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Housing Affordability and Parental Income Support

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Abstract

In many countries, the cost of housing has greatly outpaced income growth, leading to a housing affordability crisis. Leveraging Canadian loan-level data and quasi-experimental variation in payment-to-income constraints, we document an increasing reliance of first-time homebuyers on financial help from their parents, through mortgage co-signing. We show that parental support can effectively relax borrowing constraints—potentially to riskier borrowers.

Topics: Housing; Financial services; Financial system regulation and policies
JEL codes: G51, D64, E21, G18, E24

Résumé

Dans plusieurs pays, les prix des logements ont augmenté beaucoup plus rapidement que les revenus, ce qui a entraîné une crise de l'accès au logement. En exploitant des données canadiennes au niveau des prêts et la variation quasi expérimentale générée par les contraintes fondées sur le ratio du service de la dette hypothécaire, nous constatons que les accédants à la propriété ont de plus en plus recours à la cosignature de leurs parents pour l'obtention d'un prêt hypothécaire. Nous montrons que cette aide financière parentale peut être un moyen efficace de pallier les contraintes d'accès au crédit, et ce, potentiellement même pour les emprunteurs plus à risque.

Sujets : Logement; Services financiers; Réglementation et politiques relatives au système financier
Codes JEL : G51, D64, E21, G18, E24

1 Introduction

In many countries, house prices have grown dramatically over the past two decades, substantially outpacing income growth. This has led to an affordability crisis, with many prospective first-time buyers unable to enter the housing market. Regulations constraining access to credit—put in place to limit banks from taking risks in the mortgage sector—have also made access to housing more difficult. However, the impact of the affordability crisis is felt unequally. Some parents can, and often do, help their adult children to purchase homes.

Parents can help their children enter the housing market in two main ways. The first is through transfers, which could be in the form of gifts, loans, or bequests. The literature has shown that parental transfers can help young people raise the funds required to meet loan-to-value (LTV) requirements imposed to reduce risk. For example, Engelhardt and Mayer (1998) and Guiso and Jappelli (2002) document that first-time homebuyers (FTHB) who receive a transfer enter the market earlier and buy larger homes. Blickle and Brown (2019), Lee et al. (2020), and Wold et al. (2024) find that intra-family wealth transfers significantly increase homeownership rates. Benetton et al. (2022) are the first to use consumer credit records to provide evidence of the extent to which parents extract equity from their own homes to finance the home purchases of their children.

LTV restrictions, however, are not the only constraints imposed on prospective borrowers. In many jurisdictions borrowers must also satisfy some form of payment-to-income (PTI) constraint.[1] Typically, a limit is imposed on the size of the monthly mortgage payment as a fraction of income.[2] Transfers are one way to overcome a PTI restriction—a larger down payment implies a smaller monthly payment. The second way that parents can help their children enter the housing market is by co-signing, i.e., by taking on default risk. Co-signing can be a particularly effective way of relaxing a PTI constraint as it directly raises the qualifying income of the mortgage. In addition, parents may find it easier to help through co-signing if they do not have sufficient liquidity to provide a gift but have incomes that are high relative to their debt.

The contribution of this paper is to document the rising importance of parent co-signing

[1] The PTI constraint, also known as a debt-to-income (DTI) constraint, is widely used. Crowe et al. (2013) report that half of the 36 countries surveyed in 2010 imposed PTI restrictions, while 47 percent had LTV restrictions.

[2] Defusco et al. (2020), for example, analyze the implementation of the Dodd-Frank "Ability-to-Repay" rule in the U.S., which is tied to a PTI ratio, while Corbae and Quintin (2015) use the PTI constraint to study the link between default risk and credit growth in the U.S. housing market. Greenwald (2018) instead focuses on the important role of PTI constraints in understanding boom–bust housing cycles.

for FTHBs and to highlight how this form of support can help to overcome PTI constraints but also potentially adds risk to the financial system. Our focus is on the Canadian mortgage market, for which we have access to monthly credit bureau data augmented with administrative contract data, which together provide detailed information on co-signing borrowers. Two additional factors make the Canadian setting particularly suitable for this analysis. First, house prices have more than quadrupled since 2000, with debt levels rising to over 180 percent of disposable income. As a result, entering the housing market is out of reach for many younger households. For example, in Vancouver, a borrower must have $212,800 in annual income to qualify for a mortgage on an average house, while the median household income in Vancouver is just $83,600.[3] Second, adjustments to macroprudential regulations provide exogenous variation in PTI restrictions, allowing us to identify the causal impact of such restrictions on parent co-signing. Since rising house prices and PTI restrictions are not unique to Canada, our findings on the relationship between housing affordability and parent co-signing are also relevant for other countries.

We begin by sketching a simple framework to illustrate the ways in which parental support can help borrowers overcome PTI constraints. The model formalizes the role of borrowing constraints in restricting housing choice and highlights how these constraints become more prominent in an environment with rising house prices, tighter regulation, and increasing borrowing costs, such as higher interest rates. Importantly, the decrease in housing affordability disproportionately impacts younger FTHBs with low income or savings and those without parental support.

We then leverage our rich data to present a series of stylized facts that are consistent with the predictions from the model. First, we provide evidence that parental co-signing among FTHB mortgages has increased over time along with house prices, rising from 4 percent in 2004 to 13 percent by 2022. Second, with parent–co-signed mortgages, adult children, on average, enter the market at a younger age (5 years younger) and with lower credit scores (4 percent lower). Finally, we show that houses purchased with parent co-signing are 7 percent more expensive than those without support. We document that the majority of parent co-signers are mortgage-free; however, roughly one-third have a mortgage and sometimes also have an attached home-equity line of credit (HELOC).

[3]The median individual income in Vancouver is $60,600. The median household (individual) income in Canada is $80,700 ($57,100). All values are in 2022 constant Canadian dollars. The Bank of Canada publishes a measure of housing affordability in Canada—an estimate of how much disposable income is required to meet housing-related expenses (of which the mortgage is the largest component). As of September 2023, the number is 98 percent for Vancouver and 80 percent for Toronto.

In order to make causal claims about the effect of borrowing constraints on co-signing, we next use quasi-experimental variation in loan qualification restrictions resulting from changes to macroprudential regulations in 2016 and 2018. Specifically, borrowers are required to *stress-test* their mortgages against possible future interest rate increases or income decreases. Rather than meeting PTI constraints based on the contract rate, the stress tests require borrowers to qualify at rates approximately 200 basis points above typical rates. We compare the impact of the introduction of the stress tests by sorting borrowers into a treatment group (those more likely to be close to the borrowing constraint) and a control group (those more likely to be far away from the borrowing constraint). In a difference-in-differences specification, we find that parental co-signing increased in response to the stress tests. This relaxed the borrowing constraint of their adult children, which allowed them to enter the housing market despite the tighter regulatory constraints.

Having established a causal link between tighter PTI constraints and parent co-signing, we ask a key question of the paper: How important are parents on co-signed mortgages? Our model shows that parental support allows adult children to obtain more housing while still satisfying the regulatory borrowing constraints. We perform counterfactual exercises, where parents are removed from co-signed mortgages, to quantify this effect. One challenge, however, is that our dataset, although rich along many dimensions, does not have information on how the income reported to the mortgage issuer is split between different parties on the contract. To get around this, we make conservative assumptions on how income is shared and evaluate the ability of adult children to qualify for a mortgage on their chosen house without parental support.[4]

We focus on the 11 percent of mortgages that are parent co-signed and remove parents' income, debt, and credit scores from the mortgage applications. As a result, 74 percent of these adult children would fail to qualify for the mortgage because they would be unable to meet either the PTI requirements (72 percent) or the credit score requirements (9 percent). Next, concentrating our attention on these *constrained FTHBs*, we quantify the importance of parent co-signing via two exercises. First, assuming FTHBs hold fixed their downpayment, we calculate the most expensive house they would have qualified for without parental support. Second, we hold fixed the house price and calculate the additional downpayment required to

[4]For instance, in our main analysis, we assume that adult children earn the same as their parents. This is conservative given the typical income profile over the life cycle. According to Statistics Canada, the median (average) income for someone between the ages of 25 and 34 is $48,100 ($55,000) and for someone between the ages of 55 and 64 it is $48,900 ($64,300). Our results are robust, however, to different assumptions about income splitting (see the Appendix).

buy without parental support. We find that without parental co-signing, the purchase price would have had to be 37 percent lower for the average adult child to qualify for a mortgage. Alternatively, an average additional downpayment of $203,430 would have been required to purchase the same house bought with the support of a parent.

Finally, we investigate the potential implications of parent co-signing for financial stress. Although we document that many of the parents who co-sign are likely financially secure, we nevertheless find, on average, higher mortgage and non-mortgage delinquency rates for borrowers on parent–co-signed mortgages following origination. The results are driven mainly by borrowers on parent–co-signed mortgages involving constrained FTHBs. This evidence suggests that in an environment where co-signing has become prevalent and the costs of borrowing are rising, some parents could come under financial stress due to their exposure to the mortgage market through their adult children.

Literature review. A substantive literature has documented the importance of intergenerational wealth transfers and their impact on numerous outcomes (such as wealth inequality, savings and consumption, education, health, and social mobility). Our focus is on the housing market. Linneman and Wachter (1989) and Ortalo-Magné and Rady (2006), among others, document the importance of income and wealth constraints in explaining the transition from renting to homeownership. Engelhardt and Mayer (1998) show that FTHBs who receive a transfer purchase a home nine months earlier than those who do not. Guiso and Jappelli (2002) find that in Italy, transfers enable recipients to buy larger homes at a younger age (although the number of borrowers receiving transfers was small). Blickle and Brown (2019) use a survey panel of Swiss households to show that intra-family wealth transfers increase the propensity of individuals to move from renting to homeownership by 35 percent. Brandsaas (2021), using a life-cycle framework, finds that parental transfers account for 31 percent of the homeownership rate among young Americans. Similarly, Wold et al. (2024) find that in Norway, households with wealthier parents are nearly 15 percent more likely to be homeowners by age 30, and when they buy, they tend to take on more leverage and purchase more expensive homes. Lee et al. (2020) use the University of Michigan Health and Retirement Survey combined with the Panel Study of Income Dynamics to demonstrate that transfers increase the probability of buying a home. In Canada, Mirdamadi and Khalid (2023) document that adult children aged 22–31 in 2021 are twice as likely to own a home if their parents are homeowners, relative to adult children with parents who do not own a home.

A growing literature focuses on regulatory constraints and homeownership. Acolin et al.

(2016) estimate that in the aftermath of the Global Financial Crisis (GFC), homeownership rates in the U.S. were 2.3 percentage points lower as a result of tighter borrowing constraints. Mabille (2022) documents a 25 percent decline in young homeownership rates post-GFC in the most expensive U.S. cities and a 10 percent decline in the cheapest U.S. cities. Similar results were found in Ireland (Kinghan et al. (2019)) and Switzerland (Bolligera et al. (2024)), where the young and lower income households were most affected by the introduction of macroprudential policies to restrict the expansion of mortgage credit. Bolligera et al. (2024) document how intra-family transfers partially offset the tightening of LTV constraints in Switzerland. In an innovative use of surveys, Fuster and Zafar (2021) elicit willingness-to-pay for housing in the U.S. under different financial scenarios. They find consumers are highly sensitive to downpayment requirements and less sensitive to mortgage rates. Benetton et al. (2022) document that parents in the U.S. extract equity from their house prior to the home purchases of their children, which is highly suggestive that they are re-leveraging to help a child enter the housing market.

Finally, there is a small literature on co-signing (also known as co-borrowing). In a small-scale 2023 online survey of new homeowners in Norway and the U.S., Wold et al. (2024) report that 8 to 11 percent of the respondents received parental support via co-signing or co-purchasing. Tzioumis (2017), Jakucionyte and Singh (2022), and Goodman and Zhu (2023) use U.S. data from the Home Mortgage Disclosure Act and Fannie Mae and Freddie Mac to identify mortgages with more than one borrower. The main finding is that, conditional on observable characteristics, co-signing mortgages is associated with lower default/forbearance rates because of risk sharing among co-borrowers.

In contrast, our paper focuses on FTHBs who would not be able to qualify for a mortgage without co-signing with a parent due to their relatively low income and credit score. The detailed credit bureau data also allow us to investigate borrower performance on credit products beyond mortgages. We find that borrowers on parent–co-signed mortgages tend to have higher delinquency rates on both mortgage and non-mortgage products.

Outline. The rest of the paper is organized as follows. Section 2 describes the Canadian housing and mortgage markets, including the restrictions on mortgage qualification. Section 3 presents a simple framework for thinking about the role of parental support. Section 4 introduces our datasets, and Section 5 presents a descriptive analysis of the data. Section 6 investigates whether tightening qualification constraints has a causal impact on parental support. Section 7 studies counterfactual scenarios in which there is no parental support. Section 8 concludes by discussing the risks associated with parental co-signing.

2 Institutional details

In this section, we provide background information on the housing and mortgage markets in Canada. These details are important in informing the features that are part of our modelling and empirical exercises in later sections.

