Essays in Wealth Effect, Family Structure, and Female Labour Supply

by

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Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Statement of Contribution

Chapters 1 and 2 are co-authored with my supervisors, Professor Ana Ferrer and Professor Stéphanie Lluis, respectively. I contribute to these two chapters at all stages including the research question development, data searching and methodologies selection, implementation of analysis, results interpreting, and policy implication contribution. Chapter 3 is written solely by myself and a subset of the data is provided by Professor Ana Ferrer.

Abstract

This thesis consists of three self-contained essays evaluating topics in family structure, household wealth, and married women's labour decisions using Canadian data.

The twentieth century has seen significant changes in family formation and dissolution in Canada. Chapter 1, coauthored with Ana Ferrer, investigates the role of family structure (family disruption or reconstitution) on cognitive outcomes of primary school Canadian children. We focus on reading and math scores of these children and look into differential effects by gender as well as child's cultural background, which is an important dimension to consider in diverse societies. Using the rich panel data information from the National Longitudinal Survey of Children and Youth (NLSCY), collected biennially since 1994, we find substantial disadvantages in reading, but not math, scores among children in single parent families, relative to children in intact families. However, we find that single parenthood seems to affect boys more than girls in terms of their reading performance, but girls' math performance suffers more than that of boys when in step families. In addition, when looking into differential effects across cultural/religious affiliations of family structure on cognitive performance, we typically observe differential effects in math, but no reading scores. These results suggest that exploring the heterogeneity of children's performance responses to family disruption might be an important factor in assessing the benefits of programs aimed at helping children to cope with family disruptions.

It is worth noting that changes in marital status of parents not only affect their children's performances but also influence their own welfare. The spouse (typically the wife), who usually has less labour market attachment compared to the other spouse (typically the husband) due to the traditional gender roles, is less likely to accumulate much assets during the marriage. Therefore, this spouse with less assets might have less intra-household bargaining power and could potentially face worse financial conditions in the event of a divorce compared to the other one. Chapter 2, coauthored with Stéphanie Lluis, studies a reform of the marital property law following the amendment of the Civil Code of Quebec to improve economic equality between spouses by imposing an equal division of the family assets when a marriage ends. This change created an unexpected shift in the bargaining power of the spouse with relatively lower investment in the family assets, usually the wife. We explore whether and if so how the changes in this redistributive divorce law impacted female spouses' labour market decisions and individuals' marital decisions. We use a difference-in-difference approach and exploit detailed information on female labour supply and marital status from the Canadian Labour Force Survey (LFS) data to analyze outcomes before and after the reforms in Quebec, relative to other provinces which did not experience marital property law changes over that time period. We find that the reform of

marital property law that improve economic equality between spouses in Quebec reduced married women's hours of work and the adverse employment effect is relatively stronger for less educated women (the most disadvantaged spouse) and among couples with larger wealth as measured by the ownership of the couples' property. At the extensive margin, we find that the redistributive law change significantly decreased the labour force participation of the relatively more educated married women but increased the labour force participation of the relatively less educated women (among married women who stayed married). This differential result by education among married women suggests that the labour supply impact of the redistributive law change likely depends on the decision to stay married as marital decisions are also part of the household bargaining outcome. We investigate this question by studying the Quebec amendment impact on divorce rates and the decisions of whom to marry. We find that the redistributive law change had no impact on overall divorce but significantly increased the likelihood of divorce/separations among less educated spouses. In addition, over the sample of young individuals deciding whether or not to marry, the Civil Code amendment contributed to increasing the proportion of marriages in which the wife is more educated than the husband.

The intra-household bargaining position is not the only factor that could affect female labour supply as well as people's marital decisions. The wealth of a household is also another important factor that might influence spouses' decisions in the labour and marriage markets. Chapter 3 examines the impact that changes in household wealth due to the house price variations during the 1990s and 2000s had on the labour market behaviour of Canadian married women. House prices in Canada have tripled over the past decades. This dramatic rise has essential effects on households' wealth and the wealth effects might be different on house owners versus renters (potential house buyers). I use time-series average house prices data from the Canadian Real Estate Association's Multiple Listing Service data set (CREA MLS) which covers the entire Canada, 102 real estate boards (REBs), and provides detailed geographical variations in house prices in both urban and rural areas. Then, I link these house prices to each respondent in the confidential longitudinal household files - the Survey of Labour and Income Dynamics (SLID). Estimating the causal effects of housing wealth changes on female labour supply is challenging. For instance, The life-cycle theory of the labour supply emphasizes that unexpected gains in wealth should decrease household labour supply. However, wealth changes due to rising house prices could be anticipated by a household. Thus, there might be no effect if the household was forward looking and incorporated these expected wealth changes into their decisions. In addition, the reverse causality between house prices and female labour supply has been highlighted in literature. Rising housing prices induce more female spouses to participate in the labour market to offset the future housing purchase costs if their families intend

to enter homeownership or balance rising rental prices. Nonetheless, it is also plausible that more working women in one area, which contributes to a higher proportion of two-earner households with stronger payment capacities, may bid up the house prices there. Therefore, I apply two strategies to overcome these challenges. My first strategy is to calculate a measure of house-price shocks which is aimed at capturing unexpected variations in local house prices, rather than variations that could be anticipated by people. My second strategy is constructing comprehensive and exogenous topography instruments to address the reverse causality between the house prices and female labour supply. After capturing unexpected changes in local house prices, among house owners, I find that an increase in (positive) house-price shocks causes a reduction in the likelihood of participation of married women. At the intensive margin, I find that an increase in the house price shocks induces a decrease in annual work hours of a woman at the low percentile. Additionally, I find heterogeneous effects of house-price shocks on women's labour supply depending on their education level and residence locations. These results are consistent with the prediction of family labour supply and life-cycle models, which indicates that unexpected gains in wealth should decrease household labour supply. There is no evidence showing that house-price shocks have labour effect on renters in this study, which might suggest that they choose to delay to enter homeownership or find a cheaper residence instead of adjusting their labour supply when an appreciation of house prices occurs. The IV approach which uses the fraction of buildable land and the difference in elevation as the instruments also provides consistent results as the house-price shock approach does.

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Dedication

To the most beautiful and important persons in my life: my parents, my husband, and my little lovely angel.

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Chapter 1

Family Structure and Child Cognitive Outcomes: Evidence from Canadian Longitudinal Data of Children

1.1 Introduction

The twentieth century has seen significant changes in family formation and dissolution in North America. Over the past twenty years, the fraction of married individuals in the US has gone from 52 percent in 2017 to 61 percent in 1980, while the fraction of divorced individuals has doubled (from five percent to ten percent).[1][2] Similar divorce rates are reported for Canada in this period.[3] The rise in family dissolution implies a higher fraction of children living in non-intact families - either families headed by a single parent or families in which one (or both) of the parents is not the biological parent. Over 50 percent

[1]U.S. Bureau of the Census, Statistical Abstract of the United States: 1981 (102d edition.) Washington, D.C., 1981.

[2]U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements, 2000 to 2017.

[3]Comparable numbers are not available for Canada since the 1981 Census does not identify individuals living common law. However, other studies document an increasing proportion of individuals living common law among those in a couple, from 6% in 1980 to 20% in 2011 (Milan (2013)).

of US children and 30 percent of Canadian Children live in non-intact families (Livingston (2014); Statistics Canada (2017)).[4][5] These changes in family structure may have important consequences for child well-being, since family disruptions are generally associated with a range of negative outcomes for the children involved, both cognitive and emotional, such as mental health, educational attainment, earnings, and employment status. In this paper, we focus on reading and math scores of primary school Canadian children to explore the effect of family disruption on their cognitive outcomes. Additionally, we look into differential effects by gender as well as child's cultural background, which is an important dimension to consider in diverse societies. Given the increase in the number of children experiencing family disruptions, investigating the association between changes in marital status and children's outcomes seems crucial to inform social policy.[6] If there are significant negative effects on child outcomes caused by family dissolution or reconstitution, adequate support policies could be put in place to attenuate these effects and give all children an equal start in life.

The main psychological theories attempting to explain how family structure affects children performances stress that lack of resources such as income and/or parental involvement in specific family structures reduces children's attainment. In addition, parental conflict before a divorce or the involvement of new family members after remarriage may induce stress on children, which could affect their performances (Haveman and Wolfe (1995); Amato (2000); Hill et al. (2001)). In the United States, the literature investigating these connections finds that children raised by divorced or separated couples were more likely to have psychological and behavioral problems compared to children raised in intact families (Aughinbaugh et al. (2005) and Amato and Anthony (2014), among others). The influence of living in a non-traditional family on children's cognitive outcomes, such as test scores, has also been analyzed extensively (Gennetian (2005) and Sanz-de Galdeano and Vuri (2007)). Many of these papers find a negative impact on children's cognitive outcomes due

[4]Part of the striking difference comes from the age of children considered (17 and younger in the US, 14 and younger in Canada). Approximately, twice as many of these children who are in non-intact families in both countries are living with a single parent, while the rest live with blended families.

[5]Statistics Canada. Fifty Years of Families in Canada: 1961 to 2011. Statistics Canada, 2012.

[6]See for instance, Biblarz and Gottainer (2000); Gruber (2004); Björklund et al. (2007) and references wherein.

to parental divorce that diminishes or disappears once family and individual background is accounted for.

It is unclear what would be the effect of remarrying (or starting a new relationship) on children. It is possible that individuals who experienced a failed relationship will weigh higher education, income or "good" parental skills heavily in a second relationship, and that these positive parental skills of step-parents improve children's performance (Hofferth and Anderson (2003); Gennetian (2005)). On the other hand, children might resist the new relationship, leading to high stress and resulting in worse school performance (Kiernan and Mensah (2009)).

In Canada, the literature has linked family disruption or reconstitution with negative consequences for children's non-cognitive outcomes. Pagani et al. (1998) found that teenage boys who experienced family reconstitution are more likely involved in delinquency than those who stayed in intact families. Similarly, Strohschein (2005) and Strohschein (2012) documents a positive relationship between parental divorce and children's anxiety/depression, and Kerr and Michalski (2007) - when studying hyperactivity problems - report an advantage for children living in intact families compared to those living in step families. Ram and Hou (2003) have also investigated the adverse impact of living in a non-intact family on children's cognitive outcomes. They find that one possible explanation for children's lower performance in cognitive (math or reading scores) outcomes and negative emotional-behavioral outcomes (hyperactivity, offense, or aggression) is linked to the deterioration of economic resources typically accompanying family disruption.

The challenge of identifying the causal effect of family structure on child's cognitive outcomes lies in disentangling it from other factors, also affecting the child's academic performance, such as socioeconomic factors, including parental involvement in the child's education. Preexisting problems such as parental conflict before the divorce or breaks in the child's routine (during a separation preceding a divorce) might affect children's outcomes as well. In this regard, the impossibility of fully capturing all related factors can overstate the detrimental impact of divorce. Researchers have employed various methodologies to deal with this omitted variable bias and tried to identify the causal effect of parental divorce or remarriage. The traditional Ordinary Least Squares (OLS) model, often used to

investigate the effect of parental dissolution/reconstitution on cognitive outcomes, cannot fully control for the omitted variable bias (McLanahan et al. (2013)). Later studies use relatively more advanced statistical models, such as the value-added (VA) model, or fixed effect (FE) models to control for some unmeasured variables from the previous period that may influence current children's outcome (Ram and Hou (2003); Aughinbaugh et al. (2005); Gennetian (2005); Sanz-de Galdeano and Vuri (2007); Amato and Anthony (2014); Arkes (2015)). An alternative methodology uses parental death, or divorce-law reforms as natural experiments, to investigate the influence of changes in parents' marital status on children (Corak (2001); Gruber (2004)). While the estimates of this approach can produce unbiased estimates for the treated population, they are sensitive to the randomness of the event or the validity of the instrumental variable used. Propensity score matching models (Amato (2003); Hannan and Halpin (2014)) also rely heavily on how good the match between the treated and control group is. Each of these approaches has advantages and limitations, emphasizing the importance of investigating whether results are robust across multiple models (McLanahan et al. (2013)). In this study, we use the broad set of variables available in the NLSCY to control for confounding effects in our initial estimation. Additionally, we exploit the panel nature of our data, estimating a VA model and FE model to further isolate the effect of family structure on children's outcomes.

An important dimension that might be lost in fixed effect models is the heterogeneity in children's responses. Specifically, children in different population groups might have different ability to adjust to changes in family structure they have experienced. In the U.S., some studies highlight the importance of investigating the heterogeneity of the family structure effect. They have analyzed how the effect of family structure differs by gender, or race/ethnicity (e.g., Fomby et al. (2010); Lee and McLanahan (2015)).[7] In Canada, research has provided only limited evidence in this area (Beaujot et al. (2013)). Our main contribution is that, in addition to extending the analysis to a longer period and alternative methodologies, we disentangle part of the heterogeneity in children responses. Specifically,

[7] Lee and McLanahan (2015) find that the effect of family instability on cognitive outcomes is stronger for girls than boys, for Black children than White/Hispanic children in the U.S.. However, in terms of socioemotional performances, the effect of family instability is stronger for boys than girls, for White/Hispanic children than Black children.

we explicitly examine a differential effect by gender, religion (Catholic/non-Catholic) and by Canadian/French heritage claimed by the parents.[8] Our estimates suggest that such heterogeneity is important. Previous results pointed towards small, non-statistically significant effects on children's math performance. Our analysis suggests that these mask a differential effect along those dimensions and therefore more tailored polices to help children cope with family instability could increase their well-being. We also find a differential effect by gender in reading scores.

The remainder of the study is organized as follows: Section 1.2 explains the data and presents methodology used in this article. In Section 1.3, we present regression results analyzing the family structure effect on children's cognitive outcomes. Section 1.4 concludes.

1.2 Data and Methodology

1.2.1 The National Longitudinal Survey of Children and Youth (NLSCY)

The data used in this article comes from the National Longitudinal Survey of Children and Youth (NLSCY). The NLSCY collected comprehensive information on Canadian children and "the person most knowledgeable about the child (PMK)" (excluding children who live on Indian reserves and institutionalized children) regarding their education, health, environment, development, behavior, friends and activities (Statistics Canada (2008)). It also reports children's reading (for school children aged 4 or 5) and math scores (for schoolchildren aged 7 to 15 years). The math test score is derived from the Mathematics Computation Test given to school children during the interview, which measures the students' skills of addition, subtraction, multiplication, and division of numbers. The reading comprehensive test is derived from the Peabody Picture Vocabulary Test – Revised (PPVT-R), which was "designed to measure children's receptive or hearing vocabulary skills" (Statis-

[8] We use the term Canadian/French heritage very loosely, being limited by the nature of questions in the survey and the reported cell size of the categories.

tics Canada (2008)). We used a normalized version of these scores as dependent variables in this study.

The children in our sample range from ages 1 to 5 during the initial cycle, turning 11 to 15 during the sixth cycle. There are 2,227 children with valid math test values across the three later cycles (Cycles 4 through 6) and 1,962 children with valid reading test values in either of two initial cycles (either Cycles 1 and 2, or Cycles 2 and 3).[9] We excluded children living in adoptive or foster families from the dataset since we want to focus our attention on children who remain in the care of at least one biological parent.[10] (See the timing of the data in Table *A*.5 in the Appendix).

The family structure at the time of the test is our main variables of interest. Our definition of family structure is based on the child's living arrangement in each period. We consider (1) Intact families (the child lives with his/her two biological parents), (2) Lone-parent family (there is only one biological parent present), (3) Step families (the child lives with one biological parent present and his/her married or common law partner, who is not biologically related to the child).

We include a broad set of current family characteristics that may potentially help to isolate the effect of family structure. Some of these variables are standard in the literature analyzing child outcomes, such as the child' s age and gender, whether the child has an education disability or the number of siblings. Also standard is the inclusion of parent's characteristics that might account for differential approaches to parenting, such as the PMK's age, gender and education, the PMK's age at birth of the child, PMK's place of birth (whether born in Canada or not), and whether the PMK's was a teen parent. For the analysis of math scores, collected in later cycles, we also account for preexisting problems by including variables for previous (during cycles 1 to 3) changes in family structure and in

[9]No child has valid reading scores across all first three cycles of the NLSCY, due to the age restriction of this test.

[10]Many studies indicate that the social attitude towards biological and adoptive parents is different (Brodzinsky (1987); Kressierer and Bryant (1996)). Adoptive or foster children also show a higher risk of behavior and academic problems compared to those who live with their biological parents (Haugaard (1998); Wierzbicki (1993)). Our dataset has less than 3% children in an adoptive or foster family, which impedes us to focus on this issue.

the PMK's employment history. These could affect the child's outcomes either by directly affecting the long-term behavior of the child or by changing the amount of resources (in time and money) available to the child, which may in turn have long-term effects on cognitive performance.[11] Finally, we include a set of controls aimed to account for resources available to the child, such as the number of adults in the household, household income and the PMKs' depression and family functioning scores.[12] Household income is reported by categories in the first three cycles of the NLSCY, and as a continuous variable in cycles 4 through 6. We also introduce the PMK's current work status in each cycle (either employed or non-employed) as a further approximation of time resources available to the child, once household income has already been included as a control variable.

1.2.2 Descriptive Statistics

Most children in our sample lived or stayed in intact families and the percentage of children in intact families decreased slightly over time (88% in cycle 1 to 71% in cycle 6). PMKs are mostly employed in each cycle (over 70%), or remained employed between two adjacent cycles (over 63%). The percentage of PMKs employed and staying employed increased slightly over time and it is generally higher during cycles 4 through 6, coinciding with better economic conditions in the early 2000s. Along these lines, the fraction of PMKs experiencing changes in working status during cycles 1 through 3 is relatively large (29.4%) as Canada's economic struggled through the slow recovery of the early 1990s bust. (See Appendix Table *A*.8 and Table *A*.9).

Children's average age ranges from 66 months in the reading sample to 139 months in the math sample, equally distributed by gender.[13] The average reading and math scores are 100.69 and 457.13, respectively, with children in step families showing a slight advantage

[11] Although the NLSCY has rich information in terms of parenting and family situations, it does not provide the actual time the PMK spends with the child.

[12] A high score of the PMK's depression or family functioning shows the presence of depression and family dysfunction respectively (Statistics Canada (2008))

[13] Following Chen et al. (2015), we used the actual age of children in months in the analysis in order to control for the difference of ability in children who are relatively young compared to their classmates.

on math scores – but not on reading scores - than those in intact families and children in intact families a slight advantage in reading scores relative to the other children. Children in single parent families do not show an obvious disadvantage. PMKs are most likely the mother of the child. Most PMKs have at most a high school diploma and are born in Canada (a higher fraction than in the total population). The average depression score for the PMK is about 4 (on a scale from 0 to 36) suggesting that the levels of depression are low on average, but more prevalent in single parent homes (6.6 to 7.6). Most families have no additional adults in the household and reside in a CMA. About 23% of children in the reading sample live in a low-income household.[14] Household income averages $75,913 before taxes and deductions in the math sample. Average household income in single parent families is much lower than in the other families ($39,772), even though it includes child and spousal support from former partners.[15] Average family functioning score is about 8 (on a scale from 0 to 36) suggesting relatively low levels of family dysfunction, which is higher in single parent homes (9 to 12). (See Appendix Table *A*.6 and Table *A*.7)

1.2.3 Empirical Model

Identifying the association effect of family structure on children's performances requires disentangling it from other aspects of family background that can affect cognitive performance and taking into account the initial disadvantage of children in non-intact families. To this effect, we apply different identifications strategies in this work. First, we used a standard OLS model to ascertain the effect of family structure on child reading and math scores after controlling for observable characteristics. Second, we use a VA model, which includes a lagged value of the dependent variable, to control for some unmeasured variables from the previous period that may influence current child's outcomes. Third, we use individual and time specific FE models to control for time-invariant unobserved child/family characteristics that may further influence children's outcomes.

The basic equation we estimate for the OLS model is

[14] A family is considered as a low-income family when its income is below the pre-tax low-income cut-off (LICO) after the family size and the community have been taken into account (Statistics Canada (2008)).

[15] Household income is provided in real 2002 Canadian dollars, using CPI with 2002 basket content.

$$y_{it} = \alpha_0 + \alpha_1 SP_{it} + \alpha_2 SF_{it} + \alpha_3 X_{it} + \delta_t + \gamma_p + \epsilon_{it} \tag{1.1}$$

where y_{it} represents the child i's reading or math scores in cycle t (t = 1, 2, 3 in reading scores analysis and 4, 5, 6 in math scores analysis). SP_{it} and SF_{it} stand for Single parent or Step family. X_{it} is a group of control variables, which contains basic characteristics of the child, PMK and household, as well as – in the case of the math sample - previous changes in family structure and PMK's work status. δ_t and γ_p are year and province fixed-effect. ϵ_{it} is the error term. α is a vector of parameters to be estimated, with α_1 and α_2, being the primary focus of this analysis.

Despite the broad set of controls that we are able to include in the analysis, it is plausible that there are unobserved factors correlated with family structure that affect children's performance and introduce a bias in our analysis. Specifically, current reading and math skills are likely based on previously obtained skills and may be due to some (unobserved) action taken in the past to change previous scores, such as engaging extra tutorial time in the school. If these actions are linked to changes in family structure, they might introduce a bias in our estimates. For instance, a bad score may induce parents in intact families to engage a tutor, but low grades may remain unaddressed in families struggling through divorce or separation. Hence, the adverse effect of separation may be related to lack of tutorial support, rather than the separation per se. The VA model incorporates these unobserved actions through past scores:

$$y_{it} = \alpha_0 + \beta_0 y_{it-1} + \alpha_1 SP_{it} + \alpha_2 SF_{it} + \alpha_3 X_{it} + \delta_t + \gamma_p + \epsilon_{it} \tag{1.2}$$

where y_{it-1} represents child i's reading or math scores in cycle t-1 and the rest of the variables are as before. For the reading sample, t=2,3, whereas t=4,5 in the math sample.

Finally, it is possible that there are unobserved time invariant characteristics that influence performances, such as a child's innate reading or math ability. The panel dimension

of our data allows eliminating the influence of such time-invariant characteristics through FE models, which isolates the effects of all time invariant characteristics.

$$y_{it} = \alpha_0 + \alpha_1 SP_{it} + \alpha_2 SF_{it} + \alpha_3 X_{it} + \delta_t + \gamma_p + c_i + \epsilon_{it} \tag{1.3}$$

where c_i is a person-specific indicator that controls for time invariant unobserved characteristics such as parental and children's abilities.

In each equation, the reference group is composed by children who were in an intact family, α_1 and α_2 are the parameters estimating the effect of single parent and step family structures on reading or math scores relative to children in intact families. All models use a robust standard error regarding heteroskedasticity across children or families.

1.3 Results

Table 1.1 presents the effect of family structure on reading and math performance for the specified models. Children in single-parent families score between four and 18 points lower in their reading tests than do those in intact families. The estimates are significant in both OLS and VA models. Children in step families score between one and five points lower in their reading tests than do those in intact families, however, the estimate is never significant, except when no other controls are included in the regression. It is worth noting that previous reading scores have a significant and positive effect on current reading scores (column 3). Children in single parent families score around nine points less in math than children in intact families. However, the relationship is no longer significant under any model once a full set of controls is added to account for confounding effects. Similarly, living in step families seems to have little effect on children's math outcomes across these models. Again, not surprisingly, previous math scores have a significant and positive effect on current math scores (column 7). The effect of other control variables is reported in Appendix Table *A*.10 to save space. It is worth mentioning that some, such as past changes in family structure and past changes in PMKs' work status, have little or no effect

on children's achievements. Other, such as the basic demographic characteristics of children and PMKs - have an impact on children's reading and math scores. The PMK's education (having at least high school education) has positive effects on children's outcomes, while having a learning disability has a negative effect.

1.3.1 Heterogeneous Effects: Gender

So far, our results show that family structure has a somewhat significant effect on children's reading performance, but little impact of family structure on children's math performance. It is plausible however, that this is the result of aggregation, which might mask differential effects in different subgroups of the population. In particular, it is plausible that family structure has a differential effect in young boys and girls. Numerous studies find that boys behave differently than girls, particularly if raised in disadvantaged circumstances (Autor et al. (2016)). In addition, since mothers (fathers) tend to allocate more time parenting daughters (sons), daughters may receive more parental attention than boys in single parent households typically led by women – or less attention in step-families if the mother remarries (Baker and Milligan (2016); Bertrand and Pan (2013)). To address this possibility, we include an interaction between the family structure indicators and an indicator for girl child in our models.

Table 1.2 shows the effect of family structure on the child' s reading (columns 1-3) and math (columns 4-6) sample by gender using the OLS, VA and FE models. The coefficient of *Single parent family* or *Step family* represents now the effect on the reading /math scores of boys living in single parent family or step family respectively. The sum of the coefficients of *Single parent family* and *Girl*Single parent family* (the sum of the coefficients of *Step family* and *Girl*Step family*) represents the effect on the reading /math scores of girls in the specified families. The interaction coefficient, *Girl*Single parent family* or *Girl*Step family*, then shows the differential effect that family structure has on girls relative to boys.

Boys in single parent families score between 8 and 19 points lower in their reading tests than boys in intact families; the estimate is significant in both OLS and value-added models and remains large, though not significant in the FE model. Similarly, girls in single parent

Table 1.1: Effect of Family Structure on Academic Performance

	Reading				**Math**			
	OLS		VA	FE	OLS		VA	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reading (t-1) or Math (t-1)	-	-	0.59***	-	-	-	0.53***	-
	-	-	(0.03)	-	-	-	(0.03)	-
Family structure								
Single parent family	-4.44***	-17.85***	-16.02***	-8.43	-8.88*	-8.65	-6.80	-9.57
	(1.17)	(3.77)	(2.32)	(7.04)	(4.37)	(5.93)	(6.08)	(10.18)
Step family	-4.84***	-1.38	-1.99	-3.28	1.34	-6.37	-2.42	-7.20
	(1.52)	(1.62)	(1.56)	(2.90)	(7.33)	(7.57)	(7.79)	(12.08)
PMK's employment status								
Non-employment	NO	0.86	1.36	2.42**	NO	1.49	7.53	8.26
		(0.91)	(0.97)	(1.02)		(4.26)	(4.95)	(5.47)
Household income								
Continuous variable	-	-	-	-	NO	0.09***	0.07**	-0.01
						(0.03)	(0.03)	(0.03)
7 indicators	NO	YES	YES	YES	-	-	-	-
Previous Family Structure	-	-	-	-	NO	YES	YES	-
Previous PMK's employment	-	-	-	-	NO	YES	YES	-
Other child/PMK's information	NO	YES	YES	YES	NO	YES	YES	YES
R-squared	0.02	0.14	0.44	0.83	0.34	0.65	0.61	0.87
Number of observations	3924	3924	1962	-	6681	6681	4454	-
Number of children	-	-	-	1962	-	-	-	2227

Note: Children who were in an intact family are the reference groups. Robust standard error values are in parentheses.

Previous transitions in family structure includes indicators for (1) staying in an intact family, (2) staying in a non-intact family (3) experiencing a change in family structure during the first three cycles. **PMK's previous employment status** includes indicators for the PMK (1) staying persistently employed (2) staying persistently non-employed (3) experiencing unstable work patterns during the first three cycles. **Other child and PMK's information** includes child' s age and gender, whether child has an education disability, number of siblings, PMK's age and gender, whether PMK has high school or less education, PMK's age at birth of the child, PMK's place of birth, PMK's was a teen parent, PMKs' depression and family functioning scores, CMA residence, number of adults in the household, year and province fixed effects.

