HEC MONTRÉAL
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Essays on Consumer Default

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Résumé

Cette thèse de doctorat est composée de trois articles indépendants sur les défauts des consommateurs. Chaque chapitre documente de nouveaux faits empiriques et fournit des modèles économétriques pour expliquer ces résultats. Le chapitre 1 et le chapitre 3 exploitent un ensemble unique de dossiers d'insolvabilité au Canada qui a été fourni par le Bureau du surintendant des faillites (BSF). Le chapitre 2 utilise des données administratives sur les prêts recueillies par la Société canadienne d'hypothèques et de logement (SCHL).

Le premier article,*intitulé L'impact de la réforme de la faillite sur l'insolvabilité des consommateurs*, examine l'incidence des modifications apportées en 2009 à la Loi sur la faillite et l'insolvabilité (LFI) sur le choix de l'insolvabilité des consommateurs. Les résultats montrent que les politiques nationales de faillite peuvent avoir des impacts sensiblement différents au niveau régional.

Le deuxième document, *Les choix d'insolvabilité des immigrants*, explore la variation des choix d'insolvabilité des immigrants et des non-immigrants. Les résultats mettent en évidence l'incertitude des revenus en tant que facteur qui influence le choix des immigrants en matière d'insolvabilité diffère de celui des non-immigrants et suggèrent l'importance de l'auto-assurance pour le risque de variation du revenu plus élevé.

Le dernier article, *Possibilités d'inexactitude du revenu sur les demandes de prêts hypothécaires: données du marché canadien de l'habitation*, examine la relation entre la surévaluation frauduleuse du revenu et la défaillance hypothécaire. Les résultats suggèrent que les emprunteurs sont plus incités à fausser leur revenu dans les marchés où les prix sont élevés, ce qui conduit à des taux de défaut plus élevés.

Mots clés: faillite des consommateurs, réforme des faillites, restructuration de la dette, immigration, fausses déclarations de revenus, prêts hypothécaires, défaut de paiement, dette des ménages

Méthodes de recherche: microéconomie empirique, variables instrumentales, données de panel, différences dans les différences, effet fixe, scores de propension généralisée

Abstract

This doctoral thesis consists of three independent essays related to the topic of consumer default. Each essay documents new empirical facts and provides econometric models to explain the findings. Essays one and two exploit a unique dataset of insolvency filings in Canada that was provided by the Office of the Superintendent of Bankruptcy (OSB). The third essay uses loan-level administrative data collected by the Canada Mortgage and Housing Corporation (CMHC).

The first essay, *The Impact of Bankruptcy Reform on Consumer Insolvency Choice*, investigates the impact of the 2009 amendments to the Canadian Bankruptcy and Insolvency Act (BIA) on consumer insolvency choice. The results show that national bankruptcy policies can have sizeably different impacts at the regional level.

The second essay, *Immigrants' Insolvency Choices*, explores the variation in the insolvency choices of immigrants from those of non-immigrants. The results point to income uncertainty as a statistically significant explanation for differences between the insolvency choices of immigrants from non-immigrants. This finding highlights the importance of self-insurance against higher income risk.

The third essay, *Possible Income Misstatement on Mortgage Loan Applications: Evidence from the Canadian Housing Market*, investigates the relationship between fraudulent income overstatement and mortgage default. The results suggest borrowers have greater incentive to misstate their income in high-priced markets, which leads to higher default rates.

Keywords: Consumer bankruptcy, Bankruptcy reform, Debt restructuring, Immigration, Income misstatement, Mortgage lending, Default, Household debt

Research methods: empirical microeconomics, instrumental variables, panel data, differences-in-differences, fixed effect, generalized propensity score

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To: Nasrin and Pouran,

for their unconditional and endless love.

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Ottawa, September 30, 2018

Kiana Basiri

General Introduction

This doctoral thesis consists of three independent essays related to the topic of consumer default. The essays are self-contained, and each was written with the purpose of being published as a separate article in an academic journal.

The first essay, *The Impact of Bankruptcy Reform on Consumer Insolvency Choice*, investigates the impact of the 2009 amendments to the Canadian Bankruptcy and Insolvency Act (BIA) on consumer insolvency choice. There are three options for an insolvent individual:

(i) Bankruptcy, which is associated with debt discharge in exchange for non-exempt assets and subsequent wage garnishment,

(ii) Proposal Division I, called the commercial proposal, which is the only option for individuals with a debt above $250,000,

(iii) Proposal Division II, called the consumer proposal, which is available to individuals with a debt below $250,000.

The amendment to the BIA, which came into effect in September 2009, increased the limit for allowing Division II proposals from $75,000 to $250,000 of debt, and increased the wage garnishment period for bankruptcies from 9 to 21 months. To quantify the average treatment effect of the reform on the choice between Division I and II and between bankruptcy and proposal, this paper exploits administrative data on the population of insolvency filings in Canada between 2007 and 2012.

The design of the experiment is a difference-in-differences (DiD) estimation pre-post reform between the treated and control group. The liabilities threshold is such that, prior to September 2009, debtors with non-principal residence liabilities above $75,000 could

not file the more cost-effective Division II proposal. The treatment group is then filers with $75,000 to $250,000 of liabilities, who were previously ineligible for Division II proposals, while the control group is filers below $75,000 of liabilities. The nature of the exercise is that the DiD estimator takes the difference between the cross-sectional discontinuity at $75,000 after 2009 and the cross-sectional discontinuity at $75,000 before 2009. This difference represents the causal impact of the policy change. Overall, the results suggest that the 2009 bankruptcy reform was a success. In addition, the increase in proposals is mostly in provinces without generous asset exemptions and more important for home-owners.

The second essay, *Immigrants' Insolvency Choices*, explores the variation in the insolvency choices of immigrants and those of non-immigrants. While the literature on consumer bankruptcy choices and on immigrants' labour income is vast, no previous paper examines the insolvency choices of immigrants. The results of this paper, therefore, improve our understanding of immigrants' insolvency choices. The choice between debt restructuring and bankruptcy is a decision about protecting current assets versus future earnings, and it has implications for individual consumption smoothing and future access to credit. Previous studies of immigrants' labour market outcomes support the view of the differentiated income risk among immigrants and native-born citizens. Assuming the higher income uncertainty of immigrants relative to non-immigrants, we expect a higher rate of debt restructuring among immigrants. This is possibly because retaining some assets helps them with self-insurance, which they prefer since they face higher income risk relative to the non-immigrant population.

Using the same dataset as in the first essay, I show the propensity of debt restructuring relative to bankruptcy is higher in neighbourhoods with a higher share of immigrants. I confirm my findings using a generalized propensity score with neighbourhoods' share of immigrants as a continuous treatment. This paper presents a theoretical framework to establish the link between income uncertainty and insolvency choice. I show that for borrowers with positive assets, a higher chance of unemployment increases the marginal benefit of a proposal. To the extent that the neighbourhood share of immigrants is a proxy for

individual immigration status, my analysis shows higher rate of proposals among immigrants. One possible explanation for why immigrants are more likely to choose proposal over bankruptcy is income uncertainty, which suggests the importance of self-insurance against higher income risk.

The third essay, *Possible Income Misstatement on Mortgage Loan Applications: Evidence from the Canadian Housing Market*, investigates the relationship between fraudulent income overstatement and mortgage default. If borrowers overstate their income on their mortgage application either to enter the housing market or to obtain larger loans, a negative income shock could translate to a higher probability of mortgage default due to cash flow problems. I exploit Canada Mortgage and Housing Corporation's (CMHC) administrative data and Canada Revenue Agency's (CRA) income tax data and build a measure of Possible Income Misstatement (PIM) for regional real estate markets. The basic idea is that in the absence of any change in the level of income misstatement on mortgage applications, income reported on mortgage applications and tax files rises (or declines) at the same rate over a certain period. Therefore, we expect to see little to no growth difference (i.e. no expansion or contraction in the gap). Using a two-stage least square framework to correct for the endogenous nature of house prices and PIM, I find robust evidence that part of the observed dispersion in PIM is caused by house price variation. Moreover, I investigate the relationship between PIM and mortgage default. Borrowers living in areas with higher levels of PIM are more likely to default on their mortgage.

Taken together, these results suggest that high-priced markets appear more likely to create incentives for borrowers to overstate their income, and this creates a channel for more defaults due to possible cash flow problems. These findings have important implications for regulators designing mortgage market policies. In addition, income reported on mortgage applications, especially in high-priced markets, should be considered with caution, as a borrower's income could be overstated.

The remainder of this thesis consists of the three essays introduced above, each of which constitutes a separate chapter.

Chapter 1

The Impact of Bankruptcy Reform on Insolvency Choice

Coauthored with Jason Allen[1]

Abstract

We examine the impact of the 2009 amendments to the Canadian Bankruptcy and Insolvency Act on insolvency decisions. The amendments were successful in steering debtors out of Division I debt restructuring and into the more cost-effective Division II debt restructuring. While total insolvencies remained flat following the amendments, they led to a significant substitution out of bankruptcies and into debt restructuring. The extent of substitution greatly depends on regional and individual circumstance. For example, generous asset exemptions under bankruptcy at the provincial level discourage debt restructuring while homeownership encourages it. Our results show, therefore, that the impact of national bankruptcy policies can have sizably different impacts at the regional level.

JEL codes: D14, K35

Keywords: consumer bankruptcy; debt restructuring

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1.1 Introduction

In September 2009 the Canadian government passed legislation to encourage financially distressed borrowers to file for debt restructuring rather than declare bankruptcy. The amendments to the Bankruptcy and Insolvency Act (BIA) included increasing the maximum debt limit (excluding debt secured by principal residence) for filing a consumer proposal (Division II), thereby allowing consumers to escape the more onerous Division I proposal. It also increased the cost of filing for bankruptcy for high-income debtors. Specifically, it codified that all high-income debtors face wage garnishment for 21 months compared to 9 months. In some ways, the change in Canadian legislation was similar to changes in the U.S. in 2005 when Congress passed the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA). The BAPCPA was meant to increase the cost of bankruptcy and introduced income-testing to steer debtors into debt restructuring. We know very little, however, about the impacts of this type of steering.[2] In this paper we examine the impact of the BIA amendments on household insolvency choice.

The decision for financially distressed borrowers about how to file for formal insolvency—via bankruptcy or debt restructuring, involves trade-offs. Filing for bankruptcy results in a “fresh start", whereby almost all debt is forgiven, assets not protected by exemption limits are seized, and creditors must cease collection action. Filing a proposal, on the other hand, involves a formal restructuring plan with reduced debt repayment over a 3- to 5-year period. Debt restructuring allows individuals to keep all their assets and also have access to cheaper credit markets.[3]

Our results are as follows. The introduction of the BIA amendments led to an in-

[2]Sullivan et al. (2001) document that the majority of debt restructuring cases are unsuccessful. Dobbie and Song (2015) and Dobbie et al. (2015) find that debt restructuring can lead to benefits in terms of financial outcomes, labour earnings, and even mortality risk. Albanesi and Nosal (2015) document how the BAPCPA was only successful in decreasing the number of bankruptcies, because a larger fraction of insolvent individuals actually did not file because of the increased cost of filing.

[3]Credit bureaus record proposals differently than they do bankruptcies and for a shorter time frame (3 years compared with 7). Han and Li (2011) document that recent bankruptcy filers have less access to unsecured credit than individuals who have never filed for bankruptcy, and are more likely to use expensive lending sources. Han et al. (2015) find that recent filers can access credit cards but at more expensive rates, and have lower limits than those offered to non-filers.

crease in proposals and this increase is a result of a shift in the composition of insolvency type and not due to an overall increase in insolvencies. The amendments were successful in that we observe a 92% increase in the more cost-effective Division II proposals relative to expensive Division I proposals. In addition, proposals increased by approximately 11.5% relative to bankruptcies. The extent of substitution greatly depends on the costs of bankruptcy. Generous asset exemptions under bankruptcy, for example, make debt restructuring unattractive since a primary benefit of debt restructuring is asset protection. We document that the increase in proposals is mostly in provinces without generous asset exemptions (including homestead exemptions); we see a nearly three-times larger increase in proposals in provinces without these exemptions relative to provinces with them. Similarly, the increase in debt restructuring by home-owners (who are looking to protect their largest asset) is more than twice that of renters. National bankruptcy policies, therefore, can have sizably different impacts depending on regional differences in asset exemptions and home-ownership rates.

To identify the impact of the 2009 BIA amendments on households' insolvency choices, we use administrative data on the population of insolvency filings in Canada and rely on a difference-in-differences (DiD) strategy to identify the average treatment effect of the amendments on the choice of insolvency instrument for insolvent households. We combine two sources of variation, before/after 2009 and just below/above a liabilities threshold. The liabilities threshold is such that, prior to September 2009, debtors with non-principal residence liabilities above $75,000 could not file the more cost-effective Division II proposal. The intuition for our identification strategy is straightforward: the DiD estimator takes the difference between the cross-sectional discontinuity at $75,000 after 2009 and the cross-sectional discontinuity at $75,000 before 2009. This difference represents the causal impact of the policy change.

The paper is organized as follows. Section 1.2 describes the institutional environment, in particular, the two options for consumers filing insolvency in Canada and the 2009 amendments to the Bankruptcy and Insolvency Act. Section 1.3 presents an analysis of the data, including a description of assets and liabilities of individuals filing for insolvency.

Section 1.4 presents the empirical analysis. Section 1.5 concludes.

1.2 Institutional Details

Consumer insolvencies in Canada are governed by the Bankruptcy and Insolvency Act and supervised by the Office of the Superintendent of Bankruptcy (OSB), the national regulator. In September 2009, Chapter 36 of the Statutes of Canada was enacted, making amendments to the BIA. The amendments came into force in stages, the first in July 2008 and the second in September 2009. In 2008, the government decreased the non-dischargeable period for student loans from 10 years to 7. In 2009, amendments were made to encourage Division II proposals. The debt limit (excluding debt secured by principal residence) for Division II proposals was increased from $75,000 to $250,000, thereby allowing consumers to file Division II proposals rather than Division I proposals if they had less debt than the new limit. Furthermore, the length of time bankruptcy filers with surplus income had their wages garnished was increased from 9 months to 21 months. The focus of this paper is on the 2009 amendments, given that student loans are only a small fraction of total liabilities among defaulters in Canada.

For individuals who are insolvent there are two types of bankruptcy: ordinary and summary; and two types of proposals: Division I and Division II. Both bankruptcy and proposals stop most collection actions and terminate the accumulation of interest accruing on unsecured debt. Under bankruptcy, most debt is written off in return for asset liquidation. The difference in types of bankruptcies is in the value of assets. An ordinary administration bankruptcy is for individuals with more than $15,000 in assets and a summary bankruptcy is for individuals with less. We do not differentiate bankruptcy types in our analysis.

Under bankruptcy, a trustee might sell, lease, borrow against, or apportion to the creditors any non-exempt property of the bankrupt. The property of a bankrupt that is exempt from seizure varies by province.[4] The higher the asset exemption level, the more the

[4]The most important exemptions are food and heating fuel, health aids, clothing, furniture, the tools

debtor is protected during bankruptcy. The bankrupt may also be required to make payments from subsequently earned surplus income for distribution to the creditors. The more surplus income, the more a bankrupt is required to contribute. Bankruptcy trustees calculate surplus income as income less allowable expenses. First-time bankrupts with surplus income of more than $200 per month are obliged to contribute 50% of this income towards repaying debts to their creditors for 21 months after the date of bankruptcy and before the discharge.[5] Before the amendments, these filers were able to obtain an automatic discharge as early as 9 months after the date of bankruptcy. Approximately 14% of filers have surplus income. This number is relatively constant over our sample and uncorrelated with the 2009 BIA amendments.

First-time bankruptcy filers who fulfill all the requirements set out by the courts are automatically discharged of their debt after a period of 9 months (standard) to 21 months (in the cases where someone has surplus income) and make a "fresh start."[6,7] Bankruptcies remain on an individual's credit report (R9) for 6 to 7 years, depending on the province.[8]

In contrast to bankruptcy, consumer proposals are meant to modify unsecured debt payments, as secured debt payments are unchanged. The main difference between proposal types is process, and this is driven by accessibility. Consumers cannot file Division II if they had liabilities (excluding debt secured by principal residence) totaling more than $75,000 prior to 18 September 2009 and $250,000 after 18 September 2009. The ratio-

of one's trade, farmland, animals, equipment, and supplies, pensions or retirement savings. Additional exemptions include any property the bankrupt holds in trust for another person (e.g. registered education plans); government prescribed savings plans (e.g. Registered Retirement Saving Plans (RRSPs) except for contributions within one year of filing); or prescribed payments relating to the essential needs of an individual. Table A7 in the Appendix lists the main exemptions.

[5]For example, for a family of 3 the limit for allowable expenses is $3,156 per month. An individual with income of $3,500 a month owes $172 a month to the creditors via the trustee.

[6]Individuals with more than $200,000 in personal income tax debt that makes up 75% or more of their total unsecured debt are not eligible for an automatic discharge. After applying to the Court, the Court may suspend or refuse the discharge or may impose conditions, such as partial payment of debts over a specific period of time (Highlights of the 2009 legislation, Industry Canada).

[7]Even after a "fresh start", some debts, such as taxes, child support, or court-ordered payments (e.g. fines or penalties imposed by the court or a debt arising from fraud) are not discharged and the filer must meet these obligations. Student loan debts are only discharged once the filer has been out of school for a lengthy period of time (10 years prior to 18 September 2009 and then decreased to 7 years).

[8]An R9 credit rating is also assigned if an individual has bad debt, debt is assigned to a collection agency, or if the individual moved provinces without providing creditors with a forwarding address.

nale of the 2009 BIA amendments was to "channel more debtors into the simpler and more cost-effective consumer proposal scheme."[9] The nature of the cost-effectiveness of Division II is both for borrowers and lenders.

The repayment schedule under a proposal must be completed within 5 years. A Division I is available to both businesses and consumers and there is no limit with respect to how much money is owed. To ensure approval, a Division I proposal requires a 50% plus one majority in the number of creditors, a two-thirds majority in dollar value, and court approval. A Division II proposal requires only a simple majority of creditors to ensure approval. Division II proposals are either approved or rejected by ordinary resolution and are deemed approved by the Courts if no requests have been received to have the Court review the proposal. In a Division II proposal, an automatic bankruptcy does not occur if there is disagreement among creditors. Overall, Division II is faster and cheaper relative to Division I. If debtors default on the proposal, the creditor is allowed to garnishee debtors' income, seize their bank accounts, or intercept their tax returns. A proposal is flagged on a credit report for 3 years (designated R7). As of 18 September 2009, debtors are considered in default if they have missed an equivalent of 3 payments. Prior to that, debtors were considered in default for missing a single payment. An important rationale for the 2009 BIA amendments was keeping consumers in the proposal stream rather than forcing them into bankruptcy.

There are important differences in administrative fees for individuals considering their insolvency options, with fees being higher under Division I. This ultimately reduces the proceeds distributed to the creditors and, therefore, reduces the chances of the proposal being approved. Finally, if a Division I proposal is rejected, the debtor is automatically bankrupt. Fees are set by the BIA and depend on the amount owed. Although bankruptcy fees in Canada can reach into the thousands, the typical bankruptcy fees in Canada add up to approximately $1,600 (Ben-Ishai and Schwartz (2007)). Bankruptcy fees include (2) required counselling sessions. The typical fee for proposals is two charges of $750 and

[9]See the rationale for change in definition of creditor in section 66.11 of the legislation: `https://www.ic.gc.ca/eic/site/bsf-osb.nsf/eng/br02282.html#consumer`. Accessed April 16, 2018.

20% of what is distributed to creditors. The upfront cost of filing a proposal is therefore similar to the upfront cost of filing for bankruptcy. The maximum distribution amount is equal to non-exempt assets less total liabilities plus unsecured liabilities. For the average proposal filing, this is equal to $15,600; therefore, the trustee collects on average $3,120 for a proposal. This is money not distributed to creditors.

1.3 Data

In this section, we provide details on the consumer-level data used in this paper, as well as complementary data on city-level employment and key census variables.