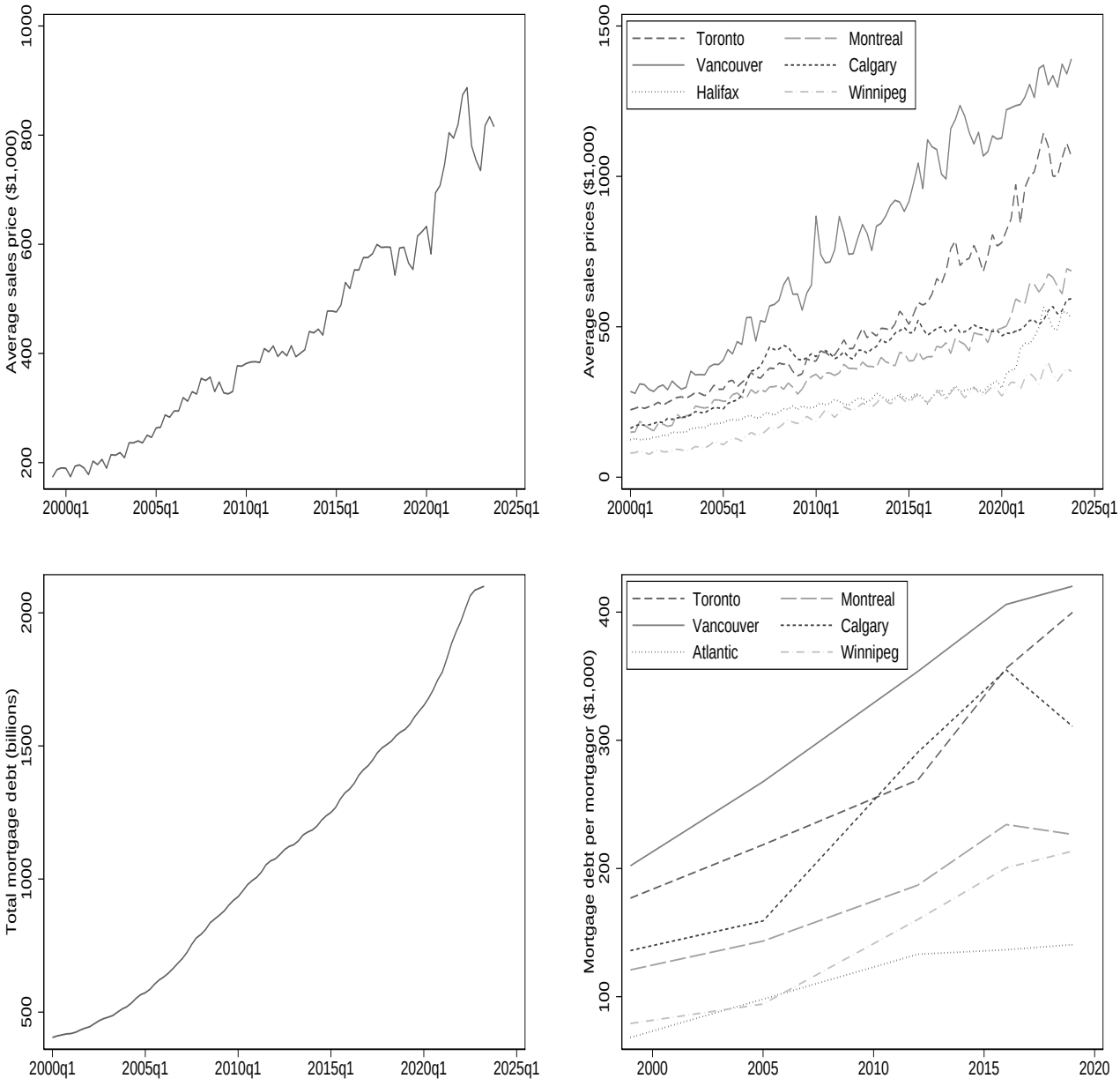
2.1 House prices and the homeownership advantage

House prices in Canada have risen dramatically since the early 2000s. The top panels of Figure 1 illustrate that house prices have quadrupled over this period, and that the increase has been especially significant in the cities of Vancouver and Toronto. Despite the tremendous growth in house prices, many Canadians remain eager to enter the housing market for a number of reasons. Beyond a widespread aspiration to own a home, as in many other countries, homeownership comes with significant tax advantages. The main advantage in Canada is that any capital gains on a primary residence are not taxed.

Over the last two decades, incomes have not kept up with house price growth. As a result, affordability is a primary concern for the majority of FTHBs. Although a number of programs exist to facilitate entry into homeownership, the house price increase was accompanied by a rapid buildup of mortgage debt.[5] The bottom panels of Figure 1 demonstrate this fact and show that total mortgage debt has increased from less than $500 billion to over $2 trillion between 2000 and 2023 (Statistics Canada). At the city level, we use data from the Survey of Financial Security to plot average mortgage debt per mortgagor in six cities. The surveys were conducted in 1999, 2005, 2012, 2016, and 2019. Across cities, mortgage debt per mortgagor doubled between 1999 and 2019, with the highest debt levels seen in the most expensive cities.

[5]For example, couples who are both FTHBs can withdraw, tax-free, from their registered retirement plans (RRSPs) for their downpayment. The maximum withdrawal is $35,000 for an individual and $70,000 for a couple. This was increased from $25,000 and $50,000, respectively, in March 2019. Approximately 11 percent of FTHBs report using money from these accounts as a source of downpayment. Other examples include an FTHB tax credit to help pay closing costs, an FTHB refund on sales tax for new construction, rebates on land transfer taxes in some provinces and cities, and the ability to roll insurance premiums into the mortgage. A 95 percent LTV mortgage has a 4 percent insurance premium. On a $500,000 house, this allows the borrower to roll the $20,000 premium into their monthly mortgage payment, amortized over 25 years.

Figure 1: Evolution of house prices and mortgage debt



2.2 The Canadian mortgage market

The Canadian mortgage market consists of large federally regulated banks, provincially regulated credit unions, and mortgage finance companies. See Allen et al. (2014), Allen et al. (2019), and Coletti et al. (2016) for a detailed description of the Canadian mortgage market. There are two types of mortgages: insured and conventional (uninsured). The typical insured mortgage contract is a 5-year fixed-rate term with a 25-year amortization. That is, every five years the borrower renegotiates the rate on the outstanding balance. Insured mortgages are securitized into the NHA-MBS program (Mordel and Stephens (2015)). Conventional mortgages are similar, except that borrowers can choose to amortize the mortgage over 30 years. Finally, in addition to the most popular fixed-rate mortgages, borrowers can also sign variable-rate mortgages. These are 3- to 5-year contracts that increase in popularity when interest rates are low.

2.3 Mortgage qualification

Prospective borrowers must satisfy certain constraints imposed by the government to qualify for a mortgage. First, they must have a LTV ratio of at most 95 percent. Furthermore, if this ratio is greater than 80 percent, then the mortgage requires insurance to protect the lender in case of borrower default (for the full amortization period of the mortgage). Otherwise, the mortgage is uninsured.[6]

Second, whether the mortgage is insured or uninsured, prospective borrowers must satisfy two income-based borrowing constraints. These constraints are based on the gross debt

[6]Implementation of the mortgage insurance program is via federally-backed mortgage insurers and covers federally regulated banks, provincial credit unions, and mortgage finance companies. The insurers are the Canada Mortgage and Housing Corporation (CMHC), Sagen (formerly Genworth Financial), and Canada Guaranty. Mortgage insurance premiums are set by CMHC and can be found here: https://www.cmhc-schl.gc.ca/consumers/home-buying/mortgage-loan-insurance-for-consumers/cmhc-mortgage-loan-insurance-cost. The banking regulator, the Office of the Superintendent of Financial Institutions (OSFI), sets lending guidelines for uninsured mortgages for federally regulated lenders. Federally unregulated lenders can also originate uninsured mortgages—these tend to be small private lenders as well as credit unions. The large non-banks mostly originate insured mortgages since these are the only type of mortgage that can be securitized. In this case, the non-banks must follow the mortgage insurance rules.

service (GDS) and total debt service (TDS) ratios, which are defined as:

$$\text{GDS} \equiv \frac{\text{mortgage payment + property taxes + heating costs + 50\% of condo fee}}{\text{gross qualifying income}},$$

$$\text{TDS} \equiv \frac{\text{all payments in GDS + payments on other debt obligations}}{\text{gross qualifying income}}.$$

Gross qualifying income is defined as the sum of pre-tax income of every borrower legally responsible for the mortgage. Payments on other debt obligations is the sum of payments on all other debt (auto loan, demand loan, credit cards, and other mortgages) for every borrower legally responsible for the mortgage. The qualifying thresholds for each ratio have been adjusted over time and are a function of whether a mortgage is insured or not. That being said, over our sample period, the typical maximum allowable GDS and TDS ratios are 39 and 44 percent, respectively.

Borrowing constraints were substantially relaxed between 2000 and early 2008, followed by many rounds of tightening between mid-2008 and 2021.[7] Since July 2012, the maximum allowable LTV in Canada has been determined by the purchase price of the house (see Han et al. (2021)). Any house over $1 million is not insurable (i.e., it requires at least a 20 percent downpayment), while any home under this threshold can be bought with as little as a 5 percent downpayment. Starting on February 15, 2016, however, the government began requiring a 10 percent down payment for any amount above $500,000, up to the $1 million threshold. These house-price thresholds have not been adjusted despite 6.3 percent annual house price growth between 2012 and 2023. As a result, the share of insured mortgages has fallen dramatically over time. Using the earliest regulatory data available for federally regulated banks, we observe that the volume of new insured lending fell from 34.6 to 17 percent between July 2015 and July 2023. Finally, a minimum credit score of 620 was introduced (with room for some exemptions) in July 2008 in response to the U.S. housing crisis. In October 2016 the government removed any exemptions for credit scores below 600. In June 2020, this was increased to 680. In each case, at least one person on the mortgage must have a score above the minimum—including a parent co-signing.

[7] See https://www.ratespy.com/history-of-mortgage-rule-changes-03255560 for a list of the majority of rule changes in Canada. See Allen et al. (2020) for a discussion of macroprudential policies in Canada and Claessens (2015) for a broad overview of these types of policies implemented globally. Benetton (2021) analyzes leverage constraints in the U.K. and their interaction with risk-based capital requirements.

Insured stress test. Effective October 17, 2016, all insured borrowers were required to meet a *stress test* to qualify for credit. While the GDS and TDS use the contractual interest rate to calculate *mortgage payment*, the stress test constructs a hypothetical mortgage payment calculated using a *qualifying* rate, which is approximately 200 basis points more than the median contract rate.[8] As a result, loan qualification became more difficult. Consider, for example, a $500,000 house with a $475,000 mortgage and $25,000 downpayment. The contractual monthly payment on a 5-year fixed-rate mortgage amortizing in 25 years with an interest rate of 2.64 percent is $2,161. In order to qualify for this mortgage under the stress test a borrower has to show that they have sufficient income to make monthly payments at 4.64 percent, i.e., $2,666 per month. Suppose that the borrower is at their maximum allowable GDS of 39 percent with the contract rate, which implies a monthly income of $5,541, assuming for simplicity that property taxes, heating, and other debt obligations are zero. Then, to qualify at the stress-test rate, the borrower would need to reduce their loan size by approximately 19 percent, or $89,971 (by either making a larger downpayment or buying a smaller house), or increase their income by about $1,295 per month.

Uninsured stress test. For uninsured mortgages, a similar stress test was announced on October 17, 2017, and came into effect on January 1, 2018. Qualifying rules were further tightened in June 2021. Prior to 2018, lenders did not face a regulatory GDS or TDS constraint for uninsured mortgages with a 5-year fixed-rate term or longer.[9] Similar to the insured stress test, the test for uninsured mortgages uses a qualifying rate—in the case of the 2018 rule, it was the maximum of the contracted rate plus 200 basis points or the five-year posted rate, and in 2021 a fixed floor of 5.25 percent was added.

3 Model

In this section, we present a simple model of housing choice that takes into account leverage and PTI constraints faced by borrowers. The objective is not to capture every feature of the complex housing decision, but instead to highlight how PTI constraints can prevent borrowers from achieving their desired level of housing. The predictions derived from this

[8]Specifically, between October 2016 and February 2020, an insured mortgage was stress-tested using the five-year posted rate of the largest Canadian banks. In June 2021, the government tightened the stress test so that the qualifying rate had to be the maximum of the contract rate plus 200 basis points or a 5.25 percent floor rate.

[9]In October 2012, OSFI imposed a stress test on uninsured mortgages with a term of less than five years that matched the insured stress test. See Clark and Li (2022).

simple framework help to organize the presentation of the empirical evidence in Section 5.

3.1 Benchmark model

We start by describing the basic optimization problem faced by a borrower and its solution. We then introduce regulatory constraints and the possibility that the mortgage contract is co-signed with parents.

Borrower's optimization problem. A borrower (FTHB) with savings s and future income y maximizes utility from consumption c and housing h:

$$\max_{c,h,L} \quad ln(c) + \sigma ln(h - h_0) \tag{1}$$

$$s.t. \quad c + RLph \leq s - (1 - L)ph + y, \tag{2}$$

$$(1 - L)ph \leq s, \tag{3}$$

where σ captures borrower preference for housing relative to consumption and h_0 represents a minimum housing standard (e.g., minimum number of bedrooms) below which the borrower prefers not to enter the housing market (e.g., they rent). Note that to simplify the exposition, we express the problem as a static optimization: the household makes its consumption and housing choices simultaneously and once and for all.

The first constraint, given by (2), corresponds to the FTHB's budget constraint, where the choice variable L denotes the LTV ratio; p corresponds to the per-unit housing price; and $R > 1$ is the mortgage payment per dollar of borrowing (and hence $R - 1$ is the mortgage interest rate over the amortization period of the loan, e.g., 25 or 30 years). Given these definitions, the cost of the house is given by ph, and the size of the mortgage by Lph. Expenditure on consumption, c, and the loan repayment (with interest), $RLph$, must be covered by future income y and saving s, net of the downpayment $(1 - L)ph$. The second constraint, given by equation (3), imposes that the downpayment must be funded out of initial savings.