The child longitudinal weights provided by the NLSCY are used in the analysis. * Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

families score between 9 (-8.32 - 0.75 = -9.07 (SE 7.37)) and 17 (-18.49 + 1.70 = -16.79 (SE 3.87)) points lower in their reading tests than girls in intact families, the estimate is significant in both OLS and value-added models. Living in step-families has little effect on both boys' and girls' reading scores.[16] On the other hand, living in single-parent families has relatively little effect on both boys' and girls' math performance.[17] However, while living in step-families has no distinct effect on boys' math score, relative to boys in intact families, it does on girls, who score between 16 and 31 lower points than boys in math test if living in step families. Although the results from the FE are not significant, the magnitude of the coefficient is rather large, so it is likely that the imprecise estimates relate to the small number of transitions in the data (see Table *A.9* for the distribution of children by the transition in family structure). The total effect on math scores for girls in step families relative to girls in intact families is large in magnitude, around 20 (SE 7.90) and 13 (SE 8.58) and 22 (SE 17.07) points lower in the OLS, VA and FE models respectively, although only the OLS result is statistically significant.

1.3.2 Heterogeneous Effects: Cultural Heritage

Another dimension that can have significant effect on the child academic performance relates to the parenting style as influenced by the parent's cultural ancestry. Different cultures put different stress on the role of parents in child's development and education. For instance, traditional cultures tend to promote a strict division of labour in terms of child rearing, emphasize the nurturing role of mothers and relegating fathers to a secondary role in early childhood development. If that is the case, the effect of family dissolution on these families may create a larger vacuum in the time and resources available to the child than in families with a more equal distribution of tasks. For instance, mothers could be ill prepared to assume an active role in the labour market, or if forced to do

[16] In the OLS model, the total effect on girl's reading scores in step families relative to girls in intact families is, -1.03 - 0.70 = -1.73 and statistically insignificant (SE 2.49). The VA and FE estimates are qualitatively similar.

[17] In the OLS model, the total effect on girl's math scores in single parent families relative to girls in intact families is, -8.73 - 0.05 = -8.78 and statistically insignificant (SE 6.63). The VA and FE estimates are qualitatively similar.

Table 1.2: Effect of Family Structure on Academic Performance by Gender

	Reading			Math		
	OLS	VA	FE	OLS	VA	FE
	(1)	(2)	(3)	(4)	(5)	(6)
Reading (t-1) or Math (t-1)	-	0.59***	-	-	0.53***	-
	-	(0.03)	-	-	(0.03)	-
Child-girl	-0.25	-2.54***	-	-4.85*	-5.10*	-
	(0.75)	(0.80)	-	(2.79)	(3.04)	-
Family structure						
Single parent family	-18.49***	-17.70***	-8.32	-8.73	-5.35	-3.07
	(3.84)	(2.49)	(7.33)	(6.96)	(7.61)	(11.83)
Step family	-1.03	-1.57	-4.24	0.86	3.59	8.42
	(2.01)	(2.06)	(3.52)	(8.44)	(8.53)	(14.00)
Girl*Single parent family	1.70	4.14*	-0.75	-0.05	-2.75	-10.51
	(1.81)	(2.41)	(3.98)	(6.78)	(8.42)	(18.60)
Girl*Step family	-0.70	-0.85	1.70	-21.10***	-16.67*	-30.73
	(3.12)	(2.79)	(5.16)	(8.10)	(8.68)	(21.46)
PMKs' employment	YES	YES	YES	YES	YES	YES
Household Income	7 indicators	7 indicators	7 indicators	Thousands	Thousands	Thousands
Previous Family Structure	-	-	-	YES	YES	-
Previous PMK's employment	-	-	-	YES	YES	-
Other child/PMK's information	YES	YES	YES	YES	YES	YES
R-squared	0.14	0.44	0.83	0.65	0.61	0.87
Number of observations	3924	1962	-	6681	4454	-
Number of children	-	-	1962	-	-	2227

Note: Children who were in an intact family are the reference groups. Table descriptors are as in Table 1.1. The child longitudinal weights provided in the NLSCY are used in the analysis. Robust standard error values are in parentheses.

* Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

so, have difficulty balancing work and family life. Similarly, fathers may have difficulties with shared custody if they are ill equipped to take care of children. While these skills can be learned, it may take a longer time for "specialized" parents to adjust to the new parameters of parenthood, than for parents that already have an equal partnership in child rearing before family dissolution. Culture may also affect the attitudes towards family dissolution per se. For instance, a strong position against divorce may intensify conflict in the family before or after family dissolution, with the subsequent effect on children (Obergruber (2016)). We use the religious affiliation of the PMK and the cultural group the PMK identifies him/herself with, to explore whether culture mediates the effect of the family structure on child performance.

We identify the religious affiliation of the PMK as Catholic, or non-Catholic to understand whether religion mediates the effect of family structure on the reading and math performance of children. It is not clear what the direction of the effect would be. Traditionally, one could expect Catholic families to avoid divorce, if it is perceived as a stigma, increasing the possibility of conflict around family dissolution. It is unclear if these traditional views are aligned with the way modern Catholics practice their religion. We introduce an interaction of religious affiliation with family structure to identify whether Catholic PMKs show a differential effect of family structure on children's performance.

In the NLSCY, PMKs are also asked to identify themselves with different ethnic/cultural groups. "To which ethnic or cultural group(s) did your ancestors belong?" respondents are offered different possible answers to which they answer "Yes" or "No". The first offered answer is "Canadian?", followed by "French?", successive answers (up to nineteen possibilities) cover the majority of traditional and new ethno-cultural groups arriving to Canada. Multiple affirmative answers are possible and the PMK can identify him/herself with several of these cultural groups. This structure complicates the construction of a precisely defined variable for cultural identity. We choose to distinguish between *Canadian* and *French* heritage because they may best reflect differences in social values that are mimicked by policy institutions as discussed in Beaujot et al. (2013). Moreover, although a substantial fraction of our sample (around 80%) identifies with more than one cultural identity, more than half the PMKs identify themselves with at least one of these groups

(Canadian or French). This makes these two groups of particular interest in terms of exploring heterogeneity.[18] To try isolating the effect of these two cultural identities on cognitive performance, we estimate regressions separately for those families where the PMK identifies him/herself as *Canadian* and those families where the PMK identifies him/herself as *French*, including an indicator for whether the PMK identifies him/herself with a unique cultural group.[19] Approximately one third of the *Canadian* responses correspond to a unique identifier, whereas a little under one fifth of the *French* responses do. The coefficient of this "unique" identifier is negative and insignificant in the Canadian heritage sample and significant, but small, for the French heritage sample in the VA models. It is worth noting that the distribution of respondents across provinces, Quebec versus Rest of Canada (RoC), is surprisingly even, with a 50/50 split among those with a Canadian identifier, and 63/37 distribution among those with a French identifier. Note that all our specifications include provincial and CMA indicators, so the coefficients are to be interpreted net of any provincial/CMA idiosyncratic effect (particularly differences in schooling systems). The characteristics of families by religious affiliation or cultural group can be found in Appendix Table *A*.11. In general, the three groups share similar characteristics with the exception of the proportion of PMKs who are Canadian born, which is smaller among Catholic families. In the math sample, the average household income is slightly higher in Catholic families than in other groups.

Table 1.3 shows that, consistently with the literature, single parenthood is associated with a significant decline in reading scores - between 11 and 20 points - but the impact is mostly similar between Catholic and non-Catholic PMKs (Arkes (2015)). We find, however, a strong and significant negative effect of single parenthood on math scores, between 14 to 18 points lower for non-Catholic families. However, here children in catholic, single parent families show an advantage relative to other children in single parent families. In fact, there is no difference between catholic children in single parent families and those

[18]The results are robust to slight modifications of the definition of Canadian heritage to include those who identify themselves as uniquely from "British", Scottish or "Irish", since these groups very rarely identify the PMK uniquely.

[19]Self-identification is an endogenous choice of the individual and correlated with unobservable characteristics affecting cognitive performance. We do not have a way to address this source of endogeneity, hence we opt to estimate the effect of family structure separately for the two groups.

in (catholic), intact families. For instance, using OLS estimates, the former group scores 2.4 points lower in math tests than the later (-16.16 + 13.74 = -2.42) and the effect is statistically insignificant. The results are qualitatively similar in the value-added and fixed-effect models.

Table 1.4 continues to document the disadvantage of children in single parent families, who score between 6 and 14 points lower reading scores than children in intact families. Results are quite robust, even in the FE model, which are similar although less precisely estimated. Most significantly, both cultural affiliations perform similarly in the tests.

The results for math scores are somewhat surprising, relative to those obtained for the whole sample. Recall that in general, non-intact families perform worse relative to intact families. In our sample of *Canadian* self-identified PMKs (column 7 in Table 1.4) we observe a similar pattern, with children of single parents/step families scoring 17/15 points below of children in intact families with the same heritage. However, among children of PMKs claiming *French* cultural affiliation (column 8 in Table 1.4), those in single parent households score 14 points below children in intact families, but children in step families score 11 points higher. These numbers are not precisely estimated, most likely due to small sample sizes, but the larger (and positive) estimates are robust through the OLS and VA. The coefficient is not positive in the FE specification, but it is substantially lower than that reported for the *Canadian* group. We interpret this result as suggestive that step families within the context of *French* cultural identification have an advantage to non-intact families of *French* cultural identification that it is not apparent among those claiming *Canadian* heritage.

Table 1.3: Effect of Family Structure on Academic Performance - by Catholic Affiliation

	Reading			Math		
	OLS	VA	FE	OLS	VA	FE
	(1)	(2)	(3)	(4)	(5)	(6)
Reading (t-1) or math (t-1)	-	0.58***	-	-	0.53***	-
	-	(0.03)	-	-	(0.03)	-
PMK - Catholic	-0.96	-0.59	-	-7.32**	-4.88	-
	(0.94)	(1.08)	-	(3.15)	(3.52)	-
Family structure						
Single parent	-19.58***	-12.95***	-11.25**	-16.16**	-14.35*	-18.01*
	(3.88)	(3.02)	(4.56)	(7.24)	(7.60)	(10.78)
Step family	-3.93*	-3.39	-4.61	-8.33	-3.41	-1.79
	(2.37)	(2.61)	(3.74)	(8.93)	(9.32)	(12.37)
Catholic*Single parent	-0.93	-5.22*	-2.05	13.74*	14.34*	20.17
	(2.11)	(2.72)	(3.43)	(7.07)	(8.67)	(14.64)
Catholic*Step family	2.99	1.62	0.65	2.90	1.60	-6.79
	(3.05)	(3.13)	(5.06)	(8.97)	(9.24)	(13.16)
PMKs' employment	YES	YES	YES	YES	YES	YES
Household Income	Indicators	Indicators	Indicators	Thousands	Thousands	Thousands
Previous family structure	-	-	-	YES	YES	-
Previous PMK's employment	-	-	-	YES	YES	-
Other child/PMK's characteristics	YES	YES	YES	YES	YES	YES
R-squared	0.14	0.44	0.83	0.65	0.61	0.87
Number of observations	3924	1962	-	6681	4454	-
Number of children	-	-	1962	-	-	2227

Note: Children who were in an intact family are the reference groups. Table descriptors are as in Table 1.1. The child longitudinal weights provided in the NLSCY are used in the analysis. Robust standard error values are in parentheses.

* Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table 1.4: Effect of Family Structure on Academic Performance by Cultural Affiliation

	Reading						**Math**					
	OLS		VA		FE		OLS		VA		FE	
	Canadian	French	Canadian	French	Canadian	French	Canadian	French	Canadian	French	Canadian	French
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Reading (t-1) or math (t-1)	-	-	0.58***	0.60***	-	-	-	-	0.47***	0.67***	-	-
	-	-	(0.05)	(0.06)	-	-	-	-	(0.05)	(0.04)	-	-
Family structure												
Single-parent family	-6.29**	-12.28***	-11.51**	-13.98***	-11.83	-10.00	-17.09**	-13.95	-16.41**	-17.67*	-29.25***	-26.67
	(2.54)	(4.44)	(4.70)	(4.52)	(8.82)	(6.82)	(8.67)	(10.40)	(8.65)	(9.96)	(11.12)	(16.21)
Step-family	-1.05	-1.12	-3.03	-1.73	-8.12*	1.82	-15.40	10.70	-9.80	13.26	-25.27*	-13.18
	(2.33)	(2.19)	(2.35)	(1.98)	(4.55)	(3.67)	(11.96)	(14.04)	(11.71)	(13.40)	(15.20)	(19.46)
PMKs' employment	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Household Income	Dummies	Dummies	Dummies	Dummies	Dummies	Dummies	('000)	('000)	('000)	('000)	('000)	('000)
Previous family structure	-	-	-	-	-	-	YES	YES	YES	YES	-	-
Previous PMK's employment	-	-	-	-	-	-	YES	YES	YES	YES	-	-
Other child/PMK's information	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.20	0.23	0.45	0.50	0.83	0.84	0.65	0.64	0.59	0.65	0.87	0.88
Number of observations	1580	1070	790	535	-	-	2907	1860	1938	1240	-	-
Number of children	-	-	-	-	790	535	-	-	-	-	969	620

Note: Children who were in an intact family are the reference groups. Table descriptors are as in Table 1.1. The child longitudinal weights provided in the NLSCY are used in the analysis. Robust standard error values are in parentheses.

* Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

1.4 Discussion and Conclusion

We investigate the role of family structure on cognitive outcomes of children using the NLSCY. In agreement with the literature, we find substantial disadvantages in reading, but not math, scores among children in single parent families, relative to children in intact families. However, we find that single parenthood seems to affect boys more than girls in terms of their reading performance, but girls' math performance suffers more than that of boys when in step families, a result consistent with Sanchez et al. (2004). In addition, when looking into differential effects across cultural/religious affiliations of family structure on cognitive performance, we typically observe differential effects in math, but no reading scores. These results suggest that exploring the heterogeneity of children's performance responses to family disruption might be an important factor in assessing the benefits of programs aimed at helping children to cope with family disruptions.

Differential effects by gender could be related to parental allocation of time and resources by gender of the offspring (Bertrand and Pan (2013); Baker and Milligan (2016); Lundberg (2017)). If fathers spend more time with their biological male children and mothers with their biological female children, boys who have experienced divorce might have lower reading skills due to the absence of a (biological) father figure since the development of this skill requires much parental involvement. Further evidence suggests that boys' performances are more likely affected by their father absence than girls' (Autor et al. (2016); Lundberg (2017)). In addition, a mother's divorce or remarriage may limit the resources (both familial and economic resources) she previously devoted to the female offspring from a previous relationship. Therefore, girls who have experienced family instability might have lower math skills due to this lack of resources. Moreover, many studies indicate that girls have more emotional problems in step families than boys do and the long-term relationship of stepfather-son is better than that of stepfather-daughter (Clingempeel et al. (1984); Bray and Berger (1993); Lundberg (2017)). Thus, persistently living in a step family might disrupt girls' performances more than boys'.

Beaujot et al. (2013) suggests that institutional differences between Quebec and the Rest of Canada have contributed to differentials in fertility, family structure and parental

work patterns, all of which may contribute to explain the differential effects by French heritage (net of the well-known differences in common law rates in Quebec), in particular the unusual relative positive math performance of children in step families relative to children in French intact families. Similarly, the differential effect for catholic single parents suggests that catholic affiliation provides access to positive supportive structures.

The models discussed here take a static view on the effect of family structure, considering only whether the current family structure affects children's performances and not whether it is changes in family structure that might be the most disruptive for the child's (Wu and Martinson (1993); Amato (2000); Crosnoe et al. (2014); Obergruber (2016)). To take into account these aspects of family dynamics, in alternative specification we have looked at whether transitions in family structure also affect academic scores. We replaces SP_{it} and SF_{it} by a vector of transitions in family structure: (1) the child stayed in intact families in both adjacent cycles (reference group); (2) the child stayed in single-parent families in both adjacent cycles; (3) the child stayed in step-families in both adjacent cycles, and (4) the child experienced a change in family structure between two adjacent cycles.[20] The results are similar when we consider transitions in family structure as the main independent variable and can be found in Appendix (Table *A*.1, Table *A*.2, Table *A*.3 and Table *A*.4). These models support the idea that children's academic achievement depends heavily on the amount of resources, in either time or money, invested by the PMK. The role of PMK's engagement in the labour force on children's outcome has been the subject of much debate (Gruber (2004)). While additional income brought in by the working PMK may increase resources that can be devoted to the child's education reducing the stress of money pressures on the family, participation in the labour force will reduce the time that the PMK spends with the child, which has a beneficial influence on child measures of well-being. A back of the envelope calculation based on OLS results from Table *A*.1 (column

[20]The category "change in family structure" includes children who either moved from an intact family to a non-intact one, or moved from a single-parent family to a step family, or moved from a step family to a single-parent one. We combine these three cases due to the small sample sizes involved in these transitions. When analyzing reading scores, we use just "stay in non-intact families" and "change in family structure", due to the relatively small sample size available for analysis. We exclude an unusual scenario, children who transferred to an intact family from a non-intact family, because there were only a handful of observations for this scenario.

5), suggests that the PMK becoming non-employed is associated with an increase of 26.03 additional points in the math test, but an increase of $24,500 in household income – the average employment income in our sample - only improves math scores by 3.19 points.[21]

To finish we would like to remark that the fact that we find differential effects in Math, but less so in reading when looking at different groups, could be related to the age groups involved. Children aged 7 to 15 will likely react to family disruptions more strongly than younger children, or might be experiencing long term effects of family instability. It is possible that similar effects can be perceived in the reading scores of children as they grow older (Arkes (2015)).

[21] 26.03 is the coefficient of the indicator for the PMK's moving from employment to non-employment. The coefficient of household income is 0.13 (0.13*24.5=3.19).

Chapter 2

Marital Property Laws and Women's Labour Supply

2.1 Introduction

Since the 1980s, women's labour force participation has increased substantially, especially among married women.[1] In addition, the share of two-earner couples and the contribution of the wife to household income has also substantially increased.[2] These trends reflect interactions between labour supply and marital decisions evolving as a result of social and economic policies (e.g. divorce law and child-care service reforms) changing attitudes toward women at work and incentivizing employment. Moreover, who controls family resources affects not only consumption expenditures (Lundberg et al. (1997); Ward-Batts

[1] According to Statistics Canada Labour Force Survey data (LFS), the labour force participation (LFP) rate among Canadian women aged 15 years and older increased by about 10 percentage points (from 48.5% in 1978 to 58.1% in 1998) over the two decades following the start of the first workplace and family reforms. The LFP rate of married women increased by 15 percentage points (from 47.1% in 1978 to 62.3% in 1998), while the rate (already high) increased much less among divorced/separated women (from 60.3% in 1978 to 64.6%in 1998).

[2] The proportion of two-earner couples has increased from 52.1% to 59.8% and the wife's contribution from 26% to 32.8% between 1979 and 1998 (Chiappori et al. (2005) based on US data from the BLS). In Canada, the fraction of two-earner families in Canada was 45.09% in 1985 and 54.68% in 1995 from our calculation using the LFS data.

(2008)) but also each spouse's time allocation (Schultz (1990)). By creating laws and policies affecting the distribution of resources between men and women, the government has the potential to promote outcomes that help to reduce women's entry into poverty and improve well-being inside and outside marriage (Smock et al. (1999); Bedard and Deschenes (2005)).

In this paper, we study the effect of a redistributive divorce law on the labour supply of married women and on couples' marital decisions in Canada. The 1989 amendment of the Civil Code of Quebec was made to favour economic equality between spouses by imposing an equal division of the family patrimony (family house, vehicles and the spouses' retirement savings). This change created an unexpected shift in the bargaining power of the spouse with relatively lower investment in the family assets, typically the wife.[3] The potential increase in the share of the family assets at divorce associated with the redistributive change could lead to a reduction the labour supply of married women, especially among long-term married couples more likely to have accumulated family assets. The redistributive change is also likely to impact the marital decisions of couples already married or thinking about marriage as the unexpected bargaining power shift may have created unresolvable tensions or changed expectations about the financial implications of investing in a marriage.

We use a difference-in-difference approach and exploit information on female labour supply and marital status from the Canadian Labour Force Survey data to analyze outcomes before and after the reforms in Quebec, relative to other provinces. Our main research question applies to three outcomes: Did the change in the redistribution of resources within couples influence 1) the labour force participation and hours of work of married women, 2) divorce transitions, and 3), the marital decision of young and never married individuals regarding whom to marry.

[3] According to the Canadian Census in 1981 and 1986, the average contribution of the husband to family income was 70.20% (48.74% corresponds to labour income and 21.46% to non-labour income). In the 1990s, the average contribution of the husband to family income only reduced to 64.29% (40.90% corresponds to labour income and 23.39% to non-labour income) so the contribution of the wife increased but the husband's contribution still represented the majority of the family wealth. Regarding house ownership by gender among couples, 94.14% of house owners were men and only 5.86% were women in the 1980s. In the 1990s, 89.51% of them were men and 10.59% were women.

The period of the Quebec marital property law change is interesting because over the mid 1980s to mid 1990s, women's involvement in the workplace was rapidly growing. On the other hand, finding the ideal dataset covering that time period is challenging. The Labour Force Survey (LFS) data provides demographic and labour market information over several years of data covering the pre- and post- treatment periods. However, the question related to marital status does not distinguish marriage from common law unions until the mid 1990s which is after our main period of study. The distinction is available in the marital status question of the Canadian Census data but the information is available over only two years of the pre-intervention period (1981, 1986) leaving insufficient variations to exploit in a DiD estimation setting. We perform our main estimations using the LFS data but use the Census data for additional checks and conclude that our results are unlikely to be driven by the inclusion of common law couples.[4]

An advantage of the LFS data is that it contains detailed demographic and labour market information for a representative sample of Canadian households that we exploit to address our research questions. We use information on home ownership and education of each spouse to further analyze whether the effect of the Quebec marital property law change more strongly impacted the labour supply of married women for couples with greater assets (home owners as opposed to renters) and of married women with lower earnings potential (such as less education) suggesting a weaker bargaining position prior to the law change. We also take advantage of the panel format of the LFS data to measure the dynamics of divorce transitions of couples married before and after the law change. We use information on age and the age of a couple's children whenever relevant to further identify long-term couples more likely to respond to the policy change. The household format of the LFS allows us to compare the profile of each member of the household to estimate the extent of assortative matching among newly married couples. Finally, we employ additional selection criteria to address possible confounding effects coming from other policy changes that took

[4]While the literature notes a greater incidence rate of common law unions in Quebec in the mid 1980s relative to other provinces (Statistics Canada (1997); Le Bourdais and Lapierre-Adamcyk (2004)), the trends in the rate of incidence of common law unions are in fact very similar before the mid 1990s and only started to change in Quebec relative to the rest of Canada in the later part of the 1990s. Our results on the other hand show that the significant labour supply impact of the Quebec marital property law is found in the earlier part of the 1990s.

place in Quebec around 1989 (e.g. an amendment to the social assistance policy, a new family allowance policy and a parental wage assistance program). Our results are robust to these checks as well as a falsification test based on an analysis of the Quebec law change on single women for whom a labour market response to the Quebec marital property law change is not expected.

The literature on the economics of the family is broad ranging from theoretical modelling of family decisions to empirical investigations of societal and legal determinants of marriage and divorce rates. The collective bargaining theory of marital decisions emphasize the importance of an intra-household sharing mechanism and distribution factors that impact each spouse's labour and consumption decisions within the household (Manser and Brown (1980); McElroy and Horney (1981); Chiappori (1988); Chiappori (1992); Browning and Chiappori (1998); Chiappori and Ekeland (2001); Chiappori et al. (2002)). In these models, a wife's labour supply is predicted to decrease when her bargaining power rises, where bargaining power is determined by human capital investments, ownership of assets (non-labour income), social networks, and by redistributive family laws. For example, reforms in divorce or marital property laws that redistribute household assets (or the future stream of income from such assets) in favour of one spouse (usually women), raise the spouse's bargaining power thereby reducing their labour supply (Agarwal (1997); Chiappori et al. (2002)).

The empirical literature on the economics of the family that studies the link between marital property divorce laws and female labour supply is relatively small and focused on the US (Peters (1986); Parkman (1992); Gray (1998); Stevenson (2008); Voena (2015)). A few studies have analyzed marital property reforms in other countries (Kapan et al. (2008); Brassiolo (2013); Ziparo (2017)). Overall, and especially among the more recent studies[5], the results generally support the collective model's prediction that a redistributive divorce

[5]Among the earlier studies that have investigated how the adoption of unilateral divorce influences women's labour supply in the United States, Gray (1998), estimating data at two points in time, finds that a wife's labour supply increases with her increasing bargaining position (as measured by the adoption of the unilateral divorce law), which is inconsistent with the prediction of the collective model. Stevenson (2008), however, criticized Gray's results emphasizing the idea that variations in bargaining power within the household might be captured by cross-states variations in property division rules than the adoption of unilateral divorce.

law favouring one spouse, by increasing her bargaining power within the household, reduces her labour supply. In the US, Voena (2015) explores panel data on married women who stayed married throughout the sample period and finds that their employment declines in states where the unilateral divorce imposes equal division of property and the intra-household bargaining power shifts to their benefit. Similarly, Kapan et al. (2008) and Brassiolo (2013) analyze reforms in property division regimes in England and Wales, and Spain, respectively, applying a difference-in-difference methodology to panel data. The empirical results in both studies show that labour supply decreased for wives who married before the policy changes and stayed married afterwards, when the property division regime became favourable to them. It is also worth noting that the work disincentive effect in these three studies is estimated shortly after the reform, but long-term effects may be different (Ziparo (2017)). Moreover, divorce reforms may have differential impact on couples' decisions depending on marriage duration as divorce risk declines with increasing returns from marriage investments (Simard-Duplain (2018)). We also hypothesize that a redistributive divorce law is likely to have stronger (likely short-term) effects coming from unanticipated wealth changes resulting from an equal sharing rule among more mature marriages whose accumulated assets are large. In Canada, Ligon et al. (2003) analyzed the association between the matrimonial property laws and female suicide. They find that the reforms, reduced married women's suicide. To our knowledge, there has been no empirical economic investigations of the impact of the 1989 Civil Code amendments in Quebec on women's labour supply.

Our study complements the literature in three ways. First, we test whether the Civil Code reform in Quebec lead to a reduction in the labour supply of married women as a result of increased bargaining power consistent with the prediction of the collective model of household bargaining. In the Canadian context, we are able to isolate the impact of the marital property regulations determined at the provincial level from the no-fault divorce law that was adopted nationwide. We exploit a unique change in the marital property law that took place only in Quebec and no other provinces thereby allowing us to differentiate the time trends from the law-specific effects. Second, the rich information provided in our data allows us to further study the bargaining power implications of the redistributive divorce

law by further estimating the impact of Quebec's reforms by the educational attainment of the wife and property ownership of the couple. Third, we emphasize selection issues associated with any analysis of the impact of a matrimonial regime amendment on the labour supply of married women who stayed married after the reform by estimating the impact of the Quebec Civil Code reform on marital decisions and on measures of assortative mating. Family law reforms not only influence the decision to marry or divorce, they are also likely to affect couples' decisions of whom to marry by inducing people to marry a partner with a similar background (assortative matching). Some studies have explored whether couples show similarity in educational attainment and cultural background in the United States (Mare (1991); Kalmijn (1994); Pencavel (1998); Watson et al. (2004)).[6] Our study adds to this literature by exploring whether a law change towards more equitable sharing of resources among spouses at dissolution increases the likelihood that individuals with the same financial profile will decide to marry. To our knowledge, in Canada, no literature has exploited the exogeneity of legislation changes to analyze the impact of these law reforms on people's decisions of whom to marry.

The remainder of the study is organized as follows: The next Section presents an overview of the literature and the institutional background pertinent to the present study and question. In particular, Section 2.2.1 reviews the literature on household labour supply and family laws, and Section 2.2.2 describes the marital property law in Quebec as well as the rest of Canada. Section 2.3 explains the data, measurements and provides descriptive statistics. Section 2.4 presents the methodology used in this paper as well as results. Section 2.5 concludes the work and discusses future steps.