1.3.1 Consumer bankruptcy data

The main data set consists of individual-level insolvency filings provided by the OSB from March 2007 to March 2012. In December 2002, the OSB started collecting insolvency filings electronically, and by 2007 all filings were done electronically. We use data 30 months before and after the change in bankruptcy policy. We drop the day of the announcement and two days before and after the announcement in case of any errors with filing dates. In addition to a person identifier, we have socio-demographic information on the filer (age, marital status, employment status, home postal code), we have information on income and expenses, as well as a detailed breakdown of assets, liabilities, and creditors.[10] The key variable in this study is total liabilities (excluding debt secured by principal residence) at the individual level. Total liabilities (excluding debt secured by principal residence) is our assignment variable, and it determines our treatment and control groups. Unsecured liabilities form the majority of total liabilities as most filers are renters. Preferred creditors are included as well. They do not have access to secured

[10] Asset categories are cash on hand, cash-surrender value of life insurance policies plus RRSPs, furniture, personal effects, securities, house, cottage, land, automobile, motorcycle, snowmobile, other motor vehicle, recreational equipment, estimated tax refund, and other assets. Liability categories include real property, bank loans, finance company loans, credit cards (banks), credit cards (non-banks), taxes, student loans, loans from individuals, and other loans.

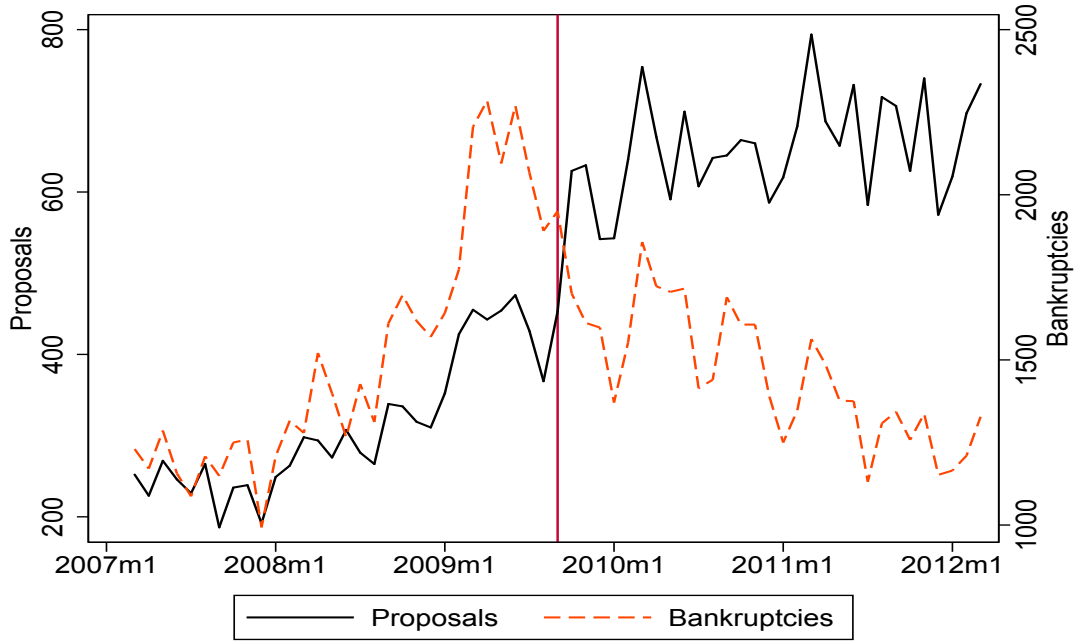
property but are paid out before unsecured creditors in situations where there are returns on sold assets.

We define the *treatment group* as individuals who have debt (excluding debt secured by principal residence) greater than $75,000 and less than $250,000 when filing for the first time. The *control group* are individuals who have debt (excluding debt secured by principal residence) of less than $75,000. In order to have individuals with comparable liabilities we restrict our sample to those with liabilities within $25,000 of the threshold. Restricting the sample further reduces the size of the control group relative more; we purposely do this because we think that individuals far away from the threshold are not as impacted by the threshold.

Figure 1.1 shows the evolution of proposals and bankruptcies over the sample period. One observation from this graph is that there was no run-up in filings pre-amendments. This is in contrast to the U.S. experience prior to the implementation of the BAPCPA. The increase in bankruptcies in late 2008 and early 2009 is related to the the mild recession Canada experienced between the fall of 2008 and the summer of 2009. Bankruptcies actually started falling several months prior to September 2009. One likely reason why we do not observe a spike in bankruptcies just prior to the rule change is that the amendments were advertised as a tool for highly indebted households to restructure their debt rather than an increase in cost for bankruptcy filings. The second observation from Figure 1.1 is that, following the 2009 BIA amendments, bankruptcies fall, proposals increase, and overall insolvencies are relatively unchanged. In section 1.4 we present more precise evidence on total insolvencies and the lack of importance of the extensive margin in explaining consumer credit post-amendments.

The most striking feature of the data presented in Table 1.1 is the increase in proposals for the treatment group, from 5.6% to 30.1%, in contrast to the control group, which increased from 21.5% to 31.5%. A part of this increase in proposals is from the relative increase in the number of homeowners filing for insolvency. Homeowner insolvency in the treatment group went from 34.1% to 40.5%, whereas in the control group the increase in homeowner insolvency was smaller, from 32.1% to 35.7%. The fraction

Figure 1.1 – Total insolvencies between March 2007 and March 2012



of filers who were unemployed did not increase. Unemployed debtors are more likely to file for bankruptcy because they do not have the required income to make monthly debt repayments. In addition, the average age and total income of filers were slightly higher post-amendments.[11]

[11] In our regression analysis, we control for filer as well as market characteristics given that in 2008-2009 there was a recession. Fieldhouse et al. (2012) document that the average age of defaulters was higher in the recession and incomes were lower. They also document that defaulters were more likely to be married over this period. Sullivan et al. (2001) document that the most common reason to file for Chapter 13 in the U.S. is homeownership. Domowitz and Sartain (1999) document that higher marriage rates, higher income, and higher equity-to-debt levels all lead to a greater propensity to file for debt restructuring over bankruptcy.

Table 1.1 – Summary statistics of regression sample

The sample is from March 2007 to March 2012 and includes 120,195 observations divided between the control group pre- and post-amendments, with 30.9% in the treatment group and 53.4% observed post-amendments. I(proposal) is equal to 1 if the filing is a proposal and 0 otherwise. I(employed) is equal to 1 if the filer is unemployed and 0 otherwise. I(surplus income) equals 1 if the filer has surplus income and 0 otherwise. I(homeowner) equals 1 if the filer is a homeowner and 0 otherwise. I(married) equals 1 if filer is married and 0 otherwise. "Non-principal res. debt" is total liabilities excluding debt secured by principal residence. Total and employment income are individual monthly reported. All the liabilities, assets, and income categories are adjusted for inflation using the consumer price index (base 2002). Assets are based on estimated realizable amounts. Total liabilities include secured, preferred, and unsecured. FBB stands for financial benefit of bankruptcy and reflects the costs and benefits from bankruptcy. All continuous variables except age are in Canadian dollars.

	Control/Before		Control/After		Treatment/Before		Treatment/After	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
I(proposal)	.22	.41	.32	.47	.057	.23	.30	.46
Non-principal res. debt	61,111	6,703	60,901	7,108	86,278	7,143	86,110	7,159
age	44.9	11.7	46.3	12	45.8	11.3	47	11.3
I(unemployed)	.14	.35	.14	.34	.17	.38	.14	.35
Employment income	1,425	1,301	1,462	1,386	1,329	1,355	1,486	1,507
Total assets (exempt)	18,927	55,805	29,499	78,957	24,466	71,637	38,292	93,688
Total assets (not exempt)	75,039	112,129	87,467	123,374	79,873	118,623	104,271	142,083
Total liabilities	118,607	99,810	133,528	115,805	151,453	108,290	176,451	131,702
I(surplus income)	.15	.36	.15	.35	.14	.34	.14	.35
FBB	57,579	11,829	57,400	11,807	81,364	15,432	81,297	15,724
I(homeowner)	.32	.47	.36	.48	.34	.47	.41	.49
I(married)	.44	.50	.43	.50	.48	.50	.48	.50
Nb. of bankruptcies	31,241		29,616		15,324		14,628	
Nb. of proposals	8,535		13,630		918		6,303	

We also observe from Table 1.1 that exempt assets increased post-amendments, as did non-exempt assets. Table A7 in the Appendix lists the main exemptions by province. Non-exempt assets increased for both the control and treatment groups, but this was almost exclusively due to the increase in homeowner filings. Total liabilities increased substantially from an average of $118,607 to $133,528 for the control group and from $151,453 to $176,451 for the treatment group.

Table 1.1 also reports a measure of net financial benefit of bankruptcy (FBB, Fay et al. (2002)). We report the FBB only for bankruptcies, since the benefit for proposals depends crucially on the negotiated reduced repayment plan. Specifically, we define FBB by equation (2.9):

$$FBB = \max\{D - \max\{W - E, 0\}, 0\} - \frac{m}{2}S, \tag{1.1}$$

where D is debt (excluding debt secured by principal residence); W is total assets minus total secured liabilities; E is total exempt assets; S is monthly surplus income; and m is the number of months a bankrupt has to pay surplus income, 9 months prior to the 2009 amendments to the BIA and 21 months after the amendments. The net gain from filing a bankruptcy, therefore, is the amount of unsecured liabilities that are wiped out after non-exempt assets are liquidated. On average, the net financial benefit of filing for bankruptcy for an individual in the control group is about $57,500 whereas it is about $81,300 in the treatment group. The differences in FBB suggest that the benefits of filing for bankruptcy are greater for filers with more than $75,000 in debt (excluding debt secured by principal residence). We do not see much of a difference in the pre- and post-amendments levels of FBB in either the control or treatment groups.[12]

Figure 1.2 (a) decomposes proposals into control and treatment groups, shedding light on the identification of the impact of the amendments on insolvency choice. Pre-amendments proposal rates are higher in the control group; although important for the

[12]One caveat is that we are underestimating FBB in the pre-period. This is because we assume that surplus income is collected for 9 months in all cases. However, depending on the trustee, surplus income can be collected for up to 21 months in the pre-period. We do not have information on the fraction of cases where wage garnishment extended past 9 months.

DiD, the trends are parallel. Post-amendments, we observe a large increase in proposals in the treatment group and a small increase in proposals in the control group. This suggests the gains from filing a proposal are deemed substantial by indebted households. These gains include reductions in administrative and legal costs as well as restructured loan repayment as opposed to wage garnishment for high-income filers. Similarly, Figure 1.2 (b) presents Division II proposals decomposed into treatment and control groups. Pre-amendment treatment-group filers did not have the option to file Division II. When given the option to do so, they take it. Post-amendments, therefore, we observe a very large increase in proposals in the treatment group.

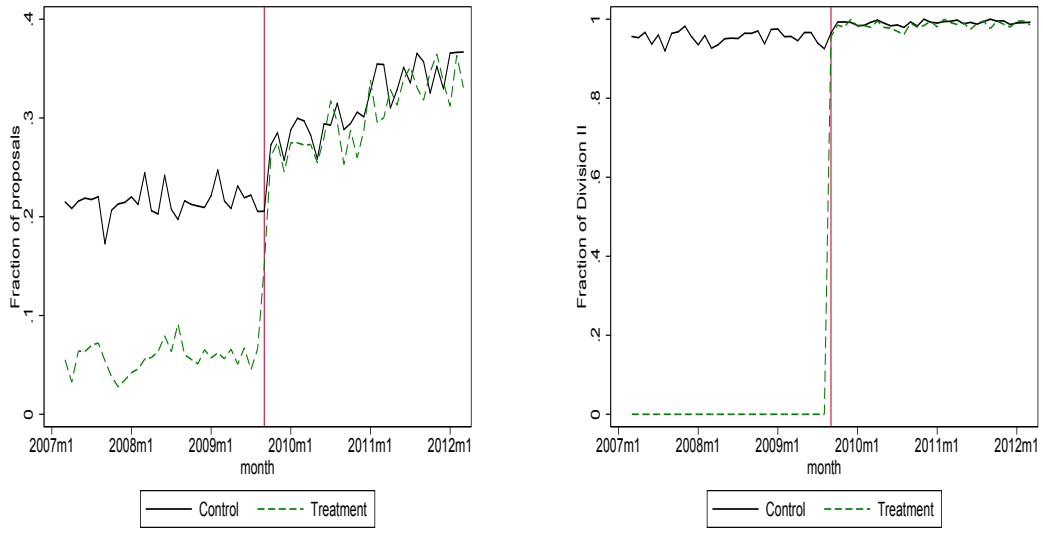
Table 1.2 shows the distribution of liabilities of all insolvencies for the regression period for the control/treatment groups, before and after the amendments. Mortgage debt increases for both the control and treatment groups, as does credit card debt. The fraction of filers with a mortgage increases 8.9 percentage points in the treatment group but only 4.6 percentage points in the control group, providing some evidence that the distribution of defaulter-type shifted somewhat toward homeowners. Fieldhouse et al. (2012) attribute the increase in the number of homeowners filing for insolvency to the business cycle, which we control for in our econometric analysis. Total credit card debt makes up the largest fraction of unsecured debt, followed by bank loans. Student loans are relatively flat in the control and treatment groups, averaging around $23,000 per filer, conditional on having a student loan. Between 10% and 12% of filers have student debt. Finally, the majority of filers have “other" debt. This includes debts to individuals, such as lawyers, doctors, and friends; it also includes debts to utilities.

Table 1.2 – Total liabilities breakdown conditional on owing

The sample is from March 2007 to March 2012 and includes 120,195 observations divided between the control group pre- and post-amendments, with 30.9% in the treatment group and 53.4% observed post-amendments. There are three types of debt: unsecured, preferred, and secured. All dollar amounts are adjusted for inflation using the consumer price index (base 2002). We consider 30 months before to 30 months after the bankruptcy amendments. Consumer bank loans are all bank loans except mortgages. Taxes include federal, provincial, and municipal taxes. "Other" includes payday loans, additional liabilities owed to government, utilities, and debts owed to lawyers, doctors, and individuals. Payday loans are less than 0.5% of total liabilities. The column $I(owe)$ is an indicator variable, giving the percentage of filers in each category who defaulted.

	Control/Before				Control/After			
	Mean	S.D.	$P(50)$	$I(owe)$	Mean	S.D.	$P(50)$	$I(owe)$
Bank loans	24,414	22,825	20,000	70.2	25,573	24,750	20,123	73.0
Finance co. loans	14,243	15,510	10,000	44.7	13,828	15,095	9,950	37.9
Credit cards-banks	20,395	15,643	17,107	82.2	21,863	15,792	19,200	84.2
Credit cards-others	10,857	10,629	7,536	67.3	11,290	10,603	8,128	66.1
Mortgages	171,786	106,396	155,006	30.3	193,691	113,917	180,000	34.9
Taxes	13,948	18,502	4,500	40.5	13,142	17,904	4,140	42.8
Student loans	20,966	16,796	16,515	12.9	20,700	17,010	16,106	12.3
Loans-individuals	12,772	12,643	9,000	3.6	12,586	13,103	8,776	3.5
Other	16,090	27,422	6,489	62.8	13,291	22,367	4,943	56.3
	Treatment/Before				Treatment/After			
	Mean	S.D.	$P(50)$	$I(owe)$	Mean	S.D.	$P(50)$	$I(owe)$
Bank loans	32,258	30,786	25,000	71.8	32,710	30,707	25,367	75.0
Finance co. loans	17,036	19,214	10,989	45.2	16,281	18,502	10,481	38.9
Credit cards-banks	27,278	21,719	22,107	83.5	29,216	21,853	24,885	85.7
Credit cards-others	13,935	13,762	9,339	68.0	14,306	13,563	10,000	67.9
Mortgages	181,607	114,613	162,001	31.9	210,320	125,977	193,519	40.8
Taxes	24,147	28,098	9,500	46.6	22,094	27,368	7,945	48.1
Student loans	23,871	20,078	17,500	10.0	23,604	20,265	17,475	9.8
Loans-individuals	16,703	16,706	10,500	4.4	18,417	18,545	12,000	4.6
Other	23,580	37,361	9,459	68.1	18,576	29,419	6,902	60.1

Figure 1.2 – Fraction of insolvencies that are proposals – treatment and control



(a) Fraction of filings that are proposals (b) Fraction of proposals that are Division II

1.3.2 Supplementary data

We include city-level information from a number of sources. This includes monthly city-level employment data (Labour Force Survey) and information on financial literacy (based on the 2003 International Adult Literacy and Skills Survey), as well as census data on education, migration, ethnicity, housing, etc. Table 1.3 summarizes some of the key variables. Unemployment increased substantially over the sample period; however, the control and treatment markets' experiences were approximately the same. Population sizes are similar across groups, as are rates of homeownership, financial literacy scores, and income.

1.4 Empirical Analysis

Our empirical strategy is as follows. We first use a DiD approach to measure the impact of the amendments to the BIA on the decision to file a Division II proposal versus a Division I proposal. Next, we examine the impact of the amendments to the BIA on the

Table 1.3 – Summary statistics on auxiliary data of main regression sample

The sample is from March 2007 to March 2012. Only a partial list of variables is represented here because of space restrictions. The literacy scores are from 2003 and the census variables are from 2006. Omitted are age and immigration variables as well as variables related to education, migration, ethnicity, and dwelling type.

	Control/Before		Control/After		Treatment/Before		Treatment/After	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
log(2003 literacy score)	5.6	.04	5.6	.04	5.6	.04	5.6	.04
I(home-owner)	.70	.18	.70	.18	.70	.18	.71	.18
Population	25791	15034	25919	15122	25670	14939	25910	14987
Mean household income	70220	21895	70478	21607	70526	22327	71282	21570
Std error household income	1581	1648	1610	1731	1633	1838	1617	1607
Unemployment rate	7.26	2.52	8.14	2.06	7.25	2.61	8.12	2.06

choice between bankruptcy and proposal. We further decompose the relative increase in proposals by province (based on homestead exemptions) and home-ownership status. Finally, we show that total insolvencies did not increase as a result of the BIA amendments; and therefore, the increase in proposals is not on the extensive margin. That is, it is not from debtors following Division II proposals rather than continuing to pay off their debt outside the insolvency framework.

1.4.1 Impact of Policy on Proposals

We start with proposals. Tables 1.4 and 1.5 present the results for different specifications of the following DiD estimator:

$$\mathrm{P}_{it} = \alpha + \theta D_t + \kappa T_i + \beta D_t T_i + \gamma X_{it} + \xi D_t X_{it} + \varepsilon_{it}, \tag{1.2}$$

where, in Table 1.4, P_{it} is an indicator variable equal to one if the individual (i) files a Division II proposal and zero if the individual files a Division I proposal at date t; and in Table 1.5, P_{it} is an indicator variable equal to one for a proposal filing and zero for a bankruptcy filing. In both cases D is the amendments indicator variable equal to 1 after 18 September 2009 and 0 otherwise; T is the treatment indicator, equal to 1 if treated and

0 otherwise. D drops out of the regressions because we include week fixed effects in all specifications. Treated individuals are those with total debt (excluding debt secured by principal residence) greater than $75,000.[13] Those in the control group are individuals with total debt (excluding debt secured by principal residence) less than $75,000. Individuals above $75,000 are considered treated because pre-amendments they could not file a Division II proposal, whereas they could afterwards. Individuals below $75,000 are in the control group because both pre- and post-amendments they could file a proposal and are, therefore, unaffected by the amendments. We focus on individuals "close" to the $75,000 cut-off, which is defined as plus/minus $25,000 from the threshold.[14] We estimate Equation 1.2 using a linear probability model.

The parameter β captures the effect of bankruptcy amendments on the propensity to file (i) Division II versus Division I and (ii) a proposal versus a bankruptcy. We compare repeated daily observations on a cross-section of individuals (i) over 30 months (t) pre-amendments to 30 months post-amendments. This limits the possibility of confounding factors that might contaminate the estimate while also keeping a relatively large sample. Included in the covariates (X's) are the individual's age, marital status, home-ownership status (including whether or not a filer has sold property in the 12 months preceding the insolvency), occupation, employment status, number of creditors, and an indicator variable for whether a filer has surplus income.[15] Also included are market-level characteristics such as monthly unemployment rates (census Division); controls for ethnicity, education, and housing, as well as financial literacy (based on the 2003 National Financial Literacy Survey). We also vary location fixed effects, using either province or FSA fixed effects, where an FSA is the first three digits of a debtor's home postal code. We also interact

[13] Since liabilities are in real dollars, the cut-off is also adjusted in the regression.

[14] Results using the propensity score matching estimator are similar and available upon request. We also note that the $25,000 cut-off is nearly identical to twice the optimal bandwidth chosen to ensure there is no difference in manipulative sorting around the cut-off between the pre-treatment and post-treatment period.

[15] For some occupations, bankruptcy is very costly since individuals lose their practicing licence during the time of filing and discharge; e.g. public accountants (Bennett (2014)). Marital status affects household income and therefore can affect the filing decision. In particular, unemployed filers might choose a proposal because their spouses have sufficient income to pay creditors at a reduced rate. Home-ownership status controls for the fact that homeowners are more likely to choose a proposal than renters and therefore keep their residence.

the amendments date indicator with filer characteristics to control for the possibility that these could change with the policy.

