15		15		17		17		17		17	
Triple Helix														
Arellano-Bond test for AR(1)			0.001		0.001		0.001		0.001		0.087		0.087	
Arellano-Bond test for AR(2)			0.015		0.015		0.020		0.020		0.230		0.230	
Sargan test of overid. restrictions:			0.278		0.278		0.556		0.556		0.556		0.556	
Hansen test of overid. restrictions:			0.044		0.044		0.038		0.038		0.038		0.038	
Traded Clusters														
Arellano-Bond test for AR(1)			0.005		0.005		0.009		0.009		0.114		0.114	
Arellano-Bond test for AR(2)			0.189		0.189		0.476		0.476		0.634		0.634	
Sargan test of overid. restrictions:			0.024		0.024		0.305		0.305		0.305		0.305	
Hansen test of overid. restrictions:			0.095		0.095		0.181		0.181		0.181		0.181	
Note:														
*p<0.1; **p<0.05; ***p<0.01														
All the commands and algorithms are coded using Stata Statistical Software 14 version														
Multiple regression analysis using Droscoll and Kraay , One-step diff GMM ,One-Step System GMM and Two-step System GMM. All regression results show the Bootstrap as to further account for the small nature of our TSCS panel.														

Regional analysis of tHelix and tradedClusters institutional support with the variable "ptPlecements"														
Table 02 Driscoll & Kraay robust covariance matrix & GMM regression models northern regions 1a & 2a														
Explanatory varibales		Dependent variable: Log **(GDPpesos)**												
Models	**9**		**10**				**11**				**12**			
	Driscoll& Kraay		**One-step diff GMM**		**Bootstrap**		**One-step sys GMM**		**Bootstrap**		**Tow-step sys GMM**		**Bootstrap**	
	coeff	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**
Lag**(GDPpesos)**														
L1	0.4410972	0.001	0.7782366	0.001	0.7782366	0.001	0.661567	0.001	0.661567	0.001	0.6641717	0..001	0.6641717	0.001
L2			0.2904051	0.004	0.2904051	0.011	0.2824996	0.008	0.2824996	0.029	0.2739897	0.042	0.2739897	0.062
tHelix	4.12587	0.001					0.0079826	0.683	0.0079826	0.637	0.0077274	0.696	0.0077274	0.904
ptPlacements	3.38E-05	0.242	-0.0007621	0.066	-0.0007621	0.153	-0.0008199	0.021	-0.0008199	0.068	-0.0007675	0.050	-0.0007675	0.217
tHelix:ptPlecements	-7.72E-06	0.005	0.0001728	0.211	0.0001728	0.177	0.0001689	0.160	0.0001689	0.204	0.000187	0.264	0.000187	0.238
Log(fdi)	0.0035896	0.684												
Log(investments)	0.0126555	0.005												
Log(funding)	0.0158265	0.804												
Model	**13**		**14**				**15**				**16**			
L1	0.4461171	0.001	0.6947819	0.001	0.6947819	0.001	0.5538842	0.001	0.5538842	0.001	0.563436	0.001	0.563436	0.002
L2			0.3382666	0.001	0.3382666	0.003	0.4151387	0.001	0.4151387	0.005	0.4231558	0.001	0.4231558	0.028
tradedClusters	0.208906	0.001					-0.0196305	0.030	-0.0196305	0.295	0.0021817	0.906	0.0021817	0.974
ptPlacements	0.0008826	0.430	-0.0168155	0.079	-0.0168155	0.262	-0.0338826	0.128	-0.0338826	0.115	-0.0160109	0.371	-0.0160109	0.583
tradedClusters:ptPlecements	-1.38E-05	0.425	0.0002651	0.078	0.0002651	0.264	0.0005342	0.126	0.0005342	0.115	0.0002507	0.375	0.0002507	0.586
Log(fdi)	0.0037068	0.671												
Log(investments)	0.0109768	0.016												
Log(funding)	0.0446999	0.455												
Observations	201		167		167		186		186		186		186	
R Square														
Within R-Square	0.8491													
Fixed-effects regression	yes													
Number of Group	16		16		16		16		16		16		16	
Number of Instruments			15		15		17		17		17		17	
Triple Helix														
Arellano-Bond test for AR(1)			0.005		0.005		0.025		0.025		0.179		0.179	
Arellano-Bond test for AR(2)			0.022		0.022		0.030		0.030		0.244		0.244	
Sargan test of overid. restrictions:			0.251		0.251		0.279		0.279		0.279		0.279	
Hansen test of overid. restrictions:			0.114		0.114		0.211		0.211		0.211		0.211	
Traded Clusters														
Arellano-Bond test for AR(1)			0.008		0.008		0.049		0.049		0.219		0.219	
Arellano-Bond test for AR(2)			0.092		0.092		0.132		0.132		0.084		0.084	
Sargan test of overid. restrictions:			0.023		0.023		0.868		0.868		0.868		0.868	
Hansen test of overid. restrictions:			0.161		0.161		0.366		0.366		0.366		0.366	
Note:														
*p<0.1; **p<0.05; ***p<0.01														
All the commands and algorithms are coded using Stata Statistical Software 14 version														
Multiple regression analysis using Droscoll and Kraay , One-step diff GMM ,One-Step System GMM and Two-step System GMM. All regression results show the Bootstrap as to further account for the small nature of our TSCS panel.														