[6]These measures include the differential of education, age, cultural background, political orientation, and emotional personality. Kalmijn (1994), Pencavel (1998), Watson et al. (2004) find that couples have shown similarity in educational attainment since the 1980s. Mare (1991) indicates that this fact was also true even before the 1980s using five decades data. Moreover, Watson et al. (2004) suggest that newlyweds have also shown significant similarity in other attributes such as age, cultural background, and political orientation.

2.2 Literature and Institutional Background

2.2.1 Theoretical and Empirical Studies

The significant growth in labour force participation and post-secondary education of women over the last decades strengthened their influence over economic decisions within the household. In parallel, the modelling of intra-household decision-making developed rapidly; moving away from the traditional unitary model which assumes common preferences and single pooling of resources, the models introduced mechanisms reflecting the sharing and distribution of resources within the household and in particular, the concept of a couple's bargaining power (Thomas (1990); Hoddinott and Haddad (1995); Lundberg et al. (1997)).[7]

Because the internal allocation process of the intra-household resources among family members cannot be identified under the single decision-making unit assumption of the unitary model (Chiappori (1992)), alternative multi-agent household models have developed in which household members' preferences depend on each other. Manser and Brown (1980) and McElroy and Horney (1981) developed the cooperative bargaining model based on Nash bargaining theory in which husbands and wives have heterogeneous utility functions that depend on their own consumption and leisure, as well as on shared household public goods. They cooperate in intra-household decisions regarding the labour market, consumption, and the sharing of public goods.

The collective model generalizes the mechanism behind the cooperative bargaining model (Chiappori (1988); Chiappori (1992); Browning and Chiappori (1998); Chiappori and Ekeland (2001); Chiappori et al. (2002); Blundell et al. (2007)). The model relies on the assumption that households' decisions are Pareto-efficient and the idea that given preferences that can either be "egotistic" or "caring", it is possible to define a sharing

[7]For example, Lundberg et al. (1997) reject these hypotheses based on analyzing a 1979 child benefit policy reform in the United Kingdom that changed this child financial subsidy recipients from fathers to mothers. They find that this income redistribution induced families to spend more on women's and children's clothing, while less on men's clothing. These findings suggest that wives usually place more weight on their children and families' expenditures than husbands do.

rule identifying how household ressources are allocated to household members.[8] The decision process involves two stages: first, all household members decide a "sharing rule" to share the household non-labour income, according to factors such as the wage rate, non-labour income, and their attributes; second, each member individually chooses his/her own labour involvement and consumption subject to the corresponding budget constraints and the sharing rule.

Additionally, the "distribution factors" introduced in the collective model framework permit an analysis of the influence of the intra-household decision-making in the presence of exogenous shocks generated by quasi-natural experiments such as legislation changes (Chiappori et al. (2002); Kapan et al. (2008))[9]. The collective model predicts that a wife's participation in the labour market decreases if she gains more intra-household bargaining power. The same prediction is also found in the dynamic version of the collective model presented in Voena (2015).[10]

The empirical literature that exploited the exogeneity of family-related policy changes (enhancing women's bargaining position within a marriage and their financial welfare after divorce) investigated the impact of these law reforms on women's labour supply (Peters (1986); Parkman (1992); Gray (1998); Genadek et al. (2007); Stevenson (2008); Kapan et al. (2008); Brassiolo (2013); Voena (2015); Ziparo (2017)). Overall, the results are generally supportive, especially among the more recent studies, of the collective model's prediction that a redistributive divorce law favouring one spouse, by increasing her bargaining power within the household, reduces her labour supply.

In the U.S., several researchers explore the impact of the adoption of unilateral divorce

[8] Under the egotistic preference, a person's utility only depends on his/her own consumption and leisure. In contrast, under the caring assumption, a person's preference depends on both his/her own and the spouse's utility (Chiappori et al. (2002)).

[9] Chiappori et al. (2002) and Kapan et al. (2008) define the "distribution factors" as any exogenous variables that can influence the intra-household decision process without affecting individuals' preferences or budget constraints.

[10] The collective model predicts that a wife decreases her labour supply (increases her leisure) if she gains more intra-household bargaining power. It is worth noting that a wife's leisure is defined by economists as non-labour time which includes all unpaid activities such as (unpaid) household productive work as well as leisurely activities. A decrease (increase) in a wife's labour supply does not necessary mean an increase (decrease) in her leisurely activities (Gray (1998)).

on women's labour supply (Peters (1986); Parkman (1992); Gray (1998); Chiappori et al. (2002); Genadek et al. (2007); Stevenson (2008); Voena (2015)). Some early studies find a positive association between the bargaining power and wives' labour supply (Peters (1986); Parkman (1992); Gray (1998)). For instance, Peters (1986) and Parkman (1992) indicate a positive impact of the unilateral divorce law on female labour force participation. Using data at two points in time, these results have been questioned by Gray (1998) who first finds an insignificant impact on women's labour supply as a result of this unilateral divorce law, without controlling for the marital property law in each state. After the marital property laws have been taken into account, he finds that married women in the community-property states, which strengthened wives' rights, are more likely to increase their labour supply; while wives in the common-law states, which weakened married women's rights, are more likely to decrease their labour supply[11]. This positive relationship is inconsistent with the prediction of the theoretical models[12][13].

In contrast, a more recent study by Voena (2015), found a negative relationship between the bargaining power and wives' labour supply. Exploring panel data with longer time periods compared to that of previous literature, Voena (2015) finds a decline of women's employment due to the unilateral divorce in equal division of property states, where the intra-household bargaining power shifts to their benefit. This finding is consistent with predictions by the collective model[14].

[11] In the community-property states, property accumulated during marriage is considered as community property. In contrast, in the common-law states, property accumulated during marriage by each spouse is his/her own property.

[12] Gray (1998) explains this contradiction with a shift in their allocated time from home production to the labour market. He indicates that a woman's non-labour time could consist of two parts: leisure and home production hours. Under this assumption, when her bargaining power increases, she will allocate more time to the labour market from her home production hours, rather than from her leisure time.

[13] Stevenson (2008), however, has revisited this research and criticized the results in Gray (1998), indicating that the effects of the unilateral divorce law on wives' labour supply is independent of the property division rules in the state. Stevenson (2008) has pointed out the omitted variable bias and potential problems of coding states by their property division regimes in Gray (1998) and indicates that married women increased their labour supply after the adoption of the unilateral divorce law, regardless of the marital property laws. Genadek et al. (2007) also suggest that the effect of the unilateral divorce law on wives' labour supply is independent of the property division rules in the states through analyzing the effects of this law change on married mothers and non-mothers' labour supply.

[14] Chiappori et al. (2002) also find that married women reduced their labour supply when the divorce

Three studies focus on marital property division law reforms in in France, England and Spain (Ziparo (2017); Kapan et al. (2008); Brassiolo (2013)). The legal changes were similar in all three cases in that the reforms were intended to insure a more equal division of assets at dissolution of the marriage. In France, it was done by reforming the default matrimonial regime of the country. In Spain and England, it was done by ruling over the default regime (of separate ownership of property) by entitling the financially weaker spouse (typically the wife) to an economic compensation that reflected a more equitable sharing of the assets acquired during marriage in case of a divorce.

In France, the change took place in 1966 through a reform of its matrimonial regime (the "universal community" regime) by eliminating the husband's right to manage the separate property of his wife and limiting his right and power to manage the common assets. The new legal regime automatically established upon marriage included personal and real assets acquired by the spouses during the marriage. The new default regime (in the absence of any marital contract) is called the partnership of acquests. In Spain, the legal change took place in Catalonia in 1993 and modified the existing default property division regime (the separate property regime where property is divided based on which spouse owns the legal title) at divorce to introduce an economic compensation to the spouse who has financial disadvantages.[15] In England, a change towards equal division of assets was implemented in 2000 following a landmark decision by the House of Lords (white v. White) where the default regime was based on the principle of separate ownership of assets.

Note that Ziparo (2017) does not find a significant negative employment effect when comparing the labour supply responses of women married following the matrimonial regime reform in France compared to women married before the policy changes. However, his study points to the different timing at which the pre- and post-reform impacts were measured. The work disincentive effect found in the other studies (Kapan et al. (2008); Brassiolo

laws enhanced their rights with the functional-form model in the collective model they developed.

[15]The policy reforms to the separation of property regime in Catalonia were the following: in 1993, the financially weaker spouse would receive an economic compensation in the event of a divorce; in 1998, marital contracts could include marital property provisions when a marriage ends. The empirical results indicate that wives' labour supply reacted in the opposite way under these two reforms: it decreased when the first change improved wives' bargaining power, but increased after the second change, when the scope of the marriage contract canceled this improvement.

(2013); Voena (2015)) is estimated shortly after the reform, but long-term effects may be different.[16] In addition, divorce reforms may have differential impact on couples' decisions depending on marriage duration as divorce risk declines with increasing returns from marriage investments (Simard-Duplain (2018)). We also hypothesize that a redistributive divorce law is likely to have stronger (short-term) effects coming from unanticipated wealth changes resulting from an equal sharing rule among more mature marriages whose accumulated assets are large.

Furthermore, Frémeaux and Leturcq (2013) note in their analysis of the evolution of the matrimonial regimes in France that while the adoption rate of the default regime of the partnership of acquests newly implemented in 1966 increased slowly over the following two decades to become the regime chosen by the majority of married couples, the progression slowed down afterwards.[17]

Similar developments in matrimonial regimes happened in Quebec as the civil code of Quebec was largely inspired by the French civil code. On the other hand, family law in the other provinces of Canada is governed by common law. In the next subsection, we present details regarding the differences in the matrimonial regimes in Quebec and the rest of Canada and the different timing of the reforms.

In general, comparing the context of the changes just described in France, the UK, Spain and the US with the Quebec amendment of the civil code, the Quebec initiative arose in the late 1980s, two decades after and separately from the no-fault divorce law implemented throughout Canada (implemented in 1968). It was also two decades after the first reform of the matrimonial regime in Quebec changing the default regime from the "universal community" regime restricting the power of decision of the wife to the more egalitarian regime of the partnership of acquests (implemented in 1970). The initiative

[16] Kapan et al. (2008) show that a property division regime reform in England and Wales, by giving a greater proportion of the total assets to the disadvantaged spouse, negatively impacted the labour supply of wives. Brassiolo (2013) examined two changes of the separation of property regime in Catalonia using a difference-in-difference approach and found similar negative employment outcomes for wives.

[17] The authors offer two reasons: between 1990 and 2010, the marriage rate declined as common-law unions increased and the choice of the matrimonial regime based on the separation of ownership among married couples gained in popularity.

that lead to the 1989 amendment initially came from a report submitted by the Conseil du Statut de la Femme to the Quebec government (report written by Mailloux and Olivier (1986)). Concerns were raised that a large proportion of married couples had not adopted the default regime of the partnership of acquests more likely to protect the spouse with fewer assets and wealth invested in the marriage and were instead married under the regime of separate ownership of property (about 52% of married couples over the 1971-1985 time period, annex 1 of the report). The amendment when in effect, applied to all married couples irrespective of the matrimonial regime chosen by the couple or when they got married and likely affected more strongly couples with the conventional regime involving few commonly own wealth and acquests.[18] In Canada, there has been no empirical economic investigations of the impact of the 1989 Civil Code amendments in Quebec on women's labour supply.

Regarding the question of whether family-related law reforms affect individuals' marital decisions as well as the issue of assortative matching, some researchers have explored the influence of adopting unilateral divorce law or no-fault divorce law on divorce rates (Peters (1986); Allen (1998); Gray (1998); Friedberg (1998); González and Viitanen (2009); Brassiolo (2013)). Peters (1986) and Gray (1998) indicate that the adoption of unilateral divorce laws in the United States does not increase divorce rates. This finding is consistent with the Coase Theorem which suggests that the likelihood of divorce should be similar under either mutual consent or unilateral divorce laws if spouses can transfer resources to each other with insignificant cost (Gray (1996)). However, Friedberg (1998) has suggested that this legal shift in the United States increases individuals' likelihood of divorce. Allen (1998) and González and Viitanen (2009) also find this growing effects on divorce rates due to the adoption of no-fault divorce law in Canada and Europe, respectively. Brassiolo (2013) has analyzed an unexpected reform on marital property division in the event of a divorce in Spain. This study also suggests that this reform, which allows women to gain more bargaining power within marriage, has increased the divorce rate. Our paper investigates this question using Canadian 6-month panel data to more closely estimate how

[18]There was an 18 months period from July 1989 until December 1990 during which couples married before July 1989 were able to opt out of the amendment. By October 1990, only about 2% of married couples had opted out (Le Soleil (1990)).

the Quebec redistributive divorce law affected individuals' marital status transitions. Many researchers have analyzed the issue of assortative matching, using various measurements (e.g., the differential of education, age, cultural background, political orientation, and emotional personality), to indicate the level of similarity between spouses in the United States (Mare (1991); Kalmijn (1994); Pencavel (1998); Watson et al. (2004)). Our study add to this literature by exploring whether a law change towards more equitable sharing of resources among spouses at dissolution increases the likelihood that individuals with the same financial profile decide to marry. According to our knowledge, in Canada, no literature has exploited the exogeneity of legislation changes to analyze the impact of these law reforms on people's decisions about whom to marry.

2.2.2 Marital property laws in Canada

In Canada, the marital property law in each province was reformed during the middle of the 20th century. Table *B*.1 in the Appendix presents the marital property act in each province in 1989 (the year of the change in Quebec). Note that the titles of the marital property laws are different across provinces; For example, in Quebec, this law is called "family patrimony rules", however, Ontario uses "Family law Act" as the title. Each of these laws has been amended several times by its own provincial government.

Marital property law at Divorce in Quebec before and after 1989 Act

From Table *B*.1 in the Appendix, we can see that, in Quebec, the 1989 Act amended the Civil Code to favor economic equality between spouses. First, this amended law created a concept of "family patrimony" and specified which kind of property should be included in this creation. Properties included in the family patrimony are (1) The houses where a family is living (2) Objects in the family's homes for furnishing or decorating (3) The motor vehicles for family's use (4) The retirement savings accounts. Second, this amended law specified that the value of the family patrimony should be equally divided between spouses after deducting any debts in the event of a divorce, even if some of the property

does not belong to the common property. Third, any property excluded from the family patrimony is divided following the matrimonial regime rules, which is "partnership of acquests", or "separation as to property", or "community of property" depending on couples choices as well as the date of marriage (https://www.educaloi.qc.ca/en/capsules/matrimonial-regimes-rules-managing-and-dividing-property)[19].

Before the 1989 Act, all properties were divided following the matrimonial regime rules. The new act created an unexpected change in the intra-household financial situation of couples where one spouse, typically the wife, has little ownership of and is less equally invested into the assets contributing to the family patrimony. Despite the growing emancipation of women in the 1980s, by 1989, the husband was still typically the principal income earner, and the house was usually under the name of the husband (Gray (1998); Chiappori et al. (2002); Stevenson (2008)). According to the Canadian Census ((1981, 1986, 1991 and 1996), the average contribution of the husband to family income was 70.20% (48.74% corresponds to labour income and 21.46% to non-labour income) in the 1980s. In the 1990s, the average contribution of the husband to family income only reduced to 64.29% (40.90% corresponds to labour income and 23.39% to non-labour income) so the contribution of the wife slightly increased but the husband's contribution still represented the majority of family wealth.

Regarding house ownership among married people, only 5.86% were women in the 1980s. In the 1990s, only 10.59% were women.[20] As a result, wives with relatively lower

[19] "If a couple signed a marriage contract in front of a notary, their matrimonial regime is the one stated in the contract. If they did not sign a marriage contract in front of a notary, or if their marriage contract doesn't mention a matrimonial regime, then the regime depends on when they were married. Community of property used to apply automatically to all couples married before July 1, 1970 who had not chosen a matrimonial regime in a notarized marriage contract. Spouses today can still choose the community of property regime in a marriage contract. Partnership of acquests applies automatically to all marriages in Quebec since July 1, 1970 if the spouses did not choose a matrimonial regime in a notarized marriage contract." (https://www.educaloi.qc.ca/en/capsules/dividing-your-property-overview; https://www.educaloi.qc.ca/en/capsules/matrimonial-regimes-rules-managing-and-dividing-property; https://www.educaloi.qc.ca/en/capsules/matrimonial-regimes-community-property; https://www.educaloi.qc.ca/en/capsules/matrimonial-regimes-partnership-acquests)

[20] In the Canadian Census, respondents are only surveyed to answer whether the dwellings they are living in are owned by a family member. Therefore, the house ownership of a respondent himself/herself

earnings potential who accumulated less into the payment of the family house, the car and with little pension income (having invested less time in the labour market and more time into home production) are at a disadvantage during property division at divorce under the rules of matrimonial regimes that failed to consider economic equality between spouses. Additionally, these assets (family home, vehicle, and pension plan) usually contribute a significant portion of the total family property. In summary, having an equal share of the family property after divorce is expected to improve women's bargaining power and economic conditions.

According to the Statistics Canada Survey of Consumer Finances and Survey of Financial Security, the share of the value of the principal residence and other real estate assets as well as the vehicle in total family assets was 47.90% in 1984, the share of the value of financial assets (such as pension plans and stocks) in total family assets was 21.10%. In 1999, the share of the value of the principal residence and other real estate assets as well as the vehicle in total family assets was 45.80%, the share of the value of financial assets in total family assets was 31.10%.[21]

The new family patrimony act created an unexpected change in the intra-household financial situation of couples by imposing a particular definition of the family patrimony to be equally shared. It applied to all married couples irrespective of their chosen or default matrimonial regime. Even for couples under the default partnership of acquests who already commonly shared their house and any other assets acquired during the marriage, the unexpected change they likely faced is the automatic sharing of the pension benefits which before the 1989 amendment were considered own property.

is not clear. We use the information regarding whether a respondent is the primary household maintainer to proxy his/her ownership.

[21] The other categories included in total family assets are equity in business ("the estimated amount the respondent would receive if the business were sold, after deducting any outstanding debts to be paid" (Statistics Canada (2012))) and other non-financial assets.

Marital property laws at Divorce in the rest of Canada

In 1989, the other (common-law) provinces of Canada had introduced the concept of equal division of the family property in their marital property laws for several years already (Appendix Table *B*.1). Before their reforms, the existing matrimonial regime, the "separation of property",[22] implied that individuals kept their own property after divorce; however, the property accumulated during the marriage was frequently placed under the husband, who was usually the principal income earner in the family.

From Appendix Table *B*.1, we see that the basic idea of the equal sharing of family property is similar across provinces, even though the regulations in each province vary in details such as the right to share the family home, the concept of family property and the division of pre-marriage property. For example, even though the presumption of property division at divorce is equal distribution, the marital property law in Alberta does not specify how to share the family home directly and clearly. Additionally, Ontario and Newfoundland and Labrador laws describe how to share the family home in the case when the family home belongs to the pre-marriage property, but the other provinces do not. Ontario, Nova Scotia, Newfoundland and Labrador amended their marital property acts around 1989, and the others did not.

In order to conduct a treatment analysis in Quebec using a differences-in-differences model, we need to find a comparison group of provinces such that marital property laws have not been updated or replaced around 1989. As a result, Ontario, Nova Scotia, Newfoundland and Labrador are excluded. We use the remaining six provinces as the control group since they have relatively similar marital property regulations[23]. The marital property laws of these provinces defines the equal rights and responsibilities for each spouse. If the marriage ends, the family property will be divided in half along with the debts and

[22] "Separation of property is the legal regime which now applies in all provinces, meaning that each spouse fully owns whatever he or she purchases. However, ownership is often uncertain over time or if a joint bank account served as the source of the purchase."(http://www.duhaime.org/LegalResources/FamilyLaw/LawArticle-35/Matrimonial-Property-Law-in-Canada--A-Primer.aspx)

[23] We also conducted a differences-in-differences analysis using all provinces except Quebec for the comparison group as a robustness check. The results, not reported here, are qualitatively similar to those that exclude Ontario, Nova Scotia, Newfoundland and Labrador.

liabilities. We can therefore compare the impact of the adoption of equal sharing of the marital property in Quebec on the labour supply comparing the changes before and after the 1989 amendment and differencing out the labour supply trends of the comparison group of provinces who had already adopted a system of equal division of the marital property.

2.3 Data and Measurement

The data used in this paper comes from the monthly Labour Force Survey (LFS) over the period 1985-1995. We drop observations referring to the period between July 1, 1989, and Dec 31, 1990. During this period, couples married prior the date (July 1, 1989) could choose whether the new family patrimony rules would apply to them. They had until December 31, 1990 to opt out of the amendment. Therefore, we exclude this period from our sample in order to avoid confounding effects coming from couples' decisions to review their marriage contract. The pre-intervention years are 1985-1989 (until June of 1989) and the post-intervention years are 1991-1995. The LFS is a representative monthly household survey that provides detailed information on individuals' labour supply and marital status as well as several additional demographic characteristics.

Table 2.1 presents the summary statistics of the basic characteristics of the LFS (such as the proportion of all respondents in different marital status, the LFP rate, respondents' ages and education levels, etc.) for Quebec and the rest of Canada (with Ontario, Nova Scotia, Newfoundland and Labrador excluded), before and after the Civil Code amendment, separately. After comparing the summary statistics of these two groups in the pre-intervention periods, we can see that, on average, Quebec has a similar proportion of married/common-law couples and a slightly smaller proportion of divorced/separated people than other provinces. The proportion of single people is similar between these two groups. The average hours of work and the mean LFP rate in Quebec is slightly lower than those in other provinces. The proportion of female and respondents' age are on average very similar. Overall, we conclude that, before the Civil Code amendment, the Quebec sample shared attributes similar to those of the other provinces sample. Even though

there are some differences, they are not large in magnitude. The similarity of observations' attributes between Quebec and the control group in the pre-intervention period suggests that the parallel trends assumption discussed later in this subsection, might be satisfied in our model.

Table 2.1: Summary Statistics of Respondents' Basic Characteristics in Quebec and Other Provinces in Pre and Post Intervention Years

	Quebec				Rest of Canada (with Ontario, Nova Scotia, Newfoundland and Labrador excluded)			
	Before 1989		After 1989		Before 1989		After 1989	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Married/Common-law %	64.08	0.48	63.57	0.48	63.68	0.48	63.30	0.48
Divorced/Separated %	5.89	0.24	7.14	0.26	6.58	0.25	7.23	0.26
Single %	24.13	0.43	23.33	0.42	24.08	0.43	23.94	0.43
Female %	51.07	0.50	51.00	0.50	50.13	0.50	50.22	0.50
Age	41.52	16.84	42.85	16.73	41.50	17.45	42.66	17.34
High school or less %	68.34	0.47	55.60	0.50	63.81	0.48	52.20	0.50
First child 6 years or above %	33.40	0.47	32.22	0.47	31.26	0.46	30.97	0.46
No child %	57.48	0.49	59.06	0.49	59.41	0.49	60.65	0.49
Children under 5 years %	12.56	0.33	12.11	0.33	13.87	0.35	12.72	0.33
Labour force participation %	65.04	0.48	64.35	0.48	68.84	0.46	68.98	0.46
Hours of work (per week)	22.30	21.09	21.50	21.03	24.50	22.63	24.80	22.65

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

We restrict our sample to women aged 18 to 65 years to capture as many observations with valid information on both labour supply and marital status as possible in the women's labour supply analysis. In contrast, for the analyses of individuals' marital decisions and of potential assortative matching, we restrict our sample to individuals aged 18 years and above to ensure all respondents had reached the legally marriageable age. In these three analyses, we have imposed further conditions, described in Section 2.4, on our sample to better investigate our research questions.

For the measures of labour supply outcomes, we use women's labour force participation and the usual number of hours worked per week. To analyze the impact of the law change on divorce, we exploit the longitudinal 6-month panel format of the LFS data to

create monthly marital status transitions. Additionally, to analyze the potential assortative matching implications of the Quebec amendment, we use differences in educational attainment between spouses as our main interest by following the existing studies (Mare (1991); Kalmijn (1994); Pencavel (1998); Watson et al. (2004)) since individuals' education decisions are more likely took place before the law change. Moreover, peoples' education attainments are related to their earnings. Employing this measure as our outcome of interest allows us to explore whether the reforms induced people to marry a partner with similar financial status. Appendix Table *B*.2 presents the summary statistics for our sample of married/common law women based on the LFS data.

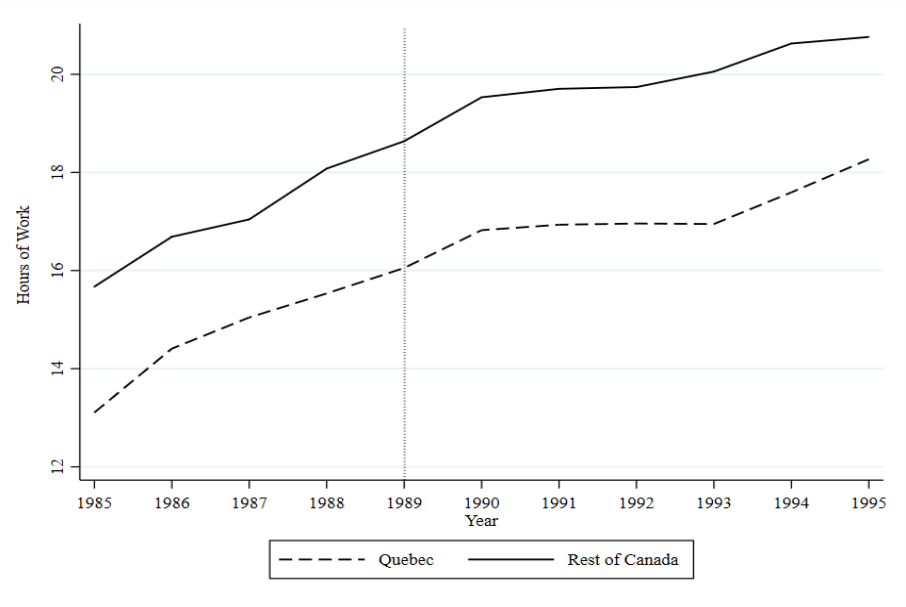
It should also be noted that the family patrimony rules in Quebec apply only to married couples, not common-law unions. Each partner in common-law unions usually keeps his/her own property and is responsible for his/her own debts after separation.[24] However, the marital status question in the LFS does not distinguish the two groups in the years studied. We will present robustness checks the estimations using alternative data coming from the Census in which married and common law couples are separately identified.

Table *B*.3 in the Appendix presents the differences-in-differences framework for the married women's labour-force analysis, and describes the treatment group (T) and control groups (C).

In differences-in-differences identification strategies, a parallel-trend assumption is required for consistency. Figure 2.1 and Figure 2.2 present the average hours of work and the labour force participation rate, respectively, of the women in the treatment group (women married/cohabited before 1989 in Quebec) and the control group (women married/cohabited before 1989 in the other provinces) from 1985 to 1995. From each graph, an upward trend can be seen in both the treatment and control groups, while the hours of work and labour force participation rate are higher in the control group. After comparing the trends in the outcome of interest between these two groups in the pre-intervention periods (LFS, 1985-1989), we might suggest that the parallel trend assumption appears

[24]The share of married couples versus common-law unions in Quebec as well as the rest of Canada is presented in Appendix Table *B*.7. In general, married individuals represent the majority of the population in a couple relationship.