Table 1.4 presents results on the propensity to file Division II versus Division I proposals post-amendments—the primary target of the amendments. In all our specifications—column (1), where we include 2006 census variables and province fixed effects; column (2), which includes FSA fixed effects as well as year times province fixed effects; and column (3), which includes census variables and province fixed effects as well as province times year fixed effects and the amendments date interacted with demographic variables—we find the amendments led to a 92% to 93% increase in Division II proposals. The results indicate that the policy change led the treatment group to behave like the control group once the regulatory restriction was removed and highlight the benefits to debtors of being able to file a Division II proposal. [16]

Table 1.5 highlights the change in insolvency from bankruptcy to proposal following the amendments. Our baseline estimate of the impact of the amendments on proposals is 11.8%. This is controlling for week and province fixed effects, year-province trends, and 2006 census-level variables. In columns (2) and (3) we focus only on homeowners and renters, respectively. The impact of the change in regulation is larger for homeowners, 18.4% compared to 7.9% for renters. This is because homeowners have a large asset to protect (house); and therefore, once the liabilities threshold is relaxed these individuals prefer to file for debt restructuring rather than bankruptcy. The impact on renters, however, is still substantial, highlighting that insolvency choice is not only related to home-ownership, and that there were gains from filing a proposal for renters that were not possible post-BIA amendment.[17]

In column (4) we report our preferred specification, which interacts the policy date

[16] In results not reported here, but available upon request, we implement a propensity scoring matching (PSM) estimator (Heckman et al. (1997)) to estimate the average treatment effect. PSM DiD explicitly controls for differences in observable reasons why some debtors might file for Division I versus Division II by matching filers in the control and treatment groups that are 'similar'. The results are close to the OLS results, on the order of an 85% increase in Division II post-amendments.

[17] We control for property sales which to some extent alleviates the concern that renters are previous home-owners.

with the debtor characteristics. This is clearly important as different debtor-types might file for proposal versus bankruptcy. We saw this, for example, in columns (2)-(3) for homeowners/renters. In addition, although we do not show all the debtor characteristics here, it is the case that debtors filing proposals are more likely to be married, older, and have surplus income. An increase in debtors with surplus income will necessarily lead to more proposals, as will an increase in the number of homeowners, a situation that occurs for business-cycle reasons.[18] The interaction term allows us to control for any change in debtor-type occurring at the time of the policy change. In terms of surplus income, for example, there is a slight decrease in filers with surplus income overall, in particular for those filing a proposal; this suggests that the increase in surplus income overall is not generating the increase in proposals. Once we control for the change in composition of debtors, we estimate an impact of the BIA amendments of 11.5%.

One potential concern with our estimate is that it is capturing both the increase in proposals resulting from the increase in bankruptcy costs and the decrease in costs from filing a proposal. The difference in upfront costs for bankruptcy and proposals is minimal. Proposals involve two payments of $750, whereas bankruptcy fees are on average $1,600 over 12 months. The impact of the amendments on bankruptcy costs therefore more likely originate from the increase in the period of wage garnishment from 9 months to 21 months for the 14% of filers with surplus income than from a change in fees. Recall that, in section 1.3, the FBB is larger in the treatment group than the control group; therefore, the gains from bankruptcy are greater above the $75,000 threshold. To separately identify the individual effects of increasing bankruptcy costs and the decreasing costs in proposal filings in columns (5)-(6), we compare the impact of the rule change in Alberta and Saskatchewan versus the rest of Canada. Alberta and Saskatchewan have the highest asset exemption levels under bankruptcy in Canada; therefore, proposals are not as attractive. Any increase in proposals, consequently, should come from the increase in bankruptcy costs. The impact of the amendments in Alberta/Saskatchewan is substan-

[18] We also examined the impact of the BIA amendments on house prices but leave them out of the paper because the results were insignificant. This could be, however, because of the lack of quality data on Canadian house prices at the city level.

Table 1.4 – Impact of the BIA amendments on proposal filing as Division II

The dependent variable is an indicator variable for whether the proposal was Division II and not Division I. The treatment group comprises filers with more than $75,000 but less than $100,000 in total debt (excluding debt secured by principal residence). The control group are filers with less than $75,000 in total debt but more than $50,000 (excluding debt secured by principal residence). Robust standard errors clustered at the FSA level are in parentheses. The coefficients on all covariates are excluded because of space restrictions but are available upon request. BIA = Bankruptcy and Insolvency Act; D is an indicator variable equal to 1 if post-amendment and 0 otherwise; F.E.= fixed effects; FSA is the first three digits of a filer's postal code. Significance levels *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
Policy effect	0.93***	0.92***	0.92***
	(0.01)	(0.01)	(0.01)
Treated	-0.94***	-0.92***	-0.93***
	(0.01)	(0.01)	(0.01)
Constant	1.23***	0.86***	1.04***
	(0.17)	(0.07)	(0.16)
Observation	26,862	26,854	26,854
R^2	0.63	0.68	0.64
Week F.E.	✓	✓	✓
Census 2006	✓		✓
Province F.E.	✓		✓
FSA F.E.		✓	
Year × Province F.E.		✓	✓
D× Demographics			✓

tially lower than the rest of Canada, a 5.1% increase versus 12.4%. These results suggest that the increase in bankruptcy costs is about 2.5 times less important than the increase in benefits from filing a proposal.[19]

Finally, we bring your attention back to Figure 1.2. Consistent with the graph, the empirical results indicate that the policy change led to the treatment group behaving like the control group once the regulatory restriction was removed. The propensity to file a proposal is approximately 35% for both groups post-amendments. As in the case of

[19]Mikhed and Scholnick (2014) highlight the role of distance as one reason debtors might not file for bankruptcy. This is in addition to other costs noted in the literature, such as fees (Gross et al. (2014)) and stigma (Livshits et al. (2010) and Gross and Souleles (2002)). These are all are level effects that either do not change with the amendments or affect the treatment and control groups equally, and are therefore wiped out by the DiD, leaving us with an estimate that is a measure of the impact of the amendments on insolvency choice.

Table 1.5 – Impact of the BIA amendments on proposal filings

The treatment group are filers with more than $75,000 but less than $100,000 in total debt (excluding debt secured by principal residence). The control group are filers with less than $75,000 in total debt (excluding debt secured by principal residence) but more than $50,000. Robust standard errors clustered at the FSA level are in parentheses. The coefficients on all covariates are excluded for reasons of space but are available upon request. D is an indicator variable equal to 1 if post-amendment and 0 otherwise; F.E.= fixed effects; FSA is the first three digits of a filer's postal code; RoC is rest of Canada. Significance levels ** p<0.05, * p<0.1.

	(1) Full sample	(2) Homeowner	(3) Renter	(4) Full sample	(5) RoC	(6) AB/SK
Policy Effect	0.12***	0.18***	0.08***	0.12***	0.24***	0.05
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Treated	-0.14***	-0.20***	-0.10***	-0.14***	-0.14***	-0.07***
	(0.004)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)
Constant	0.47***	-0.25	1.01**	0.47	1.12	-1.32
	(0.53)	(1.03)	(0.45)	(0.53)	(0.69)	(1.27)
Observations	115,487	40,445	75,042	115,487	101,630	13,857
R^2	0.13	0.15	0.09	0.13	0.11	0.10
Province F.E.	✓	✓	✓	✓		
Week F.E.	✓	✓	✓	✓	✓	✓
Census 2006	✓	✓	✓	✓	✓	✓
Year× Province F.E.	✓	✓	✓	✓	✓	✓
Demographics	✓	✓	✓	✓	✓	✓
D × Demographics				✓	✓	✓

the choice within proposals, removing the liabilities constraint allowed highly indebted filers to make the same choices as less-indebted filers, and they chose to do so. Our results therefore quantify the impact the 2009 BIA amendments had on the substitution of proposals for bankruptcy.

1.4.2 Aggregate Insolvencies

An unintended consequence of the amendments could be an increase in insolvencies, that is, consumers filing formal proposals who otherwise might have repaid their debt. This would show up as an increase in proposals and an increase in total insolvencies for a

Table 1.6 – Impact of the 2009 BIA amendments on total insolvencies

The dependent variable is total insolvencies per capita (10,000). The treatment group comprises filers with more than $75,000 but less than $100,00 in total debt (excluding debt secured by principal residence). The control group are filers with less than $75,000 in total debt but more than $50,000 (excluding debt secured by principal residence). Robust standard errors are in parentheses. Significance levels *** p<0.01, ** p<0.05, * p<0.1 .

	(1)	(2)
Policy effect	-0.003**	-0.003***
	(0.00)	(0.00)
Policy date	0.002***	0.002***
	(0.00)	(0.00)
Treated	0.004***	0.004***
	(0.00)	(0.00)
Constant	0.05***	0.12**
	(0.00)	(0.05)
Observations	4667	4667
R^2	0.95	0.95
Demographics		✓

given bankruptcy rate. We therefore use our DiD strategy to measure the impact of the 2009 amendments on total insolvencies. We do the same when examining the time-series variation in total insolvencies at the provincial level presented in Table 1.6. In column (1) we present the results for total insolvencies where the treatment is the increase in the $75,000 threshold. Column (2) adds our demographic variables. An observation is a province-week. We therefore compare total insolvencies above the threshold to below it, before and after the BIA amendments, controlling for province fixed effects and also demographics. We see that total insolvencies actually fall, but the magnitude is very small. This is likely because Canada experienced only a mild recession between the fall of 2008 and the summer of 2009 and had already started recovering when the BIA amendments were introduced.

1.5 Conclusion

In 2009, the Canadian government reformed the Bankruptcy and Insolvency Act, increasing the attractiveness of Division II proposals and increasing the cost of bankruptcy. The government policy was extremely successful in steering indebted households into the most cost-effective debt restructuring plan. Another way of seeing this is that the previous debt limit for Division II proposals was too tight. Relaxing the constraint allowed debtors to make a more cost-effective choice. In addition, the BIA amendments led to an increase in proposals relative to bankruptcies. The main benefit of bankruptcy is debt forgiveness. The main cost is a loss of unprotected assets. The two key benefits of proposals are that filers are able to keep their assets and can maintain access to credit markets. The cost is (partial) debt repayment. Take-up of proposals increased by 11.5% following the change in legislation and has trended to move upward since. This would imply that individuals value the increased access to proposals, in addition to disliking the increase in wage garnishment associated with bankruptcy for those with high income. Our results are consistent for homeowners and renters, although clearly there are larger gains for homeowners of filing for debt restructuring. All of this we have uncovered using detailed data on insolvency choice and individuals' balance sheet and income statements.

Our results come with some caveats. This paper explores the impact of bankruptcy reform on the decision to file for bankruptcy or proposal only. We do not fully capture the decision of people who would not have filed a proposal had it not been for the legislation. Exploring panel data sets with insolvency decisions to further investigate the impact of the 2009 BIA amendments would help us better understand the extensive margin. Also, we do not have information on how lenders responded to the bankruptcy reform. Given the well-known trade-off between risk-sharing and commitment associated with different insolvency designs (Zame (1993)), a by-product of an increase in proposals should be that banks are more willing to lend and to do so at lower rates. Athreya (2002), Li and Sarte (2005), Chatterjee et al. (2007), Livshits et al. (2007), and Chatterjee and Gordon (2012), among others, provide quantitative models of these trade-offs to measure the wel-

fare implications of different regimes. See Livshits (2015) for a review of the literature. Matching a data set on bankruptcy filers with a credit registry could shed additional light on how financial institutions responded to the bankruptcy reform.

1.6 Appendix

Table A7 – Asset exemptions at the provincial level in Canada

This table presents provincial asset exemptions. Additional exemptions include any property the bankrupt holds in trust for another person, government prescribed savings plans (e.g. RRSPs), or prescribed payments relating to the essential needs of an individual. All amounts are in Canadian dollars. These amounts represent maximum values of assets protected from seizure by creditors in bankruptcy and can sometimes be less. This is especially true for housing, where the maximum is based on joint-filing. Even where there is no dollar limit, exemptions are limited to what the debtor and his/her dependents need, and the provinces often adjust the exemptions for various reasons, such as inflation.

Province	Food	Furniture	Vehicle	House	Clothing
Alberta	12-month supply	4,000	5,000	40,000	4,000
British Columbia	None	4,000	5,000	12,000	Unlimited
Manitoba	6-month supply	4,500	3,000	2,500	Unlimited
New Brunswick	3-month supply	5,000	6,500	None	Unlimited
NFLD	12-month supply	4,000	2,000	10,000	4,000
Nova Scotia	Unlimited	6,500	6,500	None	Unlimited
Ontario	11,300		5,650	None	5,650
PEI	2,000		6,500	None	Unlimited
Quebec	Unlimited	6,000	Unlimited	10,000	Unlimited
Saskatchewan	12-month supply	4,500	Unlimited	32,000	Unlimited

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Chapter 2

Immigrants' Insolvency Choices

Abstract

Are insolvent immigrants more likely to restructure their debt or file for bankruptcy? This study investigates the variation in insolvency choice between immigrants and non-immigrants. First, I show that the propensity of debt restructuring relative to bankruptcy is higher in neighbourhoods with a higher share of immigrants. I confirm my findings using a generalized propensity score with neighbourhoods' share of immigrants as a continuous treatment. Next, I establish the link between income uncertainty and insolvency choice. More specifically, I show that for borrowers with positive assets, a higher chance of unemployment increases the marginal benefit of a proposal. To the extent that the neighbourhood share of immigrants is a proxy for individual immigration status, my analysis shows a higher rate of proposals among immigrants. One possible explanation for why immigrants are more likely to choose proposal over bankruptcy is income uncertainty, which suggests the importance of self-insurance against higher income risk.

JEL classification: D14, J15, K35.

Keywords: Personal Bankruptcy, Household Finance, Debt Restructuring, Immigration.

2.1 Introduction

There are two insolvency options for financially-distressed borrowers who are facing an adverse income shock: (i) to propose a debt restructuring plan to creditors or (ii) to file for bankruptcy. In bankruptcy, future income is protected, but not current wealth. By contrast, debt restructuring protects current wealth, but not future income.[1] Therefore, the choice between debt restructuring and bankruptcy is a decision about protecting current assets versus future earnings. The choice between insolvency options is important because it has implications for individual consumption smoothing and future access to credit.

As highlighted in the theoretical literature, by Chatterjee et al. (2007), Athreya (2005) and Livshits et al. (2007), for instance, debt restructuring results in a greater level of commitment to future repayment, which improves lenders' recovery rates and can lead to lower credit costs and greater credit availability. As a result, borrowers can better smooth consumption over time. Bankruptcy, however, allows borrowers to reduce repayment at times when their income is particularly low, which facilitates consumption smoothing by providing a greater ability to walk away from their debt. In turn, financial institutions price their loans accounting for the higher probability of default, which is likely to be reflected in the higher cost of credit.

My goal in this analysis is to empirically examine whether the possibility of being borrowing constrained in the future, in combination with uncertain labour income, results in different insolvency choices between immigrants and non-immigrants. Using Canadian data, I first establish a relationship between insolvency choice and immigration status. Then I show theoretically that income uncertainty leads to more proposals in comparison to bankruptcy. Finally, I refer to the literature that establishes higher uncertainties about future income between natives and immigrants to highlight income uncertainty as a channel through which immigrants' insolvency choice is different from that of non-immigrants.

The extent to which immigrant status impacts insolvency choice is hard to tease out.

[1] In simple terms, debt restructuring is a proposal made to creditors to allow a reduced repayment plan. In this paper, I use "debt restructuring" and "proposal" interchangeably.

I exploit data collected by the Office of the Superintendent of Bankruptcy (OSB), containing information on *all* financially distressed borrowers who filed for insolvency in Canada. The OSB data set includes detailed balance sheet information on bankruptcy and debt-restructuring histories, employment status, income, different types of debt, assets, expenditures and geographical location. I use the population of insolvency filers in 2011 and augment the OSB data with Statistics Canada's 2011 National Household Survey (NHS) at the FSA level. An FSA is the first three digits of a borrower's home postal code. The NHS data set includes information about the immigration status of Canadians. For the purpose of this analysis, I consider immigrants as individuals born outside the country, without characterizing them on the basis of their ethnicity or assimilation over time. While I do not have access to individual-level immigration status, I use the neighbourhood share of immigrants as a proxy for individual immigrant status.

In my empirical analysis, I control for borrower's observable socioeconomic characteristics and balance sheet information at the time of filing, as well as neighbourhood characteristics. These neighbourhood's characteristics ensure that I am controlling for the income distribution effect, financial literacy effect, unemployment effect, and credit market competition across neighbourhoods. Province fixed effects are included to control for the different levels of asset exemption and wage garnishment in each province.

My first set of results suggests that there is a significant and positive relationship between the share of immigrants and (i) the share of insolvencies and (ii) the share of debt restructuring at the FSA level. For example, going from an FSA with a zero share of immigrants to an FSA with a 0.16 share of immigrants (one SD increase), the share of proposals increased by 0.32, which is an 11% increase in the average share of proposals (the average share of proposals is 0.29).

Having established a correlation between share of immigrants in each FSA and insolvency choice, I examine the probability of choosing a proposal at the individual level. In particular, I use a binary probit model, where the dependent variable is defined as an indicator variable equal to "one" if a borrower files for proposal and "zero" if he/she files for bankruptcy. I find that the average predicted probability of choosing debt-restructuring

is consistently around 0.39, whether or not I include neighbourhood-level variables or province fixed effects. The estimated coefficient of share of immigrants is positive and significant at 1 percent across all specifications. This implies that individuals in a neighbourhood with a higher share of immigrants are more likely to file for debt restructuring than for bankruptcy.

To mitigate the scope for alternative interpretation of the evidence, I use a generalized propensity score (GPS) matching estimator (Hirano and Imbens (2004)), which allows for continuous treatments (share of immigrants). Similar to the binary propensity score (Rosenbaum and Rubin (1983)), the GPS controls for differences in observable reasons why some FSAs might have different shares of immigrants by matching FSAs in the control and the treatment groups that are similar, thereby reducing bias due to the covariates. The share of immigrants in each neighbourhood varies continuously from zero to 0.73. This feature enables me to estimate a continuous dose-response function that relates each value of the dose, i.e. share of immigrants, to the share of proposals (the response). The results, based on the matched sample, support previous findings that neighbourhoods with higher share of immigrants have a higher share of proposals.

Given these findings, it is important to ask why immigrants are more likely to file for debt restructuring compared to bankruptcy? Borrowers with higher income uncertainty prefer to accumulate more savings in order to smooth consumption. Filing for debt restructuring allows borrowers to keep their assets as “savings for a rainy day". More precisely, for borrowers with positive assets, the higher chance of unemployment increases the marginal benefit of debt restructuring. I establish the relationship between income uncertainty and insolvency choice in section 2.4. One possible explanation for why immigrants are more likely to choose proposal over bankruptcy is income uncertainty, which suggests the importance of self-insurance against higher income risk.

Previous studies of immigrants' labour market outcomes support the view of the differentiated income risk between immigrants and native-born citizens. As documented in Dustmann et al. (2010), income uncertainty is higher for immigrants relative to native-born citizens, even within the same skill group. Controlling for origin composition and

educational background, they find a larger cyclical response of unemployment for immigrants. They provide evidence for differences in job separation rates and differences in capital-labour complementarities between groups as possible explanations that could contribute to this pattern. In another study, Barth et al. (2004) highlight the differential wage responsiveness of immigrants and natives to changes in macroeconomic conditions in Norway and the United States. Prean et al. (2012) show that the unemployment rate of Austrian immigrants compared to natives is more sensitive to labor market shocks. A greater variability in the employment of immigrants could be due to the selection of immigrant workers into specific industries or temporary jobs.[2] Assuming the higher income uncertainty of immigrants relative to non-immigrants, we expect a higher rate of debt restructuring among immigrants, because this option would help them to keep their assets and smooth consumption over time.

While the literature on consumer bankruptcy choices and immigrants' labour income is vast, no previous paper has examined the insolvency choices of immigrants. This paper is a first step to comparing the insolvency choices of immigrants and those of non-immigrants. Second, while I cannot rule out other reasons why immigrants are more likely to choose debt restructuring compared to bankruptcy, this paper is the first to establish the link between income uncertainty and insolvency choice.