Solution. In solving for the optimal bundle, we assume that $Rs < Rph_0 < y + s$. This ensures that (i) the FTHB cannot afford the minimum quantity of housing (h_0) with only their savings, but (ii) can cover it with a mortgage, which would be repaid through future income.

Since the budget constraint is binding at the optimum, we can rewrite the problem as:

$$\begin{aligned} \max_{h,L} \quad & ln(s + y - (1 - L + RL)ph) + \sigma ln(h - h_0) \\ s.t. \quad & (1 - L)ph \leq s. \end{aligned}$$

The solution to the utility maximization problem is given by:

$$h^* = \frac{\sigma y + \sigma Rs + Rph_0}{(1 + \sigma)Rp}, \qquad L^* = \frac{\sigma y - Rs + Rph_0}{\sigma y + \sigma Rs + Rph_0}.$$

Note that under our assumptions, the FTHB uses all savings for their downpayment. We can then calculate the mortgage PTI ratio at the optimum:

$$\frac{RL^*ph^*}{y} = \frac{\sigma y - Rs + Rph_0}{(1 + \sigma)y},$$

which decreases in income y and savings s, but increases in housing price p, per-unit borrowing cost R, housing preference σ, and minimum housing standard h_0.

Regulatory constraints. As in the mortgage markets in many jurisdictions, borrowers in Canada face a number of regulatory constraints. Our focus is on the PTI constraint imposed by the regulator/lender that requires that PTI $\leq \delta$, i.e., the mortgage payment cannot exceed δy.[10] The optimal housing choice under this constrained problem is given by:

$$\bar{h}^* = \min\{h^*, \bar{h}\},$$

where $\bar{h} = \frac{Rs + \delta y}{Rp}$ is the maximum level of housing that satisfies the PTI constraint. Note that the PTI constraint is more binding for borrowers with lower income (y) and savings (s). It is also more likely to bind with higher housing price, p, per-unit borrowing cost, R, housing preference, σ, and minimum housing standard, h_0. To ease the exposition, we refer the reader to Appendix A.1 for an extension that includes a regulatory constraint on the borrower's TDS ratio.

In addition to the PTI constraint, borrowers in Canada also face an LTV constraint, which imposes a maximum loan size given the value of the house. While adding this constraint to our model would be straightforward, we omit it since parent co-signing does not interact

[10] This corresponds to the GDS/TDS constraints defined in Section 2. For tractability, our model abstracts from housing-related expenses other than the mortgage payment, as well as non-mortgage debt obligations.

directly with the LTV constraint.

Co-signing. Consider an FTHB who cannot achieve the unconstrained optimal housing due to the PTI constraint, that is, $h^* > \bar{h}$. This could be because they have low income or savings; they have a strong preference for housing; or house prices and borrowing costs are too high. To relax the PTI constraint, the FTHB can ask their parents to co-sign and add their income, y_p, to the mortgage application. If the parents agree, the maximum level of housing satisfying the PTI constraint becomes:

$$\bar{h}_p = \frac{Rs + \delta y + \delta y_p}{Rp} > \bar{h},$$

and the optimal housing choice is given by:

$$\bar{h}_p^* = \min\{h^*, \bar{h}_p\} > \bar{h}^*.$$

The FTHB's parents, who care about their adult child's welfare, weigh the child's utility loss, $(u(\bar{h}_p^*) - u(\bar{h}^*))$, against any potential cost of co-signing, drawn from a distribution $F(\cdot)$.[11] If the cost realization is small enough relative to $u(\bar{h}_p^*) - u(\bar{h}^*)$, parents accept to co-sign. Therefore, holding the distribution $F(\cdot)$ fixed, we find that as the PTI constraint becomes more binding, a larger fraction of parents would co-sign their childs' mortgage.

Main takeaways. This simple framework contains a number of takeaways. First, the PTI constraint is more likely to bind for borrowers with lower income and savings and those with stronger housing preferences. It is also more likely to bind as house prices rise, borrowing costs increase, or authorities tighten the regulatory threshold. Second, for FTHBs faced with a binding PTI requirement, parent co-signing can effectively relax the constraint. In Section 6, we use macroprudential policy changes in Canada to establish a causal link between tighter PTI constraints and parent co-signing. In Section 7, we quantify the effects of parent co-signing on FTHBs' housing choices.

3.2 Parental gifts

Given data availability, the focus of this paper is on parental co-signing of new mortgages. However, parents can also help their adult children with a house purchase through gifts,

[11] We do not model default. We think of this as either an opportunity cost or financial stress cost.

either as a one-time transfer or as ongoing payments. We next look at the role played by each type of gift in our model.

Gifted downpayment. As an alternative (or a complement) to co-signing, parents can also provide a gift, g, to support their child's initial downpayment on the housing purchase. As a result, in the optimization problem given by equations (1)-(3), the funds available for downpayment increase from s to $s+g$. Thus, the optimal housing choice becomes:

$$h^* = \frac{\sigma y + \sigma R(s+g) + Rph_0}{(1+\sigma)Rp}, \qquad L^* = \frac{\sigma y - R(s+g) + Rph_0}{\sigma y + \sigma R(s+g) + Rph_0}.$$

In other words, relative to the solution of the benchmark model, the gift leads to an increase in housing consumption, h^*, and lower LTV, L^*. In addition, the PTI ratio at the optimum, $\frac{RL^*ph^*}{y} = \frac{\sigma y - R(s+g) + Rph_0}{(1+\sigma)y}$, decreases: gifting a downpayment is an alternative way to relax the PTI constraint.

Ongoing income support. In the benchmark model, parent co-signing helps mortgage qualification by lowering the PTI ratio. It does not affect the FTHB's unconstrained optimal housing choice. As an alternative option, parents may support their adult child by contributing to their monthly mortgage payments. In the context of the model, this would be akin to parents pledging a fraction of their income, Δy_p, to relax their adult child's budget constraint. Under this assumption, the child's housing choice becomes:

$$h^* = \frac{\sigma(y + \Delta y_p) + \sigma Rs + Rph_0}{(1+\sigma)Rp},$$

implying more housing consumption at the optimum.

At the optimum, the actual PTI ratio (i.e., including parental help) decreases:

$$\frac{RL^*ph^*}{y + \Delta y_p} = \frac{\sigma(y + \Delta y_p) - Rs + Rph_0}{(1+\sigma)(y + \Delta y_p)},$$

while the qualifying PTI, which is calculated based on the adult child's income only, rises to:

$$\frac{RL^*ph^*}{y} = \frac{\sigma(y + \Delta y_p) - Rs + Rph_0}{(1+\sigma)y}.$$

That is, when promised income support, adult children re-optimize and choose more housing.

This, in turn, makes the qualifying PTI constraint more likely to bind and raises the need for parent co-signing.

4 Data

In this section, we describe the main sources of data and definitions that we rely on for the empirical analysis.

4.1 Data sources

The primary dataset is the universe of Canadian monthly credit reports from TransUnion, one of two credit bureau companies operating in Canada. We focus on the sample of FTHB (defined in subsection 4.2) originating mortgages between January 2015 and October 2022. All of the data are anonymized to protect borrower identities. We observe the credit portfolio of over 30 million Canadians: (i) mortgage, (ii) lines of credit, (iii) auto and installment loans, (iv) personal loans, (v) credit cards, (vi) student loans, and (vii) utilities. For each account, we observe origination limits, outstanding balances, and monthly payments, including frequency of payment (weekly, bi-weekly, monthly) and lender name. We also observe monthly credit scores and all information on delinquencies (30+, 60+, and 90+ days). We also observe individual physical addresses up to the postal code. There are over 800,000 postal codes in Canada, and on average there are about 50 individuals with a credit file per postal code.

For each account, we also observe ownership type. That is, we know whether the account holder is the sole owner and therefore solely responsible for the debt, or whether the account is jointly owned (co-signed). Mortgages have the largest share of co-signing, while products such as credit cards, student loans, and personal loans have zero or close to zero co-signing. We observe all co-signers—typically two to three individuals—but we also observe cases with more co-signers (see Appendix Table A.1 for detailed shares). The main benefit of a co-signed mortgage is that qualification becomes a function of multiple sources of income and credit histories.[12] The cost of co-signing is that everyone on the contract is legally responsible for the mortgage payments; and Canadian mortgages, with the exception of uninsured mortgages in Alberta and Saskatchewan, are full recourse.

[12]See https://www.ratehub.ca/blog/co-signing-a-mortgage/ for a blogger discussion of the costs and benefits of co-signing a mortgage.

We match the credit report data to administrative mortgage-contract data from OSFI, which regulates federal financial institutions. The match is performed at the date of mortgage origination. This allows us to observe many more borrower, contract, and house characteristics than available in credit bureau data. For example, the merged dataset allows us to observe the contract and qualifying interest rates. The difference between the two rates is that the regulator tests a borrowers' ability-to-pay using a qualifying rate that is a higher than the contract rate. In addition to these two rates, we also observe qualifying income, house price, LTV, and contractual and qualifying GDS and TDS ratios, where contractual is based on the mortgage contract rate and qualifying uses the qualifying interest rate. We also observe whether the mortgage is insured or uninsured. Finally, for a subset of mortgages, we observe the source of downpayment. The different sources of downpayment are reported as following: (i) cash savings, (ii) assets, (iii) gifts, (iii) sweat equity, and (iv) other. For the purposes of our analysis, we define "equity" to mean either cash or assets, and include sweat equity with "other." That leaves us with three categories: equity, gifts, and other. Savings/assets includes tax-free borrowing from an RRSP.

The administrative data also reports whether a mortgage was a purchase, a renewal, or a refinancing.[13] In terms of the house characteristics, we observe the type (condo, detached, row house, semi-detached) and age of the property, including whether it is new construction. Finally, we include average house price and price growth at the forward sortation area (FSA) level, which is based on a repeat-sales index developed by Teranet and published quarterly.[14]

4.2 Definitions

In this section, we define a number of important concepts used throughout the next sections.

First-time homebuyer (FTHB). In the credit bureau data, we define a borrower as an FTHB if, at the time of mortgage origination, we do not observe any previous mortgage product (active or closed) associated with the borrower reported by the credit bureau. We focus on FTHBs under 50 years old.

Parent co-signing. We define parent–co-signed mortgages using credit bureau data. For each

[13] A typical Canadian mortgage amortizes over 25–30 years but the contract terms must be renewed every 3–5 years, depending on the term. See Allen and Li (2024) for a description of the dynamic game played between borrowers and lenders. Different from a renewal, refinancing is when a borrower extracts equity from their house or extends the amortization period.

[14] Based on the 2021 Canadian census, there were more than 1,600 FSAs in Canada. The average FSA counts a population of about 22,500 and close to 10,000 private dwellings.

co-signed mortgage, we calculate the age gap between the oldest borrower and the youngest borrower. If the age gap is greater than 18 years, we classify the mortgage as parent co-signed. We then define borrowers who are at least 18 years older than the youngest ones as parents and the remaining borrowers as adult children. We restrict to mortgages where at least one of the adult children is an FTHB.[15]

Income. The administrative mortgage contract data only report the aggregate income from all borrowers on a co-signed mortgage. Therefore, to understand the role of parent co-signing in mortgage qualification, we need to make an assumption regarding the share of aggregate income contributed by parents. Our baseline assumption is simple and conservative: we assume that a parent has the same income as an adult child, i.e., the parent-to-child income (PCI) ratio is equal to 100 percent. We can then calculate the adult children's income:

$$\text{children income} = \left(1 - \frac{\text{num. parents} \times \text{PCI}}{\text{num. parents} \times \text{PCI} + \text{num. children}}\right) \times \text{total income},$$

where num.parents is the number of parents on a co-signed mortgage. In Appendix A, we conduct robustness checks with two alternative assumptions on PCI: (i) an even more conservative PCI of 75 percent, and (ii) estimated PCI by age using an auxiliary dataset on insured mortgages provided by the mortgage insurance companies. We show that our main counterfactual results are robust to these alternative assumptions.

Debt. For mortgages co-signed with parents, we can split the total amount of non-mortgage debt obligations used in the calculation of the TDS ratio into debt from the adult child's household and debt from the parent's household (both are observed in the credit bureau data). Note that the parents' share of other debt obligations also includes payments towards their own mortgage, if they have one.

Borrower types. We define three categories of borrowers.

- **No parents.** This includes 89 percent of FTHBs. This includes singles (38 percent) or borrowers buying with peers (e.g., friends or couples) of a similar age (51 percent).
- **Parent co-signed (constrained).** We label an FTHB household that is co-signing with their parents as constrained if one of the following conditions holds: (i) without parent

[15]Note that if there is an age gap of over 18 years for a couple and the younger is an FTHB, we would misclassify them as parent-child. From the 2016 and 2021 censuses, we know that 1 percent of Canadian couples have an age gap of more than 18 years. We do not know, however, how many of these households also include an FTHB—but it is likely to be even less than 1 percent.

income, the FTHB's GDS ratio exceeds 39 percent; (ii) without parent income (and parent debt), the FTHB's TDS ratio exceeds 44 percent; (iii) without a parent's credit score better than their own, the maximum FTHB credit score falls below 620 (or is unreported). We estimate that 8 percent of FTHBs are in this category, and this share has been increasing over time.