Figure 2.1: Hours of Work among married Women, 1985-1995



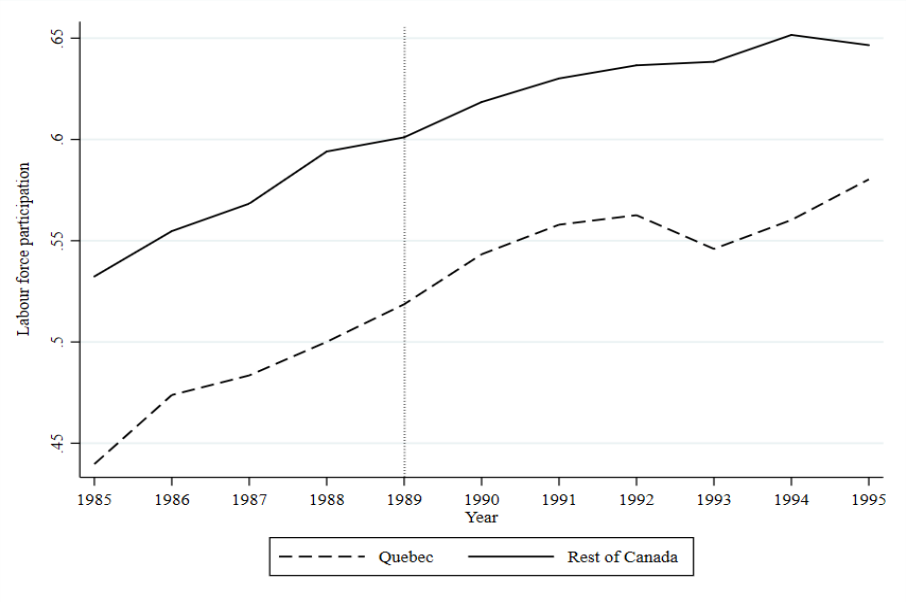
Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

to be satisfied. In addition, we also use Equation 2.1 to test whether the treatment and control groups have common trends in the pre-policy periods.

$$y_{ipt} = \alpha_0 + \alpha_1 Quebec_p + \sum_{j=1985}^{1989} \alpha_j year_j + \sum_{k=1985}^{1989} \alpha_k Quebec * year_k + \epsilon_{ipt} \tag{2.1}$$

We test the hypothesis that the coefficients of $Quebec * year_k$ are equal to each other (Test results are reported in Appendix Table B.4). The coefficients of $Quebec * year_k$, which indicate the potential anticipated effects among women in Quebec before the policy changes, are statistically insignificant suggesting evidence of parallel trends.

Figure 2.2: Labour Force Participation Rate among married Women, 1985-1995



Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

2.4 Analysis

2.4.1 Impact of the Quebec Family Patrimony Rules on Married Women's Labour Supply

In this section, we are interested in analyzing the impact of the Quebec family patrimony rules on wives' labour market behaviour. We use the changes in the family patrimony rules in Quebec as the treatment and the population of married women as the population susceptible to respond to the treatment and apply a differences-in-differences identification method using group of married wives in other provinces which did not experience changes in family patrimony rules over that time period as the control group.

In 1970, Quebec experienced a change in its matrimonial regime. For couples who married before July 1, 1970, the "community of property" was the default regime. After that date, the default regime became the "partnership of acquests". However, the "community of property" regime can still be chosen by couples today in a marriage contract. To insure that our sample of wives faced the same default regime at marriage throughout the sample period, we need to exclude couples whose matrimonial regime is the "community of property". Based on 1985 data from Quebec statistics, only 0.06% of couples were under the "community of property" regime that year (Mailloux and Olivier (1986)). This suggest that the exclusion of the couples under this regime is not a major sample selection concern.

More importantly for our analysis of the labour market response of married women before and after the 1989 law changes, we need to insure that our sample faced the same matrimonial property laws at marriage which implies that they all married before the 1989 law change.

Sample

The choice of sample is based on information regarding the duration or the year of the respondent's marriage. Identifying couples who married before 1989 for the pre-intervention periods (LES, 1985-1989) is straightforward. For instance, if a respondent's status is

indicated as "married" in these survey years, he/she automatically matches the rule of being married before 1989. However, selecting couples married before 1989 for the post-intervention periods is tricky without information on the year of the marriage or marriage duration. The 6-month panel format of the LFS is too short and cannot be used to estimate marriage duration. We proxy for duration by using information on the age of the couples' first child if the couple has children. The first child of a couple who married before 1989 will be five years of age or above by the time of the post-intervention survey years of 1991 and 1995.[25][26][27]

For wives without children, we calculated the average age of women without children who married before 1989 using the information from the General Social Survey (GSS), Cycle 5, 1990 and Cycle 10, 1995 because these two cycles of the GSS provide abundant details of respondents' marriages including age at marriage. Using wives' ages at marriage and their current age, we are able to figure out the date of their marriages and then select those who were married between 1970 and 1989 and have no children in their family. Based on this group of women, we calculated an average age of 40 in Cycle 5, 1990, and 51 in Cycle 10, 1995[28]. Therefore, we select wives without children aged more than 40 years for

[25]Note that this approximation (age of the first child) is only suitable for women in their first marriages. Women in the second or third marriages could have children from previous relationships. Therefore, the age of the first child cannot approximate the duration of the current marriages. On the other hand, according to the General Social Survey (GSS), Cycle 5, 1990, 89.49% of married women aged 40 years and above (an age group who are more likely to have children five years of age or above) are in their first marriages. Note also that children could be born when parents are living in common-law (prior to marriage). However, according to the GSS, Cycle 5, 1990, the proportion of women having children prior to their first marriages is only 7.38%.

[26]The retrospective nature of the GSS data allows us to distinguish whether a respondent's current marriage is his/her first as well as obtain his/her duration of marriage. However, we do not use this dataset in our study for two reasons. First, the small sample size of the GSS is a main limitation of conducting our research using the differences-in-differences method when the treatment group only focuses on a specific group of women in Quebec. Second, the potential recall bias problem of using the retrospective data has been addressed by many researchers (Horvath (1982); Sable (1999); Paull (2002)).

[27]We use measures that indicate the number of children in a specific age group in the LFS (e.g., the number of children between 0 to 5 years, the number of children between 6 to 14 years) to capture the age of first child in the household. Due to this categorical variable nature, we restrict our sample to married women with the first child aged 6 years or above rather than 5.

[28]Some women without children in 1990 may give birth in the next five years and exist from this group. Thus, the average age of this group in 1995 is higher than expected.

all post-intervention years. We also impose this restriction on all pre-intervention years to keep the pre-intervention and post-intervention samples as similar as possible. This age restriction also allows to exclude the group of married women who might be influenced by the amendment of the social assistance policy which took place in Quebec in 1989. This amendment improved the benefit of childless social assistance for individuals under 30 years who have no children living with them, which further affected their labour market behaviour (Lemieux and Milligan (2008)).

Our sample selection strategy serves an additional purpose which is to further identify the population most likely to be impacted by the treatment reflected in the 1989 Act. Because divorce risk declines over the course of a marriage (see Simard-Duplain (2018) for a detailed structural analysis of the dynamics of marital and labour supply decisions over the life cycle), a divorce reform may have weaker effects on more mature married couples who have optimized their choices of labour supply and marital status. However, the 1989 Civil Code amendment reflected an unexpected change in the redistributive divorce law and as a result, created a transitory (one-time change) and unanticipated wealth change which is expected to generate a labour supply response through a leisure-inducing income effect and the response is also expected to be stronger for older spouses who have accumulated assets.

Specification and Estimation

To estimate the effect of the family patrimony rules on the married women's labour supply, the differences-in-differences specification of this analysis is:

$$y_{ipt} = \alpha_0 + \alpha_1 After_t + \alpha_2 T_{ip} + \alpha_3 T_{ip} * After_t + \sum_n \beta_n X_{ipt} + \delta_t + f_p + c_{pt} + \mu_{ipt} \quad (2.2)$$

where y_{ipt} is either the number of hours worked by women or women's labour force participation. $After_t$ is the post-intervention periods' indicator, which is equal to 0 for survey years 1985-1989, and 1 for survey years 1991-1995. T_{ip} is the treatment group indicator. Therefore, our main interest, α_3, indicates the responsiveness of married women's labour

market behaviour to Quebec's family patrimony rules. X_{ipt} is a group of control variables: age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, and the age of their first children dummies[29]. We also include the province fixed effects (f_p), year-by-month fixed effects (δ_t), and province-by-time fixed effects (c_{pt}) in our model to control for some provincial and nation-wide changes, as well as the differential trends of female labour force participation.[30] The standard errors (μ_{ipt}) are clustered at the province-by-time level (Bertrand et al. (2004))[31][32].

At the extensive margin, we apply the linear probability model (LPM) as our baseline estimation. We also employed the Logit estimation as a robustness check. At the intensive margin, we use the OLS estimation as our baseline model. In our sample, a fairly large proportion of married women worked zero weekly hours (they are either out of the labour force or unemployed). Thus, we use the Tobit and Heckman models as a robustness check (Heckman (1977)). Additionally, we estimate the impact of the family patrimony rules on married women's hours of work using unconditional quantile (UQ) regression following Firpo et al. (2009))[33] We explore the effects of Quebec's family patrimony rules on hours of work per week for three different samples of married women according to the strength of their attachment to the labour force. First, we focus on the sample of all married women, which is the one used at the extensive margin (follow Angrist and Pischke (2009)). Second, the sample is restricted to married women who are in the labour force, either employed

[29]Including the age of their first children dummies can help us to control differential marriage/relationship duration among married women.

[30]The results are similar whether or not we include province-specific time trends.

[31]798 clusters: 7 provinces times 10 years times 11.4 months (The observations between July 1, 1989, and Dec 31, 1990, have been dropped.).

[32]Researchers have questioned the correlation across clusters of clustering on province-year pair (Cameron and Miller (2015)). Therefore, we estimate the standard errors clustered at different levels (cma-by-time and province-by-cluster). While the results are not shown to avoid lengthening the appendix (but available upon author's request), we find that the level of statistical significance of the results do not change across the various clustering methods. We also performed the two-step method in Donald and Lang (2007) as an additional robustness check and the results were also very similar.

[33]We used the Stata programs generously shared by their authors on Nicole Fortin's webpage at faculty.arts.ubc.ca/nfortin/datahead.html. The UQ approach has been used previously to analyze labour supply effects of policy changes in Schirle (2015) and Koebel and Schirle (2016).

or unemployed and more strongly attached to the labour force compared to the women in the first group. Third, we further restrict the sample to married women who have been employed 6 years or more (to insure they were employed before the policy changes and stayed employed afterwards). This group of women has the strongest attachment to the labour force. Estimating the impact of the family patrimony law change over this group of women who were employed before the law change remained employed throughout the period helps isolate the intensive margin response and eliminates any compositional effects coming from a change in married women labour force participation before and after the law change.

Note that we report coefficient estimates rather than marginal effect given the problems of calculating and interpreting the marginal effect of an interaction term in a nonlinear model have been discussed in many studies (Athey and Imbens (2006); Lechner et al. (2011); Buis et al. (2010); Puhani (2012); Karaca-Mandic et al. (2012)). As the authors point out, calculating the first derivative of the interaction term as the marginal effect can lead to a biased result when using a differences-in-differences approach(Buis et al. (2010)). Puhani (2012) and Buis et al. (2010) provide an alternative way to calculate the interaction effect and some tips of interpreting it, respectively.

Results

Table 2.2 indicates the treatment effects on married women's labour supply using Equation 2.2 at both the intensive and extensive margins. A full set of control variables described in Section 2.4.1 is included in each specification.[34][35]

At the intensive margin (rows 1-3), the OLS estimations (column 1) imply that the labour supply of married women in Quebec (subject to the family patrimony law change) has declined by 0.43 hours per week (not statistically significant) compared to those in the other provinces. When we restrict our sample to married women in the labour force, as

[34]Due to the 6-month panel nature of the LFS, only one observation (the first one) per individual is included in the model.

[35]In the Heckman selection model, we include the spousal education as the additional variable in the selection equation.

expected, this negative effect of the Civil Code reforms in Quebec on wives' work hours is stronger and significant. The estimated reduction in labour supply is 1.42 hours per week. Furthermore, when the sample is restricted to married women who were employed before and after the policy changes, the labour supply reduces by 0.70 hours per week significantly among this group of women. The magnitude of the hours adjustment is smaller among employed women with longer tenure.

The results of the Tobit (column 2) and Heckman regression (column 3) estimations are consistent with those in the OLS estimation. The UQ estimates (column 4) also indicate that, at the median, the impact of the Civil Code reforms in Quebec on wives' hours worked is strongest when we restrict our sample to married women in the labour force.

At the extensive margin (row 4), the results from the LPM estimation (column 1) and the Logit model (column 2) show that the family patrimony rules had no statistically significant effect on the probability of married women entering the labour force.

In summary, we find a statistically significant negative effect of the Civil Code reforms in Quebec on wives' working hours and the impact is consistent with the prediction of the collective model by Chiappori et al. (2002), which indicates that women will reduce their labour supply when the intra-household bargaining power shifts to their benefit.

Robustness Checks

As mentioned earlier, the family patrimony rules in Quebec apply only to married couples, not common-law unions but the marital status question in the LFS data does not identify separately couples who are married from those who are cohabiting. Since spillover effects of the Quebec marital property law change on cohabiting couples are possible, the labour supply effects of the law change we find could be driven by the women living in common-law unions. A few studies noted that the incidence of common-law unions is substantially higher in Quebec than in the rest of Canada (Statistics Canada (1997); Le Bourdais and Lapierre-Adamcyk (2004)). In Appendix Table *B*.7 we present summary statistics from the Census data for the years 1981, 1986, 1991 and 1996 based on the same sample selection rules as those we used with the LFS data for comparison. The demographic characteristics

Table 2.2: Family Patrimony Rules Effects on Married Women's Labour Supply

Intensive margin (Weekly hours worked): T*After	OLS	Tobit	Heckman	UQ Median	N
	Coefficient	Coefficient	Coefficient	Coefficient	
All married women	-0.43	-0.38***	-0.60	0.13	252796
	(0.27)	(0.07)	(0.39)	(1.91)	
Married women in the labour force	-1.42***	-1.57***	-0.99***	-0.67***	144952
	(0.31)	(0.33)	(0.29)	(0.24)	
Married women employed 6+ years	-0.70*	-0.71**		-0.14	64461
	(0.37)	(0.37)		(0.29)	
Extensive margin (Labour force participation):	LPM	Logit			
	Coefficient	Coefficient			
All married women	0.01	0.04			252796
	(0.01)	(0.04)			

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, the age of their first child dummies, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

are similar between the two datasets. We note as well the relatively higher rate of common-law unions in Quebec compared to other provinces.

We performed a differences-in-differences analysis using the Census data and estimating separately the impact of the Quebec marital property law change for married and common-law unions. The results however (not included but available from the authors upon request) were inconclusive because of the fact that having two data points for the pre-intervention period does not generate sufficient variations to allow precise and meaningful estimations.[36]

On the other hand, if we calculate the trends in the incidence of common-law unions and compare the pre-intervention and post-intervention periods (Appendix Table $B.8$), we see that the within trends in Quebec and the rest of Canada have evolved in a remarkably similar way. The rates increased by 2.62 ppt in Quebec and 0.51 ppt in the rest of Canada before 1989 and increased by 2.96 ppt in Quebec and 0.87 ppt in the rest of Canada over the 1991-1996 time period. In both cases, the trends have increased by about the same quantity (0.3 ppt) before and after the 1989 marital property law change. We therefore do not observe a relatively greater change in the common-law trends in Quebec compared to the other provinces around the year of the law change. We do however note a greater increase in the trend in Quebec between 1986 and 1991 compared to the rest of Canada. Many factors could explain the relatively steeper trend in Quebec during that time period including a reaction from new couples to the government imposing the definition of a family patrimony as well as its equal sharing at marriage dissolution. If our sample of married women includes a relatively greater proportion of women in common-law unions in Quebec relative to the rest of Canada as a result, we expect potential differences in labour supply behaviour between women in cohabiting couples and married women to be similar in Quebec and the rest of Canada.[37]

[36] The results showed estimates of the effect of the Quebec law change for both married and common-law union women that were of larger magnitude and with standard errors that were four to five times larger than the magnitude of the estimated standard errors based on the LFS data. This may not be surprising as small variations in the covariates create a large inverse matrix $X'X$ affecting simultaneously both the magnitude of the estimated betas and their standard errors.

[37] El Lahga and Moreau (2007) find using German data that married women on average work less than women living in common-law as they allocate more time in non-market domestic work. Our estimate reflecting the work disincentive effects of the law change would have been more negative if we had been

Furthermore, we performed an event study using the LFS data by estimating the impact of the marital property law change at the different post-intervention years. The results (presented in Appendix Table $B.9$) show that the estimated effects of the law change on the labour supply of married women are strong and statistically significant only in the first two years following the law change, a time period during which the incidence rate of common-law unions was not growing particularly more strongly in Quebec compared to the rest of Canada (from our previous trends analysis).

Overall these additional results suggest that the labour supply impacts found in Table 2.2 using the LFS data are unlikely to be driven by a change in the relatively greater incidence of common-law unions in Quebec compared to the rest of Canada.

Another concern relates to the possibility that other policy changes occurred in Quebec around 1989 that may have impacted the labour supply of married women. In particular, in the May 1988, Quebec province introduced a baby bonus program — the Allowance for Newborn Children (ANC) — under the Act Respecting Family Assistance Allowances (Milligan (2002)).[38] Moreover, in September 1989, the Quebec government announced its intention to provide 27 weeks of paid leave (in addition to the 15 weeks covered by federal maternity benefits) to parents who have three or more children and grant 34 weeks of unpaid paid parental leave Baker (1994)). Since these family policies potentially affected the fertility decisions of all families with and without children, our analysis needs to control for the presence of a newborn in addition to controlling for the couples' number of children. Appendix Table $B.10$ shows the results of estimations replicating the analysis done to produce the results of Table 2.2 but adding an additional control for the presence of a newborn. The results are very similar whether or not we control for the fact that women may have responded to the baby bonus and extended parental leave incentives.

able to exclude the cohabiting women from our sample.

[38] In Milligan (2002), the author has described the details of this program: "Payments under the ANC took the following form. Initially, families received $500 on the birth of their first child, $500 for a second child, and the first of eight quarterly payments of $375 (totalling $3,000) when a third or subsequent child joined the household. By 1992, the benefit grew to $500 for a first child, $1,000 for a second, and 20 quarterly payments of $400 (totalling $8,000) for a third or subsequent child". (Retrieved at http://www.cdhowe.org/pdf/milligan_backgrounder.pdf)

Also, new income and employment support programs were introduced in Quebec in 1988 and 1989 (Canadian Social Research Links (2014)). The programs targeted families with a spouse with a mental or physical condition limiting employment (See Canada, 1988. Bill S-3.1.1. for a description of the financial support program), or low-income families with at least one dependent child (See Canada, 1988. Bill S-3.1.1. as well for a description of the parental wage assistance program). To be eligible for the first program, one spouse has to be incapacitated and unable to work. To be eligible for the second wage assistance program, the family cannot own a property. We reran our estimations separately for the sample of married women who would not qualify to any of these two programs. In the first case, the estimations were done over the sample of married women with an employed husband (Appendix Table $B.11$) and in the second case, over the sample of married women of families who indicate being home owners (Appendix Table Table $B.12$).[39] In both cases, the results are very similar to our main results in Table 2.2. We conclude that the labour supply effects found in Table 2.2 are not driven by the financial support or the parental wage assistance programs.

An additional way to test for the validity of our differences-in-differences model is to perform a falsification test. Since the Civil Code reform was designed for married couples, single people in Quebec are unlikely to have been affected by the change in family patrimony rules. We can therefore impose a "false" treatment in 1989 for single women in Quebec. The identification, estimation method and results of this analysis are presented in Appendix Table $B.13$. As expected, the results show that single women in Quebec did not respond to the family patrimony rules, since the results are small and statistically insignificant in all the estimations.

Heterogeneous Effects

Next, we further explore the effects of the Quebec law change by considering possible factors by which the law change affected intra-household bargaining power: the potential

[39]The results based on home renters are not included because the sample size drop was too large for the results to provide any additional useful information.

returns to the wife's investments in the labour market, as well as its interaction with the accumulated property wealth (the size of the pie to be equally divided in the event of a divorce). We estimate the wife's potential returns to labour market investments using her education level. We proxy for the magnitude of the wealth associated with the property by using information on her household's property ownership.

Table 2.3 shows the impact of the family patrimony rules further interacted by the wife's highest level of education achieved (HSLess is equal to 1 if wives have a high school education or less, and equal to 0 if wives have post-secondary education) The differences-in-differences specification equation for this analysis is:

$$y_{ipt} = \alpha_0 + \alpha_1 After_t + \alpha_2 T_{ip} + \alpha_3 T_{ip} * After_t + \alpha_4 HSLess_i + \alpha_5 T_{ip} * HSLess_i$$
$$+\alpha_6 After_t * HSLess_i + \alpha_7 T_{ip} * After_t * HSLess_i + \sum_n \beta_n X_{ipt} + \delta_t + f_p + c_{pt} + \mu_{ipt} \tag{2.3}$$

In this case, α_3 indicates the potential impact of the family patrimony rules on wives' labour market behaviour who are more-educated, while the sum of α_3 and α_7 indicates the potential impact among less-educated wives. α_7 presents the differential impact between these two groups.

At the intensive margin, the results among all married women (rows 1-2), indicate that the decline of women's labour supply due to the Quebec reform found in Table 2.2 seems to be mainly driven by the more-educated wives. For instance, as mentioned, the effect for more-educated wives in Quebec is represented by the coefficient of $T_{ip} * After_t$. The effect for less-educated wives is given by the sum of the coefficients for $T_{ip} * After_t$ and $T_{ip} * After_t * HSLess_i$. In the OLS model (columns 1-2), the sum is -1.05 + 0.71 = -0.34 and statistically insignificant (SE 0.31), while the coefficient of $T_{ip} * After_t$ is negative and significant. The Tobit (columns 3-4) and Heckman (columns 5-6) estimates are qualitatively similar to the OLS estimates. In addition, the UQ estimation (columns 7-8) indicates consistent and stronger results at the median than those obtained with the OLS. This could be the case because a greater proportion of less-educated wives may not

be working and have no hours of work to adjust down from[40].

Among married women who are more strongly attached to the labour force (rows 3-6), the results indicate that the decline in working hours is mainly driven by the less-educated wives, consistent with the idea that the law change provided more bargaining power to the group of women who had the least of it prior to the change. Given the lower returns from the labour market for less-educated wives, an equal division of the family property would be relatively more attractive financially compared to more-educated working wives whose potential earnings are greater. In fact, this impact is expected to be stronger, the larger the size of the property wealth to divide. We analyze this hypothesis in the next table.

At the extensive margin (rows 7-8), we see that more-educated wives are significantly more likely to exit the labour force, while less-educated wives are more likely to join the labour force. For instance, the effect for less-educated wives is -0.02 + 0.04 = 0.02 and statistically significant from 0 (SE 0.01) in the LPM model. The Logit estimates are qualitatively similar to the LPM estimates. This result showing opposite effects of the law change by wives' education level at the extensive margin is surprising. This finding may result from the endogenous joint labour market decisions of couples who stayed married after the law change (Manser and Brown (1980); McElroy and Horney (1981); and Goussé et al. (2017)). The larger work disincentive response of the more educated married women could be explained using the leisure-inducing income effect mechanism of the life-cycle model which is plausibly large among couples where the wife (and husband) are more educated and have therefore accumulated greater wealth. This is likely even more the case given that more educated women are older, more likely to be married later with wealth accumulated prior to marriage.

We are also able to further test whether the differential impact of the law change by education is driven by the size of the assets to be divided at divorce with house owners having a relatively larger pie to divide than house renters. Table 2.4 summarizes the results from estimating the effects of Quebec's family patrimony rules on married women's labour supply by education among house owners. At the intensive margin (rows 1-6), we see that,

[40]In the sample, less-educated married women have median hours of work of 0.

as expected, the decline in labour hours supplied due to the reform is similar and slightly stronger (except the UQ regression) compared to the results in Table 2.3.

At the extensive margin (rows 7-8), we see that more-educated wives whose household owns a house are more likely to leave the labour force, as before. Unlike the results shown in Table 2.3, less-educated women in a household who owns a house did not statistically significantly respond to the reform in this case. For instance, the effect for less-educated wives is -0.03 + 0.04 = 0.01 and statistically insignificant (SE 0.01) in the LPM model. The Logit estimates are qualitatively similar with that in the LPM.

Couples who rent a house might be unlikely to have been affected significantly by the equal division of the family property since a house usually represents the major family asset. However, the changes in family patrimony rules can influence their labour market behaviour through redistributing the pension in the event of a divorce. We further analyze the family patrimony rules effects among house renters by husbands' education as the husband is usually the principal earner in the household (Gray (1998); Chiappori et al. (2002); Stevenson (2008)). Their education level, which is related to the potential returns to labour market investments, could be a proxy for the magnitude of the pension to be equally divided in the event of a divorce. However, the results based on home renters are not reported here because the sample size drop was too large for the results to provide any additional useful information.

A concern is that our post-policy sample is not randomly selected since the Civil Code reforms may affect individuals' marital decisions (e.g., likelihood of divorce). For instance, we have selected women who stayed married in the post-policy sample excluding from the analysis the possible impact of the law change on the labour supply of women who divorced as a result of the amendment. The Civil Code reforms in Quebec, by changing the intra-household bargaining positions of each spouse, may have encouraged divorce for people who wanted to prior to the law but could not afford to. In this case, wives who married before the law change and decided to stay married afterwards may have different labour supply response than those whose marriages did not survive. This fact may influence our estimations through introducing a selection bias in the results. We investigate this issue in the next section when we analyze whether the family patrimony rules affect marital

decisions.

Evidence that the Quebec family patrimony rules impacted divorce rates will indicate that while the labour supply response we have estimated is conditional on staying married, ignoring the labour supply response associated with divorce can only provide a lower bound to the overall short-run female labour supply response coming from the law change.[41]

Note also that given our results in Table 2.3, if more education provides married women with the bargaining power to drop the labour force while staying married, it is possible and we suspect that education may also moderate the impact of the Quebec redistributive law change on divorce rates. The less educated spouse, being the one most likely to benefit from equal sharing of the family patrimony may be more likely to divorce after the law change relative to the more educated spouse. We therefore also investigate this potential differential effect by education in the next section.

[41] Abstracting from the changes in the patrimony rules, the labour supply of divorced women is generally greater than the labour supply of married women with a working spouse. Our results for married women are therefore likely to suffer from a downward bias given that divorced women with generally greater labour supply are excluded from the sample. We will return to this discussion point in the next section.