The outline of the remainder of this paper is as follows. Section 2.2 reviews the related literature. Section 2.3 describes the institutional environment, in particular the two options for consumers filing for insolvency in Canada. Section 2.4 establishes the relationship between insolvency choice and income uncertainty. Section 2.5 presents a detailed analysis of the data, including a description of the assets and liabilities of individuals filing for insolvency. Section 2.6 presents the empirical analysis and provides a discussion of these results, and section 2.7 concludes.

[2]Immigrants tend to be over-represented in industries with poor wages and little job security such as construction or hotels and restaurants (OECD, 2009). Another explanation may be that recent immigrants experience higher job-separation rates during the recession if the employer follows a reverse seniority layoff rule (McDonald and Worswick (1997)). Recent immigrants may also experience lower job-finding rate because of information asymmetry about their foreign education and training credentials (Chiswick (1978)).

2.2 Related literature

This paper is related to the literature that tries to explain factors that impact borrowers' choice between straight liquidation (bankruptcy) and debt restructuring. These factors can be summed up in two categories. The first explanations link insolvency choice to socio-economic characteristics (White (1987), Domowitz and Sartain (1999), Nelson (1999), Li (2001)). For unemployed borrowers, bankruptcy is usually the only option, since one must have a source of income to file a proposal for debt restructuring. Marital status affects household income and can therefore affect the filing decision: unemployed filers could choose debt restructuring because their spouse has sufficient income to pay creditors at a reduced rate. Home-owners are also more likely to choose debt restructuring, which helps them keep their residence.

The second group of explanations focuses on the financial costs of each option as an important factor that drives the variation in insolvency choice. In broad terms, bankruptcy and debt restructuring are "*substitutes*", with increases in the costs of one option substantially increasing use of the other. There are two main costs associated with insolvency that have been frequently mentioned in the literature. The first cost is the effect of insolvency on filers' future ability to obtain credit. The temporary exclusion from the credit market has been incorporated into macroeconomic models, for example, by insolvents' inability to borrow and save during the insolvency period (e.g. Livshits et al. (2007), Chatterjee et al. (2007) and Athreya (2008)). Some empirical papers find that recent insolvency filers have more restricted access to unsecured credit than individuals who have never filed for insolvency (Han and Li (2011), Cohen-Cole et al. (2009), Jagtiani and Li (2013) and Musto (2004)). The second cost is either assets, in the case of bankruptcy, or future income, in the case of debt restructuring, that will be forfeited to satisfy the claims of unsecured creditors.[3] The higher the value of exempted assets, holding other things constant, the lower the expected cost of bankruptcy (Sullivan (1982)). Many papers have explored the impact of asset exemption and garnishment laws on bankruptcy

[3]Other costs associated with bankruptcy include administrative and legal fees and social stigma attached to bankruptcy (Sullivan (1982); DeVaney and Lytton (1995)).

filings (Domowitz and Sartain (1999), Nelson (1999)) and on access to unsecured debt and consumption smoothing (Grant (2010), Gropp et al. (1997)). Most found that increasing the level of exemptions has a positive, although modest, impact on bankruptcy filings and causes less debt to be held by households. Others document that the optimal level of exemption is positive but low (Pavan (2008)). In this paper, I argue that potential differences in income uncertainty between immigrants and native-born citizens may have an effect on their insolvency choices.

There is a large body of literature on immigrants, but there is a sparsity of studies that compare the insolvency decisions of immigrants and those of non-immigrants. The most directly related paper using Canadian data is the study by Ostrovsky (2008), in which he investigates the dynamics of earnings inequality and earnings instability among immigrants in Canada. Using the Longitudinal Administrative Databank (LAD) and the Longitudinal Immigration Database (IMDB), he provides evidence of positive earnings inequality and earnings instability among immigrants. In another study, Gilmore (2009) studies employment quality[4] for both native-born Canadians and immigrants. Using data from the Labour Force Survey (LFS), he shows that immigrants are more likely to have involuntary part-time work and temporary jobs and are less likely to have employer-sponsored pension plans and life insurance coverage compared to native-born Canadians. The results support the idea of positive earnings inequality and earnings instability among immigrants. In this paper, I provide a first step to test the link between the share of immigrants in each neighbourhood and insolvency decisions.

2.3 Institutional details on Canadian insolvencies

In Canada, similarly to in the situation in the U.S., there are two insolvency options available to financially distressed borrowers: bankruptcy and debt-restructuring proposal. Consumer insolvencies in Canada are governed by the Bankruptcy and Insolvency Act

[4]The employment quality includes an individual's safety at work, their financial and non-financial remuneration, working hours and work-life balance, job stability, social dialogue, skills development and job satisfaction.

(BIA) and supervised by the Office of the Superintendent of Bankruptcy (OSB), a federal regulator. Consequently, all Canadian records are kept by the OSB. This is a substantial advantage over the U.S., where bankruptcy data is managed at the state level. Both insolvency options stop most collection actions and terminate the accumulation of interest accruing on outstanding debt. Under bankruptcy, most debt is written off in return for asset liquidation, while debt restructuring allows repayment on different terms from future income.[5]

Under bankruptcy, a trustee might sell, lease, borrow against, or apportion to the creditors any non-exempt property of the bankrupt party. The trustee first pays the balances owed to secured creditors; and, if there is a surplus left, preferred and unsecured creditors will be paid in order of priority. The property of a bankrupt party that is exempt from seizure varies according to provincial laws. The higher the asset exemption level, the more the debtor's wealth is protected during bankruptcy, and the relative cost of filing decreases.[6] The bankrupt party may also be required to make payments from subsequently earned surplus income, to be distributed to the creditors. Bankruptcy trustees calculate surplus income as income less allowable expenses. First-time bankruptcy filers with surplus income of more than $200 per month are obliged to contribute 50% of this income toward repaying debts to their creditors for 21 months after the date of bankruptcy and before the discharge.[7] The more surplus income a filer has, the greater the nominal amount they are required to contribute.

Moreover, the filer is also required to participate in two mandatory financial counselling sessions designed to assist him or her in managing his or her financial affairs in

[5]Certain types of debts are excluded from the discharge, including support payments and child-support, some student loans, a fine or penalty imposed by the Court or debt arising from fraud.

[6]The purpose of the asset exemption is to enable individuals to keep essential assets to make a "fresh start" after bankruptcy. The most important exemptions are: food and heating fuel, health aids, clothing, furniture, the tools of trade, farm land, animals, equipment, and supplies, pensions or retirement savings. Additional exemptions include any property the bankrupt holds in trust for another person; government prescribed savings plans (e.g. RRSPs); or prescribed payments relating to the essential needs of an individual.

[7] Annually, the OSB publishes a guideline that sets out suggested payment depending upon the size of income and the number of dependents. The standards are the same across Canada and do not take into account regional disparities of income and expenses (Bennett (2014)). For example, for a family of 3, the limit for allowable expenses is $3,156 per month. An individual with a net income of $3,500 a month owes $172 a month to the creditors via the trustee.

the future. First-time bankruptcy filers, who fulfill all the requirements set out by the courts, are automatically discharged (forgiven) of their debt after a period of nine months (without surplus income) to 21 months (with surplus income) and make a "fresh start."[8,9] A bankruptcy flag remains on an individual's credit report for six to seven years, depending on the province in which the filing is made. A bankruptcy procedure is equivalent to Chapter 7 filings in the U.S. (e.g. Livshits et al. (2007)).

A debt-restructuring proposal requires the negotiation of a reduced repayment plan, through a trustee, with a plan duration of three to five years. If a debtor defaults on a payment to a creditor while under a proposal, the case is either dismissed, and the remaining debts will not be forgiven, or it is converted to a bankruptcy.[10] If the case is dismissed, the creditor is allowed to garnish a debtor's income, seize his or her bank accounts, or intercept his or her tax returns. Unlike bankruptcies, which remain on an individual's credit report for six to seven years, a proposal is flagged for only three years.

The amount to be repaid under debt restructuring must be at least as much as the amount that would be repaid under bankruptcy. Creditors, particularly unsecured creditors, therefore, realize a higher percentage of the claims outstanding against debtors under debt restructuring. In Canada, creditors realize 21.7 percent of claims outstanding against the debtor under debt restructuring. This is considerably higher than what they can expect to receive in bankruptcy (Serra (2008)).

[8]Individuals with more than $200,000 in personal income tax debt that makes up 75 percent or more of their total unsecured debt are not eligible for an automatic discharge. Instead, they must apply to the Court for a discharge. The Court may suspend or refuse the discharge or may impose conditions, such as partial payment of debts over a specific period of time (Highlights of the 2009 legislation, Industry Canada).

[9]Even after a "fresh start" some of the filer's debts such as taxes, child support or court ordered payments such as a fines or penalties imposed by the court or a debt arising from fraud are not discharged and the filer must meet these obligations.

[10]As of 18 September 2009, a debtor is considered in default if he or she has missed 3 payments. Prior to that a debtor was considered in default for missing a single payment.

2.4 Income uncertainty and choice of insolvency

This section establishes the relationship between insolvency choice and income uncertainty. I consider an environment in which time is discrete and consists of two periods. The first period is an *insolvency* period, in which distressed borrowers choose either to file for bankruptcy or to file a proposal for debt restructuring. The second period is the *post-insolvency* period, in which borrowers get discharged of their debt and make a "fresh start." I assume shocks to employment happen in the post-insolvency period. Borrowers cannot perfectly insure their income risk. Instead, they have access only to remaining assets and income subject to penalties associated with their insolvency choice in the first period.

The central difference between bankruptcy and proposal, as described in section 2.3 is that, after debt restructuring, a borrower's current assets A are protected, but the borrower still faces debt, which has to be paid from future income. Let π denote a probability of unemployment in the post-insolvency period and $1-\theta$ denote the proportion of income garnished. By contrast, after bankruptcy, the household receives a "fresh start" and owes nothing in exchange for current assets net of exemption and surplus income payments. Let E denote asset exemption defined by the trustee for each borrower. By construction, for each borrower, asset exemption E is a subset of the borrower's asset holdings A. The income threshold $\underline{I}$, set by the Superintendent of Bankruptcy, defines the portion of the income that a borrower is allowed to keep. For a borrower who chooses to file a proposal in the insolvency period, the expected utility is given by

$$u_P = u(A+\theta I) + \beta\pi u(A) + \beta(1-\pi)u(A+I), \tag{2.1}$$

where u(.) denotes the utility function; β defines the rate at which households discount future consumption; I is the borrower's income; θ is the proportion of income remaining after the repayment plan under the proposal. An unemployed borrower only consumes his assets. For a borrower who chooses to file for bankruptcy in the insolvency period, the expected utility is given by

$$u_B = u(E + \underline{I}) + \beta\pi u(E) + \beta(1-\pi)u(E+I), \tag{2.2}$$

Assuming a standard concave utility function, following lemma holds

$u_P - u_B$ is weakly increasing in π.

The intuition is simple. Borrowers with higher income uncertainty prefer to accumulate more savings in order to smooth consumption. Filing a proposal allows borrowers to keep their assets as “savings for a rainy day."

We have

$$u_P - u_B = F(\pi) + G, \tag{2.3}$$

where

$$F(\pi) = \beta\pi[u(E+I) - u(E)) - (u(A+I) - u(A))], \tag{2.4}$$

and

$$G = u(A + \theta I) + \beta u(A+I) - u(E + \underline{I}) - \beta u(E+I). \tag{2.5}$$

We take a derivative of equation 2.3 with respect to π

$$\frac{d(u_P - u_B)}{d\pi} = \frac{dF(\pi)}{d\pi}. \tag{2.6}$$

Equation 2.6 is positive if and only if

$$u(A) - u(A+I) \geq u(E) - u(E+I). \tag{2.7}$$

Since asset exemptions are a subset of assets, the above equation holds and leads us to the following proposition

For borrowers with positive assets, a higher chance of unemployment increases the marginal benefit of a proposal.

A key implication of these results is that the choice between bankruptcy and proposal is correlated with income uncertainty.

2.5 Data and methodology

2.5.1 Sample selection and summary statistics

The sample for this analysis is constructed by combining two different databases. The primary dataset contains individual-level insolvency data collected by the Office of the Superintendent of Bankruptcy Canada (OSB). Filers are required to provide full details of their assets, liabilities, current income, expenses as well as their creditors' information when filing for bankruptcy or filing a proposal for debt restructuring. Therefore, the balance sheet data of each filer includes separate amounts for a variety of assets, liabilities (secured, unsecured, and preferred), current income and expenses. I also observe some socio-demographic information on the filer, such as age, marital status, employment status, and geographic location. Table 2.1 presents summary statistics for the sample used in our analysis. The sample includes 101,526 observations divided between 69,553 bankruptcies and 31,973 proposals. The maps in figure 2.1 and 2.2 show that the rate of bankruptcies and proposals varies across major census metropolitan areas (CMAs).

Filers are on average in their forties. They are mostly employed, with annual income below the average annual income of $40,650, reported in Statistics Canada's 2011 National Household Survey (NHS). Only 12 percent of them have surplus income, and their net assets are negative. Unsecured credits form the majority of total liabilities, as most filers are renters. On average, a filer has six creditors.

The immigration information comes from the 2011 NHS. The NHS is designed to collect social and economic data about the Canadian population, such as basic demographics, education, ethnicity, immigration, housing, income and earnings, etc.[11]

I match our insolvency data from the OSB to the immigration data from the NHS. The OSB data are listed by the six-digit home postal code of each filer. First, I aggregate the

[11] In 2011, Statistics Canada introduced a voluntary, self-administered survey, for the first time, as a replacement for the long census questionnaire, more widely known as Census Form 2B. I used this data at the FSA-level from the following source: Census Canada, "2011 National Household Survey, Forward Sortation Area (FSA) Level [custom tabulation]", `http://hdl.handle.net/10864/10517` Map and Data Library, University of Toronto [Distributor] V4 [Version].

Table 2.1 – Summary Statistics: OSB Data

The sample includes 101,526 observations divided between 69,553 bankruptcies and 31,973 proposals. Assets are based on estimated realizable amounts. Total liabilities include secured, preferred, and unsecured liabilities. All continuous variables except age are in Canadian dollars. To ensure outlier values are not included in our sample, I Winsorized the sample at the 1% level.

Variables	Mean	S.D.	$P(25)$	$P(50)$	$P(75)$
I(proposal)	.31	.46	0	0	1
age	46	13	36	45	55
I(unemployed)	.14	.35	0	0	0
I(surplus income)	.12	.32	0	0	0
I(homeowner)	.26	.44	0	0	1
I(married)	.38	.48	0	0	1
employment income	29,707	17,052	18,312	26,976	38,508
total assets (exempt)	24,201	77,184	1,555	4,000	8,501
total assets (not exempt)	72,766	131,248	301	7,000	112,003
total liabilities	110,678	140,486	25,150	50,150	145,480
unsecured credit	55,994	65,519	21,213	36,687	64,639
number of creditors	5.7	2.7	4	5	7

Figure 2.1 – Rate of Bankruptcies across Census Metropolitan Area (CMA) in 2011

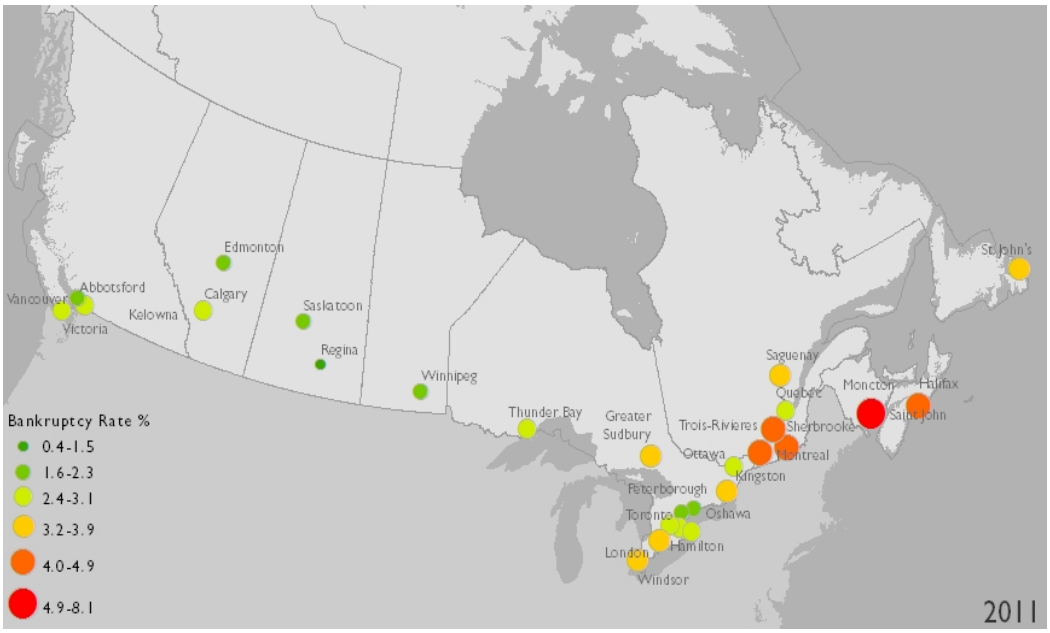
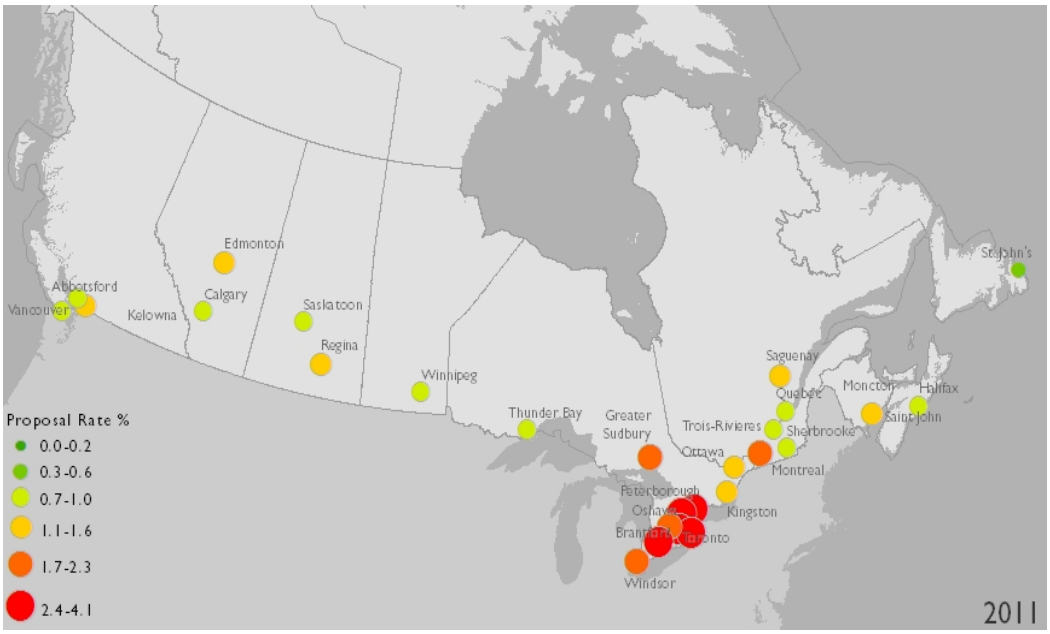


Figure 2.2 – Rate of Proposals across Census Metropolitan Area (CMA) in 2011



data at the larger geographic areas called forward sortation areas (FSAs). FSAs are the geographical regions within which all postal codes start with the same three characters. Next, I match the immigration data, which is available at the FSA level, with the OSB data. These FSAs constitute the neighbourhoods in our study.[12]

I also include information on FSA-level financial literacy based on Statistics Canada's 2003 International Adult Literacy and Skills Survey (IALSS),[13] FSA-level employment data (Statistics Canada's Labour Force Survey), city-level house prices for cities for which the data was available (Canadian Real Estate Association), and information on the number of trustees and financial institutes in each FSA.[14]

My analyses focus mostly on two outcome variables: insolvency and debt-restructuring proposals. These two variables provide direct measures of the cross-sectional disper-

[12]I include 1,506 FSAs in the sample. FSAs are usually as big as a medium-sized city. The average FSA has a radius of 7.6 kilometres, while the median is much lower at 2.6 kilometres. The average number of households in each FSA is approximately 8,000.

[13]For more details on the IALSS and the computation of the literacy scores, see Murray (2011).

[14]Although, bankruptcy trustees have a fiduciary duty to debtors, their financial interests are at odds with those of the client. As a result, they might steer debtors toward one particular bankruptcy alternative (Sullivan et al. (1988), Braucher (1993), Hackney et al. (2015), McIntyre et al. (2015)).

sion of personal insolvency and choice of insolvency by controlling for variation in borrowers' and neighbourhoods' characteristics at the FSA level. The *share* of insolvency is measured as the number of insolvencies per 1,000 residents in each FSA, and debt-restructuring proposals are measured relative to bankruptcies. The *share* of debt-restructuring proposals is total debt-restructuring proposals per insolvency in each FSA. In addition, the proposal is defined as an indicator variable equal to "one" if a borrower files a proposal and "zero" if he or she files for bankruptcy. This variable is particularly useful for our individual-level analysis.