- **Parent co-signed (unconstrained).** These are co-signing FTHBs who would qualify for a mortgage without parental support, according to our estimates of the FTHBs' and parents' incomes. Over our sample period, only 3 percent of FTHBs are in this category.[16]

5 Descriptive evidence

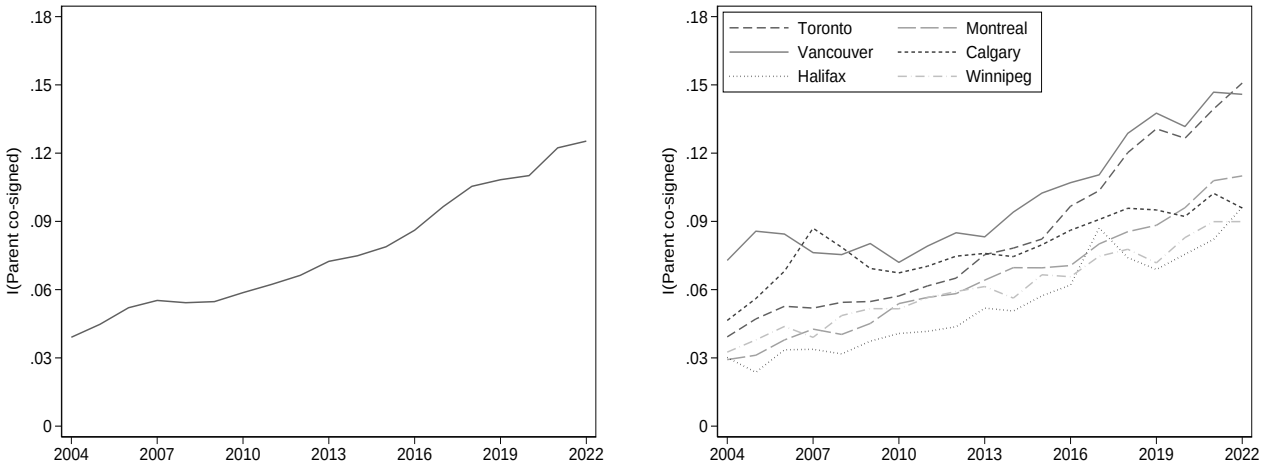
In this section we provide descriptive evidence on co-signing that is consistent with the takeaways from the model presented in Section 3.

Evolution of parent co-signing. First, we look at the evolution of parent co-signing over our sample period. The left panel of Figure 2 illustrates that the prevalence of parent co-signing has increased significantly over time in Canada, from around 4 percent in 2004 to about 13 percent by 2022. The right panel repeats the exercise but at the city level. When compared with the dynamics of house prices across cities in Figure 1, parent co-signing and the price of housing seem closely associated—the most expensive cities in Canada (Toronto and Vancouver) also display materially higher levels of co-signing. In Table 2 (described later in this section), we confirm the positive correlation between house prices and parent co-signing by presenting estimates from a linear regression of co-signing on local house prices.

Mortgage and borrower characteristics. Second, we provide in Table 1 summary statistics for some key variables of interest (see Table A.1 in Appendix A.2 for statistics on a larger set of characteristics). Recall from Section 4.2 that we divide our sample into two broad categories of mortgages: (i) "not parent–co-signed," which are all mortgages not involving

[16]This could correspond to cases where we overestimate the FTHBs' income. For this reason, we verify that our empirical findings are robust to alternative assumptions. It could also be because mortgages are pre-approved for fixed amounts—an FTHB might have wanted a large pre-approval to search for a house but ultimately borrowed a smaller sum. It could also be that parents live with their adult child, and so the co-signing reflects this.

Figure 2: Evolution of parent co-signing



a parent; and (ii) "parent–co-signed." Moreover, we subdivide the latter group into "unconstrained" and "constrained," based on whether the adult children would have been able or not to qualify without parent co-signing.

From Table 1 we see that mortgages with a co-signed parent count, on average, 2.6 borrowers, against 1.6 on average for mortgages that do not include a parent. Among mortgages without a parent, 42 percent report a single registered owner, while the remaining are co-signed by peers, such as couples. In addition, we find that FTHBs with a parent co-signing enter the market earlier than those without a parent co-signing: on average, an FTHB buys at the age of 28, which is five years younger than FTHBs buying without parental support. Figure 3 shows that this gap has been stable over time.

We also observe that parental co-signing is associated with more expensive homes—$527,300 versus $493,500, on average. Both facts are consistent with Engelhardt and Mayer (1998) and Guiso and Jappelli (2002), who find children with parental transfers enter the housing market earlier and buy more expensive homes. We find that this is also true if we focus on parent co-signing. In addition to house prices, both loan size and neighborhood house prices of the purchased home are substantially higher for mortgages that are co-signed with a parent. While we should be careful with causal interpretations, these facts appear to indicate that FTHBs who would not be able to qualify for a mortgage without parental income ultimately buy more expensive homes through increased leverage.

We also find that the combined incomes of parent–co-signed mortgages are about 38 percent higher than the income of FTHBs who do not co-sign with their parents. In Appendix

Table 1: Summary statistics by mortgage contract types

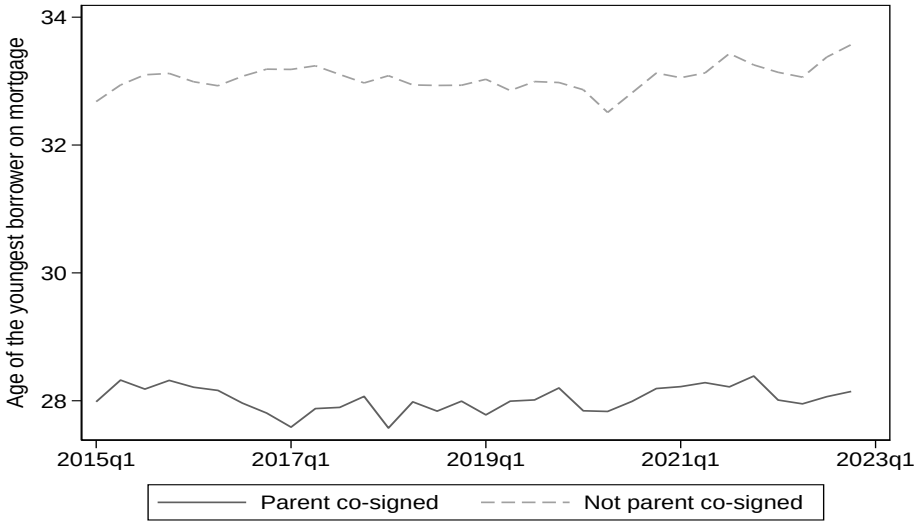
	Not co-signed	Parent co-signed	Co-signed: unconstrained	Co-signed: constrained
# of borrowers	1.591	2.552	2.558	2.549
# of parents	.	1.310	1.241	1.334
Age (max)	34.99	58.68	57.45	59.11
Age (min)	33.06	28.06	26.94	28.45
Credit score (parent)	.	802.2	816.4	797.0
Credit score (FTHB)	777.7	750.1	749.9	750.2
Total income ($1,000)	111.1	153.6	207.2	135.0
Loan size ($1,000)	386.5	397.2	286.4	435.8
Qualifying GDS (%)	29.57	23.76	12.44	27.70
Qualifying TDS (%)	36.84	39.19	32.56	41.50
Mortgage payment ($)	1671.4	1702.2	1254.3	1858.0
House price ($1,000)	493.5	527.3	368.8	582.5
FSA mean house price ($1,000)	572.2	611.5	537.9	637.1
I(house price > FSA mean)	0.352	0.339	0.209	0.385
Observations	511,148	63,083	16,286	46,797

Note: This table presents summary statistics for FTHB mortgages originated between January 2015 and October 2022. Column (1) presents summary statistics for mortgages without parent co-signing. The remaining columns are parent–co-signed mortgages. Column (3) shows borrowers who would likely qualify for mortgages even without parents, while column (4) shows borrowers constrained by GDS/TDS/credit score requirements without parent co-signing. Mortgage payments are monthly, while total income is annual total gross income. The two house price variables in the bottom two rows are based on a repeat-sales index produced by Teranet.

A.2, we also show that FTHBs with a parent co-signing are more likely to have an uninsured mortgage, and therefore a lower LTV. They are also more likely to have a mortgage with an amortization over 25 years—which is only allowed for low-LTV uninsured mortgages. On the other hand, there are little to no interest rate differences between FTHBs with and without parental support. All in all, because of the larger loans, FTHBs with a parent co-signing are responsible for larger monthly payments—despite amortizing the loan over a longer time horizon, on average.

Finally, we find that while the GDS is lower for FTHBs with a parent co-signing, their TDS is in fact higher. This is sensible: the GDS is lower precisely because parental income helps qualify, while the TDS is larger because parents have debt that must be included in the qualifying calculations. For example, we see that 28 percent of parents co-signing have

Figure 3: FTHBs co-signing with parents enter the housing market earlier



a mortgage and 30 percent have a HELOC.

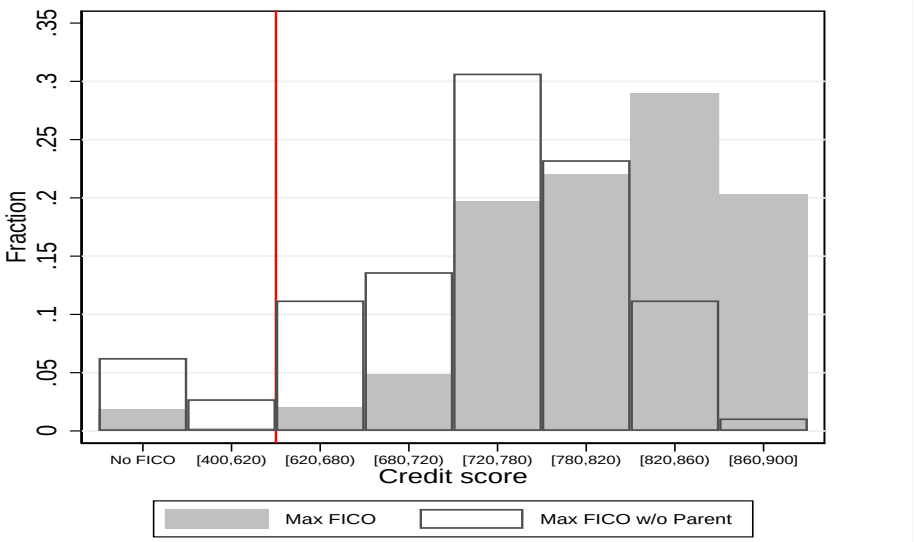
Comparing columns (3) and (4) in Table 1, we see that the main differences between unconstrained and constrained FTHBs are that the latter group has substantially lower total qualifying income (for both adult child and parents—see Table A.1), has larger GDS and TDS, has much larger loans and monthly mortgage payments, and buys more expensive homes. The level of credit scores also varies across borrower types. Figure 4 plots the distribution of the maximum credit score attached to each parent–co-signed mortgage in our sample, both across all borrowers (grey bars) and for adult children only (white bars). Not surprisingly, the distribution of the maximum credit scores among adult children is significantly lower than that for all borrowers on the co-signed mortgages. In fact, we notice that about 9 percent of the children's credit scores are either missing or below the 620 minimum.[17]

To further emphasize how co-signing varies by FTHB characteristics, Figure 5 plots the empirical probability of parent co-signing by age, credit score, income, and the ratio of average neighborhood house prices to income. We see that parent co-signing is decreasing in the age of the FTHB, credit score, and income. Parent co-signing is associated with higher house PTI ratios.

As additional evidence, Table 2 presents least-squares results for the probability of a

[17]In about 2 percent of the parent–co-signed mortgages, the maximum credit score is missing—these are borrowers without a credit history (e.g., newcomers to Canada).

Figure 4: Distribution of credit scores



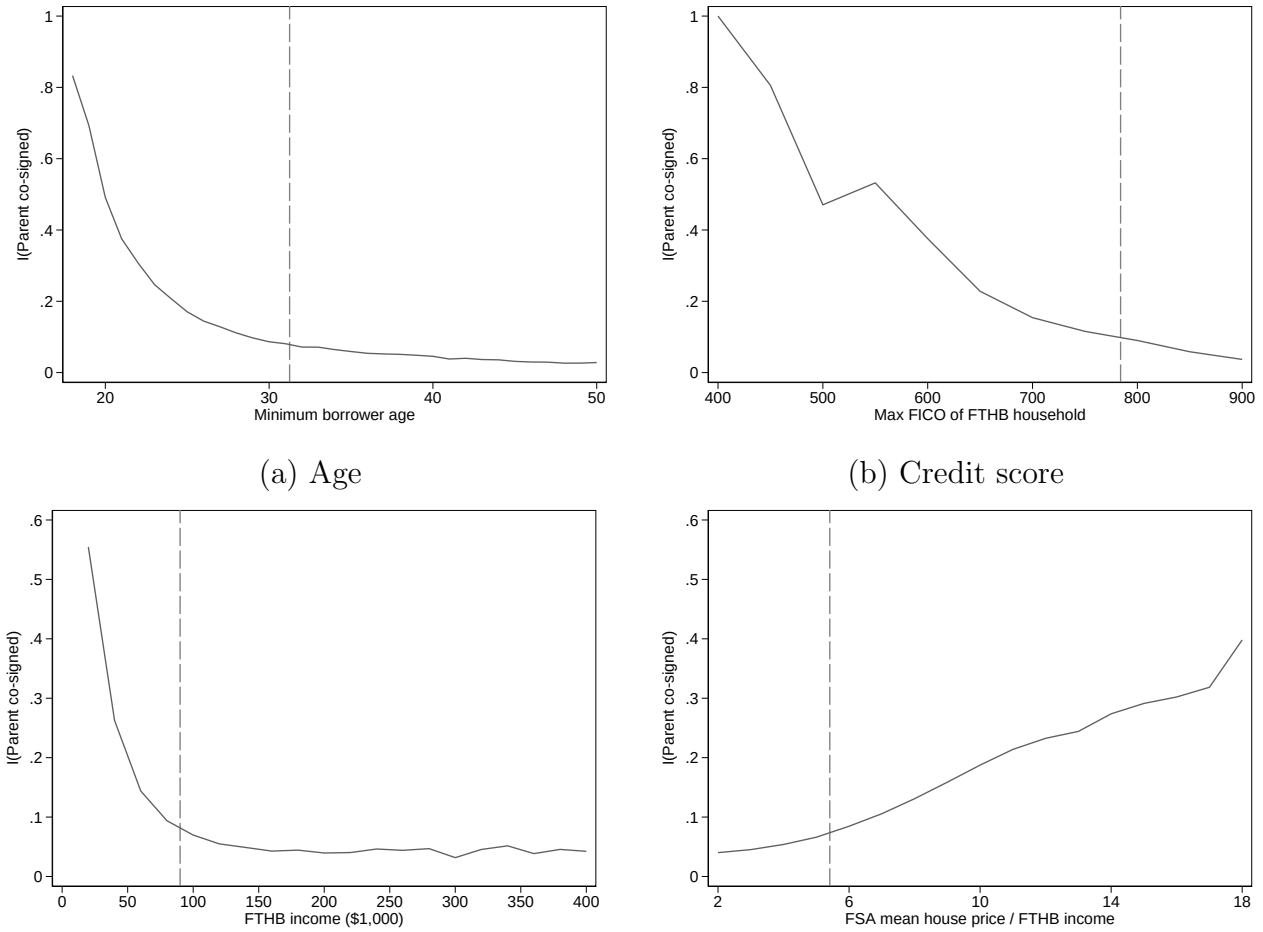
Note: This graph plots the distribution of credit scores for co-signed mortgages. The grey bars are the maximum reported credit score on the mortgage. The white bars are the maximum credit score excluding the parent score. The vertical line represents the cut-off for a mortgage to be approved.