Table 2.3: Family Patrimony Rules Effects on Married Women's Labour Supply by Education

Intensive margin: (Weekly hours worked)	OLS		Tobit		Heckman		UQ Median		N
	Coefficient		Coefficient		Coefficient		Coefficient		
	T*After	T*After*HSLess	T*After	T*After*HSLess	T*After	T*After*HSLess	T*After	T*After*HSLess	
All married women	-1.05**	0.71	-1.90***	1.65***	-0.83*	0.17	-5.82**	6.67**	252796
	(0.43)	(0.46)	(0.09)	(0.10)	(0.49)	(0.44)	(2.84)	(2.99)	
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value	Wald test	p-value	Wald test	p-value	
	1.18	0.28	1.74	0.19	2.57	0.11	0.16	0.69	
Married women in the labour force	-0.74*	-1.03**	-0.85**	-1.12**	-0.39	-0.85**	0.05	-1.15***	144952
	(0.41)	(0.45)	(0.43)	(0.48)	(0.39)	(0.43)	(0.35)	(0.36)	
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value	Wald test	p-value	Wald test	p-value	
	23.81	0.00	25.25	0.00	13.68	0.00	16.19	0.00	
Married women employed 6+ years	0.14	-1.26**	0.13	-1.27**			0.56	-0.95*	64461
	(0.46)	(0.49)	(0.46)	(0.49)			(0.40)	(0.50)	
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value			Wald test	p-value	
	7.02	0.01	7.15	0.01			1.15	0.28	
Extensive margin: (Labour force participation)	LPM		Logit						
	Coefficient		Coefficient						
	T*After	T*After*HSLess	T*After	T*After*HSLess					
All married women	-0.02**	0.04***	-0.12**	0.20***					252796
	(0.01)	(0.01)	(0.05)	(0.06)					
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value					
	4.50	0.03	4.29	0.04					

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, the age of their first child dummies, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

Table 2.4: Family Patrimony Rules Effects on Married Women's Labour Supply by Education among House Owners

Intensive margin: (Weekly hours worked)	OLS		Tobit		Heckman		UQ Median		N
	Coefficient		Coefficient		Coefficient		Coefficient		
	T*After	T*After*HSLess	T*After	T*After*HSLess	T*After	T*After*HSLess	T*After	T*After*HSLess	
All married women	-1.13**	0.67	-2.26***	1.63***	-0.45	-0.17	-3.64**	3.07*	215277
	(0.46)	(0.47)	(0.09)	(0.10)	(0.51)	(0.46)	(1.62)	(1.64)	
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value	Wald test	p-value	Wald test	p-value	
	1.67	0.20	11.09	0.00	1.96	0.16	0.21	0.64	
Married women in the labour force	-0.21	-1.18**	-0.26	-1.28**	-0.03	-0.92**	0.56	-1.10***	125980
	(0.45)	(0.51)	(0.47)	(0.54)	(0.43)	(0.47)	(0.38)	(0.41)	
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value	Wald test	p-value	Wald test	p-value	
	11.29	0.00	12.18	0.00	6.27	0.01	3.39	0.07	
Married women employed 6+ years	0.15	-1.37**	0.14	-1.38**			0.50	-0.98*	59590
	(0.50)	(0.55)	(0.50)	(0.55)			(0.44)	(0.55)	
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value			Wald test	p-value	
	7.15	0.01	7.24	0.01			1.64	0.20	
Extensive margin: (Labour force participation)	LPM		Logit						
	Coefficient		Coefficient						
	T*After	T*After*HSLess	T*After	T*After*HSLess					
All married women	-0.03***	0.04***	-0.18***	0.21***					215277
	(0.01)	(0.01)	(0.06)	(0.06)					
H_0 : T*After + T*After*HSLess = 0	Wald test	p-value	Wald test	p-value					
	0.63	0.43	0.49	0.48					

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, the age of their first child dummies, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

2.4.2 Impact of the Quebec Family Patrimony Rules on Divorce Transitions and Assortative Matching

Impact on Divorce Transitions

In this section, we want to further explore whether the Quebec family patrimony rules affected individuals' divorce decisions. In order to analyze the dynamics of divorce, we use the 6-month panel format of the LFS 1985-1995 and select both women and men aged 18 years and above who were already married when they were first surveyed, and then follow their marital status over the 6 survey months to identify a change in marital status by the end of the 6-month period. We define our dependent variable indicating the transition from married to divorce (or separation) as a dummy variable equal to 1, if a person reports being divorced/separated sometime during the second to 6th month, and 0 if the person stayed married during the 6-month window. Table $B.5$ in Appendix presents the differences-in-differences framework for divorce transitions, and describes the treatment group (T) and control group (C).

The parallel trend test results (reported in Appendix Table $B.4$) using Equation 2.1 (where y_{ipt} is a dummy variable of 1, reflecting a person divorce/separation, or 0, reflecting married/common-law) allow us to not reject the null hypothesis that the coefficients of $Quebec*year_k$ are equal to each other[42] . Additionally, all the coefficients of $Quebec*year_k$ are statistically insignificant, which implies that no effect was anticipated among people in Quebec in response to the 1989 Act.

To estimate the treatment effect on individuals' divorce transitions, we use Equation 2.2 to regress the dummy variable that reflects whether an individual gets divorced or stays married using the Logit estimation. Additionally, the impact of the family patrimony rules on individuals' divorce transitions may differ depending on their own and spouses' education. For instance, a relatively less-educated spouse who is less likely to accumulate the majority of family assets during the marriage might take advantage of the relatively

[42]We use the cross-sectional format of the LFS to perform the parallel trend test due to the small number of people getting divorced/separated within a 6-month window in the panel format.

more-educated spouse due to the equal division of the family property. This possibility might have encouraged divorce for people who are less-educated than the spouse and wanted to divorce prior to the law but could not afford to. Therefore, we further extend this analysis depending on whether a respondent is less, or more than, or equally educated to the spouse, using Equation 2.4 with the Logit estimation. α_3 indicates the potential impact of the Quebec family patrimony rules on divorce decisions of respondents who have the same education as their spouses, while the sum of α_3 and α_6 indicates the potential impact of respondents who are less educated than their spouses, and the sum of α_3 and α_7 indicates the potential impact of respondents who are more educated than their spouses.[43]

$$\begin{aligned} y_{ipt} = \alpha_0 + \alpha_1 After_t + \alpha_2 Quebec_{ip} + \alpha_3 Quebec_{ip} * After_t + \alpha_4 less_i + \alpha_5 more_i \\ + \alpha_6 Quebec_{ip} * After_t * less_i + \alpha_7 Quebec_{ip} * After_t * more_i \\ + \sum_n \beta_n X_{ipt} + \delta_t + f_p + c_{pt} + \gamma_{ipt} \end{aligned} \tag{2.4}$$

Table 2.5 (Column 1) presents the effect of the Quebec family patrimony rules on individuals' divorce decisions regardless of the differential education between spouses. The results provide little evidence that these rules affect couples' divorce decisions. However, once the differential education between spouses is taken into account, the results in this table (Columns 2-4) suggest that, as initially speculated, it is the less educated spouse who is more likely to get divorced/separated. For instance, the potential impact on divorce of individuals who are less educated than their spouse, calculated by the sum of the coefficients of $Quebec_{ip} * After_t$ and $Quebec_{ip} * After_t * less_i$, is 0.79 + 0.40 = 1.19 and statistically significant (SE 0.63). In contrast, the potential impact of individuals who are more educated than their spouses, calculated by the sum of the coefficients of $Quebec_{ip} * After_t$ and $Quebec_{ip} * After_t * more_i$, is 0.79 - 0.22 = 0.57 and insignificant (SE 0.52). The potential impact of individuals who are equally educated as their spouses, indicated by the coefficient of $Quebec_{ip} * After_t$, is insignificant as well.

[43]The sample only contains the main respondents, therefore, the unit of observation is a couple rather than an individual.

These results on the impact of the change in family patrimony rules on divorce by education are consistent with our findings in the previous section and help us provide a more complete interpretation of the impact of the redistributive law change on married women's labour supply. By reinforcing the bargaining power of the least advantaged spouse in the marriage, the redistributive law change lead to a decline in hours worked stronger for the less educated married women. At the same time, since it is the group of the less educated men and women who is also more likely to divorce to take advantage of the equal sharing rule, the estimated hours decline we find among the sample of married women (excluding women who divorced after the amendment) corresponds to a lower bound of the labour supply response. The overall labour supply response, including married and divorced women would have created an even greater hours decline associated with the law change.

Table 2.5: Impact of the Quebec Family Patrimony Rules on Divorce Transitions

All	by Differential Education between Spouses		
Quebec*After	Quebec*After	Quebec*After*Less	Quebec*After*More
0.76	0.79	0.40	-0.22
(0.52)	(0.64)	(0.55)	(0.46)
	H_0 : Quebec*After + Quebec*After*Less/Quebec*After*More = 0		
	Wald test	1.88	1.12
	p-value	0.06	0.27
N		309081	

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The controls include age dummies, sex, whether they have a high school degree or less, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

Assortative Matching

The changes in the Quebec family patrimony rules may also affect individuals' decisions of whom to marry. Due to the equal share of family property in the event of a divorce,

people who marry after 1989 are more likely to look for a partner with equal financial background relative to before 1989. This probably occurs because couples with similar economic backgrounds are more likely to make equal contributions during the marriage than those who have unequal backgrounds, which makes the equal share of family property at divorce more fair and reasonable.

For this question, we mainly focus on differential educational attainment between spouses since individuals' education level approximates well earnings potential and using current earnings creates endogeneity problems. We note that the education trends have been similar in every province in Canada. Table 2.6 presents the proportion of individuals with high school education or less in Quebec and the rest of Canada by gender in both pre and post intervention periods. The proportion has declined after 1989 as both men and women are getting more educated after the Civil Code reform. Moreover, the change in the proportion before and after the reform is of similar magnitude for each gender as well as similarly in Quebec and the rest of Canada. Any results we find cannot therefore be driven by the differential in educational attainment between Quebec and the rest of Canada prior to 1989 or the gender differential in educational attainment.

For this analysis, we select couples whose decision to marry took place either before or after 1989. We use individuals' age to approximate whether they got married after 1989 or not. For instance, we assume that young couples aged 30 years or less are more likely to have married after 1989[44]. This restriction (age $\leq$ 30) is also imposed on couples married before 1989 to ensure similarity of the attributes between pre-intervention and post-intervention samples. Additionally, this age restriction helps us to insure that couples' current marriages/relationships are their first unions. Second, we calculate the differential educational attainment between spouses and compare this difference between couples married before and after 1989 in Quebec relative to the other provinces, using a differences-in-differences approach. Table 2.7 presents how we derive the differential educational attainment between spouses, which has three values, -1, 0, or 1. Appendix Table *B*.6 presents the differences-in-differences framework for the assortative matching analysis, and describes the treatment group (T) and control group (C).

[44]At least one of the spouses was 30 years or less.

Regarding the parallel trend assumption, according to the parallel trend test results (reported in Appendix Table B.4) using Equation 2.1 (where y_{ipt} is the differential education between spouses), we cannot reject the null hypothesis that the coefficients of $Quebec * year_k$ are equal to each other.

Table 2.8 presents the treatment effect using Equation 2.2.[45] We carry out separate analyses based on three different base outcomes (when the differential educational attainment = 0): both spouses have a high school education or less, both spouses have more than high school education, and pool these two cases together as the base outcome. The coefficients of $T_{ip} * After_t$ based on the first and third base outcomes suggest that, among young couples (age $\leq$ 30) in Quebec, the equal share of family property in the event of a divorce has contributed to a high proportion of unions in which the wives are more educated than the husbands; and the results based on the second one imply that the reforms have contributed to a low proportion of unions in which the wives are less educated than the husbands.[46]

Table 2.6: Summary Statistics of Respondents' Education in Quebec and Other Provinces in Pre and Post Intervention Years by Gender

High school or less %	Female			Male		
	Before 1989	After 1989	*ppt.* change	Before 1989	After 1989	*ppt.* change
Quebec	70.04	57.67	-12.37	66.54	53.40	-13.14
Rest of Canada	64.32	53.20	-11.12	63.34	51.21	-12.13

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

[45] T is Quebec dummy in this case and there is no demographic control variables X_{ipt}.

[46] We also used a measure of the differential age between spouses. However, the results, not reported, were statistically insignificant likely because the age restriction (age $\leq$ 30) imposed in the analysis has removed most of the variations in the sample.

Table 2.7: The Differential Educational Attainment Between Spouses

Differential Educational Attainment	Frequency (%)	Husband's Education	Wife's Education
-1	11.80	Have High School or Less	More Than High School
0	73.05	Have High School or Less	Have High School or Less
		More Than High School	More Than High School
1	15.14	More Than High School	Have High School or Less

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

Table 2.8: The Multinomial Logistic Regression of the Differential Educational Attainment between Spouses

	Base Outcome		
	Both more-educated or both less-educated	Both more-educated	Both less-educated
Differential Education between Spouses	Coefficient T*After	Coefficient T*After	Coefficient T*After
-1 versus 0	0.21***	0.12	0.32***
	(0.08)	(0.09)	(0.08)
1 versus 0	-0.05	-0.15*	0.06
	(0.08)	(0.09)	(0.09)
N	211913	122193	153486

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The controls include year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

2.5 Conclusions

In this study we examine the impact of an amendment of the Quebec Civil Code towards greater economic equality between spouses on married women's labour supply and on divorce decisions and the decision of whom to marry. We exploit detailed information on individuals' labour market and marital status from the Labour Force Survey to analyze short-run changes in outcomes before and after the reform in Quebec relative to other provinces which did not experience the changes in the marital property laws over that time period.

Consistent with the prediction of the bargaining model of marital decisions (Chiappori et al. (2002)), family patrimony rules that improve economic equality between spouses reduce married women's hours of work. We estimate a decline of about 22 hours per year. This effect is stronger among married women with stronger attachment to the labour force. The estimated decline in hours for the group of women employed before the law change is 36 hours per year. In addition, we also find that the adverse employment effect of the Quebec changes in family patrimony rules is relatively stronger for less educated women (the most disadvantaged spouse) and among couples with larger wealth as measured by the ownership of the couples' property.

At the extensive margin, we find that the redistributive law change significantly decreased the labour force participation of the relatively more educated married women. While educated women have greater earnings potential and therefore and would have less to gain in bargaining power from the law change, the decline in labour force participation driven by more educated women could be explained by a simple leisure-inducing unanticipated income effect. Surprisingly, the law change increased the labour force participation of the relatively less educated women (among married women who stayed married after the change). This differential result by education among married women suggests that the labour supply impact of the redistributive law change likely depends on the decision to stay married as marital decisions are also part of the household bargaining outcome. We investigate this question by studying the Quebec amendment impact on divorce rates and the decisions of whom to marry.

We find that the redistributive law change had no impact on overall divorce but significantly increased the likelihood of divorce/separations among less educated spouses. In addition, over the sample of young individuals deciding whether or not to marry, the Civil Code amendment contributed to increasing the proportion of marriages in which the wife is more educated than the husband.

Together these results suggest that family reforms with the goal of promoting economic equality between spouses in the long-run, may create unintended short-run vulnerabilities. Indeed, our results show that the redistributive law change lead the less educated married women to reduce their working hours. Married women who are more educated and are therefore relatively less disadvantaged are also more likely to drop the labour force as a result of the law change. Furthermore, the less educated spouse is more likely to divorce as a result of the law change and marriage, an institution that provides insurance against poverty, is more likely to take place among couples where the woman is relatively more educated than the man. These results also suggest that education remains a key element to alleviate poverty and help reinforce the effectiveness of complementary family reforms.

Chapter 3

House Prices and Female Labour Supply: Evidence from Canada

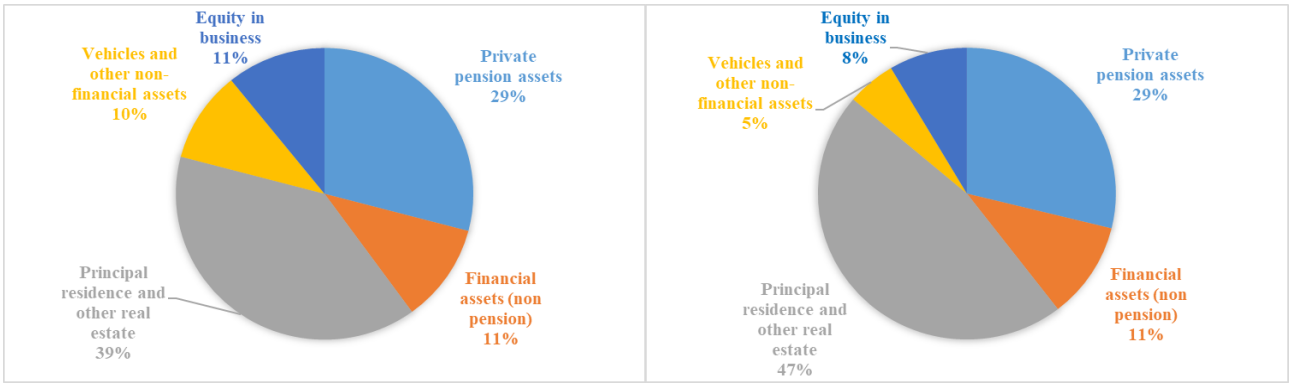
3.1 Introduction

House prices in Canada have tripled over the past three decades. According to Statistics Canada, the New Housing Price Index was at its lowest, 37.70, in 1983, and at its highest, 103.30, in 2017. Even after adjusting for inflation, real house prices have on average doubled across the country since 1976 (Kershaw and Minh (2016)). This dramatic rise in house prices has important effects on both homeowners and renters (potential house buyers). For Canadian house owners, housing usually represents a significant and rising portion of the total family wealth. Figure 3.1 shows the compositions of total family assets in 1999 (left) and 2016 (right).[1][2] In 1999, the share of the value of the principal residence and other real estate over the total family assets was 39%, the largest component of family wealth. This

[1]The statistics are based on Survey of Financial Security (SFS) and 2016 is the most recent year of this survey available on Statistics Canada's website. Five types of assets consist total family assets: principal residence and other real estate, private pension assets, financial assets (non-pension), vehicles and other non-financial assets, and equity in business.

[2]The equity in business means "the estimated amount the respondent would receive if the business were sold, after deducting any outstanding debts to be paid" (Statistics Canada (2012)).

Figure 3.1: Compositions of Total Family Assets, 1999 (Left) and 2016 (Right)



Source: Statistics Canada Survey of Financial Security (SFS)

number increased to 47% in 2016, reflecting the significant increase in house prices over the period, and the growing impact of homeownership on family wealth.[3] Additionally, the appreciated value of the house(s) a family owns allows them to relax borrowing constraints over the life cycle (Campbell and Cocco (2007)). For renters, housing market appreciations might have a negative wealth effect on them because it could raise rental prices as well as future homeownership costs if they plan to purchase a house in the future (Campbell and Cocco (2007); Begley and Chan (2018)). Based on the calculations from Kershaw and Minh (2016) in 2016, young Canadians aged 25 to 34 (potential house buyers)[4] need on average more years of work to accumulate 20% down payment, 12 years. In contrast, they needed only 5 years in 1976. These times will be longer if they live in Toronto (15 years) or Vancouver (23 years).[5]

[3]Even though an increase in house prices for an infinitely-living house owner may not change their real wealth and has no effect on their behaviours because they are hedged against fluctuations in living costs and housing prices (Dougherty and Van Order (1982); Sinai and Souleles (2005); Campbell and Cocco (2007)), finitely-living house owners may experience changes in their real wealth and adjust their behaviours due to the house prices variations (Skinner (1989); Morris (2006)).

[4]The young generation aged 25 to 34 are more likely just starting their careers and families and are more likely to enter homeownership.

[5]These calculations are based on average real local house prices and median real full-time earnings of young Canadians aged 25 to 34, as well as the assumption of 15% saving rate from earnings of people (see Kershaw and Minh (2016) for more calculations details).

Wealth changes due to variations in house prices may influence people's behaviour. In this paper, I study the effect of house prices' changes on female labour market outcomes in Canada. Specifically, I focus on married or cohabitating women because house-price changes may also influence a couple's divorce/separation hazard by affecting the cost of divorce/separation, such as the cost of separate residences after marital dissolution (Klein (2017)); and marital status changes could possibly in turn impact individuals' labour market behaviours. Therefore, selecting women who stay married or cohabitating helps to isolate the effect of changes in house-price on their labour supply per se. Additionally, married women's labour supply could be more responsive to house-price changes because a female spouse usually has less labour market attachment compared to the male spouse (who usually works in full-time already) due to the traditional gender roles and thus has more space to adjust her labour market behaviours (Fortin (1995); Henley (2004); Kohara (2010); Zhao and Burge (2017)). For instance, even though wives' labour force participation and their contribution to family income have increased over time, female spouses continue to work less than male spouses. Among dual-earner couples, on average, husbands worked 42 hours per week in 2008 and wives worked 34.7 (Marshall (2009) based on Canadian Labour Force Survey). Also, many studies have illustrated the fact that married women were more likely to be influenced than married men by wealth changes caused by various sources such as house-price changes (Henley (2004); van Huizen (2014)), marital property division rules reforms (Lluis and Pan (2018)), and amendments of the generosity of the unemployment insurance system (Lluis and McCall (2018)).[6]

This study addresses two main research questions: (1) Does an unexpected appreciation of house prices impact married women's labour supply in Canada? (2) How do these effects differ across married women based on their house tenure choices (e.g., own or rent a house), residence location, and other demographic characteristics such as education and age? Understanding the effect of changes in house prices on female labour supply is an important policy issue for policymakers who are trying to optimize the housing and labour markets. For instance, if an appreciation in the housing market could influence female

[6]An analysis based on male spouses' labour supply is also conducted (results are presented in Appendix C.2). As expected, there is no strong evidence showing that changes in house prices have effects on their labour market behaviours.

labour decisions through either discouraging or encouraging them to work, this might provide policymakers with some insights on how to achieve gender equity in the labour market. Moreover, married women's labour decisions not only affect their own well-being but also influence the welfare of their families especially their children. Informing the social planners about a possible way of realizing gender equity in the labour market may also assist welfare agencies in improving female and child benefits.

Family labour supply model and dynamic life-cycle theory predict that unexpected gains in wealth should not only increase households' consumption, but also decrease their labour supply as leisure is also a normal good (Ashenfelter and Heckman (1974); Heckman and MaCurdy (1980)).[7] Empirical investigations attempt to document this relationship through focusing on the effect of unanticipated shock in housing wealth on individual's labour market behaviours. However, the empirical evidences are relatively small and mixed. On the one hand, after capturing the exogenous variations in local house prices, some studies found evidence which is consistent with the predictions of the life-cycle theory of labour supply (e.g., Henley (2004); Zhao and Burge (2017); Begley and Chan (2018)). And these studies suggest that female spouses are more likely to response to the changes in the housing wealth than male spouses. On the other hand, other research (not many) shows that an appreciation in the housing market is positively related with house owners' labour supply, which is inconsistent with the theories (e.g., He et al. (2015); Zhao et al. (2018)).

However, there is a paucity of research exploring the effect of changes in house-price on female labour supply in Canada. This is likely due to a lack of adequate Canadian house-price data. Canadian surveys do not generally include questions about the value of a respondent's house as the U.S. surveys do (e.g., the Health and Retirement Study (HRS)). Aggregated house price time series constructed by government agencies, on the other hand, have not been offered at sufficiently detailed geographical level to be of use.

Besides the data limitation, there are other challenges of estimating the causal effects

[7] It is worth noting that a household's leisure is defined by economists as non-labour time which includes all unpaid activities such as (unpaid) household productive work as well as leisurely activities. A decrease (increase) in an individual's labour supply does not necessary mean an increase (decrease) in his/her leisurely activities (Gray (1998)).

of housing wealth changes on female labour supply which have been emphasized by researchers. As mentioned, many researchers have tried to capture unanticipated variations in local housing market, rather than variations that could be expected by households (e.g., Klein (2017); Begley and Chan (2018)). This is essential because the wealth changes due to rising house prices could be anticipated by a household under the assumption of perfect foresight and no liquidity constraints in the life-cycle theory of the labour supply. Therefore, these expected wealth changes might have no impact on people's labour supply due to the fact that these changes could already have been incorporated into their decisions (Henley (2004); Klein (2017); Begley and Chan (2018)). Applying an appropriate method to derive the unanticipated changes in the housing wealth is necessary and demanding. Another challenge of identifying the causal effects is the reverse causality between house prices and female labour supply which has been highlighted in literature (Johnson (2014)). For instance, rising housing prices induce more female spouses to participate in the labour market to offset the future housing purchase costs if their families intend to enter homeownership or balance rising rental prices. Nonetheless, it is also plausible that more working women in one area, which contributes to a higher proportion of two-earner households with stronger payment capacities, may bid up the house prices there. Identifying and disentangling these two directions is a key in analyzing my research questions.

In this study, I complement the literature in two ways. First, I explore how wealth changes due to house-price variations influence the labour supply of married women in Canada. The mortgage finance system is non-trivial distinct in Canada compared to that of many other countries from the institutional arrangements and regulations perspectives (Fortin (1995); Walks and Clifford (2015); Clark and Ferrer (2019)). For instance, the mortgage lending process and regulations are more uniform and rely on the federal state in Canada compared to other countries because these rules have largely been dominated by a national corporation, the Canada Mortgage and Housing Corporation (CMHC) (Fortin (1995); Walks and Clifford (2015)). In addition, Canadian mortgage regulations are more conservative with a relatively low loan-to-value (LTV) ratio and mortgages with a higher LTV ratio (above 80%) must be insured. Also, the fixed-term mortgage contract has a typically short period (around 5 years) in Canada compared to that of other countries

such as the US which has 10 to 20 years of fixed-term mortgages (Fortin (1995); Walks and Clifford (2015); Clark and Ferrer (2019)). Finally, in contrast with many countries like the US, mortgage interest is not tax-deductible in Canada. Canadian households who intend to purchase a house might be incentivized to make a larger down payment compared to those in other countries (Clark and Ferrer (2019)). All of these differences in the Canadian mortgage finance system relative to that of other countries might contribute to distinct compositions in house owners as well as renters, which could lead to different results relative to those studies focused on other countries.

I use time-series average house prices data from the Canadian Real Estate Association's Multiple Listing Service data set (CREA MLS) constructed by Clark and Ferrer (2019). This dataset covers the entire Canada, 102 real estate boards (REBs), and provides detailed geographical variations in house prices in both urban and rural areas. I link these house prices to each respondent in the confidential longitudinal household files – the Survey of Labour and Income Dynamics (SLID) from 1993 to 2010. As there is no official house-price data in Canada, the CREA MLS data are the best source available so far covering all regions of the country and providing the most detailed geographical variations in both urban and rural areas.[8]

The second contribution of this study is that I apply two strategies to overcome the challenges of examining the effects of house-price changes on female labour supply which have been addressed before. My first strategy is following Begley and Chan (2018) to calculate a measure of unanticipated house-price shocks using an autoregressive process. I also employ alternative measures of the house-price shocks for the consistency of results. My second strategy is constructing topography instruments to address the reverse causality between the house prices and female labour supply mentioned by Johnson (2014). Following Saiz (2010) and Johnson (2014), I construct a comprehensive and exogenous measure of fraction of buildable land in each REB and calculate the change in elevation between the

[8] Clark and Ferrer (2019) have noticed that, due to the significantly large size of Canada, observing only 102 REB boundaries might not be robust enough to identify all variations in house prices within each boundary because some of them are quite large. They explained that this might not be a problem for panel data if house prices of adjacent neighborhoods (both low and high prices) within each REB are moving together.

lowest and the highest point in each REB as well. As far as I know, these are the first comprehensive measures of buildable land/regional terrain in Canada at the REB level in the economics literature. I utilize the fraction of buildable land and the change in elevation as instruments of house-price changes. The share of land available for development (area that is not covered by water, wetlands, and mountains) as well as the regional terrain could be considered predetermined and exogenous (Saiz (2010)). These exogenous measures provide plausible instruments to examine the labour market responses to changes in house prices because a higher fraction of unbuildable land (area that is forgone to water, wetlands, and mountains) or rough terrain inhibit housing supply growth. These make the housing supply less elastic in the region and a relatively inelastic housing supply may induce higher house prices when there is a housing demand shock (Saiz (2010); Johnson (2014)).

It is worth noting that heterogeneous effects of changes in house prices on female labour supply could exist. For instance, households' labour supply responses to a house-price appreciation could differ by their house tenure choices since a housing market appreciation might have different wealth effects on house owners versus renters. House owners might adjust downward their labour supply due to the unexpected gain in housing wealth.[9] Renters, on the other hand, either intending to purchase a house in the future or continue renting might adjust upward the labour supply to balance the increasing future house purchase costs as well as rising rental prices (He et al. (2015); Atalay et al. (2016); Begley and Chan (2018); Disney and Gathergood (2018)).[10] Nevertheless, an increase in house prices could have little labour effect on renters in the short-run if they expect house prices will be back to the original level and delay to enter homeownership. Or they might choose to find a cheaper residence instead of adjusting their labour supply (Aladangady (2017); Zhao et al. (2018)).

Although within the house owner group, the impact of a housing price appreciation could also be different based on their demographic characteristics such as education, resi-

[9]The appreciated value of the housing a household own also allows him/her to relax borrowing constraints through refinancing the equity of the house, thus decreases his/her labour supply (He et al. (2015); Atalay et al. (2016)). However, studies found little effect from relaxing borrowing constraint due to the relatively strict restrictions of house equity loan (Begley and Chan (2018)).