Table 2.2 provides summary statistics of the main variables at the FSA level. Panel A presents the summary statistics using the 2011 NHS data and the supplementary data. The share of immigrants ranges from 0 to 73% across FSAs. On average, 17% of an FSA's population were immigrants in 2011. Figure 2.3 plots the share-of-immigrants histogram across FSAs. Table 2.2 panel B presents the summary statistics of insolvent individuals using the 2011 OSB data. All the variables are averaged at the FSA level, except the proposals and the insolvencies, which are the total number of proposals and insolvencies per FSA. On average, 0.33% of an FSA's population filed for insolvency, either bankruptcy or proposal, in 2011. Of those, almost 30% were proposals and the rest were bankruptcies.[15]

Figure 2.4 plots the average fraction of proposals per decile of immigration distribution. The upward trend in the share of proposals suggests that the share of immigrants in each neighbourhood is correlated with filing choice.

[15]The available information, but not reported in the table, indicate that neighbourhoods with high immigrant concentrations are more densely populated, have higher median and average income, and lower unemployment rates compared to those with low immigrant concentration. This suggests that immigrants target more metropolitan areas for living. There are more home-owners filing for insolvency in neighbourhoods with low immigrant concentration: 32% compared to 19%. In addition, those who are filing for insolvency in high immigrant concentration neighbourhoods tend to have higher assets, both exempt and non-exempt, and higher liabilities.

Table 2.2 – Summary Statistics: FSA level

Panel A presents the FSA-level summary statistics using 2011 National Household Survey (NHS) data. FSAs are geographical regions in which all postal codes start with the same three characters. The sample includes 1,506 observations. Canadian territories (as opposed to provinces) are not included in the sample. Home ownership refers to whether the household owns or rents their private dwelling. Average and median income are in Canadian dollars and based on total reported income of households in 2010. The literacy scores are based on the 2003 International Adult Literacy and Skills Survey (IALSS, Statistics Canada). The number of financial institutions is reported in the 5km Euclidian distance around each FSA centroid. Panel B presents the summary statistics of insolvent individuals using 2011 Office of the Superintendent of Bankruptcy (OSB) data, averaged at the FSA level. All the liabilities, income, and assets are in Canadian dollars. These, as well as the number of creditors, are the average across FSAs. Multiple products from the same lender are counted as one creditor. Assets are based on estimated realizable amounts. Total liabilities include secured, preferred, and unsecured liabilities.

Variables	Mean	S.D.	$P(25)$	$P(50)$	$P(75)$
Panel A: FSA-level census variables					
Total population	20,443	15,834	8,945	17,340	27,790
Share of immigrants	.17	.16	.04	.11	.25
Unemployment rate	8.26	4.4	6	7	10
Average income	41,156	13,404	33,003	38,102	45,154
I(home-ownership)	.71	.19	.62	.75	.85
log(2003 literacy score)	5.6	.04	5.57	5.6	5.63
Number of trustees	1.43	1.26	1	1	2
Number of financial institutions (5km)	6.2	3.44	4	7	9
Panel B: Aggregated individual insolvency data					
Total liabilities	114,936	67,343	75,156	103,336	139,357
Unsecured liabilities	59,467	27,689	44,996	55,040	68,010
Employment income	30,110	6,187	25,986	29,572	33,473
Total assets (exempt)	26,914	49,444	6,336	10,532	25,449
Total assets (not exempt)	72,693	64,482	31,602	60,978	99,257
Number of creditors	5.73	.77	5.33	5.71	6.08
Share of proposals	.29	.17	.18	.26	.37
Share of insolvencies(1,000)	3.34	1.87	2.11	3.07	4.27

Figure 2.3 – Share of immigrants across FSAs in 2011

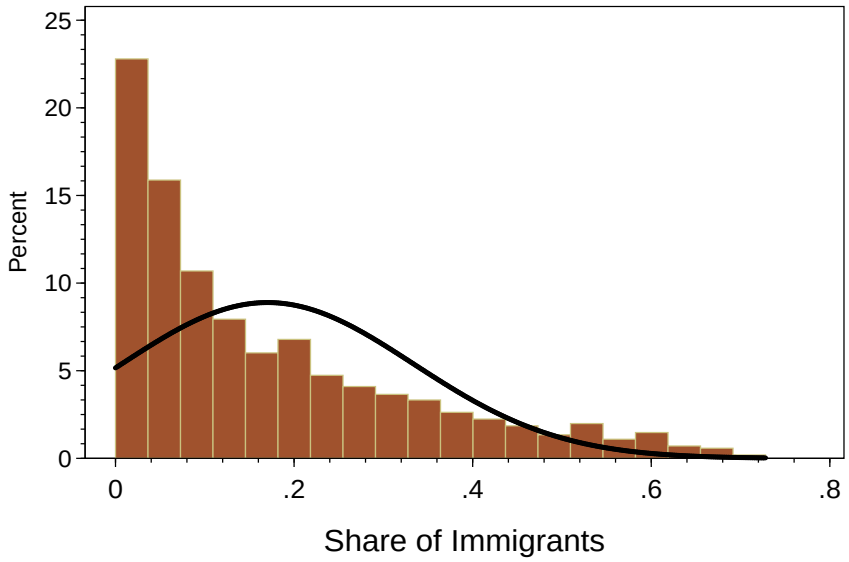
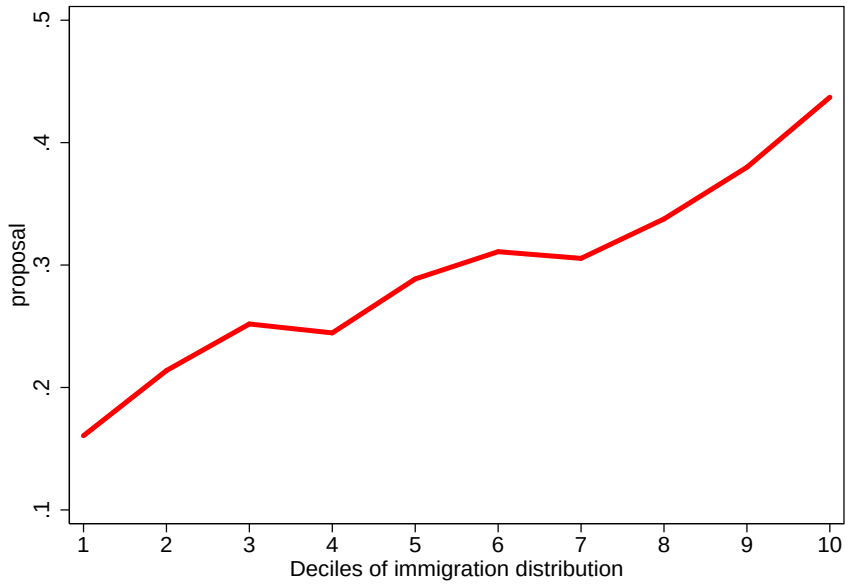


Figure 2.4 – Share of Proposals per Deciles of Immigration Distribution



2.5.2 Net financial benefit measures

I construct financial benefit measures of bankruptcy and proposal using the OSB database. The propensity to file for bankruptcy or to file a proposal for debt restructuring is positively related to the financial benefit from filing. Having assets is an important determinant of selection between bankruptcy and proposal, since proposals enable borrowers to keep their assets, while bankruptcy does not. Following Fay et al. (2002), I define net financial benefit of bankruptcy (FBB) for each filer i. The net gain from filing for bankruptcy is the amount of unsecured liabilities that are wiped out after non-exempt assets are liquidated. I follow Allen and Basiri (2018) to make an adjustment to this measure and include the surplus income. As discussed in subsection 2.3, surplus income is income less allowable expenses. First-time bankruptcy filers with surplus income of more than $200 per month are obliged to contribute 50% of this income towards repaying debts to their creditors for 21 months after the date of bankruptcy and before the discharge. In our sample, on average, 12% of filers have surplus income. FBB_i is non-negative, since households would not file for bankruptcy if their non-exempt assets exceeded the amount of debt discharged.

$$FBB_i = max\{D_i - max\{W_i - E_i - \frac{m}{2}S_i, 0\}, 0\}, \tag{2.8}$$

where D_i is unsecured debt that would be discharged in bankruptcy; W_i is total assets minus total secured liabilities; E_i is total exempt assets; S_i is monthly surplus income; and m_i is the number of months a bankruptcy filer has to pay surplus income, i.e. 21 months.

Computing the financial benefit of proposal (FBP) is not as straightforward as bankruptcy, since repayment plans are not known ex ante. However, the financial benefit of filing a proposal is closely related to the financial benefit from filing for bankruptcy, since repayment plans in proposals cannot be worse for creditors than bankruptcy. Therefore, the maximum benefit of proposal, for a borrower, is when the sum of payments under a proposal is equal to the payments under bankruptcy.

$$FBP_i = max\{D_i + W_i - max\{W_i - E_i - \frac{m}{2}S_i, 0\}, 0\}, \tag{2.9}$$

I define the difference between the net financial benefit of the bankruptcy and that of the proposal as follows:

$$\Delta_i = FBB_i - FBP_i \tag{2.10}$$

I deflate the Δ_i by total unsecured and preferred liabilities. This gives us a consistent measure across all filers. Δ_i quantifies the preference relation between bankruptcy and proposal. A debtor prefers a proposal over bankruptcy if Δ_i is negative. Therefore, the higher total assets net of secured liabilities, the higher the financial benefit of a proposal.

2.6 Empirical analysis

The results in this section are divided into three subsections. In subsection 2.6.1, I evaluate the relationship between the share of immigrants' and individuals' insolvency choices (bankruptcy vs. proposal) using 2011 cross-sectional data from the OSB and the NHS. I find that borrowers who live in FSAs with a higher share of immigrants are more likely to choose a proposal over bankruptcy, when other controls are kept constant. To show the results are robust to various estimation methods, subsection 2.6.2 uses aggregated data at the FSA level to document that when the share of immigrants is higher, the share of proposals is also higher. In subsection 2.6.3, I provide further evidence to support my previous findings by performing the analysis using a matched sample of FSAs with a similar propensity of proposal.

2.6.1 Individual-level analysis

I use the following regression, where the individual's binary decision can be represented as:

$$Pr(PROPOSAL_i) = \alpha + \beta IMM_k + \kappa X_i + \gamma N_k + \varepsilon_i, \tag{2.11}$$

where i denotes each individual, and k denotes each FSA. $PROPOSAL_i$ corresponds to the individual's i binary decision. A value of "one" is assigned when the borrower

chooses to file a proposal and “zero" when he or she chooses to file for bankruptcy. IMM_k is the share of immigrants in the individual's neighbourhood.

To make sure the result is not driven by other factors that could impact insolvency choice, I follow the literature and include X_i, a vector of individual-level covariates including socio-economic characteristics and balance sheet information at the time of filing. This information includes age, marital status, home-ownership status, employment status, total assets, liabilities, employment income, an indicator variable for whether a filer has surplus income, and number of creditors.[16] I also include the difference between the net financial benefit of bankruptcy and that of proposal as defined in subsection 2.5.2. N_k includes additional neighbourhood-level characteristics, such as monthly unemployment rates, ethnicity, education, and average income (based on Census 2011 at the FSA level), as well as financial literacy (based on the 2003 LALSS at the FSA level), the average number of financial institutions within a five-kilometre radius of each FSA, and house price growth. Province fixed effects are included to control for the different levels of asset exemption and wage garnishment in each province. I cluster the standard errors by FSA, the level at which the share of immigrants varies (Moulton (1990)) to deal with the within cluster serial correlation problem that might occur in the estimation of the effect of the aggregated variable on the micro units.

Table 2.3 presents the results. In columns (1)-(3), I use a linear probability model and in columns (4)-(6), I use a binary probit model. The marginal effects are reported in the table. The columns differ by the control variables used. Columns 1 and 4 show a simple correlation between borrowers' insolvency choice and neighbourhood's share of immigrants. Columns 3 and 6 include all the covariates, including province fixed effects. The estimated coefficient of share of immigrants is positive and significant at the 1 percent level across all specifications. This implies that individuals in neighbourhoods with a

[16]Marital status affects household income and can affect the filing decision. Home owners are more likely to restructure their debts to avoid losing their property. Unemployed filers are more likely to file for bankruptcy unless they have an important source of non-labour income. Number of creditors positively impacts the propensity of proposal, although this relationship is not linear. For more details on the relationship between the number of creditors and insolvency choice, see Allen and Basiri (2018).

higher share of immigrants are more likely to file a proposal than to file for bankruptcy. The average predicted probability of proposal is consistently around 0.39, whether or not I include neighbourhood-level variables or province fixed effects. Although I do not show all the debtor characteristics here, it is the case that debtors filing proposals are more likely to be employed, married, older, and own a home or other assets, as well as have surplus income.

Table 2.3 – Propensity of Proposal and Neighbourhoods' Share of Immigrants

The dependent variable is a binary variable equal to 1 if a borrower files a proposal and zero if he or she files for bankruptcy. IMM_k is the share of immigrants in the individual's neighbourhood. Robust standard errors clustered at the FSA level are in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)
IMM_k	0.53***	0.79***	0.57***	0.52***	0.91***	0.61***
	(0.02)	(0.09)	(0.08)	(0.02)	(0.11)	(0.09)
FBB-FBP		-0.18***	-0.16***		-0.18***	-0.16***
		(0.01)	(0.01)		(0.01)	(0.01)
log(income)		0.06***	0.06***		0.19***	0.19***
		(0.00)	(0.00)		(0.01)	(0.01)
log(assets)		0.05***	0.05***		0.06***	0.06***
		(0.00)	(0.00)		(0.00)	(0.00)
log(liabilities)		-0.08***	-0.08***		-0.11***	-0.11***
		(0.00)	(0.00)		(0.01)	(0.01)
Number of creditors		-0.01***	-0.01***		-0.01***	-0.01***
		(0.00)	(0.00)		(0.00)	(0.00)
Constant	0.21***	2.04	0.71			
	(0.01)	(1.75)	(1.93)			
Observations	103,706	53,646	53,646	103,706	53,646	53,646
R-squared	0.04	0.20	0.21	0.03	0.19	0.20
Borrower characteristics		✓	✓		✓	✓
Neighbourhood characteristics		✓	✓		✓	✓
Census2011		✓	✓		✓	✓
Province F.E.			✓			✓
Cluster	FSA	FSA	FSA	FSA	FSA	FSA
Model	OLS	OLS	OLS	Probit	Probit	Probit

2.6.2 FSA-level analysis

In this section, I compare the share of insolvencies and the fraction of insolvencies that are proposals in each FSA to aggregated borrowers' characteristics, observable at the time of filing, as well as area characteristics. In particular, I estimate the following regression:

$$Y_{k,j\in\{proposal,\ insolvency\}} = \alpha + \beta IMM_k + \kappa X_k + \gamma N_k + \varepsilon_k, \tag{2.12}$$

where the Y_k corresponds to either the share of insolvencies or the fraction of total insolvencies that are proposals; k indexes each FSA; IMM_k corresponds to the share of immigrants in each FSA. The X_k's are the individual-level covariates averaged at the FSA level. Included in the covariates are the average number of creditors, the individual's total assets, liabilities, employment income, and the difference between the net financial benefit of a bankruptcy and that of a proposal.

The N_k's are market-level characteristics. They includes the FSA's population; the average number of financial institutions within a five-kilometre radius of each FSA, which I use as a measure of market concentration between financial institutions in each FSA[17]. In addition, I use unemployment rates (FSA-level), average household income (FSA-level), number of trustees, financial literacy (based on the 2003 survey at the FSA level) and house price growth. Also included are controls for ethnicity, education, housing, and metropolitan area. Province fixed effects are included to control for the different levels of asset exemption and wage garnishment in each province.

Table 2.4 presents the results. In the first three columns, the dependent variable represents the share of insolvencies (per 1,000 residents), while in the next three columns, the dependent variable represents the fraction of insolvencies that are proposals. The columns differ by the control variables used. Within each set, the first column includes only the share of immigrants. Column (2) introduces controls for borrower characteristics, which

[17]Dick and Lehnert (2010). investigate the credit market competition and its impact on personal bankruptcy. Having access to credit post-filing reduces the cost of insolvency and might promote one option over the other in comparable situations. Allen et al. (2014) show that more than 90 percent of transactions between most consumer and their financial institutions included in a 5 KM radius.

are aggregated at the FSA level, neighbourhood characteristics, and province fixed effects to control for the different levels of asset exemption and wage garnishment in each province. These fixed effects ensure that our identification does not come from variation in debtor-protection laws in each province. Column (3) includes a control for metropolitan areas. Metropolitan areas include Toronto, Montreal, Vancouver, Ottawa-Gatineau, Calgary, Edmonton, Quebec, Winnipeg, Hamilton, and Kitchener-Cambridge-Waterloo. Those immigrants who are seeking work opportunities may prefer to live in metropolitan areas. On the other hand, metropolitan areas might be different from rural areas in their share of proposals. For instance, borrowers in metropolitan areas are more likely to file for proposals because they might be more financially sophisticated or because there may be more sophisticated trustees in metropolitan areas.

Several observations can be made about Table 2.4. First, the estimated coefficients of the share of immigrants on (i) the share of insolvencies and (ii) the share of proposals is positive and significant after controlling for borrower and neighbourhood characteristics. Neighbourhoods with higher immigrant concentrations have a higher share of proposals. The estimate of 0.327 in column 5 implies that a one standard deviation increase in the share of immigrants is associated with a 0.322 (standardized beta) increase in the share of proposals. In other words, going from an FSA with a zero share of immigrants to an FSA with a 0.16 share of immigrants (one SD increase), the share of proposals increases by 0.322, which is an 11% increase in the average share of proposals (the average share of proposals is 0.29). The results highlight the importance of self-insurance against the higher income risk present in neighbourhoods with a higher share of immigrants. Neighbourhoods with higher immigrant concentrations also have a higher share of insolvencies. One explanation may be that the higher the share of immigrants in each neighbourhood, the less homogeneous neighbours are, and this translates into fewer informal risk-sharing opportunities (i.e. fewer informal lending-borrowing agreements). Thus, less informal risk sharing can contribute to more formal defaults. Controlling for metropolitan area does not change the results. Finally, the decision to file for insolvency is not explained by the difference between the net financial benefit of a bankruptcy and that of a proposal; ag-

gregated at FSA level; however, as we expected, the difference is negative and significant for the choice between bankruptcy and proposal.

Table 2.4 – Share of Immigrant and Rate of Insolvency and Proposal

The number of observations represents the number of neighbourhoods in our sample. Borrower characteristics include: total assets, liabilities, employment income, and number of creditors. Neighbourhood characteristics include: population, median income, financial literacy score and unemployment rate, share of home owners, average number of financial institutions within a five-kilimetre radius from each FSA, and lag total insolvency. Metropolitan areas include: Toronto, Montreal, Vancouver, Ottawa-Gatineau, Calgary, Edmonton, Quebec, Winnipeg, Hamilton, and Kitchener-Cambridge-Waterloo. Robust standard errors are in parentheses. Significance levels: *** p<0.01, ** p<0.05, * p<0.1

	Insolvency rate			Share of proposals		
	(1)	(2)	(3)	(4)	(5)	(6)
IMM_k	-0.60**	2.70**	2.56**	0.45***	0.33***	0.34***
	(0.28)	(1.19)	(1.11)	(0.02)	(0.10)	(0.10)
FBB-FBP		0.47	0.47		-0.16**	-0.16**
		(0.51)	(0.51)		(0.08)	(0.08)
Metropolitan			0.11			-0.01
			(0.12)			(0.01)
Constant	3.38***	11.38	11.39	0.22***	1.22	1.22
	(0.07)	(21.44)	(21.44)	(0.01)	(1.55)	(1.54)
Observations	1,569	1,561	1,561	1,569	1,561	1,561
R-squared	0.00	0.53	0.53	0.19	0.55	0.55
Borrower characteristics	✓	✓	✓	✓	✓	✓
Neighbourhood characteristics	✓	✓	✓	✓	✓	✓
Census2011	✓	✓	✓	✓	✓	✓
Province F.E.		✓	✓		✓	✓

2.6.3 Generalized propensity score matching

In this subsection I provide further evidence to support my previous findings by using the Generalized Propensity Score (GPS) method, which allows for continuous treatments, following Hirano and Imbens (2004). Propensity score methods were initially limited to binary treatments (Rosenbaum and Rubin (1983)). Imbens (2000) introduced the propensity score for *multiple* treatment cases. More recently, propensity score methods have

been extended to continuous variables (Hirano and Imbens (2004)). The goal of creating a single score that represents the probability of receiving a treatment is to balance a set of observed covariates between neighbourhoods by treatment status. This makes it easier to isolate the effect of a treatment; and it reduces the dimension, as it only requires adjustment for a scale variable (i.e. estimates propensity score) rather than for the entire covariate vector. These methods, however, require users to overcome the challenges of (i) correctly modelling a treatment variable as a function of a possibly large number of pre-treatment covariates and (ii) modelling the response variable. I closely follow the framework suggested by Hirano and Imbens (2004).