parent co-signing on borrower characteristics (age, credit score, mean income) as well as log-mean house price at the FSA level (Teranet). We also use year and city (of the FTHB) fixed effects. Consistent with the figures, the probability of co-signing with a parent is decreasing in income and increasing in neighborhood house prices. Older FTHBs are less likely to co-sign with their parents, as are FTHBs with higher credit scores.

Parent characteristics. Tables 1 and A.1 display summary statistics about parents on co-signed mortgages. On average, they are about 58 years old and tend to have higher credit scores than FTHBs. A large share of parents have a mortgage or HELOC, and many have paid off a mortgage. They tend to live in more expensive cities, but not necessarily in the most expensive neighborhoods in those cities (see Figure A.2 in the Appendix). The average parent also has over $218,000 in debt in the months prior to co-signing. This is driven almost entirely by the 34 percent of parents with a mortgage. Finally, the average debt utilization rate (debt-to-credit limit ratio) for parents is 20 percent, and 15.9 percent have a utilization rate of at least 50 percent.

Gift-giving. Our focus in this paper is on the role of parental help via co-signing. While this angle is novel, there is an extensive literature on intra-family transfers to help with downpayments. The information contained in our credit bureau dataset significantly limits

Figure 5: Prevalence of parent co-signing across FTHB characteristics



(a) Age

(b) Credit score

(c) FTHB income

(d) FSA mean house price / FTHB income

Note: We winsorize variables with extreme outliers. The vertical line represents the median of each characteristic.

our ability to explore the role of gifts. We can exploit, however, two other data sources to gain some insights. First, in an auxiliary dataset on insured mortgages, we know whether or not the FTHB received a transfer. Figure A.1 in Appendix A.2 plots the fraction of FTHBs receiving gifts for downpayment by age group in this sample. On average, over 20 percent of FTHBs received a gift to help make their downpayment, and younger FTHBs are more likely to receive gifts than their older peers. Second, for co-signed mortgages, we are able to identify in the credit bureau data whether parents extracted equity from their home *before* they co-signed their adult child's mortgage, either via refinancing or borrowing from their HELOC. From Table A.1, we know that about 48 percent of the co-signing parents have a

Table 2: Parent co-signing and house prices

	Dependent variable: I(parent co-sign)			
Log(FSA mean house price)	0.073***	0.069***	0.070***	0.047***
	(0.0055)	(0.0047)	(0.0051)	(0.0057)
FSA price growth (%)	0.00059*	0.00044**	0.00039	0.000049
	(0.00024)	(0.00014)	(0.00022)	(0.000094)
Log(per-borrower income)	-0.070***	-0.072***	-0.070***	-0.072***
	(0.0070)	(0.0071)	(0.0070)	(0.0072)
FTHB age	-0.0094***	-0.0094***	-0.0094***	-0.0093***
	(0.00085)	(0.00082)	(0.00085)	(0.00083)
Credit score (FTHB)	-0.00090***	-0.00092***	-0.00091***	-0.00092***
	(0.000023)	(0.000021)	(0.000023)	(0.000021)
Year FE	N	Y	N	Y
City FE	N	N	Y	Y
R^2	0.088	0.090	0.090	0.093

Note: After dropping observations without a credit score, there are 503,915 observations. The dependent variable is an indicator that equals 1 if a mortgage is co-signed with parents, and 0 otherwise. The average house price and year-over-year house price growth at the FSA level are based on a repeat-sales index published quarterly by Teranet. Standard errors clustered at city level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

mortgage or HELOC. Focusing on this sample of parents, we find that 33 percent of them extracted equity within the year that predated co-signing.[18] Together with the fact that co-signed mortgages, on average, have lower LTV ratios, suggests some complementarities between gifts and co-signing.

Finally, our model predicts that when parents provide ongoing income support, FTHBs re-optimize and choose more housing, leading to higher PTI ratios and increasing the need for parent co-signing. Comparing the TDS with parents (Table 1) to the TDS without parents (Table A.1), we see that, on average, the qualifying TDS for constrained co-signers is 41.5 percent, but without parental support it is 70 percent. That is, FTHBs' monthly payments

[18]We follow Bhutta and Keys (2016) and Benetton et al. (2022) and define equity extraction as cases where a borrower's outstanding mortgage debt increases by more than 5 percent over a one-year horizon, with a minimum increase of $1,000. Within co-signed mortgages, 17 percent of the parents extracted equity within one year before co-signing. This is consistent with the survey evidence published by the Ontario Real Estate Association in 2022 (https://www.orea.com/affordabilitypollingwave2): among parents who helped their adult child with downpayment, 15 percent did so by extracting home equity.

towards housing and other debt take up 70 percent their gross income. Therefore, it is very likely that some co-signing parents are also providing ongoing income support for their adult children.

6 Stress test results

In this section, we use quasi-experimental variation in loan qualification over time to establish a causal link between tighter PTI constraints and parent co-signing. Our focus is on the changes to the stress test (ability-to-pay). As highlighted in Section 2.2, Canada has regulatory PTI requirements: GDS and TDS. We take advantage of regulatory changes to these requirements. The first change, which was announced and immediately implemented in October 2016, saw tightened GDS/TDS requirements for insured mortgages. The second change was announced in October 2017 and took effect in January 2018, imposing GDS/TDS constraints on uninsured mortgages. Table 3 summarizes the changes.

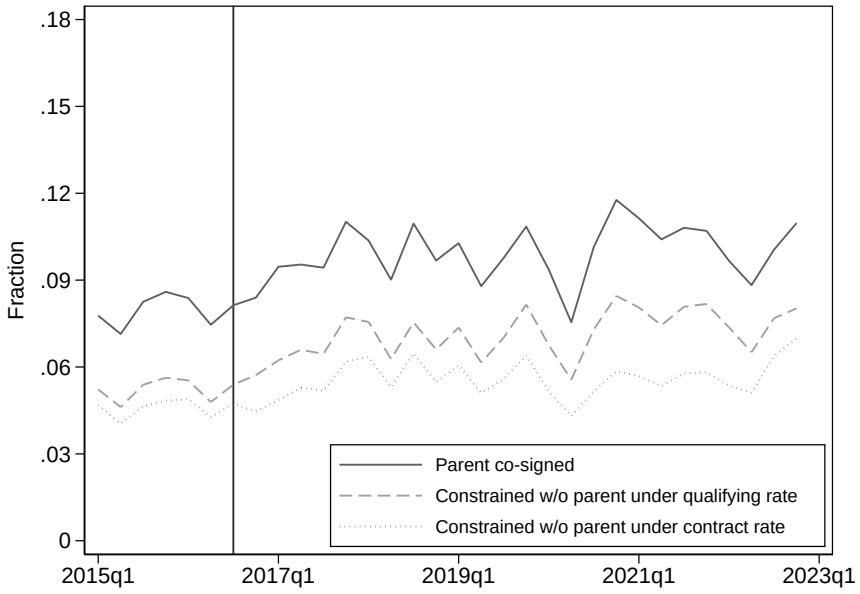
Table 3: Macroprudential policies

Announced	Implemented	Description
2016–10	2016–10	All insured mortgages must be stress tested using Bank of Canada conventional 5-year mortgage rate.
2017–10	2018–01	All uninsured mortgages must be stress tested using max (contract rate + 2%, Bank of Canada conventional 5-year mortgage rate).

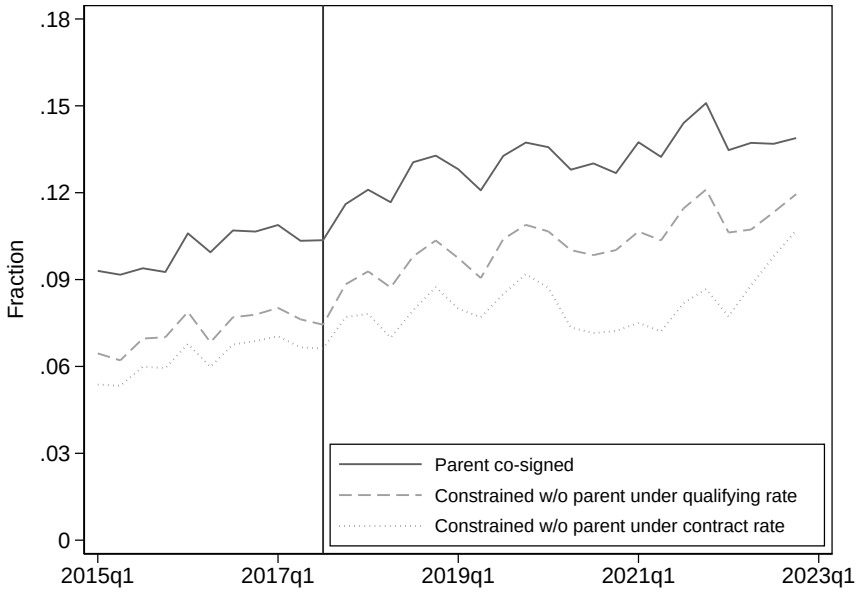
Figure 6 plots the share of mortgages co-signed with a parent for insured and uninsured mortgages. The solid line is total parent co-signing; the long-dash line is the share of FTHBs with a co-signed mortgage that would not qualify without their parents under the qualifying rate; the dotted line is the share of FTHBs with a co-signed mortgage that would qualify without their parents under the contract rate, which is lower than the qualifying rate for mortgages being stress tested. A wider gap between the long-dash line and the dotted line post–stress tests implies that a larger fraction of borrowers requires parent help for qualification due to higher qualifying rates.[19]

[19]The gap before the policy change reflects the fact that variable-rate mortgages and shorter-term fixed-rate mortgages were already being tested using qualifying rates pre-2016.

Figure 6: Fraction of FTHBs co-signing as a function of insurance status



(a) Insured



(b) Uninsured

Note: The vertical line in panel (a) corresponds to 2016q3, the quarter before the insured stress test was announced (Oct 2016). The vertical line in panel (b) corresponds to 2017q3, the quarter before the uninsured stress test was announced (Oct 2017).

Each of the stress tests imposes stricter PTI requirements on all potential borrowers. However, borrowers have different exposure/sensitivity to the policy change. For borrowers far below the constraint (low-exposure group), a stress test does not impact their housing choice. In contrast, for borrowers close to the constraint (high-exposure group), the policy change significantly influences the maximum allowable mortgage and hence their housing choice. Intuitively, we want to compare the changes in probabilities of parent co-signing between the high-exposure (treatment) and low-exposure (control) groups. Formally, we define the treatment and control groups as follows:

(1) For each stress test, we find mortgages originated within a two-year window *before* the policy announcement. For each mortgage in this pre-sample, we use a qualifying rate of 4.64 percent to calculate the counterfactual GDS/TDS ratio and determine whether the borrowers would fail the test.[20]

(2) In each pre-sample, we estimate the probability of a borrower failing the stress test as a function of borrower characteristics using a Probit regression.[21] The results are reported in Table 4.

(3) Using the estimates from the Probit regression, we predict the probability of failing for borrowers in the pre-sample and calculate the median. Then, for each borrower observed in the two-year window *around* the policy announcement, we calculate the predicted probability of failing the test using the Probit estimates. We assign borrowers to the treatment group if the predicted value of failing is above the pre-sample median and assign the remaining to the control group.

Using this classification of borrowers into treatment and control groups, for each stress test we can then estimate an event-study regression to quantify the impact on parent co-signing:

$$y_{it} = \sum_{j=-4}^{4} \gamma_j \cdot D_{it}^{j} + \alpha \cdot Treatment_{it} + \delta_t + \boldsymbol{X}_{it}\boldsymbol{\beta} + \varepsilon_{it}.$$

[20] The lowest Bank of Canada conventional 5-year mortgage rate during years 2016–2018 is 4.64 percent.