[10]Studies found that rental prices usually are positively associated with house prices (e.g., Gallin (2008)).

dence location, as well as age. For instance, a more-educated owner might respond to rising housing wealth differently compared to a less-educated one because of his/her relatively higher wages (the opportunity cost of leisure) when both the income and substitution effects are taken into account (Zhao and Burge (2017)). In addition, house values between urban and rural regions are dramatically heterogenous. With the same percentage changes in house prices, the size of changes in housing wealth of an owner in an urban centre differs from an owner in a rural area. Thus, it is reasonable to expect that households in urban area could have different responses compared to those in rural areas.[11] Finally, considering housing as both an investment and consumption good, the diverse future housing consumption (intention to downsize or upsize) among house owners with different ages may contribute to heterogenous labour supply responses to a housing market appreciation as well. A young house owner who is more likely to expand the family size and plan on moving to a larger house might respond to rising house prices differently compared to an elderly house owner who is more likely to downsize (Li and Yao (2007); He et al. (2015); Atalay et al. (2016)).[12][13] The linkage of the rich longitudinal household information to local house prices allows me to further study whether the impacts of unexpected house-price changes differ based on women's house tenure choices (e.g., own or rent a house), residence location, and their demographic characteristics such as education and age.

In this study, I find that after capturing exogenous variations in local housing market rather than variations that could be expected by households, among house owners, unexpected gains in housing wealth decrease women's labour supply at both the extensive and

[11]The housing market appreciations may also vary relative to the different labour wages between urban and rural area.

[12]Some studies suggest that a house owner who is planning on increasing the housing consumption (either buying a second house or trading up the current house to a larger one) will increase the labour supply due to the rising purchase costs; while a house owner who is intending to downsize will decrease the labour supply due to the positive wealth effect as house prices rises (He et al. (2015); Atalay et al. (2016)). These predictions rely on an assumption that the house prices growth rate is constant across types of dwellings. That is, if an owner is planning on moving to a larger house, the present discounted value of the planned purchase exceeds the fundamental value of the current house he/she owns. However, if a house owner intends to downsize, the value of the current house he/she owns exceeds the value of the future purchase. (He et al. (2015)).

[13]A household who has no plan on future housing consumption might not be affected by house price appreciation because they are hedged against price fluctuations in the long-term (He et al. (2015)).

intensive margins. Additionally, I also find that house-price shocks have heterogeneous effects on women's labour force participation and their hours of work depending on education level as well as residence location. These results are consistent with the predictions of the life-cycle model of the labour supply. The instrumental variable (IV) approach also provides consistent results.

A concern is that my sample is not randomly selected. For instance, as mentioned, I focus on married women who stay married as the sample due to the fact that housing wealth changes could also impact the likelihood of divorce and marital status changes could affect women's labour decisions as well. However, this sample selection might create an endogenous issue in the analysis because women who choose to stay married may have distinct characteristics and response differently in terms of their labour market behaviours than those whose marriages are ended. This situation might have an impact on my results through creating a selection bias in my estimations. Given that divorced women with generally greater labour supply compared to married women with a working spouse, ignoring the labour supply response associated with divorce can only provide a lower bound to the overall short-run female labour supply response coming from the changes in house price (Lluis and Pan (2018)).

The remainder of the study is organized as follows: Section 3.2 reviews related existing literature regarding my research questions. Section 3.3 illustrates the data and presents descriptive statistics. Section 3.4 explains the measurements and methodology applied in this paper as well as interprets the results. Section 3.5 concludes the study and discusses future steps.

3.2 Existing Literature

The predictions of family labour supply model and dynamic life-cycle theory suggest that unexpected gains in wealth should not only increase households' consumption, but also decrease their labour supply as leisure is also a normal good (Ashenfelter and Heckman (1974); Heckman and MaCurdy (1980)). Many empirical investigations have shown in-

creasing interest in documenting this relationship by focusing on the effect of unanticipated shock in housing wealth on individual's labour market behaviours. However, the empirical evidence are mix.

One the one hand, some studies found evidence which is consistent with the predictions of the theory. For example, researchers have analyzed how house prices affect elderly labour supply and retirement specifically. Zhao and Burge (2017) have utilized the exogenous variations in the housing market during the boom/bust cycle and found that elderly house owners decreased their labour supply relative to renters due to the housing wealth appreciation (Zhao and Burge (2017)). Begley and Chan (2018) also found that adverse housing shocks reduced elderly house owners' probability of retirement after capturing unexpected changes in local house prices and these results are consistent with those of Milosch (2014).[14] In terms of other studies focusing on the general labour market, van Huizen (2014) examined the house prices effect on both men and women using a panel data in the Netherlands. The results reveal that, among house owners, women decreased their hours of work if housing wealth increased, whereas men barely adjusted their worked hours in response to housing wealth changes. These findings are consistent with those of Henley (2004), who investigated the impact of capital gains and loss on individuals' hours of work using British panel data. The author suggested that female house owners were more likely to be influenced by housing wealth gains than males.[15] Disney and Gathergood (2018) revisited this question with panel data in the UK and found heterogeneous individuals' labour supply responses to house-price changes based on not only gender and housing tenure, but also marital status and age. For instance, young female house owners responded to house-price appreciation by decreasing their labour supply if they were married or cohabiting, whereas elderly male house owners had the same responses regardless

[14] Zhao and Burge (2017) used both a MSA-specific house prices index and self-reported house wealth as housing price measurements, and assumed that house-price changes only affect house owners not renters. Thus, they employed a differences-in-differences method using elderly renters as the control group to identify the house prices effect on elderly house owners' labour market behaviours. In contrast, Begley and Chan (2018) argued the problem of considering renters as the control group because rental prices usually increase as house prices rise (Gallin (2008)), and then constructed unanticipated housing wealth shocks only on house owners to examine their retirement decisions.

[15] Henley found that male workers were more likely to respond to housing wealth loss by increasing their normal hours worked; however, this effect was found to be offset by a decrease in hours of the second job.

of their marital status.[16]

On the other hand, some investigations show that an appreciation in the housing market is positively related with house owners' labour supply, which is inconsistent with predictions of family labour supply model and life-cycle theory. He et al. (2015) focused on couples' labour supply responses to house-price changes in the UK and allowed the labour decisions of spouses to be interdependent. The results show that rising house prices boost hours of work for both house owners and renters. Zhao et al. (2018) have also found this positive association in Urban China indicating that house-price appreciation encouraged more house owners to participate in the labour force. The results are robust across methods and several house-price appreciation measurements, and are heterogeneous based on gender, age, as well as provinces. For instance, a house-price appreciation encouraged more female (not male) house owners to participate in the labour force, and young house owners were more likely to be affected than old ones. House owners who were living in provinces with rapidly increasing house prices are more likely to participate in the labour market. They explained this positive effect of house value appreciation on participation decisions by the consumption role of a house. This role suggests that house value appreciation leads to a rise in the cost of housing consumption compared to that of other consumption not only for renters but also house owners. And this rising living cost (in the long run) only can be partially offset by the capital gains. Therefore, house value appreciation can induce house owners either upward or downward adjustment of their labour supply depending on their future housing consumption and behaviours of re-optimizing the housing stock due to house-price changes. In addition, the cultural-specific view of a house as a wealth status in China and the tradition of preparing children's marriage houses, as well as the rapid urbanization have also contributed to this positive relationship.

However, there is a paucity of literature in the Canadian context. This is likely due to a lack of adequate Canadian house-price data which could offer sufficiently detailed geographical level to be of use. This study fills the gap.

[16]Both the house prices index and self-reported housing values are available in Disney and Gathergood's paper. They used the house prices index as the instrument for the self-reported housing values because housing values could be reported endogenously by house owners (Disney and Gathergood (2018)).

3.3 Data and Descriptive Statistics

3.3.1 Data

The main data is from the confidential files of the Canadian Survey of Income and Labour Dynamics (SLID) from 1993 to 2010,[17] which is a nationally representative longitudinal annual household survey (excluding households who live on Indian reserves, northern territories, and institutions). The SLID is designed as a rotating panel structure with two panels always overlapped. Each panel interviewed the same respondent for a period of six years, and a new panel of people is included every three years. It provides rich household information, including not only household composition and income sources, but also labour market experiences, human capital variables, and demographic characteristics. The richness and sufficiently sample size of the SLID as well as its six years panel nature allow me to fulfill my research purposes and to control for time-invariant unobservable characteristics that might affect female labour market behaviours. The house ownership information provided in the SLID also allows me to analyze the possible different effects of changes in house prices on female labour supply for house owners and renters. However, the SLID does not include self-reported housing values for house owners, hence, another source of data which provides a consistent measure of house prices with detailed geographical information is essentially required.

The time-series average house prices data is from Clark and Ferrer (2019) who have constructed this dataset from the Canadian Real Estate Association's Multiple Listing Service data set (CREA MLS). This data cover 93 REBs (both urban and rural areas) for all provinces (except Quebec) of Canada and 6 Census Metropolitan Areas (CMAs) of

[17] The house ownership is not available in the first year of the survey (1993). Thus, most of the analyses are conducted without the data of this year. The last available year of the SLID is 2010.

Quebec, as well as the three territories for the period 1991-2010.[18][19][20] The mean house prices in each REB is calculated as the total sales value in a board over the total number of residential units sold there. The data also links REBs to Statistics Canada's census subdivisions (CSDs), facilitating the integration of REB house prices with most Canadian surveys. In this data, boundaries for each REB are defined using information from the various provincial websites of real estate board as well as through consulting with real estate board representatives. Then, the house prices for a particular REB is assigned to each unique CSD "when the geographic centre of the CSD area fell within that particular Real Estate Boundary" (Clark and Ferrer (2019)).[21] Using the CSD as the aggregate geographic level might be appropriate because it is consistent to "a municipality or an area that is deemed to be equivalent to a municipality for statistical reporting purposes" (Statistics Canada, 2001), and size of the CSDs corresponds generally to the REBs (Clark and Ferrer (2019)).

There are two other data sources of Canadian house prices: The new house price index (NHPI) and The Teranet–National Bank House Price Index™. However, neither of them provides as many detailed geographical variations in house prices as the CREA MLS. The NHPI includes monthly indexes only at provincial and CMA/CA levels, and it does not represent the whole housing market since it only includes all new detached, semi-detached and townhouses constructed and listed for sale or sold in Canada, but not any old houses for sale or sold in the resale market. The monthly Teranet–National Bank House Price Index™, which is derived by tracking registered houses' prices over time, only covers eleven CMAs. These two data sources could be used in the future step for robustness checks.

[18] A full list of the 102 REBs in the CREA MLS is included in Appendix *C*.1. Clark and Ferrer (2019) have also constructed a secondary house price data set (CREA MLS II) which covers 123 boundaries of 14 urban centres of the country. However, the CREA MLS II only started in 2005. Therefore, I chose the CREA MLS as the main house prices dataset in this project due to its broader coverage as well as longer time period. The CREA MLS II will be included in the future step to investigate the research questions in urban centres particularly.

[19] House prices of 6 CMAs in Quebec are from the Quebec Federation of Real Estate Boards and not available for the last three years of the sample.

[20] House prices of the three territories are collected by Clark and Ferrer (2019). However, these areas are not covered by the SLID.

[21] Please see Clark and Ferrer (2019) for more details of the matching procedure.

Additionally, a new survey, Canadian Housing Survey (CHS), has been first released by the Statistics Canada in November 2019 and the second release will occur in Spring/Summer 2020. The CHS is sponsored by Canada Mortgage and Housing Corporation (CMHC) and covers all provinces and territories including population centres and select CMAs and CAs. However, the priority of the CHS is providing dwelling information, neighbourhood satisfaction, first-time home buyers and housing affordability. Therefore, some household characteristics such as labour market behaviors might not be available in this data.[22]

For the purpose of my analysis, I make several sample restrictions. First, I restrict my sample to married/cohabitating women aged 18 to 64 years to collect as many observations with valid information on labour supply, marital statuses, and house ownership. Second, the marital status changes may result in substantial changes in family assets and couples' labour market behaviour unrelated to house-price changes. Therefore, I only select married/cohabitating women who stayed married/common-law across six years of the panel. Results are however robust to alternate age and marital status restrictions discussed below. For instance, I repeat the analysis based on the sample to married/cohabitating women aged 25 to 64 years for a robustness check, and results are similar compared to those focused on women aged 18 to 64 years. Also, I repeat the analysis among married women only (not cohabitating women) due to the potential different behaviours between these two groups. The results are similar compared to those including both groups of women.

Third, house-price changes may not be exogenous for those who decide to sell their current house and relocate across REBs (Clark and Ferrer (2019); Begley and Chan (2018)). Thus, I further restrict my sample to those women who remained in the same REB (either didn't move or only move within the REB) across six years of the panel. This helps partly addressing the simultaneity bias due to the reverse causality between the house price and female labour supply since I follow the same cohort of women who did not move or moved within the same REB. The variations I capture are not picking up any market level changes in employment related to housing price changes and vice versa. However, this might also creates a non-random selection bias in the results (people who didn't move outside of the

[22]For more details of the CHS, please see https://www.statcan.gc.ca/eng/statistical-programs/document/5269_D1_V1

region might have different labour market outcomes than those who moved). Thus, the analysis with a sample including both women who remained in the same REB (non-movers) and those who moved across REBs (movers) has also been conducted as a robust check. Following Begley and Chan (2018), the assigned house prices for movers are from their original REBs which are the prices they would have experienced if they had not moved; while the assigned house prices for non-movers are from the REB where they stayed over time. The results reported in Appendix *C*.4 are similar with those using non-movers only. Clark and Ferrer (2019) have used house prices from the original REBs of women as the instrument of house prices they currently live for both movers and non-movers to address the potential endogeneity of house prices (following Currie and Rossin-Slater (2013)). This IV strategy are reported in Appendix *C*.4 as well.

I separate women whose households own a house (owners) from those whose households do not (renters) in order to examine the different effects between these two groups. The SLID asked each respondent whether the dwelling where he/she was living was owned by any member in the household. It could be possible that a couple (with/without children) lived with their relatives in the survey year and the dwelling was owned by the relatives not the couple. For the purpose of deriving clear house ownership information, I restrict my sample to households which only contains one (census) family. Finally, since house ownership status changes may relate to life course transitions such as the first house purchasing of a couple (Clark and Ferrer (2019)) or losing the house ownership due to family financial crisis, which may also influence wives' labour market behaviours. I only focus on women who are either owners or renters consistently over six years of the panel.

The data attrition for each sample selection (e.g., staying married, remaining in the same REB, and owning/renting consistently) is about 10 to 15% among homeowners. However, the attrition is high among renters (about 30 to 50 %) due to the fact that house renters are more likely to move across REBs.

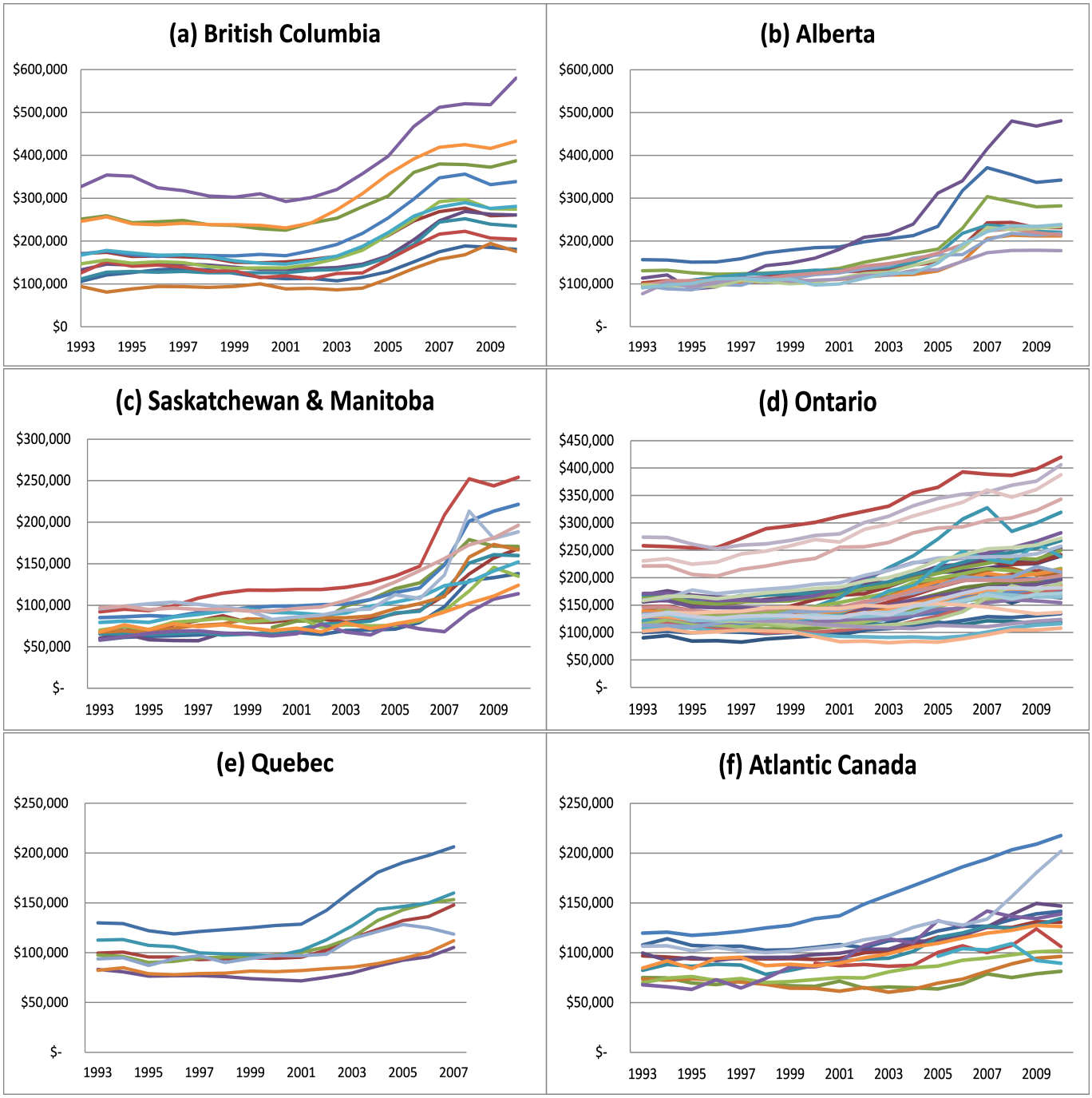
3.3.2 Descriptive Statistics

Figure 3.2, from Clark and Ferrer (2019), presents the CREA MLS time-series real average house prices (2002 = 100) for REBs in Canada by region/province from 1993 to 2010. There are large variations in house prices both across and within regions. Across regions, the real average house prices in British Columbia, Alberta, and Ontario are higher compared to the other provinces or regions. Within regions, house prices usually are higher in urban centres compared to rural areas (e.g., the regions of Toronto versus Chatham Kent). A significant but not common co-movement in house prices across REBs within region/province can also be noted (Clark and Ferrer (2019)). The summary statistics of several measures of the CREA MLS real average house prices are indicated in Panel A of Table 3.1. The mean of real average house prices among 99 REBs (the three territories are excluded) is about $ 151,900 and the mean of percentage change in real house price is 3.32%. The mean of real house-price shock calculated using an AR(2) process, the fraction of buildable land as well as the difference in elevation that are used as instruments of changes in house prices are also presented in Panel A of Table 3.1 and will be discussed in the later sections.

Panel B of Table 3.1 presents the descriptive statistics of SLID subsample described above for the main variables used in the analyses.[23] Columns 1-2 show values for house owners, whereas Columns 3-4 show values for renters. In general, owners are more likely to participate in the labour force and work more hours compared to renters. These phenomena are consistent with owners being older, more-educated, less likely to have children under 5 years old, and less likely to have a disability at work than renters (presented in the table as well). Additionally, husbands are more likely to have a university degree and to participate in the labour market among owners than renters, which suggests a higher proportion of two-earner families among owners. Renters are more likely than owners to be immigrants and to live in an urban centre.

[23] The number of observations in the summary statistics differs from those in regressions because variables used in the latter case are 1-year lagged.

Figure 3.2: Real average housing price by REBs by Region/Province, 1993-2010



Source: This figure is excerpted from Clark and Ferrer (2019). Note: Each line in the graph represents a REB in the region.

Table 3.1: Summary statistics

Panel A: REB Variables	Mean	Std. Dev.	N. observations	N. REBs
House prices ($10,000)	15.19	7.03	1733	99
House-price changes (%)	3.32	6.81	1634	99
House-price shocks (%)	-0.02	6.93	1436	99
Fraction of buildable land (%)	91.43	13.88	1760	99
Difference in elevation (meter)	691	937	1760	99

Panel B: Individual Variables	Sub-sample			
	House owners		Renters	
	Mean	Std. Dev.	Mean	Std. Dev.
Labour force participation (%)	70.72	45.50	56.43	49.59
Hours of work (annually)	1194.17	923.83	874.99	924.27
Age	46.12	9.48	43.27	10.80
University degree (%)	21.97	41.41	10.15	30.20
Number of children	1.33	1.15	1.21	1.27
Children under 5 years (%)	7.02	25.56	7.30	26.01
Husband university degree (%)	24.14	42.79	10.35	30.47
Husband labour force participation (%)	82.26	38.20	73.66	44.06
Immigrant status (%)	17.49	37.99	25.57	43.63
Disability at work (%)	14.86	35.57	21.73	41.24
Provincial UR (%)	7.18	2.08	7.51	1.94
CMA size (10,000)	114.09	158.28	169.81	179.09
Urban area (%)	78.02	41.40	91.81	27.42
Number of observations	76193		4260	

Source: Authors' tabulations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

3.4 Methods and Results

3.4.1 Estimating the house prices effect on female labour supply with unexpected shocks

Due to the anticipation and endogeneity of house prices emphasized by researchers, I apply two strategies to overcome the challenges of estimating the effects of changes in house prices on female labour supply in this study. The life-cycle theory of the labour supply emphasizes that unexpected gains in wealth should decrease household labour supply. However, wealth changes due to rising house prices could be anticipated by a household. Thus, there might be no effect if the household was forward looking and incorporated these expected wealth changes into their decisions (Henley (2004); Klein (2017); Begley and Chan (2018)). Therefore, following Begley and Chan (2018), my first strategy is to calculate a measure of house-price shocks to capture unanticipated variations in local house prices, rather than variations that could be expected by households. The measure of real house-price shocks is defined as the difference between the actual real house price growth and predicted real house price growth. First, to calculate the predicted real house prices growth, I estimate a two-period logarithmic autoregressive model (AR(2)) with a time trend of real house prices in each REB, separately, using Equation 3.1.[24][25]

$$lnP_{j,t} = \alpha_{0j} + \alpha_{1j} lnP_{j,t-1} + \alpha_{2j} lnP_{j,t-2} + \alpha_{3j} t + \epsilon_{j,t} \qquad (j = 1...99) \qquad (3.1)$$

where $P_{j,t}$ is the real house prices in REB j and year t and $P_{j,t-1}$ ($P_{j,t-2}$) is its 1-year (2-year) lagged real house prices. Then I obtain the prediction of real house prices $\hat{P_{j,t}}$ in each REB and calculate the predicted percentage change in real house prices in REB j between year $t-1$ and t, $\Delta\hat{P_{j,t}}$. The real house-price shocks since $t-1$, $Shock_{j,t}$, are derived as the difference between the actual percentage change in real house prices, $\Delta P_{j,t}$,

[24] Although there is no fully adequate method to estimate the variable of house price shocks in the housing literature, the AR(2) specification provides a decent and simple benchmark (Begley and Chan (2018)).

[25] The unit root hypothesis is rejected using the Fisher-type test, which suggests that the real house price process is stationary over time and house-price shocks do not show lasting effects(He et al. (2015)).

and the predicted percentage change in real house prices, $\Delta\hat{P}_{j,t}$.

I also employ two alternative measures of unexpected house-price shocks as a robustness checks. First, I use AR(3) and AR(4) processes rather than AR(2) for the house-price dynamics in Equation 3.1.[26] Second, I use house-price shocks based on house price levels rather than house price growth. The estimation results using these alternative measures reported in Appendix C.5 are not dramatically different from those using the AR(2).[27] In Table 3.1, the mean of the house-price shocks using the AR(2) process, reported, is -0.02%. The density functions of this measure, reported in Figure 3.3, are almost symmetric around the mean. The variance is larger if the data are restricted to the years after 2000 compared to those before 2000, which implies more fluctuations in house prices after 2000.

A housing market appreciation, for instance, might have different wealth effects on house owners versus renters. Therefore, households' labour supply responses to a house-price appreciation could differ by their house tenure choices. I explore the house-price effect on female labour supply for house owners and renters, separately, using Equation 3.2.

$$Y_{i,j,t} = \beta_0 + \beta_1 Shock_{j,t} + \sum_n \beta_n X_{i,j,t-1} + Z_i + y_t + c_{j,t} + \mu_{i,j,t} \tag{3.2}$$

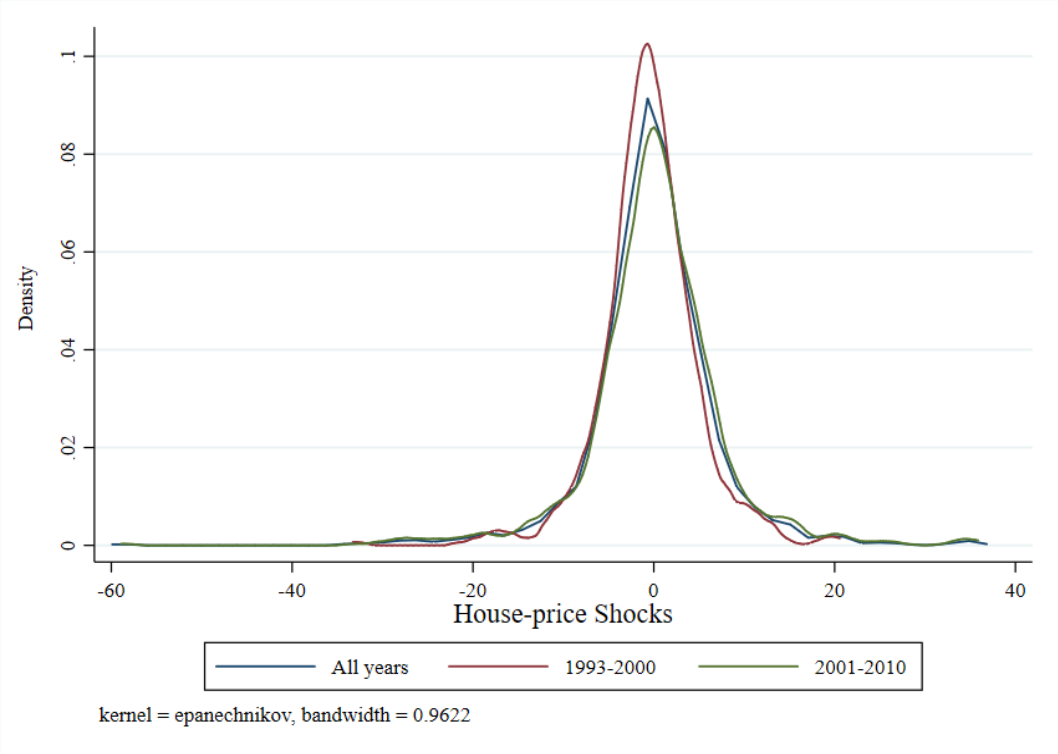
At the extensive margin, $Y_{i,j,t}$ is labour force participation indicator for woman i living in REB j in year t; $Shock_{j,t}$ is the unanticipated house-price shocks for REB j since year $t-1$, as described above. The house-price shocks are also further separated into positive house-price shocks and negative house-price shocks to capture potential asymmetric effects between these two variables (Farnham et al. (2011); Klein (2017); Begley and Chan (2018)). $X_{i,j,t-1}$ contains a set of lagged time-varying variables such as a quadratic age variable and education dummies of women, whether they have children under five years, as well as their husbands' education and labour force status dummies;[28] Z_i contains a set of time-invariant

[26] I regress the evolution of house prices on their more lagged variables (up to 4 periods) for each REB and the coefficients of the third and fourth lags are insignificant among most cases.