Methods

Suppose we have a sample consisting of N neighbourhoods. For each neighbourhood i in the sample, we observe a vector of pre-treatment covariates, X_i; the observed univariate treatments, $T_i \in \tau$, where τ is a continuous set of potential treatment values; and the value of the outcome variable is associated with this treatment, $Y_i(t)_{t\in\tau}, i = 1,...,N$, referred to as the unit-level Dose-Response Function (DRF). The objective is to estimate the average DRF. In particular, the implementation of the GPS method consists of three steps:

(1) Treatment assignment model: Model the distribution of the treatment assignment's given covariates to estimate the propensity score.

(2) Response model: Model the distribution of the response given the treatment, adjusting for estimated score.

(3) Causal quantities of interest: Estimate the causal quantities of interest and their standard error based on the fitted response model.

Treatment assignment model

The GPS is equal to the treatment assignment model's density function evaluated at the observed treatment variable and covariate for a particular neighbourhood. This is analogous to the propensity score for the binary treatment, which can be written as $e(X) =$

$r(1,X) = pr(T = 1|X)$.

$$R = r(t,x) = pr(T_i = t\,|X_i = x)\,, \tag{2.13}$$

which is the conditional probability of receiving a particular level of the treatment given the pretreatment variables.

Response model

To remove bias associated with differences in covariates, the estimated score is used to calculate the conditional expectation of the outcome, $\beta(t,r)$. For all t,

$$\beta(t,r) \equiv E\left[(Y_i(t)|r(t,x) = r\right] = E\left[Y_i|T_i = t, r(T_i,X_i) = r\right]. \tag{2.14}$$

Hirano and Imbens (2004) propose estimating the conditional expectation of the response as a function of the observed treatment, T, and the GPS, $\widehat{R}$. They recommend using a flexible parametric function of the two arguments and give the following Gaussian quadratic regression model,

$$E\left[Y_i \mid T_i, \widehat{R}_i\right] = \alpha + \beta_1 T_i + \beta_2 T_i^2 + \delta_1 \widehat{R}_i + \delta_2 \widehat{R}_i^2 + \gamma T_i \times \widehat{R}_i + \varepsilon_i. \tag{2.15}$$

This can be viewed as a generalization of Rosenbaum and Rubin (1983) covariance adjustment technique, which in the binary treatment case involves regressing Y on $\widehat{e}(X)$ separately for the treatment and control groups.

Estimating causal quantities

The average response at treatment level t over the distribution of the pre-treatment variables, $X_1,...,X_N$, is estimated, and the average outcome given a particular level of the treatment (the average DRF) is implemented by averaging $\hat{\beta}(t, r(t,X_i))$

$$\mu(t) = E\left[Y_i(t)\right] = E\left[\beta(t, r(t,X_i))\right]. \tag{2.16}$$

In particular, at treatment level t,

$$\widehat{E}\left\{Y_i(t)\right\} = \frac{1}{N}\sum_{i=1}^{N}\left(\alpha + \beta_1 t + \beta_2 t^2 + \delta_1 \widehat{r}(t,X_i) + \delta_2 \widehat{r}(t,X_i)^2 + \gamma t \widehat{r}(t,X_i)\right). \tag{2.17}$$

In 2.17 the mean response of all neighbourhoods received dose t is estimated by computing a dose-specific score: r is evaluated at t, not T. Standard errors can be calculated using bootstrap, taking into account the estimation of both the GPS and model parameters.

Implementation

The share of immigrants in each neighbourhood varies continuously from zero to 0.73. This feature allows me to estimate a continuous DRF that relates each value of the dose, i.e. share of immigrants, to the share of proposals (the response). By definition, the dose should be a non-negative variable in [0,100] interval. I use the following ratio to scale the dose (share of immigrants):

$$T_i^N = \frac{T_i - minT_i}{maxT_i - minT_i} \times 100. \tag{2.18}$$

The underlying assumption is that the dose variable (or its transformation) has a normal distribution conditional on the covariates. Since my treatment variable is positively skewed (see figure 2.3), I use the zero-skewness log transformation of our treatment variable.[18] I estimate GPS using ordinary least squares regression (OLS). Table 2.5 contains the results. Next, I calculate the conditional expectation of Y_i given T_i and $\widehat{R}_i$. Table 2.6 contains the estimation results for the GPS-adjusted DRF.

The estimated coefficients in the DRF have no direct causal interpretation (Hirano and Imbens (2004)). Therefore, I estimate the average potential outcome at treatment level t by averaging $\hat{E}\left[Y_i(t)\right]$. Figure 2.5 illustrates the estimated DRF for share of proposals. The solid curve is the point estimated values for DRF, and the dashed lines show the 95% confidence intervals. I bootstrap standard errors from 100 replications. The relationship between dose and response to the dose is significantly different from zero. The DRF traces

[18] Hirano and Imbens (2004) use a log-normal distribution to estimate their score $r(t,x)$.

Table 2.5 – Estimated GPS

Variable	Coef.	Std. Err.	z-sore
unemployment rate	0.01	0.00	2.25
married	0.73	0.11	6.53
log(assets)	0.14	0.03	5.29
log(income)	0.16	0.06	2.69
log (liabilities)	0.74	0.05	14.78
surplus	-0.39	0.14	-2.72
home owner	-2.64	0.14	-18.70
number of banks (5Km)	0.13	0.00	26.84
log(financial literacy)	1.63	0.51	3.18
log(Median income)(FSA)	-0.67	0.09	-7.22
constant	-15.65	2.44	-6.41

the size of predicted change in the share of proposals at the given share of immigrants in each FSA. For example, going from FSAs with 20% share of immigrants to FSAs with 40% share of immigrants, the share of proposals increases by 0.8.

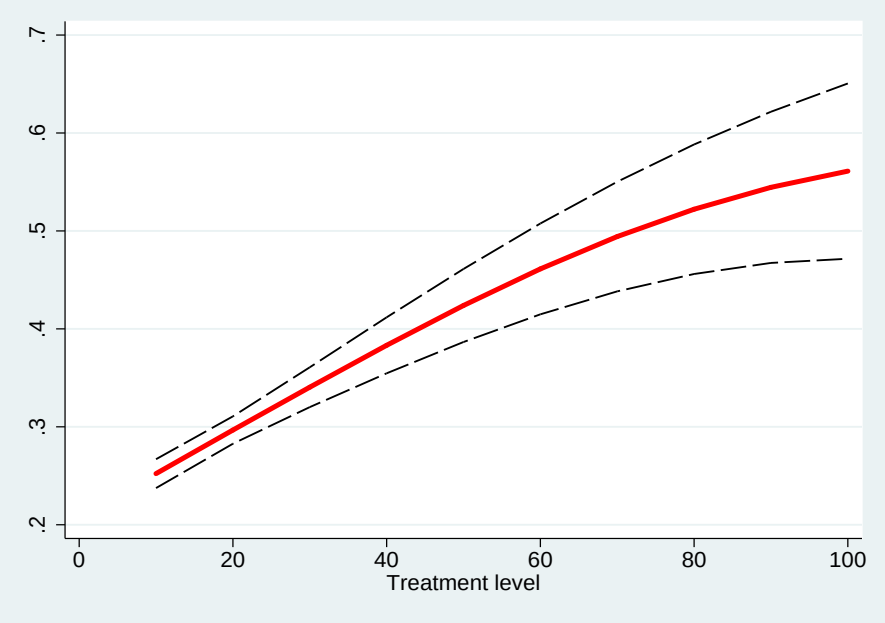
Table 2.6 – Estimated Dose Response Function

	Coef.	Err.	t
	Proposal Share		
T	0.83	0.11	7.85
T^2	-0.48	0.14	-3.40
$\widehat{R}$	-0.24	0.09	-2.59
$\widehat{R}^2$	0.30	0.10	3.02
T $\times$ $\widehat{R}$	-0.27	0.12	-2.19
Constant	0.23	0.02	10.80

2.7 Conclusion

I construct a unique data set by merging the individual insolvency data with the share of immigrants in each FSA in 2011. I find a positive and significant relationship between the share of immigrants and the share of proposals at the FSA level. To the extent that

Figure 2.5 – Dose-response function



the neighbourhood share of immigrants is a proxy for individual immigration status, the results suggest that immigrants are more likely to choose debt-restructuring proposals, possibly because retaining some assets helps them with self-insurance, which they prefer, since they face higher income risk relative to the non-immigrant population. I also find neighbourhoods with higher immigrant concentrations have a higher share of insolvencies. One explanation may be that the higher the share of immigrants in each neighbourhood, the less homogeneous neighbours are, and this translates into fewer informal risk-sharing opportunities (i.e. fewer informal lending-borrowing agreements). Thus, less informal risk sharing can contribute to more formal defaults.

This study has provided original insights on the relationship between the differentiated income risk among individuals and its impact on their insolvency choices. One challenge when using individual-level data with group-level variation in the variable of interest is that one cannot separately identify the so-called correlated, endogenous, and contextual effects (also known as the reflection problem, see Manski (1993)). That is, the propensity to file a proposal might depend, or on the average proposal rate in the neighbourhood, or

on the average attributes of people living in the neighbourhood, or on some exogenous characteristics of the neighbourhood. Having a direct link between the immigration status and the insolvency choice is likely to mitigate this problem. In addition, looking at the panel of insolvency filings for immigrants and non-immigrants, for example, allows us to see how the insolvency trend changed over time for immigrants and non-immigrants. I look forward to more research addressing these questions.

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Chapter 3

Possible Income Misstatement on Mortgage Loan Applications: Evidence from the Canadian Housing Market

Co-authored with Babak Mahmoudi[1]

Abstract

We construct a measure of Possible Income Misstatement (PIM) for first-time homebuyers by quantifying the gap between growth in incomes reported on mortgage applications and growth in incomes reported on tax files from 2004 to 2014 in Canada. Using a two-stage least square framework to correct for the endogenous nature of house prices and PIM, we find robust evidence that part of the observed dispersion in PIM is caused by house price variation. This suggests borrowers have greater incentive to misstate income in high-priced markets. We report evidence that markets with a tendency for income misstatement also had higher default rates.

JEL codes: G21, R2

Keywords: Income Misstatement, Mortgage lending, Default

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3.1 Introduction

To what extent do house prices affect borrowers' incentive to overstate their income on mortgage applications? Using Canadian data, this paper measures the gap between growth in first-time homebuyers' incomes reported on mortgage applications and growth in first-time homebuyers' incomes reported on tax files from 2004 to 2014. The basic idea is that in the absence of any change in income misstatements on mortgage applications, income reported on mortgage applications, and tax files rise (or decline) at the same rate over a certain period. Therefore, we expect to see little to no growth difference (i.e. no expansion or contraction in the gap).

This paper has three objectives: (i) to construct a measure of Possible Income Misstatement (PIM) on mortgage applications, (ii) to test whether or not part of the observed dispersion can be associated with house prices, and (iii) to document the relationship between PIM and ex post outcomes such as mortgage defaults. To achieve these objectives, we use data from the Canada Mortgage and Housing Corporation (CMHC), a federal Crown corporation that provides mortgage insurance, and we match this data at the level of forward sortation area, or FSA (the geographic area designated by the first three characters of a Canadian postal code), with tax record information from the Canada Revenue Agency (CRA) provided by the Longitudinal Administrative Databank (LAD). At the time of loan origination, the CMHC collects borrower and loan characteristics, such as mortgage interest rate, loan amount, house price, house location, terms and amortization, loan performance, income, credit score and debt service ratios. To make our sample homogeneous, we focus on first-time homebuyers (FTHB) with a loan-to-value (LTV) ratio between 80% and 95%. To identify FTHBs in the LAD, we include filers who used the Home Buyers' Plan (HBP) to purchase their house. The HBP is a federal programme that allows FTHBs to borrow, tax-free, from their registered retirement savings plan (RRSP) in order to make a down-payment on a house.[2] We are able to construct FSA-level measures of the degree of PIM for first-time homebuyers from 2004 to 2014 in Canada. Our

[2]See Steele (2007) for a comprehensive analysis of this program.

measure does not suggest a notable amount of PIM for insured mortgages in the Canadian mortgage market from 2004 to 2014.

We hypothesize that borrowers have a greater incentive to misstate their income in high-priced markets. However, if we assume borrowers overstate their income to enter the housing market, then an increase in income misstatement potentially translates to higher house prices if the supply of housing is inelastic in the short term. Therefore, we are faced with an endogeneity problem. To mitigate the scope for an alternative interpretation of our evidence, we use the average rent prices in each FSA as an instrument for house prices. We observe that the rent prices are highly correlated with the house prices, while also being uncorrelated with our error term. We find that when other controls are kept constant, PIM is higher in high-priced markets. More specifically, a 1% increase in house prices is associated with a 0.13% increase in PIM. Our results also suggest that among loan characteristics (for example, total debt service ratio, gross debt service ratio, and loan-to-value ratio), gross debt service ratio is negatively associated with possible income misstatement. This is consistent with the notion that tighter borrowing constraints could lead to a higher probability of income misstatement.

Given our findings, it is important to ask whether FSAs with higher PIM experience worse loan performance. We use two definitions of default as an indicator of loan performance: (i) mortgage in arrears, when a mortgage is 90 or more days past due within five years of the loan origination date, and (ii) mortgage in claims, when a mortgage is foreclosed and a mortgage insurance claim is submitted by the lender within five years of loan origination.[3] Arrears is an early indicator of a borrower who has cash flow problems.[4] Borrower cash flow problems could be due to income shocks, such as unemploy-

[3]Rates of claims and arrears are two measures of loan performance that are widely used in the industry. See U.S. Financial Crisis Inquiry Commission (2011, p. 215). Default is defined as "90-days or more past due or in foreclosure." Some authors, for example, Mian and Sufi (2009) also use 30-day or more delinquent as definition of default.

[4]Arrears could also be an indicator of a borrower who is in the process of strategic default. Strategic default is when a borrower with negative equity is able to make regular mortgage payments, but chooses not to pay. Strategic default is correlated with significant negative equity (Bhutta et al. (2017)). From 2004 to 2014, the Canadian housing market did not experience a significant house price decline and since strategic default is less likely to happen for insured mortgages that are recourse (Ghent and Kudlyak (2011), strategic default does not represents a big share of arrears in our sample.

ment, loss of secondary income, or marital split; increases in mortgage payments caused by an increase in a variable rate; health shocks; or mismanagement of funds. We track mortgage performance data for five years for mortgages that originated between 2004 and 2009. For example, a mortgage that originated in 2005 is flagged as a mortgage in arrears if the mortgage was 90 or more days past due between 2005 and 2010. Our results suggest that a 1% increase in predicted PIM is associated with a 0.14% increase in the share of arrears and a 0.09% increase in the share of claims.

To further validate our results, we examine the probability of arrears and claims at the individual level. In particular, we ask whether the probability of a loan being in arrears or claims, varies across FSAs with different shares of PIM. We estimate a probit model, where the dependent variable is one if a loan is in arrears or claims, and zero otherwise. After controlling for all observable loan and borrower characteristics as well as FSA fixed effects and year fixed effects, we find that borrowers living in FSAs with higher levels of PIM are more likely to experience arrears or claims. Taken together, these results suggest that high-priced markets appear more likely to create incentives for borrowers to falsify their income in order either to enter the housing market or to obtain bigger loans. This creates a channel for increased defaults due to possible cash flow problems.

A number of papers demonstrate that misrepresentations of borrowers' incomes on mortgage applications increased significantly in the U.S. during the period prior to the 2007–2008 financial crisis. These papers compare income reported on Home Mortgage Disclosure Act (HMDA) data; covering the vast majority of mortgages, with alternative sources of income data. Blackburn and Vermilyea (2012) compare the incomes of a sub-sample of U.S. homebuyers from the American Housing Survey (AHS) with income reported on HMDA data and, since a loan-level match is not possible, they use borrower and mortgage characteristics to calculate an HMDA-estimated income for each AHS observation. Avery et al. (2012) conduct a similar exercise, but use the 2000 Census and the 2005 American Community Survey instead of the AHS. Mian and Sufi (2017) use income reported on mortgage applications from HMDA and compare it with tax reported income. They use ZIP code-level differences in growth in income reported on mortgage

applications and growth in tax reported income of all the tax filers in a ZIP code. All of these studies found that income reported on mortgage applications was highly overstated during the housing boom. While there is widespread evidence of income misstatement in the U.S., no academic study has previously examined system-wide evidence for Canada on the existence and magnitude of possible income misstatement.

Using data from a single lending institution from 2004 to 2008, Jiang et al. (2014) compared average neighbourhood income reported on tax files to average income reported on mortgage applications and concluded that income exaggeration occurred on low-doc loans, resulting in elevated defaults. Ambrose et al. (2016) follow the method outlined in Jiang et al. (2014) to measure possible income misstatement with a focus on differences in employment status. They show that the majority of adverse selection and income falsification is attributed to a specific borrower group that selected into low-doc loans. They also support the findings of Mian and Sufi (2017) that mortgages granted to borrowers who were most likely to overstate income were concentrated in lower income neighbourhoods.

Our paper complements the findings of these studies in a number of dimensions. First, similar to Mian and Sufi (2017), our paper compares average income reported on mortgage applications to average tax income at the FSA level (first three characters of a postal code). However, in order to create a better match between the two data sources, we focus on FTHBs who reported their home purchases on income tax files to take advantage of a federal tax programme. Our measure of PIM compares growth differences in average income reported in the tax files of these FTHBs to the average income that FTHBs reported to lenders. This reduces the concerns about gentrification present in the previous study, which included the average income of all tax filers in a ZIP code.[5]

Second, we develop a simple empirical model of default rates during 2004 and 2014,

[5]One concern when comparing income of FTHBs with average income of all tax filers in a neighbourhood is that the discrepancy might be a reflection of gentrification of poor neighbourhoods. Relatively high-income homebuyers may be attracted to poorer neighbourhoods that are more affordable. One important contribution of this paper is that we try to select (to the best the data allows us) FTHBs from both sources, that is LAD and CMHC. Therefore, we are not comparing the high-income FTHBs purchasing homes in poorer neighbourhoods with the average income of the whole neighbourhood.

in which PIM is allowed to be a potential explanation. To our knowledge, this paper is the first study that uses Canadian data consisting of the entire historical loan portfolio of the largest mortgage insurance company in Canada to measure the importance of PIM during this period. We demonstrate that as PIM increases, loan performance deteriorates. Our paper also contributes to mortgage insurance practices by proposing appropriate measures to reduce risk, and it supports the need for better income verification.

The rest of the paper proceeds as follows: section 3.2 describes the institutional environment, in particular mortgage default insurance and fraud detection in Canada. Section 3.3 presents a detailed analysis of the data. Section 3.4 presents the empirical analysis, and section 3.5 outlines some conclusions.

3.2 Mortgage default insurance and fraud detection in Canada

Mandatory mortgage default insurance was introduced in Canada over 60 years ago to protect lenders against defaulting borrowers. When a borrower defaults on an insured mortgage, the lender typically forecloses and sells the property. The lender then files an insurance claim that includes the shortfall of the sale amount of the property to cover the outstanding balance of the mortgage and some legal and sale costs.[6]

Legislation generally requires mortgage insurance for any mortgage loan that exceeds 80% of the value of the mortgaged property (high-ratio mortgage is any loan that exceeds an 80% loan-to-value ratio). Mortgage insurance is also available for mortgages with loan-to-value ratios of 80% and under. In Canada, 45% of all mortgage credit is insured[7]. Mortgage insurance is provided by the Canada Mortgage and Housing Corporation (CMHC), a federal Crown corporation, and two private mortgage insurers, Genworth and Canada Guarantee. The CMHC covers approximately half of the market value of

[6] Alternatively, the lender can transfer the property to the mortgage insurer for the entire outstanding balance of the mortgage. In such a case, the mortgage insurer would sell the property.