[21] The explanatory variables are the FTHB income and the ratio of the FSA mean house price to the FTHB income. This choice is guided by the main takeaways from our benchmark model presented in subsection 3.1: PTI constraints are more likely to bind for borrowers earning lower income while facing higher house prices. Notice that we do not include variables that can be endogenously influenced by borrowers in response to the policy changes (e.g., loan size, chosen house price, GDS) as predictors in the Probit model.

The indicator variable corresponds to $D_{it}^{j} = 0$ for borrowers in the control group; $D_{it}^{j} = 1, j \geq 0$ for borrowers in the treatment group who originated mortgages j quarters after the policy change; $D_{it}^{j} = 1, j < 0$ for borrowers in the treatment group who originated mortgages $|j|$ quarters before the policy change. For the quarter right before the policy change, we normalize γ_{-1} to 0. The coefficient α captures the persistent level difference in likelihood of parent co-signing between the treatment and control groups. Note that we also control for year-quarter fixed effects, FSA fixed effects, and some consumer characteristics (adult child's age and credit scores).

Table 4: Probit: Probability of failing the stress tests

	Insured sector	Uninsured sector
FTHB income ($1,000)	-0.00558***	-0.00257***
	(0.00018)	(0.000082)
FSA mean house price/FTHB income	0.0451***	0.0589***
	(0.0018)	(0.0010)
Constant	-0.402***	-0.588***
	(0.022)	(0.014)
Pseudo R-squared	0.042	0.084
Observations	67,978	79,127

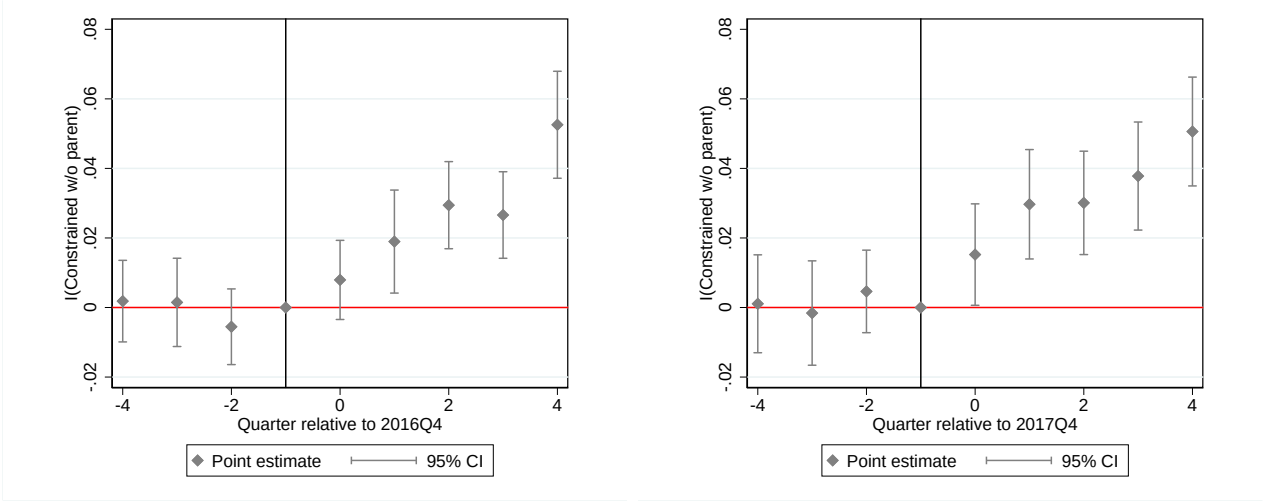
Note: For each stress test, we estimate a Probit regression using the sample of mortgages originated within the two-year window before the policy announcement. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The dynamic treatment effects are presented in Figure 7. Panel (a) focuses on the insured stress test, while panel (b) is for the uninsured stress test. The dependent variable is an indicator variable equal to 1 when FTHBs co-sign with parents and would be constrained without parental support, and 0 otherwise. In both cases, there is a material impact of the stress test. The effects are not only statistically significant, but also economically large: four quarters after the policy change, relative to the control group, the share of constrained co-signers increases by more than 5 percentage points among the treated (a priori high-exposure).

One might be concerned that the results in Figure 7 depend on our definition of constrained FTHB, which is itself a function of our assumption on the split of income between children and parents. In Figure 8, therefore, we plot results from the same event study but

with all co-signed FTHBs. The results are very similar: the impact of the stress tests is to increase the incidence of parental co-signing.

Figure 7: Event study—dependent variable: I(constrained w/o parent co-sign)

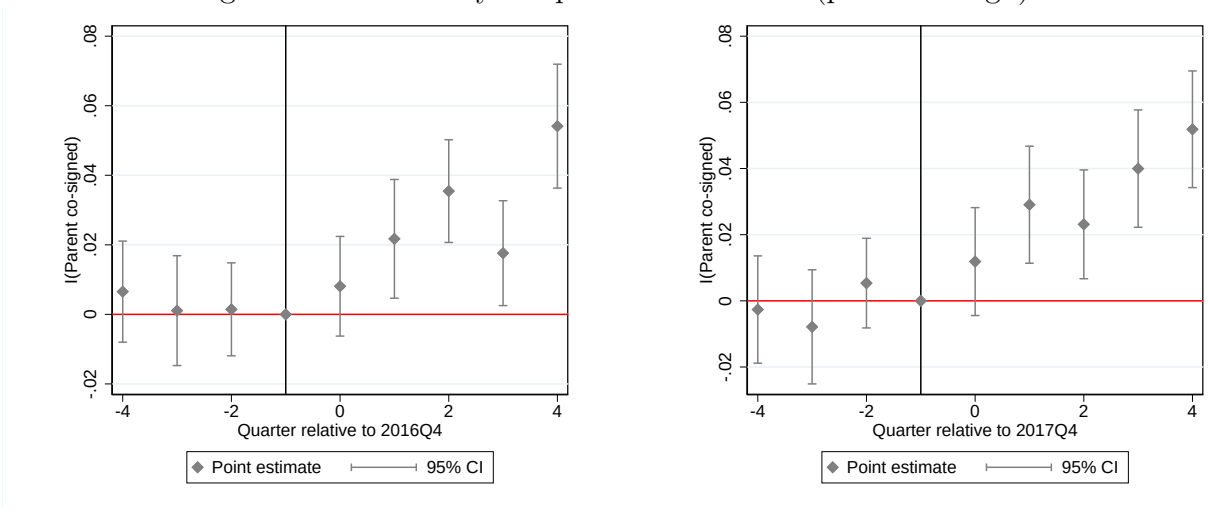


(a) Insured (stress test #1)

(b) Uninsured (stress test #2)

Note: The vertical line in panel (a) corresponds to 2016q3, the quarter before the insured stress test was announced (Oct 2016). The vertical line in panel (b) corresponds to 2017q3, the quarter before the uninsured stress test was announced (Oct 2017).

Figure 8: Event study—dependent variable: I(parent co-sign)



(a) Insured (stress test #1)

(b) Uninsured (stress test #2)

Note: The vertical line in panel (a) corresponds to 2016q3, the quarter before the insured stress test was announced (Oct 2016). The vertical line in panel (b) corresponds to 2017q3, the quarter before the uninsured stress test was announced (Oct 2017).

7 Counterfactual results

In previous sections, we documented the rise in mortgages co-signed with parents and its role in helping adult children qualify in the face of more stringent regulatory constraints. Next, we characterize and quantify the importance of parental co-signing. While a full evaluation would require a structural model, we are able to gain valuable insights through empirical counterfactual exercises.

Broadly, the question at the core of this section is the following: What if parents had not co-signed their adult child's mortgage? More specifically, how expensive a house would they have been able to purchase absent parental support? And what would have been the additional downpayment required to purchase the same house they were able to buy with the help of their parents? We perform empirical counterfactual exercises to answer these two questions and find that co-signing has a material impact on the ability of FTHBs to qualify for mortgages on more expensive houses without making large downpayments.

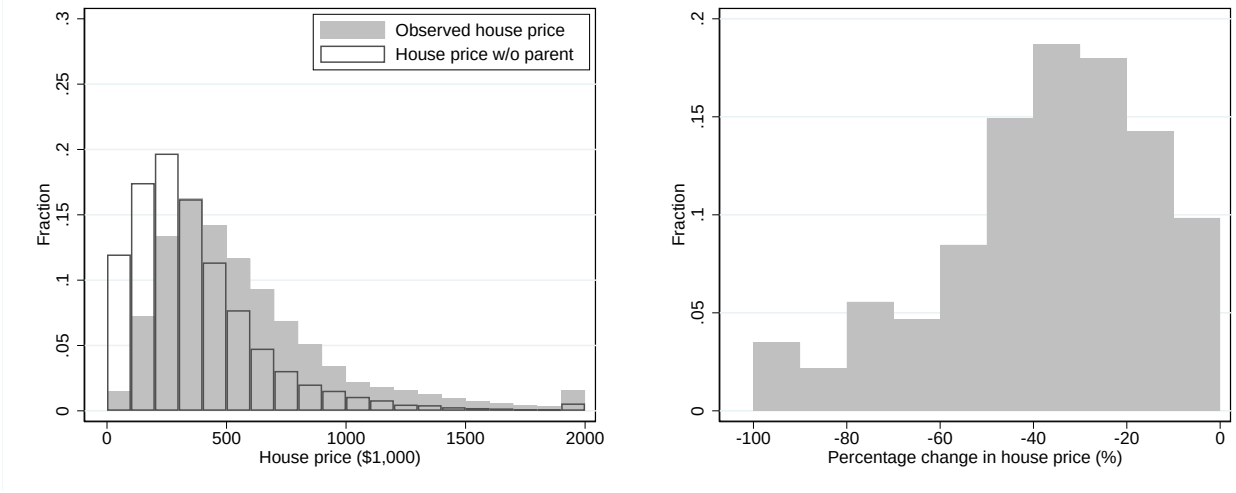
As discussed in Section 4, a challenge we face in performing our counterfactual analysis is that the credit-bureau data do not contain information on how the income reported is split between different parties on the contract. We therefore need to make an assumption on how income is shared. For the base case, we suppose that the total income associated with the mortgage is split equally across all parties. In other words, we assume that the incomes of parents and their adult children are the same. In Appendix A.2 we reproduce our findings under alternative scenarios.

In our first exercise, we investigate what would have been the maximum house price an adult child could have afforded without parental co-signing. To do so, we first identify adult children who would have been constrained: borrowers who would not have qualified for a mortgage absent parent co-signing, either because their income was too low to satisfy the GDS or TDS regulatory constraints in place at the time, or whose credit score was too low or non-existent (see Section 4 for more details). For each constraint, we then compute the house price that would have allowed them to qualify without parental help.

The left panel of Figure 9 plots the distribution of these counterfactual house prices against the distribution of actual house prices. We can see a clear and material shift in the distribution. This is confirmed in panel (b), which plots the distribution of the differences (in percent) between counterfactual and actual house prices. In many cases, the decrease would be large, with a median difference of 34 percent and a mean difference of 37 percent.[22]

[22]Note that some house price differences are extreme, sometimes very close to -100 percent. This is because some adult children do not have high enough credit scores to qualify for mortgages. In those instances, the

Figure 9: House prices in the absence of parental support



(a) House price

(b) House price change (%)

Note: Among parent–co-signed mortgages, 74% of the adult children are constrained without parent support, unable to meet either the GDS/TDS requirements (72%) or credit score requirements (9%). For these constrained children, in the absence of parent support, the median change in house price is -34%.

This counterfactual exercise indicates that in many instances, parental help was crucial to allowing some adult children to afford the house they ultimately purchased. This leads us to ask a different but related question: Is parent co-signing associated with the purchase of a more expensive house than the neighborhood average? We first compute the ratio of the house price to the mean house price within an FSA. We then regress this relative house price on the FTHB's age and credit score, the mean income across borrowers on the mortgage, and a dummy for whether the house was purchased with parental help. The results in the first column of Table 5 indicate that houses financed through mortgages co-signed with parents were on average 11 percent more expensive, once we control for local house prices. Moreover, the results in the second column indicate that this is driven entirely by those borrowers who would not have qualified without parental co-signing.

For our second counterfactual, we compute the extra downpayment that would be required for an adult child to purchase the same house without parent co-signing. Specifically, we calculate the size of the mortgage loan that would allow the adult child to satisfy the GDS/TDS constraint. The difference between the house price and the loan size defines the total required downpayment.

counterfactual maximum house price without parental co-signing is equal to the size of the downpayment.