[27] From tables in Appendix C.5, the coefficients using house-price shocks calculated with the price level are different in magnitude from the estimates using house-price shocks based the percentage change. This is because these two calculated house-price shocks are measured in different units ($10,000 versus %).

[28] In order to avoid the potential endogeneity issue, the husbands' education and labour force status

Figure 3.3: Housing Price Shock Density Functions



Source: Authors' calculations based on CREA MLS average house prices from Clark and Ferrer (2019)

variables such as race/ethnicity and birth cohort; y_t is year fixed-effect[29]. I also include REB-by-year fixed-effect ($c_{j,t}$) in my model to account for some regional and nation-wide variations, differential housing market fluctuations in each REB, as well as the distinct trends of female labour force participation[30]. The standard errors ($\mu_{i,j,t}$) are clustered at the REB level to account for the aggregated nature of house price data (Bertrand et al. (2004); Clark and Ferrer (2019))[31] I use the linear probability model (LPM) as my baseline estimation. As a robustness check, I also repeat results using Logit.

At the intensive margin, I follow the studies which focus directly on changes in hours of work rather than looking at hours of work in levels (e.g., Kohara (2010) and Bryan and Longhi (2018)). Unlike estimating a simple association between the number of hours of work and house-price shocks, looking at changes in hours of work allows me to examine the labour reaction of married women to changes in house-price shocks as well as how much stronger the reaction is when house-price shocks are larger. Therefore, $Y_{i,j,t}$ is the change in hours worked for woman i living in REB j between year t and year $t-1$ and $\Delta Shock_{j,t}$ is used instead of $Shock_{j,t}$. The control variables such as $X_{i,j,t-1}$ also are first-differentiated. Furthermore, estimating changes in hours of work of women but not the levels can help to deal with the problem of time-invariant omitted variables (Kohara (2010)). I focus on the sample used at the extensive margin (all married women) and apply the OLS estimation as my baseline model (Angrist and Pischke (2009)). Following the method I used in Lluis and Pan (2018), an unconditional quantile (UQ) regression (Firpo et al. (2009)) to examine the female labour reaction to changes in house-price shocks at the median as well as at various

dummies are controlled for in the model to approximate family income information instead of including this income variable directly. Additionally, controlling for husbands' labour market status can help me to isolate the house-price shock effects on female labour supply per se because changes in husbands' labour market status could impact wives' labour supply as well (Kohara (2010); Bryan and Longhi (2018)).

[29]The REB fixed-effect is absorbed in the individual fixed-effect (Z_i) because I restrict my sample to non-movers only.

[30]A specification without this REB-by-year fixed-effect has been tested when estimating Equation 3.2, and the estimated effects of house-price shocks are robust (results are not reported here to prevent oversize appendix).

[31]Researchers have emphasized the possible correlation across clusters when clustering the standard errors by region and year pair (Cameron and Miller (2015)). Thus, I choose to cluster the standard errors at the REB rather than REB-time pair level.

percentiles has been conducted.[32][33] A median (or average) estimation might not be able to capture women's labour hours reaction when focusing on the changes in hours of work because a fairly large proportion of women have not altered their hours of work and these changes are zero. Therefore, exploring the relatively low and high percentiles of changes in hours of work (when changes in hours of work could be either negative or positive) can help to observe women's labour hours reaction and examine how much stronger the reaction is when house-price shocks change more.

Table 3.2 reports the effect of house-price shocks on the labour supply of married women's among owners. At the extensive margin (Panel A), the LPM estimations (column 1) imply that a 10% increase in house-price shocks causes a statistically significant 0.71% (0.5 percentage point) reduction in the likelihood of labour force participation for married women.[34][35] Results are similar after including individual fixed effects (column 2). Following Klein (2017), I further separate the house-price shocks into positive and negative house-price shocks (represented as 0 when a shock with the opposite sign occurs) to capture potential asymmetric effects between these two variables (column 3)[36]. The results consistently suggest that an appreciation of house-prices induces women to supply less labour, while a depreciation of house-price has little effect. For instance, a 10% increase in positive house-price shocks significantly reduces the likelihood of labour force participation by about 1.7% (1.2 percentage point), whereas the negative house-price shocks have negligible effects on female labour participation. The results of the Logit specifications (columns 4-6) are qualitatively similar to those in the LPM estimation[37].

[32]The study has benefited from using the generously shared Stata programs on Nicole Fortin's webpage by the authors at faculty.arts.ubc.ca/nfortin datahead.html. The RIF-OLS regression specification is used in this study, which assumes that the outcome quantiles are linearly related with the observed covariates.

[33]Unlike the conditional quantile regression, the unconditional quantile estimation allows me to examine how an increase in the entire population's house-price shock growth alters a certain quantile in the unconditional distribution of women's changes in hours of work (Lindqvist and Vestman (2011)).

[34]Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation.

[35]The labour force participation rate among married women whose family own a house is 70.72%. A 0.5 percentage point reduction in the participation probability of this group leads to a 0.71% decrease ($0.5/70.72 \approx 0.71\%$).

[36]In order to easily interpret coefficients of these shocks, following Klein (2017), I use the absolute value of the negative house-price shocks.

[37]I repeat the analyses by further controlling for the dwelling type, a potential measure of the quality

At the intensive margin (Panel B), the OLS estimates (column 1) indicate that a married woman responds to a 10% increase in the house-price shocks with a decrease in annual work hours by about 4 hours. However, this effect is not statistically significant. The results of the UQ regression at the median (column 2) also show an insignificant reaction in terms of hours of work of married women. The lack of significance at mean/median is not surprising because they are consistent with the fact that a fairly large proportion of women have not altered their hours of work. On average, the changes in hours of work among female owners in my sample is 0.05. Therefore, I explore the 10th percentile (column 3) and 90th percentile (column 4) to analyze whether the hours of work reaction of these women are stronger. At the 10th percentile, I find that a 10% increase in the house-price shocks induces a woman to further reduce her annual hours of work by about six hours and this response is statistically significant, whereas the adjustment of labour hours at the 90th percentile is small and insignificant. Even though the magnitude of the labour hours reduction found at the lower tail is small (6 hours annually), this negative effect due to the house-price appreciation is non-negligible given the fact that the majority of women in the sample have not change their hours of work.

The effect of house-price shocks on married women's labour supply among renters is presented in Table 3.3. The results imply no evidence of renters' labour market adjustments to house-price shocks at both the extensive or intensive margins. These findings are not surprising if variations in house prices have been anticipated in the short-run and renters expect house prices to be back to the original levels and respond by delaying entrance into homeownership. Alternatively, they may choose to find a cheaper residence instead of adjusting their labour supply (Aladangady (2017); Zhao et al. (2018)). These insignificant results also are consistent with many studies (e.g., Disney and Gathergood (2018); Clark and Ferrer (2019)) which generally find evidence showing that wealth changes driven by house-price changes have important effects on house owners, but little effects on renters.[38].

In summary, I find a statistically significant negative effect of an appreciation in house

of a house, to capture variations across houses at both the extensive and intensive margins. The results are almost the same as before.

[38]It is worth noting that although the coefficients are insignificant, they are positive among all regressions. So it is likely that these results are imprecisely estimated due to the small sample size among renters.

prices on married women labour supply among owners but not renters at both the extensive and intensive margins. The findings are consistent with the prediction of the family labour supply and life-cycle theories which indicates that unexpected gains in wealth should decrease household labour supply, and concentrates at the intensive at the lower tails of the distribution of hours of work.

Table 3.2: Effect of House-price Shocks on Labour Supply of Married Women among Owners

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	Logit	Logit FE	Logit FE
	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Coefficient	Coefficient	Odds Ratio	Odds Ratio	Odds Ratio
House-price shocks (%)	-0.05*	-0.05**		0.99**	0.99**	
	(0.02)	(0.02)		(0.14)	(0.20)	
Positive house-price shocks (%)			-0.12***			0.98*
			(0.04)			(0.68)
Negative house-price shocks (%)			-0.02			0.99
			(0.06)			(0.75)
Number of observations	61589			61589		
Number of individuals		14743	14743		14743	14743
(Pseudo) R-squared or Chi-squared	0.16	0.69	0.69	0.14	268.57	402.86
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.		
	(1)	(2)	(3)	(4)		
	Coefficient	Coefficient	Coefficient	Coefficient		
Δ House-price shocks (%)	-0.39	-0.01	-0.64*	-0.06		
	(0.39)	(0.01)	(0.39)	(0.29)		
Number of observations	43425	43425	43425	43425		
R-squared	0.01	0.01	0.01	0.02		

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, and whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level in Specifications (1)-(4) and replicated bootstrap standard errors clustered at the REB level are in Specifications (5)-(6).

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

Table 3.3: Effect of House-price Shocks on Labour Supply of Married Women among Renters

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	Logit	Logit FE	Logit FE
	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Coefficient	Coefficient	Odds Ratio	Odds Ratio	Odds Ratio
House-price shocks (%)	0.03	0.04		1.00	1.00	
	(0.11)	(0.11)		(0.60)	(0.66)	
Positive house-price shocks (%)			0.20			1.00
			(0.41)			(2.39)
Negative house-price shocks (%)			0.12			1.00
			(0.32)			(2.66)
Number of observations	3409			3409		
Number of individuals		844	844		844	844
(Pseudo) R-squared or Chi-squared	0.20	0.64	0.64	0.18	22.52	20.50
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.		
	(1)	(2)	(3)	(4)		
	Coefficient	Coefficient	Coefficient	Coefficient		
Δ House-price shocks (%)	0.57	0.01	2.33	1.12		
	(1.77)	(0.04)	(4.63)	(3.05)		
Number of observations	2380	2380	2380	2380		
R-squared	0.02	0.01	0.01	0.02		

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, and whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level in Specifications (1)-(4) and replicated bootstrap standard errors clustered at the REB level are in Specifications (5)-(6).

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

As mentioned in Section 3.1, there could be an heterogenous effect of housing price appreciation within the house owner group. Therefore, I further explore the effects of house-price shocks by considering possible factors that contribute to heterogeneous labour market responses of married women: the opportunity cost of reducing labour supply, as well as the approximated size of housing wealth change per one percentage change of house-price shock. I estimate the women's opportunity cost of reducing labour supply using her education level, and approximate the magnitude of the housing wealth changes using the residence location (whether in an urban centre or rural area).

Table 3.4 and Table 3.5 show the effects of house-price shocks further interacted by the highest level of achieved education of married women and their residence location using Equation 3.3 and Equation 3.4, respectively.

$$Y_{i,j,t} = \beta'_0 + \beta'_1 UnivDegree_{i,t-1} + \beta'_2 Shock_{j,t} * UnivDegree_{i,t-1} + \beta'_3 Shock_{j,t} * NoUnivDegree_{i,t-1} + \sum_n \beta_n X_{i,j,t-1} + Z_i + y_t + c_{j,t} + \mu_{i,j,t} \tag{3.3}$$

$$Y_{i,j,t} = \beta''_0 + \beta''_1 Urban_{i,t-1} + \beta''_2 Shock_{j,t} * Urban_{i,t-1} + \beta''_3 Shock_{j,t} * Rural_{i,t-1} + \sum_n \beta_n X_{i,j,t-1} + Z_i + y_t + c_{j,t} + \mu_{i,j,t} \tag{3.4}$$

where $UnivDegree$ (or $NoUnivDegree$) is equal to 1 if wives have a university degree (or don't have a university degree), and equal to 0 otherwise; $Urban$ (or $Rural$) is equal to 1 if wives live in an urban centre (or a rural area), and equal to 0 otherwise.

In this case, β'_2 (or β'_3) indicates the potential impact of house-price shocks on labour market behavior of wives who have a university degree (or don't have a university degree). β''_2 (or β''_3) indicates the potential impact of house-price shocks on labour market behavior of wives who live in an urban (or a rural) area.

Table 3.4 presents the results by women's education which suggest that the decline of women's labour force participation indicated in Table 3.2 are mainly driven by those less-educated women who do not have a university degree. This is consistent with the idea that the opportunity cost of leisure for a less-educated woman is lower than that of a more-educated one because of her relatively lower returns from the labour market. Thus, when a positive housing wealth shock occurs, a less-educated woman is more likely to exit the labour force compared to a more-educated one with greater potential earnings.

Although the estimates for hours of work are insignificant, given that the size of the effects (magnitude of the coefficients) is similar to Table 3.2, this is likely a matter of power of the estimation. It is worth noting that, at the 10th percentile, the negative effect is still significant for the low educated which suggests that the response is more homogeneous for this group.

Table 3.4: Effect of House-price Shocks on Labour Supply of Married Women by Education among Owners

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	Logit	Logit FE	Logit FE
	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Coefficient	Coefficient	Odds Ratio	Odds Ratio	Odds Ratio
House-price shocks (Univ Degree)	-0.04	-0.03		0.99	0.99	
	(0.04)	(0.04)		(0.30)	(0.65)	
House-price shocks (No Univ Degree)	-0.05	-0.06*		0.99*	0.99*	
	(0.03)	(0.03)		(0.18)	(0.27)	
Pos house-price shocks (Univ Degree)			-0.11			0.98
			(0.12)			(1.88)
Neg house-price shocks (Univ Degree)			-0.06			0.99
			(0.08)			(1.48)
Pos house-price shocks (No Univ Degree)			-0.12**			0.98*
			(0.04)			(0.72)
Neg house-price shocks (No Univ Degree)			-0.01			0.99
			(0.08)			(0.91)
Number of observations	61589			61589		
Number of individuals		14743	14743		14743	14743
(Pseudo) R-squared or Chi-squared	0.15	0.69	0.69	0.13	299.17	395.38
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.		
	(1)	(2)	(3)	(4)		
	Coefficient	Coefficient	Coefficient	Coefficient		
Δ House-price shocks (Univ Degree)	-0.52	0.01	-0.77	-0.51		
	(0.96)	(0.04)	(0.72)	(0.66)		
Δ House-price shocks (No Univ Degree)	-0.37	-0.01	-0.60	0.04		
	(0.43)	(0.02)	(0.43)	(0.31)		
Number of observations	43425	43425	43425	43425		
R-squared	0.01	0.01	0.01	0.01		

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, whether having a university degree, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, and whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, and REB-by-year fixed-effect.[a] Standard errors in parentheses are clustered at the REB level in Specifications (1)-(4) and replicated bootstrap standard errors clustered at the REB level are in Specifications (5)-(6).

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

[a] Education dummies are excluded because of the inclusion of Univ Degree indicator in the regressions.

Table 3.5 shows the estimates based on wives' residence location, indicating that the downward adjustment of women's labour supply found before is mainly driven by wives living in an urban area. These findings are consistent with the idea that an owner in an urban area might experience a larger magnitude increase in the housing wealth compared to one in a rural area when a certain percentage increase in house-price shock occurs due to the significant variations in housing values between these two areas. Thus, when facing an increase in house-price shocks (or an increase in the growth of house-price shocks), a woman living in an urban centre is more likely to withdraw from the labour force (or respond by reduce her hours worked more) due to her relatively larger income effect compared to a woman in a rural area[39].

In addition, considering housing as both an investment and consumption good, the diverse future housing consumptions (intention to downsize or upsize) among house owners with different ages may also contribute to heterogenous labour supply responses to housing market appreciation. However, I do not get significant results using this approach of women's age groups.[40]

[39]In order to explore whether the found impact of house-price appreciation on female labour supply is mainly caused by women living in large urban areas such as Toronto and Vancouver, an analysis which excludes the 3 biggest cites (Toronto, Montreal, and Vancouver) has been conducted. Similar results are reported in Appendix *C*.3.

[40]I investigate the possible heterogeneous effects of house-price shocks by married women's age groups (young, mid, and elderly age groups). However, the results are inconsistent and almost insignificant across specifications.

Table 3.5: Effect of House-price Shocks on Labour Supply of Married Women by Residences Location among Owners

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	Logit	Logit FE	Logit FE
	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Coefficient	Coefficient	Odds Ratio	Odds Ratio	Odds Ratio
House-price shocks (Urban)	-0.06*	-0.06**		0.99*	0.99**	
	(0.03)	(0.03)		(0.19)	(0.28)	
House-price shocks (Rural)	-0.04	-0.03		0.99	0.99	
	(0.04)	(0.04)		(0.23)	(0.41)	
Pos house-price shocks (Urban)			-0.14***			0.98***
			(0.04)			(0.50)
Neg house-price shocks (Urban)			-0.03			0.99
			(0.06)			(0.71)
Pos house-price shocks (Rural)			-0.04			1.00
			(0.10)			(1.55)
Neg house-price shocks (Rural)			0.02			1.00
			(0.13)			(1.58)
Number of observations	61589			61589		
Number of individuals		14743	14743		14743	14743
(Pseudo) R-squared or Chi-squared	0.16	0.69	0.69	0.13	259.57	563.23
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.		
	(1)	(2)	(3)	(4)		
	Coefficient	Coefficient	Coefficient	Coefficient		
Δ House-price shocks (Urban)	-0.60	-0.01	-0.90**	0.07		
	(0.42)	(0.02)	(0.39)	(0.32)		
Δ House-price shocks (Rural)	0.23	-0.01	0.09	-0.43		
	(0.77)	(0.03)	(0.79)	(0.61)		
Number of observations	43425	43425	43425	43425		
R-squared	0.01	0.01	0.01	0.02		

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work, whether living in an urban area. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level in Specifications (1)-(4) and replicated bootstrap standard errors clustered at the REB level are in Specifications (5)-(6).

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

3.4.2 Estimating the house price effect on female labour supply with topography instrument

The reverse causality between house prices and female labour supply (bid-up effect) has been emphasized in literature (Johnson (2014)). For instance, rising housing prices induce more female spouses to work to offset the future housing purchase costs if their families plan to buy a house or balance rising rental prices if they continue renting. Nonetheless, it

is also plausible that more working women in one area, which contributes to a higher proportion of two-earner households with stronger payment capacities, may bid up the house prices there.[41] Furthermore, factors affecting house prices, such as expectations of future income, may also influence households' labour market behaviors as well as consumption (Johnson (2014); He et al. (2015); Aladangady (2017)). Previous research has employed various instruments for house prices or house-price growth to address these sources of endogeneity. Saiz (2010) studied effects of unbuildable land and land-use regulations on the housing supply elasticity and suggested that the proportion of area that is forgone to water, wetlands, and steep slopes makes the housing supply to be less elastic in metropolitan areas in the U.S. This relatively inelastic housing supply may induce higher house prices when there is a housing demand shock (Saiz (2010); Johnson (2014)). Johnson (2014) identified the effect of exogenous changes in house prices across metropolitan areas in the U.S. on female labour supply by using these topography measures as the instruments. He used a fraction of buildable land (area not covered by water or outside of the country) and a fraction of sloped land (with a degree more than 20%) calculated using Census maps as instruments of house prices. Aladangady (2017) utilized the housing supply elasticity calculated by Saiz (2010) directly, and interacted it with long-term real interest rates as an instrument of house prices growth in the U.S. to estimate the consumption responses to house prices changes.[42] The author assumed that this instrument is valid as long as the consumption responses to interest rate changes are not varying across the housing supply elasticity.

The second strategy I use to estimate the causal effect of changes in house prices on female labour supply is constructing topography instruments. Following Saiz (2010), I construct a comprehensive measure of the area that is available for building real estate (for both residential or commercial purposes) in each REB of Canada using geographic

[41] To address the reverse causality, Johnson (2014) has constructed an equilibrium model in metropolitan areas that incorporates residence location choices and wives' participation decisions. The author assumed that two-earner families are more eager to pay a high price to live near the city center in order to reduce the commuting time compared to one-earner families. Therefore, a higher female labour force participation rate (more two-earner families) is expected to bid up house prices near the city center.

[42] The housing supply elasticity that Saiz (2010) has calculated is based on the land availability as well as land-use regulations.

information system (GIS) techniques. The measure is calculated as the fraction of land not covered by water, wetlands, mountains, and greenbelts (if applicable). I utilize the coordinates of all census subdivisions in each REB obtained from Clark and Ferrer and digitizing polygon files with ArcGIS Pro versions 2.3.1 and 2.2 software.[43] It is worth knowing that it is extremely time consuming to generate slope maps using elevation data at a decent resolution (e.g., 90-m was used in Saiz (2010)) for the significantly large size of Canada. Therefore, instead of excluding steep slope area from buildable lands like Saiz (2010), I remove the area covered by mountains when constructing my land availability measure. However, due to the data limitation, mountain information is only calculated in Alberta and British Columbia where buildable land is influenced by mountain significantly. Additionally, the greenbelt information is available only in the REBs of Ontario that experienced greenbelt regulation amendments since 2005. Thus, this topography measure is time-invariant for all REBs except those in Ontario.

Besides the fraction of buildable land, I calculate the change in elevation between the lowest and the highest point in each REB using the GIS techniques as another time-invariant topography measure and apply it as the instruments. As generating slope maps for the whole Canadian area is very time consuming, this topography measure could be an easy substitution of that to approximate the terrain in each REB and capture more cross-regional variations in house prices.

As far as I know, in the economics literature, these are the first comprehensive measures of calculating buildable land and evaluating regional terrain in Canada at the REB level. Then, following Johnson (2014), I use these measures as the instruments of the percentage change in house prices.[44] The mean of the fraction of buildable land, reported in Table 3.1,

[43] Unlike other studies in the literature such as Saiz (2010) using the geographic data in the U.S., water such as oceans, lakes, rivers, and other internal water bodies has already been removed from Canadian land in the ArcGIS Pro software. Thus, the variations in this statistic are driven by wetlands, mountains, and greenbelts. Neglecting water variations when calculating the fraction of buildable land could lead this fraction to be relatively large (see Table 3.1). However, this might not be an issue if we focus on land/ground only when considering whether the area is available for building real estate.

[44] Introducing the interest rate into the instrument might bring additional wealth changes such as changes in mortgage payment, which could also affect individuals' labour supply. And these effects might differ across regions based on the heterogeneity of house prices. Therefore, I choose to use topography measures themselves as the instruments.

is 91.43%, which implies that most areas of Canada have a high land availability.[45] And the mean of the difference between maximum and minimum elevation points is 691 meters. This large number is mainly driven by the REBs in Alberta and British Columbia.

The instrumental variable (IV) estimates are conducted using a two-step least squares (2SLS) procedure at both the extensive and intensive margins. The two-stage model can be described with the following equations:

$$Y_{i,j,t} = \beta_0 + \beta_1 \Delta P_{j,t} + \sum_n \beta_n X_{i,j,t-1} + y_t + \mu_{i,j,t} \tag{3.5}$$

$$\Delta P_{j,t} = \gamma_0 + \sum_k \gamma_k G_{j,t} + \sum_n \gamma_n X_{i,j,t-1} + y_t + v_{i,j,t} \tag{3.6}$$

$$cov(G_{j,t}, \mu_{i,j,t}) = 0 \tag{3.7}$$

where $Y_{i,j,t}$ is the labour force participation indicator at the extensive margin and the hours worked at the intensive margin. Changes in hours of work are not used at the intensive margin because the instruments can not be differentiated due to its time-invariant nature in most of the REBs.[46] $\Delta P_{j,t}$ is the percentage change in house prices in REB j between year $t-1$ and t. $G_{j,t}$ are the topography instruments which are the fraction of buildable land in REB j in year t described as above[47] and the difference in elevation in REB j. $X_{i,j,t-1}$ contains lagged time-varying variables and y_t is year fixed-effect.[48] The identifying assumption in Equation 3.7 is that the fraction of buildable land and the

[45] As mentioned, this high number could be driven by the fact that water variations are neglected when calculating the fraction of buildable land.

[46] Individual fixed-effect model is not used in the IV approach due to the nature of the time-invariant topography measures.

[47] As mentioned, this topography measure is only time-varying for REBs in Ontario that experienced greenbelt regulation amendments.

[48] The REB fixed-effect and REB-by-year fixed-effect are not included in the instrument analysis due to their possible collinearity with the instruments.

difference in maximum and minimum elevation do not directly influence female labour market behaviours and therefore has zero covariance with the error term.

The implication of the model is that the share of land available for development as well as the topography could be considered predetermined and exogenous (Saiz (2010)). These exogenous topography measures provide valid instruments to examine the labour market responses to changes in house prices. A lower fraction of buildable land makes the housing supply to be less elastic in the region. This relatively inelastic housing supply may induce higher house prices when there is a housing demand shock (Saiz (2010); Johnson (2014)). Additionally, the ease of building is evaluated by the terrain. Rough terrain or large changes in elevation inhibit housing supply growth which might increase house prices as well.

The results of the effect of changes in house prices on the labour supply of married women among owners using the IV approach are indicated in Table 3.6. The first-stage results imply that the coefficients of the excluded instruments (the fraction of buildable land and the difference in elevation) on the percentage change in house prices are significant at 1% at both the extensive and intensive margins. In addition, the F-tests for the excluded instruments reported in Table 3.6 exceed the Stock and Yogo (2002) thresholds at the 15 and 10 percent level for relative size and bias at the extensive and intensive margins, respectively. All of these statistics present the excluded topography instruments as strongly relevant to REB-level house price growth. For the exogeneity, the fraction of buildable land and the difference in elevation also pass conventional exogeneity tests with a p-value of 0.46 (the extensive margin) and 0.10 (the intensive margin) in the Sargan–Hansen J test.[49]

It is worth noting that the predictions of these two instruments on changes in house-price are not always in the expected direction. For instance, from the first stage in Table 3.6, a rise in the changes in the maximum and minimum points of elevation accelerates the house-price growth. This prediction is expected because rough terrain inhibit housing

[49]Even though the endogeneity of the house prices or growth has been highlighted by researchers, the Durbin Hausman-Wu tests I conduct do not reject the null hypothesis of emphasizing house prices are considered as exogenous (the p-value is 0.11 and 0.15 for the extensive and intensive margins, respectively). However, given the relative small p-value, it is also reasonable to use instruments in the analysis.

Table 3.6: Effect of Changes in House Prices on Labour Supply of Married Women among Owners with Instruments

Panel A: Labour Force Participation	Linear IV
	Coefficient
Changes in house-price (%)	-0.92*
	(0.56)
First stage: Fraction of buildable land (%)	0.04***
First stage: Difference in elevation	0.01***
Stock and Yogo First stage F-test	19.86
(p-value)	0.00
Test of overidentification (p value of Sargan–Hansen J test)	0.46
Number of observations	64713
R-squared	0.14
Panel B: Hours of Work	Linear IV
	Coefficient
Changes in house-price (%)	-21.50
	(15.26)
First stage: Fraction of buildable land (%)	0.04***
First stage: Difference in elevation	0.01***
Stock and Yogo First stage F-test	20.63
(p-value)	0.00
Test of overidentification (p value of Sargan–Hansen J test)	0.10
Number of observations	61899
R-squared	0.14

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect. Standard errors in parentheses are clustered at the REB level.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

supply growth and could appreciate house prices. However, an increase in the fraction of buildable land also boost the house-price growth. This finding is surprising but it could be caused by the dynamic house-price profile which could change over time. For example, as mentioned, a higher fraction of buildable land with a more elastic housing supply in the region is expected to cool down house prices. So regions with plenty of buildable area (see Regina and Saskatoon in Table 3.7) usually have low house prices in level, but they also have a high house-price growth at the same time. This could occur because these regions with adequate housing supply and low original house prices are attractive for residences and investors due to their large potential of community development in the long-run and much space for house price growing. One the other hand, cities with scarce available land (see Vancouver and Toronto in Table 3.7) often have high house prices in levels but low growth rates because these cities' prices are already high and there might be no much capacity for growing.