Regional analysis of tHelix and tradedClusters institutional support with the variable "ptPlecements"														
Table 03 Driscoll & Kraay robust covariance matrix & GMM regression models of states with Triple Helix and Traded Clusters														
Explanatory varibales		Dependent variable: Log **(GDPpesos)**												
Model	**17**		**18**				**19**				**20**			
	Driscoll& Kraay		**One-step diff GMM**		**Bootstrap**		**One-step sys GMM**		**Bootstrap**		**Tow-step sys GMM**		**Bootstrap**	
	coeff	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**	**coeff**	**p>|t|**
Lag**(GDPpesos)**														
L1	0.8482301		0.9441688	0.001	0.9441688	.0.001	0.8649861	0.001	0.8649861	0.001	1.159371	0.040	1.159371	0.190
L2			0.0521235	0.635	0.0521235	0.58	0.1180964	0.0326	0.1180964	0.169	-0.152219	0.736	-0.152219	0.884
tHelix	0.6559414	0.132					-0.008379	0.290	-0.008379	0.325	-0.0298608	0.921	-0.0298608	0.991
ptPlacements	-1.46E-05	0.634	-0.0008601	0.007	-0.0008601	0.58	-0.000673	0.020	-0.000673	0.134	-0.000646	0.033	-0.000646	0.681
tHelix:ptPlecements	7.07E-07	0.75	0.0001534	0.028	0.0001534	0.21	0.0001181	0.027	0.0001181	0.205	0.0001139	0.045	0.0001139	0.868
Log(fdi)	0.004701	0.163												
Log(investments)	0.0103992	0.002												
Log(funding)	0.0097742	0.841												
Model	**21**		**22**				**23**				**24**			
L1	0.8438961	0.000	0.8627593	0.001	0.8627593	0.001	0.7811037	0.00	0.7811037	0.000	0.8039502	0.001	0.8039502	0.464
L2			0.1622477	0.019	0.1622477	0.340	0.2502109	0.081	0.2502109	0.141	0.2335878	0.176	0.2335878	0.832
tradedClusters	0.0555335	0.162					-0.0385976	0.100	-0.0385976	0.168	-0.0155196	0.378	-0.0155196	0.874
ptPlacements	0.0007182	0.164	-0.007709	0.337	-0.007709	0.760	-0.0184903	0.081	-0.0184903	0.606	-0.017522	0.241	-0.017522	0.924
tradedClusters:ptPlecements	-1.13E-05	0.161	0.0001204	0.338	0.0001204	0.760	0.0002888	0.081	0.0002888	0.606	0.0002746	0.241	0.0002746	0.924
Log(fdi)	0.0049668	0.090												
Log(investments)	0.0105939	0.0030												
Log(funding)	0.0178856	0.717												
Observations	130		110		110		120		120		120		120	
R Square														
Within R-Square	0.9765													
Fixed-effects regression	yes													
Number of Group	10		10		10		10		10		10		10	
Number of Instruments			10		10		10		10		10		10	
Triple Helix														
Arellano-Bond test for AR(1)			0.039		0.039		0.047		0.047		0.167		0.167	
Arellano-Bond test for AR(2)			0.023		0.023		0.005		0.005		0.078		0.078	
Sargan test of overid. restrictions:			0.227		0.227		0.027		0.027		0.027		0.027	
Hansen test of overid. restrictions:			0.479		0.479		0.656		0.656		0.656		0.656	
Traded Clusters														
Arellano-Bond test for AR(1)			0.020		0.020		0.050		0.050		0.178		0.178	
Arellano-Bond test for AR(2)			0.014		0.014		0.020		0.020		0.070		0.070	
Sargan test of overid. restrictions:			0.000		0.000		0.001		0.001		0.001		0.001	
Hansen test of overid. restrictions:			0.526		0.526		0.683		0.683		0.683		0.683	
Note:														
*p<0.1; **p<0.05; ***p<0.01														
All the commands and algorithms are coded using Stata Statistical Software 14 version														
Multiple regression analysis using Droscoll and Kraay , One-step diff GMM ,One-Step System GMM and Two-step System GMM. All regression results show the Bootstrap as to further account for the small nature of our TSCS panel.														