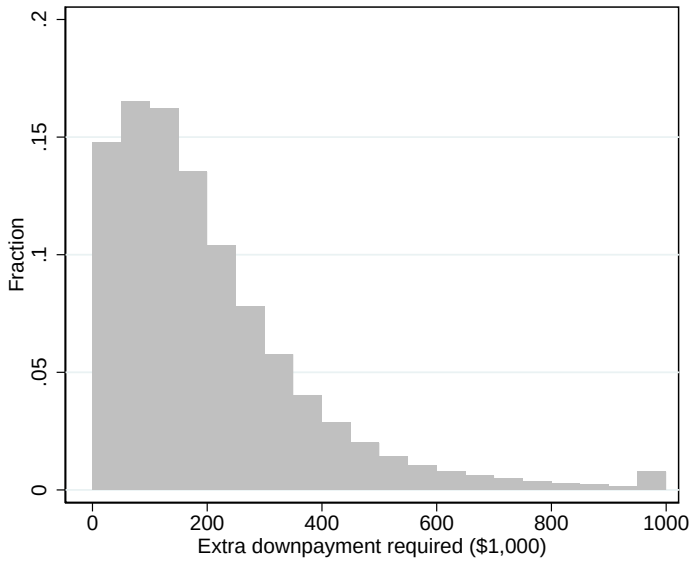
Table 5: Co-signers buy relatively more expensive houses than their neighbors

Dependent variable: House price / FSA mean house price		
I(parent co-signed)	0.11***	-0.13***
	(0.0090)	(0.0069)
I(parent co-signed)		0.33***
×I(Constrained)		(0.0080)
Log(per-borrower income)	0.31***	0.33***
	(0.014)	(0.015)
FTHB age	0.0037***	0.0034***
	(0.00057)	(0.00055)
Credit score (FTHB)	0.00100***	0.0010***
	(0.00014)	(0.00014)
FSA price growth (%)	-0.0021***	-0.0021***
	(0.00041)	(0.00040)
R^2	0.282	0.291

Note: There are 503,915 borrower observations. We also control for year, city, and property type FEs. Standard errors clustered at city level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In Figure 10, we plot the distribution of extra downpayments, defined as the difference between the required (counterfactual) and observed downpayments. Our results show that the extra downpayment required to purchase the same house would often be large: in our sample, the median additional downpayment required is $158,235 and the 25^{th} percentile is $80,830. Holding house prices and income constant, and assuming individuals could save 50 percent of their income every year, the average FTHB household (1.22 borrowers) would still require 7.7 years of savings before entering the housing market. These findings again highlight the importance of co-signing as compared with gift giving. In particular, parents who are liquidity constrained might find it easier to help their children qualify through co-signing than through gift-giving.

Figure 10: Additional downpayment required in the absence of co-signing



Note: The median additional downpayment required to replace parental co-signing is $158,235 and the mean is $203,430.

8 Discussion: Implications for financial stress

In this paper, we have documented a rise in parent co-signing. Our findings suggest that co-signing is related to higher prices and is a response to tighter PTI constraints. We have also provided evidence that co-signing has permitted adult children to buy more expensive houses than they otherwise could have afforded or saved for, given the very large downpayments.

In conclusion, we investigate the impact of parent co-signing on financial stress. If parents are relatively wealthy or have high incomes, then co-signing a mortgage should lead to lower delinquency rates—see, for example, Tzioumis (2017), Jakucionyte and Singh (2022), and Goodman and Zhu (2023) for the case of multiple versus single borrowers. However, if low-wealth–low-income parents co-sign to help their adult children enter the housing market, there can be an increase in overall risk.

Table 6 presents results from regressing the probability that any of the borrowers on a co-signed mortgage are 90+ days delinquent. The first two columns are for all products, and the last two columns focus on the mortgage. From columns (1) and (2) we see higher delinquency rates for those with a parent co-signing relative to mortgagors who do not co-sign. This is especially true for FTHBs who are the most constrained when they co-sign (4.21 percent versus 2.70 percent). Focusing on mortgages only, we see that the constrained FTHBs are

more likely to be delinquent than FTHBs without parent support. Unsurprisingly, the 3 percent of FTHBs who co-sign but who are unconstrained are not more likely than non-co-signers to be delinquent on their mortgage.

Figure 11 plots annualized 90+ days mortgage delinquency rates from 8 quarters pre-origination to 8 quarters post-origination. We see an increase in delinquency rates starting about four quarters post-origination. Importantly, the increase is not just for the adult child's mortgage: we also see a doubling in delinquency rates of parent mortgages, albeit from a low baseline level. In an environment where (1) co-signing has become prevalent and (2) mortgage payments for many borrowers are expected to increase as their loans will be renewed at higher rates than were available during the pandemic, this evidence suggests that some older parents could come under financial stress due to their exposure to the mortgage market through their adult children.

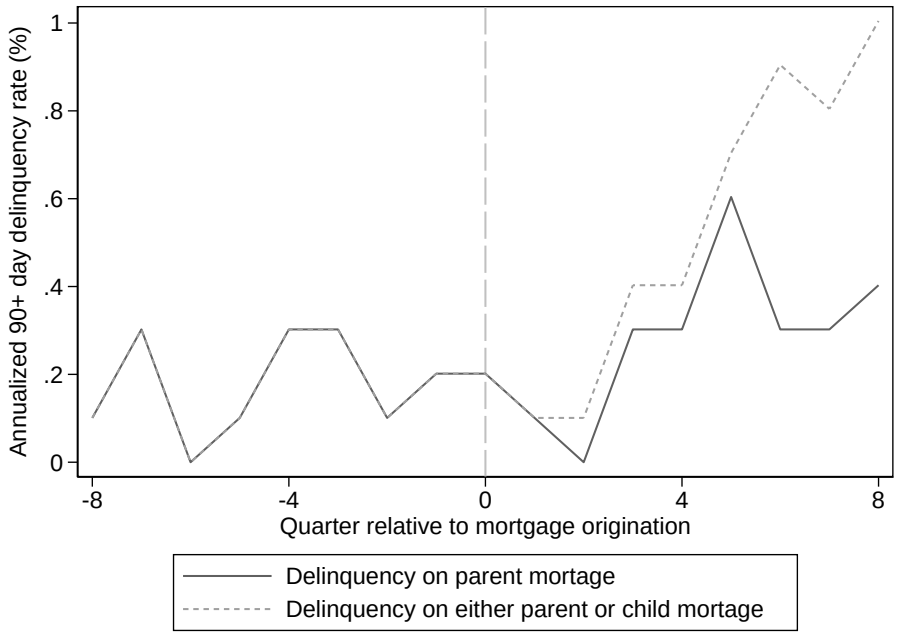
Table A.2 expands on Table 6 to look at which parent characteristics are associated with higher delinquency rates. In addition to interacting our dummy variable for whether a parent co-signed or not with I(constrained), we consider three other indicators of risk: (i) I(parent paid off HELOC/mortgage), (ii) I(parent has HELOC), and I(parent revolving debt utilization $\geq 50\%$). Mortgage-free parents or parents with a HELOC are associated with lower delinquency rates. They are more likely to be wealthy or have access to equity in the event of a negative shock. In contrast, parents with high levels of revolving debt are associated with higher delinquency rates. These parents are more likely to be constrained and unable to support their adult child in the event of a negative shock. In addition, lower LTV is associated with lower delinquency rates; and its effect on all credit delinquency is even stronger for parent–co-signed mortgages. Finally, mortgages with more borrowers are correlated with a higher probability of at least one credit product being delinquent but a lower probability of mortgage delinquency. These results suggest that there is heterogeneity in the types of parents co-signing. On the one end, there are wealthy/high-income parents who support their adult child entering the housing market by facilitating loan qualification; and on the other end, there are parents who co-sign their adult child's mortgage even though they might not be able to fully support them (or themselves) after doing so.

Table 6: Borrowers on co-signed mortgages are riskier

	Dep Var: I(delinquency within 2 years)× 100			
	All credit products		Mortgage products	
I(parent co-signed)	3.84***	2.70***	0.073**	-0.038
	(0.11)	(0.19)	(0.023)	(0.034)
I(parent co-signed)		1.53***		0.15***
× I(constrained)		(0.22)		(0.042)
R^2	0.017	0.017	0.005	0.005

Note: There are 574,221 observations. Dependent variable equals 100 if at least one borrower is 90+ days late on credit products or mortgages within two years of mortgage origination. For borrowers without parent co-signing, the average delinquency rate is 3.65% for all credit products and 0.24% for mortgage products. All regressions control for LTV, rate type (FRM vs VRM), lender fixed effects, year-quarter fixed effects, and FSA fixed effects. Standard errors clustered at FSA level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 11: Mortgage delinquency rates



A Appendix

A.1 Benchmark model with a TDS constraint

Our benchmark model focused on a pay-to-income (PTI) (or gross debt service [GDS]) regulatory constraint. In the Canadian context, borrowers also face a cap on the total debt service (TDS) ratio. The TDS is the sum of the GDS and the ratio of non-mortgage debt to gross income.

Suppose children and parents carry non-mortgage debt and need to make regular payments, d, and d_p, respectively. In particular, d_p can include payments linked to the parents' mortgage on their own house. We can rewrite the unconstrained optimal housing choice without parent co-signing as:

$$h^* = \frac{\sigma(y-d) + \sigma Rs + Rph_0}{(1+\sigma)Rp}.$$

The associated PTI and TDS ratios are:

$$\text{PTI}^* = \frac{\sigma(y-d) - Rs + Rph_0}{(1+\sigma)y}, \qquad \text{TDS}^* = \text{PTI}^* + \frac{d}{y} = \frac{d + \sigma y - Rs + Rph_0}{(1+\sigma)y}.$$

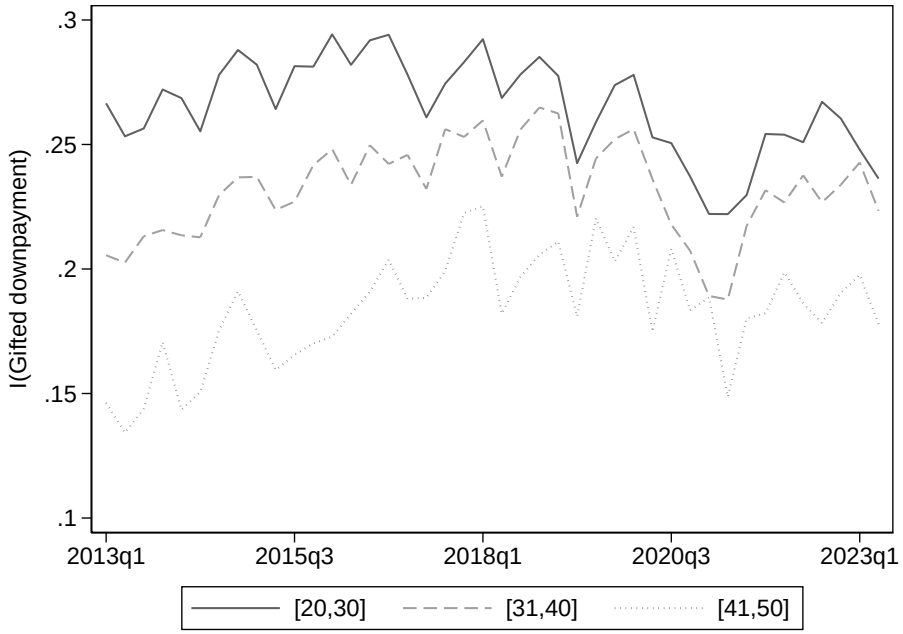
Hence, higher d lowers PTI but increases TDS. For parent–co-sgined mortgages, both parent income y_p and debt d_p would be included in the calculation of TDS:

$$\text{TDS}_p = \text{TDS}^* \times \frac{y}{y+y_p} + \frac{d_p}{y+y_p} = \frac{d + (1+\sigma)d_p + \sigma y - Rs + Rph_0}{(1+\sigma)(y+y_p)}.$$

Therefore, parents co-signing can relax the TDS constraint ($\text{TDS}_p < \text{TDS}^*$) only if $d_p/y_p < \text{TDS}^*$.

A.2 Additional empirical findings

Figure A.1: FTHBs receiving gifts for downpayment by age group



Estimating PCI. For one mortgage insurance company we have the income and age of the primary borrower, in addition to the individual incomes of co-borrowers. We use this information to construct estimates for the parent-to-child-income (PCI) ratio by age group. Specifically, we focus on the sample of mortgages with three co-borrowers with primary borrower age under 50. The sample consists of the following cases: (1) 1 child + 2 parents, (2) 2 children + 1 parent, (3) 3 peers. We construct an estimate of PCI using the following formula:

$$\text{PCI} = \frac{\text{max income of two co-borrowers}}{\text{primary borrower income}}.$$

Then, for each primary borrower age group, we find the median of this ratio as the representative PCI for this group. Notice that this number is likely still an underestimation of parental income, since the sample includes cases where an older borrower is the primary borrower and cases where all borrowers are of similar age. Figure A.3 presents the median PCI ratio estimated for each age group.