[7] According to the Office of the Superintendent of Financial Institutions (OSFI).

flow of insured mortgages[8]. Making high-ratio mortgage access conditional on mortgage insurance allows for greater scrutiny of underwriting practices for insured mortgages.

Mortgage approval requires borrowers to disclose any sources of income they have. This includes employment income, investment income, rental property income, pension income, spousal support, and self-employed income. The income verification process requires borrowers to submit a copy of their latest pay stub, a letter of employment, Canadian tax documents such as T4 income slips, T1 General tax returns and notices of assessment (NOAs), as well as documents showing other sources of income and legal agreements to support a spouse or make child support payments.

Letters of employment, pay slips, and T4 slips are falsifiable; and tax returns from previous years provide a noisy proxy for present income. Lenders and mortgage insurers take steps to detect misstatement of income, including contacting a borrower's employer for income verification. However, they do not necessary verify a borrower's income directly with the tax authority (the Canada Revenue Agency). Over the years, mortgage insurers and lenders have detected occasional sophisticated fraud schemes, such as fake phone numbers and fake companies.

The Office of the Superintendent of Financial Institutions (OSFI) requires a Federally Regulated Financial Institution (FRFI) to develop a Risk Appetite Framework (RAF), which takes into account the FRFI's risk profile. The OSFI sets out guidelines for prudent residential mortgage underwriting and is applicable to all FRFIs. Lenders follow these underwriting standards for borrowers' reported income. For example, it is common practice to require self-employed borrowers to provide evidence of at least three years of income[9]. Moreover, the OSFI requires lenders to exercise rigorous due diligence in underwriting loans that are materially dependent on rental income or for borrowers relying on income from sources outside of Canada. Lenders are required to discount reported incomes that are temporarily high due to overtime wages, irregular commissions, and bonuses.

Additionally, the OSFI expects lenders to put in place programmes that continuously

[8] According to CMHC estimates.

[9] Average income for the past three years is considered for mortgage applications for self-employed borrowers.

monitor and audit the information received on mortgage loans to reduce the potential for inaccuracies and to help detect fraud or "gaming."[10] Lenders also have underwriting requirements related to fraud detection, such as income verification, screening tools, and risk management frameworks. Third-party tools such as credit bureau reports or platforms specializing in detecting fraud are also available.[11] B-20 guidelines and lenders' underwriting policies create a structural difference between borrowers' income reported on mortgage applications and borrowers' income reported for income tax.

3.3 Data description and methodology

The sample for this analysis is constructed by combining two main databases. Our primary data on mortgage contracts and borrowers is loan-level administrative data collected by the CMHC from 2004 to 2014. At the time of origination of insured mortgages, the CMHC collects loan characteristics such as interest rate, loan amount, house price, house location, terms and amortization, and loan performance; and borrower characteristics such as income, credit score, and debt service ratios.

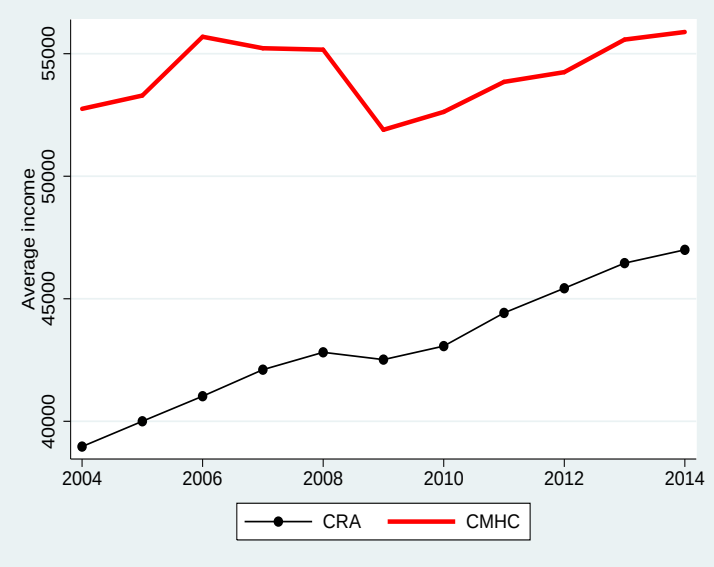
Our second source of data is income and demographic variables from the Canada Revenue Agency (CRA) tax files provided by the Longitudinal Administrative Databank (LAD). The LAD provides detailed information about both individual and family income for people who filed an income tax return between 1982 and 2014. The LAD takes a random 20% sample of all tax filers, and individuals remain in the sample for as long as they file their taxes. To ensure that the sample we used for this paper is representative of the entire population, we multiply calculated aggregate variables by their corresponding weight. Figure 3.1 shows CMHC and CRA average-reported incomes for first-time homebuyers from 2004 to 2014. The change in the gap between these two reported incomes is what we are interested in explaining. This gap could be explained by structural

[10] Mortgage insurers have fraud detection tools and processes at the underwriting stage and at the mortgage insurance claim processing stage.

[11] Equifax's Citadel, for example, is a data sharing platform used by lenders to flag cases of fraud.

Figure 3.1 – CMHC and CRA Reported Income of First-time Homebuyers

First-time homebuyer's income as reported on mortgage applications and tax files from 2004 to 2014. Both incomes are adjusted for inflation using the CPI (base 2002).



differences between income reported on mortgage applications and tax files.[12] It could also be due to inflated income reported on mortgage applications.

We use the average rent prices at FSA in each year as an instrumental variable. Our source for average rents is the Rental Market Survey, which is conducted by the CMHC every year to estimate the relative strengths in the rental market. The survey is conducted on a sample basis in all urban areas with populations of 10,000 or more, and it targets only privately initiated structures with at least three rental units and which have been on the market for at least three months.[13]

To control for neighbourhood characteristics, we include information from a number of sources, one of which is the 2011 National Household Survey (NHS), designed to

[12] for example, lenders are required to discount reported incomes that are temporarily high due to overtime wages, irregular commissions and bonuses. Self-employed borrowers with less than three years of income, borrowers reporting rental income or those relying on income from sources outside of Canada are subject to rigorous due diligence. These sources of income are included in tax data.

[13] See `https://www03.cmhc-schl.gc.ca/hmip-pimh/en/tablemapchart/rmsmethodology` for more information on this program.

collect social and economic data about the Canadian population. Information in the NHS is available at the level of the forward sortation area (FSA), which is the geographic area designated by the first three characters of a Canadian postal code.[14] We also include FSA-level credit score information from Equifax (a credit bureau).

3.3.1 Sample selection and summary statistics

We restrict our sample to contracts with homogenous terms. We exclude homeowners who were either refinancing or renewing their mortgage contract and focused only on newly issued mortgages.[15] We focus on first-time homebuyers (FTHB) with loan-to-value ratios (LTV) between 80% and 95%.[16] We also drop contracts with more than one borrower on the mortgage application (no co-borrower).

To identify FTHBs in the LAD, we track filers who used the Home Buyers' Plan (HBP) to purchase their house. The HBP is a federal programme that allows FTHBs to borrow, tax-free, from their registered retirement savings plan (RRSP) to make a down-payment on a house. Ideally, we would have liked to compare income reported on mortgage applications with income reported on tax files at the loan level. However, because of confidentiality issues, individual-level data is not available through the LAD. As a result, we constructed an FSA-level measure of FTHBs' Possible Income Misstatement (PIM).

Prior literature also uses U.S. ZIP code-level data to construct an aggregate measure of income misstatement. To improve our aggregate measures, we focus on FTHBs who reported their home purchases and not the average income of all tax filers in each FSA. First, we calculate average income for FTHBs in each FSA and year using CMHC data. Next, we match average income in each FSA for FTHBs using LAD data from 2004 to

[14]The forward sortation area (FSA) is the geographic area designated by the first half of a postal code. The average FSA has a radius of 7.6 kilometres, while the median is much lower, at 2.6 kilometres. We observed nearly 1,518 FSAs in the sample. Table A6, in the appendix, presents the number of FSAs in each Canadian province and territory.

[15]Allen et al. (2014) use similar data and show that repeat buyers have similar total debt service ratios and lower loan-to-value ratios compared to first-time homebuyers, and that they take out, on average, larger loans to purchase larger homes.

[16]FTHBs are defined as households that do not own housing assets at the time of mortgage origination. FTHBs represent 77% of CMHC's data.

Table 3.1 – Summary Statistics

This table presents a summary of statistics for FSAs in our sample. The sample contains 585,343 observations on FTHBs with LTV between 80% and 95% and with no co-borrower on the contract from 2004 to 2014. Property value, mortgage size, and income are adjusted for inflation using the CPI (base 2002) and are Winsorized at the 1st and 99th percentiles. Income (CRA) is taxable income reported to the CRA. “Other" is a category that includes proportion of mortgages originated by life insurance, monolines and trusts in our sample.

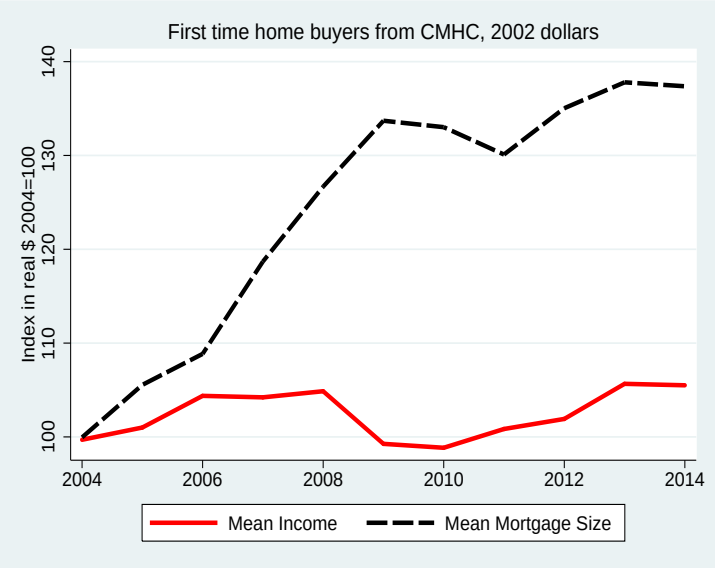
Variable	Mean	S.D.	$P(25)$	$P(50)$	$P(75)$
Property value	177,634	77,129	118,848	168,900	226,153
Mortgage size	169,043	72,678	113,733	161,222	214,678
Income (CMHC)	54,196	14,085	44,863	51,829	60,901
Income (CRA)	43,074	11,823	35,555	40,462	47,263
Loan-to-value	92.9	1.32	92.3	93.1	93.8
Total debt ratio	34.6	2.56	33.2	34.8	36.2
Credit score	715	36	700	719	735
Mortgage interest rate	4.58	.90	3.86	4.49	5.36
Bank	.536	.191	.426	.538	.65
Credit union	.18	.22	0	.09	.3
Financial services	.13	.13	.03	.11	.2
Other	.15	.14	.04	.13	.22
Self-employed	.01	.05	0	0	0
Broker	.12	.13	0	.09	.19
Arrears	.06	.09	0	.03	.08
Claims	.03	.07	0	0	.05

2014 with CMHC data, resulting in 1,518 FSAs in each year. These 1,518 FSAs represented 92% of the population of Canada in 2011. Table 3.1 presents summary statistics for the sample used in our analysis.

Figure 3.2 plots mortgage credit and income growth at origination from 2004 to 2014 in Canada using CMHC data. The mortgage size growth is the growth in the total amount of mortgages originated for home purchases in an FSA from 2004 to 2014. Both income measures and mortgage size are annualized and adjusted for inflation.[17] To ensure outlier values were not included in our sample, we Winsorized the sample at the 1st and 99th percentiles. Figure 3.2 shows a rapid increase in mortgage credit during the period 2006-

[17]We use the Consumer Price Index (CPI), excluding food, energy and the effect of indirect taxes (index, 2002=100) to adjust for inflation.

Figure 3.2 – % Change in Average Income and Mortgage Size,
CMHC Data



2009, followed by a decline during the housing bust in 2009-2011 and an upward trend since then.[18] During the 10-year window, mortgage credit grew substantially by 40%, while income grew by only 7%, in real terms. This is some indication of rising leverage among FTHBs over the past decade.

3.3.2 Loan performance measures

We use two indicators of loan performance: (i) mortgage in arrears, when a mortgage is 90 or more days past due within five years of the loan origination date, and (ii) mortgage in claims, when a mortgage is foreclosed and a mortgage insurance claim is submitted by the lender within five years of loan origination. To make claims and arrears comparable for mortgages originated in different years, we use a vintage-based approach. We track mortgage performance data for mortgages originated between 2004 and 2009 for five years. For example, we flag a mortgage originated in 2005 as a mortgage in arrears if it was 90 or more days past due at any time from 2005 to 2010. Similarly, we flag the loan

[18]Mortgage size includes mortgage amount plus mortgage default insurance premium.

as defaulted if the property was foreclosed and a mortgage insurance claim was submitted at any time between 2005 and 2010. By definition, every mortgage in default was also flagged as mortgage in arrears. The arrears rate is on average 6%, and the mortgage insurance claims rate is on average 3% for loans that originated between 2004 and 2009.[19]

3.3.3 Possible income misstatement measure

This subsection documents the construction of our main variable: Possible Income Misstatement (PIM). Our methods closely follow those of Mian and Sufi (2017). Specifically, we calculate the difference between growth in average income according to CRA tax data and growth in average income according to mortgage applications as recorded in CMHC data for FTHBs in each FSA from 2004 to 2014. In order to create a better match between the two data sources, we focus on FTHBs who reported their home purchases on income tax files to take advantage of a federal tax programme, and not the average income of all tax filers in each FSA. The basic idea is that, in the absence of any income misstatement on mortgage applications, income reported on mortgage applications and income reported on tax files rise (or decline) at the same rate over a certain period. Therefore, we expect to see little to no growth difference (i.e. no expansion or contraction in the gap).

We assume a linear relationship between the log of tax income and the log of income reported on mortgage applications. For each borrower j in FSA_i, we have the following equation:

$$I_{j,t}^{CMHC} = I_{j,t}^{CRA} + C_{j,t} + \psi_{j,t} + \varepsilon_{j,t}, \tag{3.1}$$

where I^{CMHC} is the log of income reported on mortgage application, I^{CRA} is the log of tax income and C is all the structural differences between tax income and mortgage income. C includes all forms of a borrower's income that are reported as taxable income and are

[19] Arrears and claims rates capture defaults in the first 5 years of the life of the mortgage. The likelihood of default is significantly higher in the early years of mortgages. As a result, aggregate arrears and claims rates on the entire stock of mortgages on CMHC's book are significantly lower. For example, current aggregate arrears rate for CMHC's book is around 0.4%.

not reported on mortgage applications, and vice versa. ψ is the misstatement of income on mortgage applications and ε is the error term.[20] We calculate the average income for all FTHBs in each FSA_i at time t

$$\frac{1}{n_{i,t}} \sum_{j \in FSA_i} I_{j,t}^{CMHC} = \frac{1}{n_{i,t}} \sum_{j \in FSA_i} [I_{j,t}^{CRA} + C_{j,t} + \psi_{j,t} + \varepsilon_{j,t}], \tag{3.2}$$

where $n_{i,t}$ is the number of FTHBs at time t. The above expression holds for $t+1$. We take the first difference, which gives the following for all FSA_i

$$\bar{I}_{i,t+1}^{CMHC} - \bar{I}_{i,t}^{CMHC} = (\bar{I}_{i,t+1}^{CRA} - \bar{I}_{i,t}^{CRA}) + (\bar{C}_{i,t+1} - \bar{C}_{i,t}) + (\bar{\psi}_{i,t+1} - \bar{\psi}_{i,t}) + (\bar{\varepsilon}_{i,t+1} - \bar{\varepsilon}_{i,t}), \ \forall FSA_i, \tag{3.3}$$

where " $\bar{I}$ " shows the average. We assume that for each FSA the average structural differences between two types of income and the average of the error term remains steady over time: $\bar{C}_{i,t+1} - \bar{C}_{i,t} = \bar{\varepsilon}_{i,t+1} - \bar{\varepsilon}_{i,t} = 0$, which gives

$$\bar{\psi}_{i,t+1} - \bar{\psi}_{i,t} = (\bar{I}_{i,t+1}^{CMHC} - \bar{I}_{i,t}^{CMHC}) - (\bar{I}_{i,t+1}^{CRA} - \bar{I}_{i,t}^{CRA}), \ \forall FSA_i. \tag{3.4}$$

Figure 3.3 illustrates the structural differences between the two income and the misstatement over time. We define Possible Income Misstatement (PIM) at FSA i as

$$PIM_{i,t} = \Delta \bar{I}_{i,t}^{CMHC} - \Delta \bar{I}_{i,t}^{CRA}. \tag{3.5}$$

The Δ operator represents a one-year change in a variable. PIM is the change in log of income ratios; thus, it is unitless. Figure 3.4 plots PIM across FSAs in each year. PIM varies across FSAs, but it was on average not sizeable from 2004 to 2014, meaning that overall there was no significant difference in income growth between CMHC and CRA. Table 3.2 presents summary statistics for PIM in each year. Overall, average PIM is not very different from zero in our sample period. The PIM distribution in each year is what we are interested in explaining. In the next section, we test whether variation in PIM across FSAs can be explained by house price variation.

[20] For example, self-employment income from less than two years is taxable, but cannot be reported on mortgage applications.

Figure 3.3 – Possible Income Misstatement

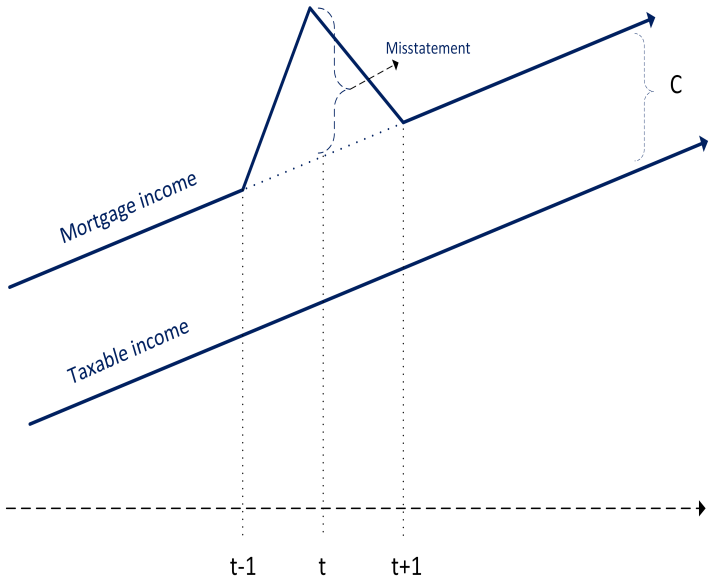


Figure 3.4 – Variation of PIM across FSAs in each year

The box plot indicates the lower and upper quartiles of PIM in each year. The median is represented by a line subdividing the box.

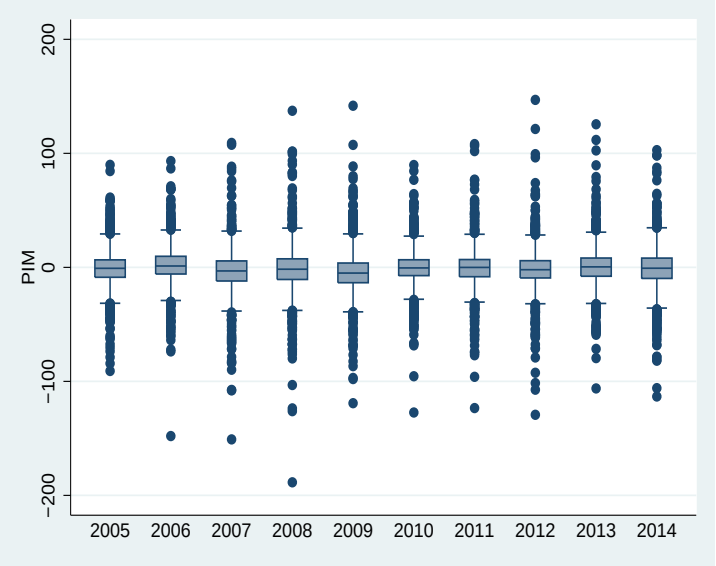


Table 3.2 – Summary Statistics on PIM by Year

This table presents descriptive statistics for Possible Income Misstatement across FSAs from 2005 to 2014.