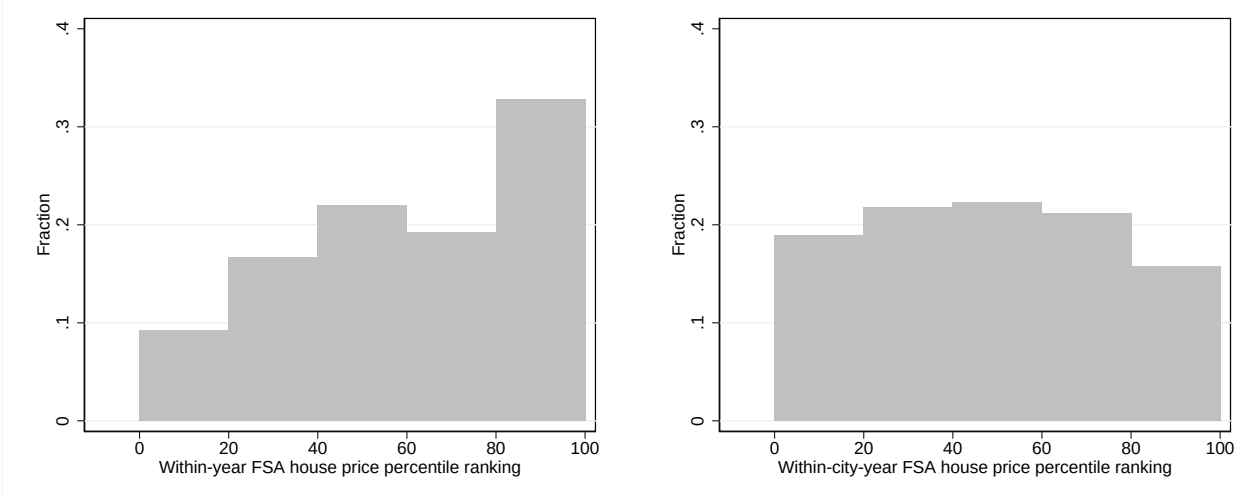
Robustness check. Figures A.4 and A.5 reproduce Figure 9 under alternative assumptions on PCI: (i) PCI = 75%, and (ii) estimated PCI that leverages our dataset that decomposes

Table A.1: Additional summary statistics by mortgage contract types

	Not co-signed	Parent co-signed	Co-signed: unconstrained	Co-signed: constrained
FTHB income ($1,000)	111.1	74.70	104.6	64.28
Per-borrower income ($1,000)	74.12	62.35	84.61	54.60
I(parent has a mortgage)	.	0.342	0.533	0.278
I(parent has a HELOC)	.	0.352	0.519	0.295
I(parent has closed HELOC/mortgage)	.	0.506	0.660	0.454
I(parent paid off HELOC/mortgage)	.	0.119	0.0803	0.133
LTV (%)	83.05	80.67	82.80	79.93
I(uninsured)	0.550	0.620	0.563	0.640
GDS w/o parent (%)	29.57	50.90	24.59	60.05
TDS w/o parent (%)	36.84	59.96	29.88	70.43
Interest rate (%)	2.594	2.614	2.641	2.605
Amortization (years)	26.23	26.64	26.04	26.85
I(amortization $>$ 25Y)	0.278	0.354	0.247	0.391
FSA price growth (%)	9.65	10.88	9.68	11.27
I(1 borrower)	0.423	.	.	.
I(2 borrowers)	0.566	0.533	0.535	0.533
I(3 borrowers)	0.0093	0.381	0.371	0.385
I(4 borrowers)	0.0025	0.0852	0.0933	0.0823
Parent debt balance ($1,000)	.	218.2	346.7	173.5
Parent revolving debt utilization (%)	.	20.55	24.97	18.89
I(parent revolving utilization $\geq$ 50%)	.	0.159	0.203	0.142
Observations	511,148	63,083	16,286	46,797

Note: This table presents summary statistics for FTHB mortgages originated between January 2015 and October 2022. Column (1) presents summary statistics for mortgages without parent co-signing. The remaining columns are parent–co-signed mortgages. Column (3) shows borrowers who would likely qualify for mortgages even without parents, while column (4) shows borrowers constrained by GDS/TDS/credit score requirement without parent co-signing. I(parent has a mortgage) and I(Parent has a HELOC) are indicators equal to 1 if, at the time of the FTHB mortgage origination, a parent had a current mortgage, and 0 otherwise. The variable I(parent has closed HELOC/mortgage) is an indicator equal to 1 if the parent had a HELOC or mortgage at some time in the past but, at the time of the FTHB mortgage origination, the product is closed. This is because the dataset allows us to track all products, even if they are closed. The indicator variable I(parent paid off HELOC/mortgage) is equal to 1 if the parent has a closed (not active) HELOC/mortgage. The indicator variables I(1 borrower)-I(4 borrowers) show the share of mortgages with 1, 2, 3, or 4 borrowers on the contract. Revolving debt utilization is debt over total credit limit across all credit cards and lines of credit. The FSA price growth is based on a repeat-sales index (Teranet).

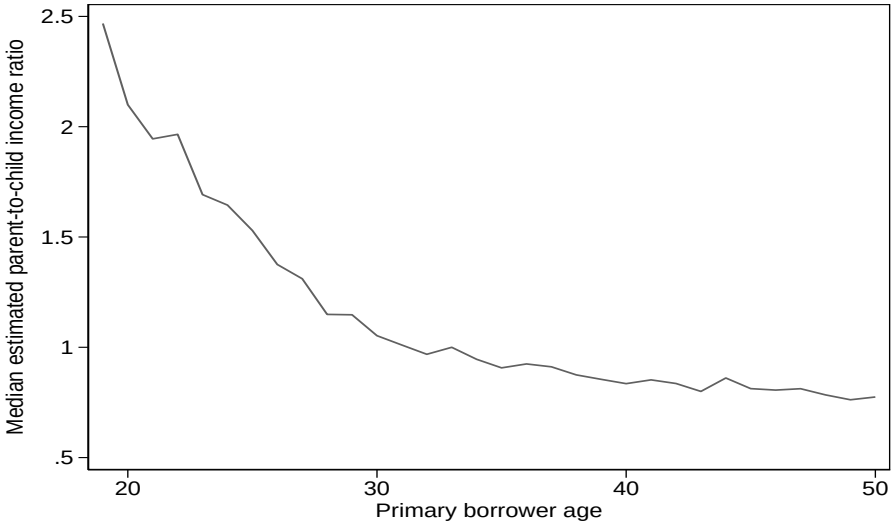
Figure A.2: Percentile ranking of house prices in a parents' neighborhood



(a) National ranking (b) Within-city ranking

Note: Panel (a) suggests that more than half of the co-signing parents live in an FSA where the average house price is higher than the national median. However, there is also a significant fraction of co-signing parents living in less expensive FSAs. Panel (b) further shows that, within each city, co-signing parents do not seem to be concentrated in the most expensive neighborhood.

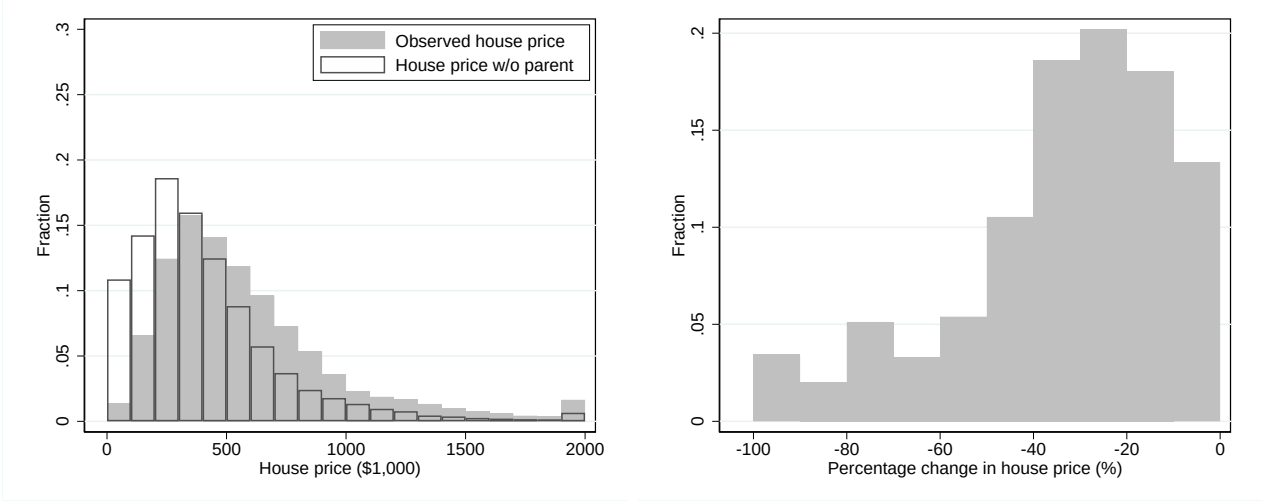
Figure A.3: Median PCI ratio estimated from mortgage insurance data



total income by each borrower, shown in Figure A.3. Our benchmark assumption of PCI = 100 percent corresponds to the medium scenario. In the benchmark, 74 percent of FTHBs on co-signed mortgages are constrained without parental support. The median counterfactual price change when removing support is -34 percent. Using a PCI of 75 percent, the equivalent

percentages are 66 percent and -29 percent. Using our estimated PCI, the percentages are 82 percent and -40 percent.

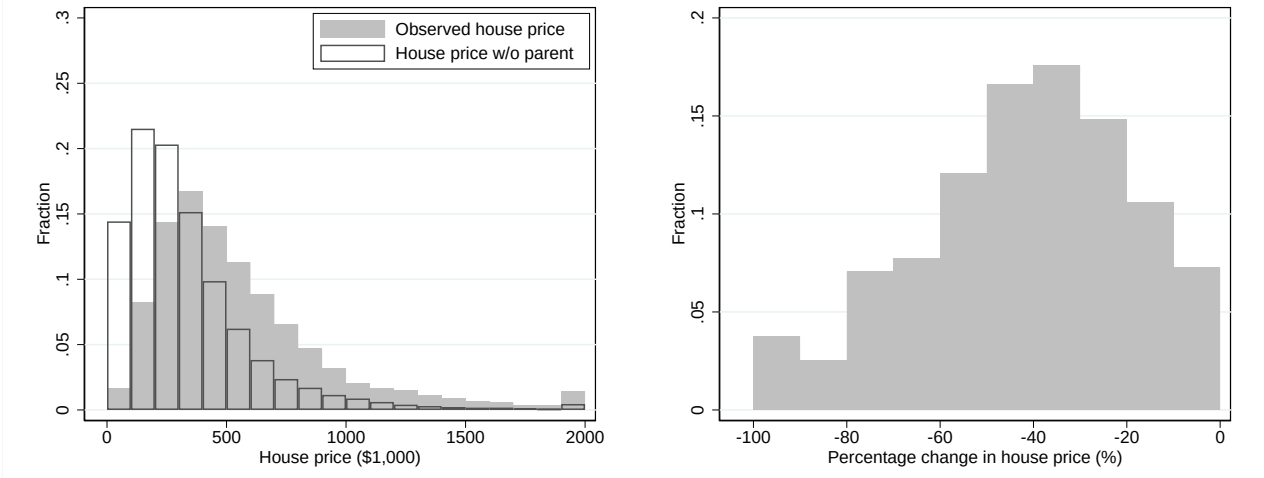
Figure A.4: House prices in the absence of parental support (PCI = 75%)



(a) House price (b) House price change (%)

Note: Among parent–co-signed mortgages, 66% of the children are constrained without parent support. For these constrained children, in the absence of parent support, the median change in house price is -29%.

Figure A.5: House prices in the absence of parental support (estimated PCI by age)



(a) House price (b) House price change (%)

Note: Among parent–co-signed mortgages, 82% of the children are constrained without parent support. For these constrained children, in the absence of parent support, the median change in house price is -40%.

Risk and wealth.

Table A.2: Borrower risk and parental wealth

	Dep Var: I(delinquency within 2 years)× 100			
	All credit products		Mortgage products	
I(parent co-signed)	1.81***	0.41	0.36***	0.25**
	(0.30)	(0.36)	(0.072)	(0.082)
I(parent co-signed)		1.65***		0.12**
× I(constrained)		(0.22)		(0.044)
I(parent co-signed)	-0.015	-0.067	-0.20**	-0.20**
× I(parent paid off HELOC/mortgage)	(0.33)	(0.33)	(0.064)	(0.064)
I(parent co-signed)	-2.24***	-1.96***	-0.26***	-0.24***
× I(parent has HELOC)	(0.22)	(0.22)	(0.044)	(0.045)
I(parent co-signed)	4.54***	4.65***	0.38***	0.39***
× I(parent revolving debt utilization $\geq 50\%$)	(0.37)	(0.37)	(0.086)	(0.087)
LTV $\in [65, 80.5)$	0.17*	0.17*	0.053**	0.053**
	(0.075)	(0.075)	(0.019)	(0.019)
LTV $\in [80.5, 95)$	0.85***	0.84***	0.11***	0.11***
	(0.10)	(0.10)	(0.024)	(0.024)
LTV ≥ 95	2.32***	2.31***	0.24***	0.24***
	(0.10)	(0.10)	(0.024)	(0.024)
I(parent co-signed) × LTV $\in [65, 80.5)$	-0.23	-0.17	0.0058	0.0099
	(0.31)	(0.31)	(0.069)	(0.069)
I(parent co-signed) × LTV $\in [80.5, 95)$	1.04*	1.12**	-0.18*	-0.17*
	(0.43)	(0.43)	(0.079)	(0.079)
I(parent co-signed) × LTV ≥ 95	1.68***	1.87***	-0.17*	-0.16*
	(0.37)	(0.37)	(0.078)	(0.079)
I(2 borrowers)	1.19***	1.20***	-0.19***	-0.19***
	(0.055)	(0.055)	(0.016)	(0.016)
I(3 borrowers)	3.51***	3.49***	-0.39***	-0.40***
	(0.21)	(0.21)	(0.039)	(0.039)
I(4 borrowers)	4.93***	4.94***	-0.30***	-0.30***
	(0.39)	(0.38)	(0.062)	(0.062)
R^2	0.019	0.019	0.005	0.005

Note: There are 574,221 observations. Dependent variable equals 100 if at least one borrower is 90+ day late on her credit products or mortgages within 2 years of mortgage origination. For borrowers without parent co-signing, the average delinquency rate is 3.65% for all credit products and 0.24% for mortgage products. The variable I(parent paid off HELOC/mortgage) is equal to 1 if the co-signing parent had a HELOC/mortgage and paid it off, and 0 otherwise. The variable I(parent has HELOC) is equal to 1 if the co-signing parent has a HELOC, and 0 otherwise. The variable I(parent revolving debt utilization $\geq 50\%$) is equal to 1 if the co-signing parent has a credit balance over credit limit of at least 50%, where credit limit is total limit across all revolving credit products. All regressions control for rate type (FRM vs VRM), lender FE, year-quarter FE, and FSA FE. Standard errors clustered at FSA level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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