Year	Mean	S.D.	$P(25)$	$P(50)$	$P(75)$
2005	-1.12	15.8	-8.7	-.846	6.57
2006	1.77	16.2	-5.84	1.19	9.68
2007	-3.19	18.4	-12	-3.14	5.6
2008	-1.85	20.2	-10.6	-1.64	7.48
2009	-4.28	18.6	-13.5	-5	3.78
2010	-.323	15.6	-7.25	-.504	6.65
2011	-.75	16.8	-8.21	-.0514	6.85
2012	-1.68	17.6	-9.31	-2.06	5.85
2013	.273	17	-7.78	.408	8.16
2014	-.682	18.5	-9.71	-.759	8.1

3.4 Empirical specifications and results

The results in this section are divided into two subsections. Section 3.4.1 documents the relationship between PIM and house prices across FSAs from 2004 to 2014. We find that, controlling for other factors, PIM is higher in high-priced markets. Section 3.4.2 uses arrears rates and mortgage insurance claims rates to demonstrate that, as PIM increases, loan performance deteriorates. Taken together, these results suggest that high-priced markets appear more likely to create incentives for borrowers to misstate their incomes either to enter the housing market or to obtain larger loans. This creates a channel for more defaults due to possible cash flow problems.

3.4.1 Do house prices impact PIM?

We start by analyzing the relationship between house prices and PIM. There are two empirical challenges associated with estimating a relation between house prices and PIM. First, if we consider that the supply of housing is inelastic in the short term, then increases in income misstatement potentially translate to higher house prices. This simultaneous relationship between house prices and PIM creates a potential endogeneity problem and

biases an ordinary least squares (OLS) framework. Second, there may be an unobservable factor that explains increases in both PIM and house prices. We employ two-stage least squares (2SLS) and fixed effects to correct for the potential endogeneity problem of reverse causality and omitted variable bias.

For our 2SLS model, we need an instrument that is highly related to the house prices and unrelated to error term. We use the average rent price in each FSA as an instrument for house prices. The average rent prices in each FSA is positively correlated with increases in house prices, which satisfies the relevance condition of an instrumental variable. The simple correlation between our instrument (rent prices) and endogenous variable (house prices) is about 0.69 in absolute value, which is not an indication of a weak instrument. A large first-stage F-statistic also indicates that our instrument is not weak. In addition, this instrument should not have a direct causal effect on the outcome. The average rent price in each FSA is a function of supply and demand for the rental market and is unlikely to be correlated with PIM, which satisfies the exclusion condition of an instrumental variable.[21]

We construct the instrumental variable as follows. We use the Rental Market Survey (RMS), which is a survey the CMHC conducts every year to estimate the relative strengths in the rental market. The survey collects market rent levels, turnover, and vacancy unit data for all sampled structures. We compute the average rent prices of all available FSAs for each year in our sample and use that as our instrument measure. Since rent information is not available for all FSAs, we lose some observations by matching the rent data to our main sample.

In addition to house prices, loan origination channel, credit score, neighbourhood income level and employment status are expected to influence income misstatement. Jiang et al. (2014) point out that mortgage brokers tend to originate lower-quality loans, which

[21]We also used (but not reported) the average mortgage interest rate in each FSA as an instrument for house prices. Currently, lenders do not use risk-based pricing when it comes to insured mortgages, since they have no loss exposure under full insurance that covers 100% of the loss-given default. Therefore, the mortgage rate spread for insured mortgages does not account for risk factors such as PIM, and this instrument is unlikely to be correlated with PIM. In other words, income misstatement is unobservable to lenders. Lenders cannot identify borrower's true income at the time of application. Therefore, we claim average contract rate at the FSA level is not correlated with PIM, which is change in the difference between incomes reported on mortgage and tax income. The results are robust to

result in borrower information falsification, known as “liar’s loans." We generate a variable that is a proxy for whether a loan was generated through a broker.[22]

Using U.S. data, Mian and Sufi (2017) show that PIM is highest in low-credit-score, low-income ZIP codes. We exploited this idea using the median income from the 2011 national household survey and average credit score from Equifax for each FSA. FSAs are sorted according to the 2014 credit score data and 2011 median income from census data and remained in the same group throughout the sample.[23]

Ambrose et al. (2016) show how borrower heterogeneity with respect to employment status contributed to income misrepresentation. They argue that documenting income and assets and conducting verification activities are more costly for both borrowers and lenders when a borrower is self-employed. The complexity of the process provides an avenue for some borrowers to inflate or exaggerate their income in order to qualify for larger mortgages. We exploit this idea by using borrowers’ employment status as reported to the CMHC. We generate a dummy variable that changes from zero to one for self-employed borrowers. We then calculate the share of self-employed borrowers in each FSA.

We run the following level-log regression:

$$PIM_{i,t} = \alpha + \beta\ log\ (HP_{i,t}) + \gamma X_{i,t} + YEAR_i + FSA_t + \varepsilon_{i,t}, \tag{3.6}$$

where i is FSA and t is the year, $PIM_{i,t}$ is the difference in growth in income according to mortgage applications and growth in income according to tax files in each FSA-year, as explained in section 3.3.3, $log\ (HP_{i,t})$ is the log of house prices reported on the mortgage applications. The vector $X_{i,t}$ includes explanatory variables, such as credit score, loan-to-value ratio (LTV), total debt service ratio (TDS), gross debt service ratio (GDS), median income, share of self-employed borrowers, and share of loans generated through brokers.

[22]Our proxy for broker-generated mortgages is equal to one when a mortgage is originated through a Mortgage Finance Company (MFC) and zero otherwise. MFCs are non-depository financial institutions that underwrite and administer mortgages through non-corresponding brokers.

[23]In results not reported here, but available upon request, we sorted FSAs based on share of individuals with credit scores below 660 instead of FSAs’ average credit score. All results were similar if we used this alternative sorting method.

Our regression set-up controls for possible systematic variation of PIM over time and across FSAs. The time fixed effects in our model are in terms of year dummies ($YEAR_i$). These control for any city-, province- or nation-wide macroeconomic factors, including unemployment rates. We also include FSA fixed effects (FSA_t) to control for any variation in economic factors, such as socioeconomic backgrounds, labour market differences, and credit supply differences at the FSA level. Identification of β after introducing FSA fixed effects relies on within FSA variation relative to the average level in a particular year. To address heteroskedasticity in $\varepsilon_{i,t}$, we use cluster-robust standard errors at the FSA level.

The results are reported in table 3.3. Column 1 reports results of OLS regression with borrower and loan characteristics variables. Column 2 reports results using the fixed effect model. Adding FSA fixed effects and year fixed effects does not affect the statistical significance of the result. Columns 3-5 use average rent prices in each FSA as an instrument for house prices. Column 3 reports the first-stage regression results and Columns 4-5 the second-stage regression results without and with FSA fixed effects, respectively. In all three specifications, we find that house prices are positively associated with PIM and that the magnitude of the effect is statistically significant at the 1% level. This suggests that borrowers in high-priced markets are more likely to misstate their income.

In the fixed effect specification, a 1% in $HP_{i,t}$ corresponds to a 0.59% increase in PIM. In the IV regression, the estimated coefficient on $HP_{i,t}$ is smaller, implying that a 1% increase in house prices is associated with a 0.13% increase in PIM. This is consistent with the notion of upward bias in the OLS regression due to reverse causality. The IV estimator would correct this and deliver a smaller coefficient. As expected, the coefficient of the credit score is negative and statistically significant at the 1% level. This is consistent with earlier findings that borrowers with lower credit score are more likely to misstate their income. We do not find any evidence that the broker channel plays a substantial role in variation in PIM.

We performed several other robustness checks that are not reported here. First, we used change in house price instead of price level. Second, we dropped the top and bottom percentiles of the distribution of our dependent variables from the regressions. The main

results are robust to all these checks.

3.4.2 Does PIM deteriorate loan performance?

We now turn to documenting whether PIM is correlated with loan performance. We use arrears and claims as indicators of loan performance, as discussed in subsection 3.3.2.

FSA-level analysis

We first run our analysis at the FSA level. We define $D_{i,t,t',claims}$ as a variable that measures the number of mortgages that originated at year t and went to claims at year $t' \geq t$ in FSA i. Similarly, $D_{i,t,t',arrears}$ measures the number of mortgages that originated at year t and went to arrears at year $t' \geq t$ in FSA i. Five-year claims and arrears rates at FSA i, year t are defined as

$$Y_{i,t,j\in\{claims,\ arrears\}} = \frac{\sum_{t'=t}^{t+5} D_{i,t,t',j\in\{claims,\ arrears\}}}{total\ mortage\ originations_{i,t}} \times 100. \tag{3.7}$$

We start by asking whether FSAs with higher PIM experience worsen loan performance. We use the following regression, where the loan performance can be represented as

$$Y_{i,t,j\in\{claims,\ arrears\}} = \alpha + \beta PIM_{i,t} + \gamma X_{i,t} + YEAR_i + FSA_t + \varepsilon_{i,t}, \tag{3.8}$$

where $X_{i,t}$ is a vector of controls (house price, credit score, LTV, TDS, GDS, loan-to-income ratio (LTI), lender type, and self-employed). We include FSA fixed effects and year fixed effects and cluster standard errors at the FSA level. Our results are displayed in Table 3.4. The impact of PIM on arrears is reported in Columns 1-3. Columns 4-6 repeat the estimate for claims. The columns differ in the PIM measures used as well as the control variables. As a robustness check, we also use early default as an indicator for poor loan performance. Early default is defined as loans that have gone to arrears within the first 2 years after origination. The results are robust to the choice of loan performance indicators.

The $\widehat{PIM_{i,t}}$ is a predicted value of $PIM_{i,t}$ from the 2SLS regression (3.6). The coefficient on the $\widehat{PIM_{i,t}}$ variable suggests that a one point increase in predicted PIM is associated with a 0.12 point increase in the rate of arrears. A movement from the 25th percentile of $\widehat{PIM_{i,t}}$ (-12.22) to the 75th percentile (9.83) would be associated with a 3% increase in the rate of arrears. Similarly, a one point increase in predicted PIM is associated with a 0.09 point increase in the rate of claims. A movement from the 25th percentile of $\widehat{PIM_{i,t}}$ to the 75th percentile would be associated with a 2% increase in the rate of claims.

These results are consistent with the notion that borrowers who misstate their income on mortgage applications are, on the average, more likely to default on their mortgages.

Table 3.3 – Explaining Possible Income Misstatement

This table presents coefficient estimates from an OLS, fixed effect and instrumental variable regressions of Possible Income Misstatement (PIM) on log of house prices reported on the mortgage applications, total debt service ratio, gross debt service ratio, loan-to-value ratio, credit score, share of self-employed borrowers, share of loans generated through brokers and log of median income at FSA level. Average rent prices are used as an instrumental variable. Heteroskedasticity-robust standard errors adjusted for clustering at the FSA level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent Variable: PIM	OLS	F.E.	2SLS		
			First Stage	Second Stage	Second Stage
	(1)	(2)	(3)	(4)	(5)
log(HP)	23.89***	58.51***			
	(0.96)	(2.01)			
Rent prices			0.001***		
			(0.00)		
$\widehat{log(HP)}$				7.91***	13.20**
				(1.46)	(6.72)
Total debt ratio	-0.11	-0.04	-0.00	0.04	0.16
	(0.12)	(0.15)	(0.00)	(0.17)	(0.20)
Gross debt ratio	-2.32***	-3.33***	0.02***	-1.38***	-2.63***
	(0.11)	(0.15)	(0.00)	(0.13)	(0.17)
Loan-to-value ratio	0.78***	0.74***	-0.02***	-0.40	-0.14
	(0.19)	(0.26)	(0.00)	(0.28)	(0.33)
Broker	-8.78***	-3.66	0.04***	-0.52	-0.58
	(1.81)	(2.41)	(0.02)	(2.33)	(2.97)
Self employed	0.49	0.23	0.21***	12.60*	7.18
	(5.14)	(6.89)	(0.06)	(7.18)	(8.22)
Credit Score	-0.01	-0.02***	-0.00***	-0.03***	-0.04***
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
log (median Income)	-7.85***			-2.72***	5.82
	(0.74)			(0.62)	(4.28)
Constant	-209.37***	-668.84***	12.95***	24.33	-120.97**
	(21.71)	(34.80)	(0.92)	(35.42)	(53.82)
Observations	15,139	15,139	10,991	10,009	10,009
Adjusted R^2/Pseudo R^2	0.14	0.30	0.74	0.11	0.20
First Stage F-statistic			1,017.03		
FSA F.E.		✓	✓		✓
Year F.E.		✓	✓	✓	✓

Table 3.4 – Relationship between Possible Income Misstatement and Loan Performance at FSA Level

This table presents coefficient estimates from an OLS and fixed effect regressions of arrears, claims and early defaults on Possible Income Misstatement (PIM). The predicted PIM is derived from a 2SLS model of PIM on log of house prices reported on mortgage applications, total debt service ratio, gross debt service ratio, loan-to-value ratio, credit score, share of self-employed borrowers, share of loans generated through brokers and log of median income at FSA level. The sample period is from 2004 to 2009. Heteroskedasticity robust standard errors adjusted for clustering at the FSA level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent Variable:	Arrears			Claims			Early Defaults		
	OLS	F.E.	F.E.	OLS	F.E.	F.E.	OLS	F.E.	F.E.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PIM	0.02**	0.02*		0.00	0.00		0.01*	0.02*	
	(0.01)	(0.01)		(0.01)	(0.01)		(0.01)	(0.01)	
$\widehat{PIM_{i,t}}$			0.12**			0.09**			0.11**
			(0.05)			(0.04)			(0.05)
Credit risk		-0.01*			-0.01**			-0.01*	
		(0.01)			(0.00)			(0.00)	
Interest Rate		1.83**			1.50*			0.82	
		(0.82)			(0.90)			(0.74)	
LTV		0.47*			0.50**			0.44**	
		(0.26)			(0.20)			(0.21)	
Constant	6.03***	-40.36*	5.23***	3.54***	-43.77**	2.58***	3.45***	-36.54*	3.21***
	(0.13)	(24.04)	(0.27)	(0.09)	(18.63)	(0.20)	(0.20)	(19.41)	(0.23)
Observations	7,561	7,561	7,558	7,561	7,561	7,558	7,561	7,561	7,558
R-squared	0.00	0.37	0.36	0.00	0.36	0.36	0.00	0.35	0.35
FSA F.E.		✓	✓		✓	✓		✓	✓
Year F.E.		✓	✓		✓	✓		✓	✓

Loan-level analysis

To further support our previous findings, we performed our analysis at the loan level. We compared ex post arrears and claims conditional on borrower and loan characteristics observable at loan origination as well as area characteristics. In particular, we estimated the following loan-level regression:

$$Pr(DEFAULT_{k,t,j\in\{claims,\ arrears\}}) = \alpha + \beta PIM_{i,t} + \gamma X_{k,t} + \vartheta W_{i,t} + YEAR_i + FSA_t + \varepsilon_{k,t}, \tag{3.9}$$

where $DEFAULT_{k,t,j}$ is an indicator for mortgage default, either arrears or claims, for loan k that originated at year $t \in [2004, 2009]$. $X_{k,t}$ contains information collected at the time of origination. This information includes loan characteristics such as house price, LTV, TDS, GDS, lender type; and borrower characteristics such as credit score, income, LTI, and self-employed status. $W_{i,t}$ includes FSA-level unemployment rate and median income. The reported standard errors are robust to heteroskedasticity and within-cluster correlation of errors at the FSA level. We are interested in the coefficient on the PIM indicator after controlling for all observable loan and borrower characteristics as well as FSA fixed effects and year fixed effects. Table 3.5 presents estimated coefficients and marginal effects from the maximum likelihood estimation of equation (3.9).

The results indicate that the risk that a borrower will default is not just a function of the borrower's characteristics, the loan terms, and economic trends, but that it also depends significantly on the neighbourhood in which the borrower lives.

3.5 Conclusion

Empirical analysis of possible income misstatement on mortgage applications in Canada has been relatively rare, which limits evidence-based policy recommendations to mitigate mortgage fraud risks. The evidence presented here shows that there was not a significant amount of possible income misstatement for insured mortgages in the Canadian mort-

Table 3.5 – Relationship between Possible Income Misstatement and Loan Performance at Loan Level

This table reports marginal effects and coefficients from probit regressions, along with robust standard errors (clustered at the FSA level) in parentheses. The dependent variable is an indicator variable of mortgage delinquency. * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. The marginal effect of a dummy variable measures the impact of a discrete change of the dummy variable from 0 to 1.

Dependent Variable:	Arrears		Claims	
		dy/dx		dy/dx
PIM	0.002***	0.000***	0.002***	0.000***
	(0.00)	(0.00)	(0.00)	(0.00)
House price	0.000***	0.000***	0.000***	0.000***
	(0.00)	(0.00)	(0.00)	(0.00)
Loan-to-value ratio	0.057***	0.006***	0.072***	0.005***
	(0.00)	(0.00)	(0.00)	(0.00)
Gross debt service ratio	0.004***	0.000***	0.004***	0.000***
	(0.00)	(0.00)	(0.00)	(0.00)
Income	0.000***	0.000***	0.000***	0.000***
	(0.00)	(0.00)	(0.00)	(0.00)
Credit score	-0.002***	-0.000***	-0.001***	-0.000***
	(0.00)	(0.00)	(0.00)	(0.00)
Self employed	0.148***	0.018***	0.150***	0.012***
	(0.03)	(0.00)	(0.03)	(0.00)
Constant	-6.352***		-8.238***	
	(0.15)		(0.19)	
Observations	279,607	279,607	279,607	279,607
Pseudo R^2	0.05	0.05	0.05	0.05
Controls	✓	✓	✓	✓
FSA F.E.	✓	✓	✓	✓
Year F.E.	✓	✓	✓	✓

gage market from 2004 to 2014. The most important feature of the results presented here is the unique nature of the data used to construct them. The sources of data consist of the entire historical loan portfolio of the largest mortgage insurance company in Canada covering a time period from 2004 to 2014, as well as income tax data collected by the Longitudinal Administrative Databank, aggregated at the FSA level. Our tests provide support for the hypothesis that part of the observed dispersion in possible income mis-

statement measure is caused by house price variation. In particular, we find that borrowers in high-priced markets have more incentive to misstate their income. Possible income misstatement is known to be prevalent in the unregulated space, where regulators do not have enough oversight (for example, Ben-David (2011); Jiang et al. (2014); Griffin and Maturana (2016); Piskorski et al. (2015)). Our study covers insured mortgages, where regulators have strong oversight on underwriting through mortgage insurers. Hence, our results should be viewed as a lower bound.

We also demonstrate the importance of possible income misstatement on loan performance. A number of studies have documented the link between income misstatement and loan performance (see, for example, Blackburn and Vermilyea (2012) and Mian and Sufi (2017)). In line with those studies, we demonstrate that higher predicted income misstatement coincides with higher rates of arrears and mortgage default insurance claims.

Our findings have important implications for regulators designing mortgage market policies. First, mortgage lenders have traditionally relied on credit scores to assess the risk of a borrower. However, when a borrower or broker misrepresents fundamental characteristics such as income, employment, debt, or the value of property, the credit score risk assessment is not as effective. Moreover, documenting and verifying income is a costly process for both borrowers and lenders, especially when the borrower is self-employed (see Ambrose et al. (2016)). The complexity of the process provides an avenue for some borrowers to inflate or exaggerate their income in order to qualify for larger mortgages. Enhancing the income verification process by, for example, adopting a more sophisticated channel through which lenders must verify a borrower's income directly with the tax authority (Canada Revenue Agency) as part of the underwriting process would improve the efficiency of the process and help reduce delinquency and improve risk assessment models. Second, income reported on mortgage applications, especially in high-priced markets, should be considered with caution, as a borrower's income could be misstated.

Better understanding of the mechanisms of possible income misstatement is an important field of future research. Understanding whether possible income misstatement is driven by borrowers or mortgage originators would require additional loan-level in-

formation. Extending our framework beyond 2014, when the Canadian housing market experienced an upward shift in house prices, especially in Toronto and Vancouver, would also improve our understanding of the impact of house prices on possible income misstatement.

3.6 Appendix

Table A6 – Number of Forward Sortation Areas by province and territory

This table presents the number of forward sortation areas (FSAs) in each Canadian province and territory. FSAs are geographical regions in which all postal codes start with the same three characters. This table is taken from Forward Sortation Area Boundary File, Reference Guide, 2011 Census. Statistics Canada Catalogue no. 92-179-G.

Province or Territory	Forward Sortation Areas
Ontario	516
Quebec	414
British Columbia	189
Alberta	152
New Brunswick	110
Nova Scotia	77
Manitoba	64
Saskatchewan	48
Newfoundland and Labrador	35
Prince Edward Island	7
Yukon	3
Northwest Territories	3
Nunavut	3
Canada	1,621

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