Table 3.7: Fraction of Buildable Land and Housing Markets

REB	Fraction of buildable land (%)	House prices ($10,000)	House-price Growth (%)
Regina	97.81	12.40	6.27
Saskatoon	99.87	14.88	6.72
Vancouver	10.56	38.61	3.14
Toronto	46.96	29.72	2.89

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

In Table 3.6, when instrumented, I find that an increase in changes in house-price causes a statistically significant reduction in the likelihood of participation for married women whose families own a house. This is consistent with the findings using the house-price shocks approach presented in the last section. For women's hours of work, I also find a negative effect of an increase in house-price growth although this effect is insignificant.[50]

The IV approach is also conducted to analyze the effect of changes in house prices

[50]The number of observations at the intensive margin is different from the one at the extensive margin because of the existence of missing values in hours of work. Some respondents did not report their hours worked in the survey even though they were in the labour force.

among renters' labour market behaviours. Consistently with the results using the house-price shocks approach, the estimates using the IV approach reported in Table 3.8 are insignificant at both the extensive and intensive margins.

Besides these two topographic measures, land-use regulations which restrict the development of real estate are also associated with a relatively inelastic housing supply and might have an impact on house prices (Saiz (2010); Green et al. (2016)). Green et al. (2016) have derived a summary index of regulation in Canadian housing market (not available to the public). A future step could be following up with the authors to collect this index. However, using the land-use regulations as the instruments also have some challenges. The endogeneity of land-use regulations has been addressed in Saiz (2010) due to the reverse causality from higher prices to more regulations. This implies that restrictive land-use regulations are more likely to occur in regions with high house prices. Also, the geographical coverage and boundaries of regions in Green et al. (2016) are different from mine. Therefore, mapping their land-use regulation index to my REBs could be very challenging due to this boundary mismatch and this fact could lead the results to be biased.

Table 3.8: Effect of Changes in House Prices on Labour Supply of Married Women among Renters with Instruments

Panel A: Labour Force Participation	Linear IV
	Coefficient
Changes in house-price (%)	-0.53
	(1.60)
First stage: Fraction of buildable land (%)	0.05***
First stage: Difference in elevation	0.01***
Stock and Yogo First stage F-test	11.39
(p-value)	0.00
Test of overidentification (p value of Sargan–Hansen J test)	0.15
Number of observations	3598
R-squared	0.17
Panel B: Hours of Work	Linear IV
	Coefficient
Changes in house-price (%)	33.87
	(29.04)
First stage: Fraction of buildable land (%)	0.05***
First stage: Difference in elevation	0.01***
Stock and Yogo First stage F-test	14.13
(p-value)	0.00
Test of overidentification (p value of Sargan–Hansen J test)	0.02
Number of observations	3430
R-squared	0.17

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect. Standard errors in parentheses are clustered at the REB level.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

3.5 Conclusions and Discussions

In this study, I investigate the impact of changes in house prices on the labour supply of married women in Canada using two approaches. After capturing unanticipated variations in local house prices instead of variations that could be expected by people, among house owners, I find that a 10% increase in (positive) house-price shocks causes a 1.7% (1.2 percentage point) reduction in married women's likelihood of participation. At the intensive margin, I find that a 10% increase in the house-price shocks induce a decrease in annual work hours of a woman by about 6 hours at the 10th percentile. Additionally, I find heterogeneous effects of house-price shocks on women's labour supply depending on their education level and residence location. These results are consistent with the prediction of family labour supply model and life-cycle theory, which indicates that unexpected gains in wealth should decrease household labour supply. There is no evidence showing that house-price shocks have a labour effect on renters in this study, which might suggest that they choose to delay to enter homeownership or find a cheaper residence instead of adjusting their labour supply when an appreciation of house prices occurs (Aladangady (2017); Zhao et al. (2018)). The IV approach, which uses the fraction of buildable land and the difference in elevation as the instruments, also provides consistent results.

Many studies in the housing literature have not explored the exogenous variations in house prices when investigating the effect of changes in house-price on households' labour market behavious. However, neglecting the anticipation and endogeneity of house prices could lead to biased estimations. In this study, one of my contributions to the literature is applying the house-price shock approach and the IV methodology to exploit the exogeneity of house prices to overcome the challenges of examining the effect of house-price changes on female labour supply. To my knowledge, in Canada, no research has used these two methods to analyze this effect. In addition, the instruments I construct are the first comprehensive measures of buildable land/regional terrain in Canada at the REB level in the economics literature. Overall, the consistency of the results using these two approaches suggests that the effect of changes in house-price found in this paper is quite robust across models. Also, comparison of my findings to those of earlier research in other countries (the U.S. mainly)

which have employed the instruments or house-price shocks (e.g., Johnson (2014); Begley and Chan (2018)) reveals generally similar conclusions.

Governments and researchers are paying more and more attention to the impact of excessive increase in house prices (especially in large cities) on people's consumption and labour behaviours, as well as their life quality. Many studies point out that a dramatic rise in house prices decreases the lifetime welfare of young individuals and induces them to work longer and consume less to accumulate down payment if they intend to enter homeownership (Kershaw and Minh (2016); Li and Yao (2007)). Governments have implemented several measures (e.g., increasing down payments and tax to foreign housing buyers) to help contain house prices and ease the stress of (young) people who intend to purchase a house but can not afford to. This study, on the other hand, provides evidences showing the influence of rising house prices on people's labour market decisions among those who have already own a house and might help social planners to develop a more complete picture of the effects caused by the rising house prices.

Additionally, I find that an appreciation of the housing market discourages married women to work. However, this is not true among married men. This highlights gender asymmetries in labour responses to shocks that may have long-term effects for women welfare. In particular, an asymmetric response to short-term higher housing wealth may lead to lower human capital and long time wealth accumulation for women, which leaves them in vulnerable positions in case of marital dissolution. Moreover, a family in which the mother shares a higher proportion of the household earned income will invest more in children's goods (Lundberg et al. (1997), Kenney (2008), Kornrich and Furstenberg (2013)). This adverse employment effect on women which could lower their human capital and long time wealth accumulation might also have an impact on their children's well-being. Investigating the effect of changes in house prices on married women's labour market behaviours might inform the social planners about a better way of understanding the relationship between housing market and women's long time welfare as well as children's development and well-being.

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APPENDICES

Appendix A

Appendix for Chapter 1

A.1 Effect of Transition in Family Structure

Table A.1: Effect of Transition in Family Structure on Academic Performance

	Reading				Math		
	OLS		VA		OLS		VA
	(1)	(2)	(3)		(4)	(5)	(6)
Reading (t-1)	-	-	0.59***	Math (t-1)	-	-	0.53***
	-	-	(0.03)		-	-	(0.03)
Transitions in family structure							
Stay in Non-intact family	-5.19***	-5.18**	-2.50	Stay in Single parent family	-10.18*	-11.10	-7.23
	(1.47)	(2.25)	(2.08)		(6.02)	(7.46)	(6.47)
				Stay in Step family	3.51	-9.04	-5.21
					(10.30)	(9.25)	(8.05)
Changed family structure	-4.76***	-4.10**	-4.22**	Changed family structure	-3.19	-7.59	-5.18
	(1.63)	(1.89)	(1.72)		(9.01)	(8.22)	(7.46)
Household Income (7 indicators)	NO	YES	YES		-	-	-
Household Income (Thousands)	-	-	-		NO	0.13***	0.07**
						(0.03)	(0.03)
Transitions in PMK's employment	NO	YES	YES		NO	YES	YES
Previous family structure	-	-	-		NO	YES	YES
Previous PMK's employment	-	-	-		NO	YES	YES
Other child and PMK's characteristics	NO	YES	YES		NO	YES	YES
R-squared	0.02	0.14	0.44		0.15	0.53	0.61
Number of observations	2934	2934	1962		4454	4454	4454

Note: Children remained in an intact family across cycles are the reference groups. See Table 1.1 for a full set of table descriptors. Robust standard error values are in parentheses.

The child longitudinal weights provided in the NLSCY are used in the analysis. * Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.2: Effect of Transition in Family Structure on Academic Performance by Gender

	Reading		**Math**	
	OLS	VA	OLS	VA
	(1)	(2)	(3)	(4)
Reading (t-1) or Math (t-1)	-	0.59***	-	0.53***
	-	(0.03)	-	(0.03)
Child-female	-1.28	-2.54***	-6.32*	-5.20*
	(0.89)	(0.79)	(3.54)	(3.03)
Transitions in family structure				
Stay in Non-intact family	-6.26**	-3.46	-	-
	(2.65)	(2.70)	-	-
Stay in Single parent family	-	-	-14.60	-9.30
	-	-	(9.07)	(8.34)
Stay in Step family	-	-	-2.25	-1.13
	-	-	(10.81)	(9.07)
Changed family structure	-4.27*	-5.24**	4.76	5.01
	(2.47)	(2.14)	(10.61)	(9.61)
Girl*Stay in Non-intact family	2.41	1.92	-	-
	(2.21)	(2.77)	-	-
Girl*Stay in Single parent family	-	-	4.84	2.61
	-	-	(9.40)	(9.22)
Girl*Stay in Step family	-	-	-25.91**	-15.92
	-	-	(11.26)	(9.69)
Girl*Changed family structure	0.39	2.32	-25.60**	-21.02*
	(2.63)	(2.58)	(13.13)	(12.08)
Transitions in PMKs' employment	YES	YES	YES	YES
Household Income	7 indicators	7 indicators	Thousands	Thousands
Previous family structure	-	-	YES	YES
Previous PMK's employment	-	-	YES	YES
Other child and PMK's characteristics	YES	YES	YES	YES
R-squared	0.14	0.44	0.53	0.62
Number of observations	2934	1962	4454	4454

Note: Children remained in an intact family across cycles are the reference groups. See Table 1.1 for a full set of table descriptors. Robust standard error values are in parentheses.

The child longitudinal weights provided in the NLSCY are used in the analysis. * Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.3: Effect of Transitions in Family Structure on Academic Performance by Catholic Affiliation

	Reading		Math	
	OLS	VA	OLS	VA
	(1)	(2)	(3)	(4)
Reading (t-1) or Math (t-1)	-	0.58***	-	0.53***
	-	(0.03)	-	(0.03)
PMK - Catholic	-1.06	-0.34	-7.05*	-4.87
	(1.09)	(1.07)	(3.91)	(3.50)
Transitions in family structure				
Stay in Non-intact family	-4.63*	-1.57		
	(2.62)	(2.41)		
Stay in Single parent family			-20.95**	-13.92*
			(8.74)	(8.11)
Stay in Step family			-16.20	-10.44
			(10.90)	(9.40)
Changed family structure	-4.17*	-2.79	-7.96	-6.73
	(2.38)	(2.34)	(12.56)	(10.93)
Catholic*Stay in Non-intact family	1.12	-2.34		
	(2.55)	(3.33)		
Catholic*Stay in Single parent family			17.73*	12.13
			(9.42)	(9.17)
Catholic*Stay in Step family			12.97	9.75
			(12.77)	(10.38)
Catholic*Changed family structure	-1.60	-3.44	-0.81	2.18
	(2.76)	(2.60)	(13.45)	(12.41)
Transitions in PMKs' employment	YES	YES	YES	YES
Household Income	YES	YES	YES	YES
Previous family structure	-	-	YES	YES
Previous PMK's employment	-	-	YES	YES
Other child and PMK's characteristics	YES	YES	YES	YES
R-squared	0.14	0.44	0.53	0.61
Number of observations	2934	1962	4454	4454

Note: Children remained in an intact family across cycles are the reference groups. See Table 1.1 for a full set of table descriptors. Robust standard error values are in parentheses.

The child longitudinal weights provided in the NLSCY are used in the analysis. * Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.4: Effect of Transitions in Family Structure on Academic Performance by Cultural Affiliation

	Reading				Math			
	OLS		VA		OLS		VA	
	Canadian	French	Canadian	French	Canadian	French	Canadian	French
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Reading (t-1) or Math (t-1)	-	-	0.57***	0.60***	-	-	0.46***	0.66***
	-	-	(0.05)	(0.05)	-	-	(0.05)	(0.04)
Transition in family structure								
Stay in Non-intact family	-1.40	-0.82	-1.03	-1.59				
	(3.12)	(3.24)	(2.95)	(3.58)				
Stay in Single parent					-17.52	-24.35	-13.95	-19.48*
					(10.83)	(14.78)	(9.44)	(11.09)
Stay in Step family					-20.04	11.13	-15.20	14.39
					(12.33)	(17.41)	(10.98)	(14.27)
Change in family structure	-2.98	-2.83	-4.97**	-3.87*	-16.89	-2,12	-14.43	0.69
	(2.72)	(2.46)	(2.34)	(2.17)	(12.93)	(16.09)	(11.44)	(13.63)
Transitions in PMKs' employment	YES	YES	YES	YES	YES	YES	YES	YES
Household Income	Dummies	Dummies	Dummies	Dummies	('000)	('000)	('000)	('000)
Previous family structure	-	-	-	-	YES	YES	YES	YES
Previous PMK's employment	-	-	-	-	YES	YES	YES	YES
Other child/PMK's characteristics	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.20	0.24	0.45	0.50	0.53	0.51	0.60	0.55
Number of observations	1144	760	790	535	1938	1240	1938	1240

Note: Children remained in an intact family across cycles are the reference groups. See Table 1.1 for a full set of table descriptors. Robust standard error values are in parentheses.

The child longitudinal weights provided in the NLSCY are used in the analysis. * Significance at 10% ** Significance at 5% *** Significance at 1%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

A.2 Distribution and Data Descriptors

Table A.5: Dataset Description

Cycle	Survey year	Age of children
Initial cycle	1994-1995	1-5
Second cycle	1996-1997	3-7
Third cycle	1998-1999	5-9
Fourth cycle	2000-2001	7-11
Fifth cycle	2002-2003	9-13
Sixth cycle	2004-2005	11-15

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.6: Summary Statistics of Reading Sample (St. Dev.)

	All	Intact Family	Single Parent Family	Step Family
Reading Skill (Scores)	100.69	101.46	96.77	96.64
	(14.90)	(14.80)	(14.95)	(14.11)
Child's characteristics				
Child's age in months	66.37	65.25	69.17	82.41
	(22.60)	(22.57)	(22.00)	(18.12)
Girls (%)	50.35	52.02	40.36	47.67
	(0.50)	(0.50)	(0.49)	(0.50)
% with educational disability	1.14	1.00	2.03	-
	(0.11)	(0.10)	(0.14)	-
Number of siblings	1.29	1.34	0.94	1.26
	(0.98)	(0.98)	(0.94)	(0.95)
PMKs' characteristics				
PMK age	34.37	34.75	32.97	30.55
	(5.37)	(5.18)	(6.06)	(4.67)
Women (%)	93.45	93.44	92.93	95.43
	(0.25)	(0.25)	(0.26)	(0.21)
% of native-born	86.73	85.35	92.22	99.04
	(0.34)	(0.35)	(0.27)	(0.10)
Age at birth	30.12	29.57	32.49	34.29
	(9.57)	(4.78)	(19.13)	(25.68)
% teenage parent	2.40	1.26	7.96	8.87
	(0.15)	(0.11)	(0.27)	(0.28)
% high school education or less	68.77	70.88	57.38	61.07
	(0.46)	(0.45)	(0.49)	(0.49)
PMK's depression score	4.79	4.31	7.55	5.97
	(9.09)	(8.66)	(10.21)	(12.18)
Households' characteristics				
N. adults (exclude parents)	0.11	0.10	0.16	0.02
	(0.46)	(0.46)	(0.48)	(0.14)
CMA (%)	71.69	71.09	76.86	67.03
	(0.45)	(0.45)	(0.42)	(0.47)
% low-income Family	22.73	15.06	69.31	31.86
	(0.42)	(0.36)	(0.46)	(0.47)
Family functioning score	8.47	7.87	12.26	8.87
	(9.44)	(7.87)	(15.26)	(11.80)
Number of observations	3924	3274	517	133

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.7: Summary Statistics of Math Sample (St. Dev.)

	All	Intact Family	Single Parent Family	Step Family
Math Skill (Scores)	457.13	456.25	454.70	471.40
	(98.73)	(98.98)	(94.70)	(104.62)
Child's characteristics				
Child's age in months	139.13	137.94	140.97	146.19
	(26.09)	(25.86)	(26.46)	(26.01)
Girls (%)	48.72	49.90	50.06	34.15
	(0.50)	(0.50)	(0.50)	(0.47)
% with educational disability	3.20	3.30	3.01	2.71
	(0.18)	(0.18)	(0.17)	(0.16)
Number of siblings	1.46	1.57	1.07	1.34
	(1.02)	(1.02)	(0.94)	(1.04)
PMKs' characteristics				
PMK age	40.33	40.60	40.43	37.49
	(5.08)	(4.72)	(5.77)	(5.74)
Women (%)	97.93	99.78	91.98	94.46
	(0.14)	(0.05)	(0.27)	(0.23)
% of native-born	83.49	83.43	77.90	97.52
	(0.37)	(0.37)	(0.42)	(0.16)
Age at birth	30.22	29.09	34.19	31.58
	(10.95)	(4.32)	(19.54)	(20.31)
% teenage parent	2.08	1.07	3.29	8.84
	(0.14)	(0.10)	(0.18)	(0.28)
% high school education or less	64.30	66.97	60.40	47.93
	(0.48)	(0.47)	(0.49)	(0.50)
PMK's depression score	3.87	3.23	6.59	3.55
	(4.98)	(4.22)	(6.56)	(5.19)
Households' characteristics				
N. adults (exclude parents)	0.24	0.22	0.35	0.16
	(0.66)	(0.58)	(0.72)	(0.43)
CMA (%)	77.90	76.68	83.91	75.21
	(0.41)	(0.42)	(0.37)	(0.43)
Household income ($)	75913	85256	39772	73031
	(57653)	(59146)	(39841)	(42965)
Family functioning score	8.16	7.98	9.42	6.87
	(4.83)	(4.76)	(4.87)	(4.81)
Number of observations	6681	5202	979	500

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.8: Distribution of Children and Average Academic Performance by Family Structure and PMKs' Work Status

	Cycle 1	**Cycle 2**	**Cycle 3**	**Cycle 4**	**Cycle 5**	**Cycle 6**
Family Structure (%)						
Two Biological Parents	88.47	83.23	78.47	76.80	74.04	71.20
Single Parent	10.13	13.92	15.02	16.92	18.89	19.37
Step Family	1.41	2.85	6.49	6.28	7.08	9.42
PMKs' Work Status (%)						
Employed	70.32	73.59	78.72	81.73	82.45	87.08
Non-employed	29.68	26.41	21.28	18.27	17.55	12.92
Outcomes	**Average Reading Scores by Gender (SD)**			**Average Math Scores by Gender (SD)**		
Boys	100.56	100.83	101.29	383.10	459.86	525.38
	(14.64)	(15.42)	(16.07)	(72.94)	(68.21)	(92.58)
Girls	102.37	100.64	98.40	380.66	454.35	512.02
	(14.90)	(14.07)	(14.67)	(80.16)	(71.13)	(95.49)
Number of observations	990	1962	972	2227	2227	2227

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.9: Distribution of Children by Transition in Family Structure and Transition in PMKs' Work Status between adjacent cycles

Panel A. Distribution of Children by Transitions in Family Structure and in PMKs' Work Status

	Reading Sample		Math Sample	
Transition in Family Structure (%)	Cycles 1-2	Cycles 2-3	Cycles 4-5	Cycles 5-6
Stay in Intact Family	83.23	78.49	74.04	71.20
Stay in Non-intact Family	10.99	12.27	-	-
Stay in Single Parent	-	-	15.42	15.92
Stay in Step Family	-	-	5.44	6.67
Changed Family Structure	5.78	9.24	5.10	6.21
Transition in PMKs' Work Status (%)				
Stay in Employment	63.65	67.40	76.94	79.03
Stay in Non-employment	6.39	5.92	4.36	3.10
Employment - Non-employment	9.94	11.32	5.51	8.05
Non-employment - Employment	20.03	15.36	13.19	9.82

Panel B. Distribution of Children in cycles 4 through 6 by cycles 1-3 transition in Family Structure

Previous Transition in Family Structure (%)	**Math Sample**
Stay in Intact Family through cycles 1-3	80.04
Stay in Non-intact Family through cycles 1-3	8.13
Changed Family Structure through cycles 1-3	11.83
Previous Transition in PMKs' Work Status (%)	
Stay in Employment through cycles 1-3	58.35
Stay in Non-employment through cycles 1-3	12.27
Changed Employment Status through cycles 1-3	29.38

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.10: The Effect of Other Control Variables on Children's Reading and Math Scores

	Reading OLS	Math OLS
Previous Family Structure		
Stay in a nonintact family	-	6.76
	-	(7.92)
Experience a change in family structure	-	6.47
	-	(6.47)
Previous PMK's employment		
Stay persistently non-employed	-	3.90
	-	(4.71)
Experience unstable work patterns	-	-2.68
	-	(2.91)
Child's characteristics		
Child's age	0.05	3.12***
	(0.03)	(0.08)
Girls	-0.10	-6.33***
	(0.68)	(2.47)
Disability on education	-19.94***	-53.20***
	(4.37)	(4.99)
Number of siblings	-1.57***	3.12**
	(0.41)	(1.37)
PMK and family's characteristics		
PMK age	0.42***	0.84***
	(0.09)	(0.33)
Women	-0.66	24.25**
	(2.07)	(11.30)
Native-born	5.13***	-12.98***
	(1.52)	(4.69)
Age at birth	-0.03	0.26
	(0.04)	(0.17)
Teenage parent	-1.31	-9.89
	(1.54)	(6.39)
High school education	4.20***	20.48***
	(0.89)	(2.69)
Number of adults	-0.24	-6.74**
	(0.96)	(2.78)
CMA	-0.21	7.00***
	(0.65)	(2.32)
PMK's depression score	-0.04	-0.24
	(0.07)	(0.25)
Family functioning score	-0.09	-0.02
	(0.07)	(0.24)

Table A.11: Summary Statistics - by Cultural and Religious Affiliation

	Reading Sample			**Math Sample**		
	Canadian	French	Catholic	Canadian	French	Catholic
Reading/Math (Scores)	101.62	101.42	100.80	459.40	461.13	458.80
Child's characteristics						
Child's age in months	66.63	66.92	66.69	139.41	140.13	139.16
Girls (%)	49.39	47.20	49.80	46.20	47.02	48.12
% with educational disability	0.82	0.78	1.09	3.63	2.87	2.26
Number of siblings	1.19	1.13	1.21	1.34	1.33	1.40
PMKs' characteristics						
PMK age	34.14	33.93	34.55	40.26	39.75	40.36
Women (%)	91.41	92.83	93.17	97.74	99.06	98.09
% of native-born	98.87	96.12	85.97	98.97	98.11	85.22
Age at birth	30.33	29.54	30.15	30.22	28.89	30.25
% teenage parent	2.63	3.22	2.06	2.13	3.08	1.95
% high school education or less	69.40	67.37	67.82	63.17	59.20	61.17
PMK's depression score	4.97	5.00	4.95	3.73	3.96	3.79
Households' characteristics						
N. adults (exclude parents)	0.04	0.06	0.12	0.14	0.16	0.23
CMA (%)	69.06	67.27	72.74	74.16	73.53	77.16
% low-income family	20.89	24.64	22.25	70147	70494	73492
Family functioning score	7.67	7.47	8.33	7.82	8.01	8.19
% Unique cultural affiliation	35.88	19.34	-	33.20	15.95	-
N	1580	1070	1730	2907	1860	3179

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.12: Distribution of Children by Family Structure and Cultural Group across Cycles 1-3 (%)

	Cycle 1			Cycle 2			Cycle 3		
	Intact	Single-parent	Step-family	Intact	Single-parent	Step-family	Intact	Single-parent	Step-family
Canadian	87.95%	9.96%	2.09%	82.25%	14.04%	3.81%	76.32%	15.76%	7.91%
Non-Canadian	89.40%	10.09%	0.51%	84.96%	12.89%	2.14%	81.04%	13.64%	5.32%
French	86.04%	12.33%	1.63%	81.85%	14.80%	3.36%	77.46%	14.48%	8.06%
Non-French	89.83%	9.10%	1.06%	84.42%	12.86%	2.72%	79.46%	14.66%	5.88%
Catholic	89.81%	8.82%	1.37%	84.94%	12.07%	2.99%	78.43%	15.01%	6.56%
Non-Catholic	87.85%	11.09%	1.07%	82.55%	14.65%	2.80%	79.52%	13.87%	6.61%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table A.13: Distribution of Children by Family Structure and Cultural Group across Cycles 4-6 (%)

	Cycle 4			Cycle 5			Cycle 6		
	Intact	Single-parent	Step-family	Intact	Single-parent	Step-family	Intact	Single-parent	Step-family
Canadian	76.10%	17.37%	6.54%	74.21%	18.15%	7.64%	69.87%	19.42%	10.71%
Non-Canadian	77.43%	16.48%	6.10%	73.97%	19.35%	6.67%	72.68%	18.82%	8.51%
French	76.24%	18.01%	5.74%	74.30%	17.98%	7.72%	71.66%	15.87%	12.47%
Non-French	77.09%	16.41%	6.50%	73.99%	19.17%	6.84%	71.37%	20.32%	8.32%
Catholic	75.96%	18.73%	5.32%	72.88%	20.71%	6.40%	71.73%	17.86%	10.41%
Non-Catholic	77.64%	15.13%	7.24%	75.19%	17.06%	7.75%	70.78%	20.78%	8.44%

Sources: Authors' calculations based on the NLSCY, Cycles 1-6.

Table *A*.12 and Table *A*.13 present the distribution of children by family structure and cultural groups across Cycles 1-3 and across Cycles 4-6, respectively. The distribution is similar between Canadian and Non-Canadian families, as well as between French and Non-French and between Catholic and Non-Catholic. This is also the case in Cycles 4-6 (Table *A*.13).

Appendix B

Appendix for Chapter 2

B.1 Summary of Marital Property Laws in Each Province in 1989

Table B.1: Summary of Marital Property Laws in Each Province in 1989
(Compiled from the sites listed at end)

Quebec
Civil Code 1989
"Marriage = Family Patrimony + Matrimonial Regime" A. Family patrimony: "Properties included in the family patrimony: 1. The family's homes: houses, family cottage, vacation condo, etc. 2. Objects furnishing or decorating the family's homes: furniture, appliances, electronics and artwork. 3. Family's motor vehicles: cars, motor homes. 4. Money saved in a retirement savings plan during the marriage: RRSP, pension fund. In the event of a divorce, the value of the family patrimony after deducting any debts is equally divided amongst spouses, even if some of the property belongs exclusively to one spouse. Any property not included in the family patrimony will be divided under the rules of the matrimonial regime at the event of a divorce." B. Matrimonial Regime: 1. "Community of property: Spouses' property is divided into three categories: husband's or wife's property, community property and wife's reserved property. Husband and wife do not have the same rights and powers during the marriage. Both spouses can manage, use and dispose of their private property but the husband manages the community property on his own. The husband needs the wife's consent to alienate or otherwise use valuable community property in investment matters. The wife manages her reserved property but needs the husband's consent to alienate or otherwise use her property in investment matters. In the event of a divorce, the wife can accept or waive the community property. If she accepts it, the community property and her reserved property will be divided equally, and the wife becomes a co-owner of the community property. If the wife waives the community property, the husband will keep the community property while the wife keeps her reserved property." 2. "Partnership of acquests: Spouses' property is divided into two categories: acquests and the private property of the parties. The acquests consist of all the property not declared to be private property of the parties (this is mainly the property accumulated during the marriage). The value of the acquests is divide when the marriage is over. Each spouse administers his or her own private property and acquests and is responsible for his or her own debts." 3. "Separation as to Property: Each spouse is independent under the regime of separation as to property. For example, a spouse can manage, use and dispose of her property without her spouse's consent, and is responsible for her own debts. Under the regime of separation as to property, the spouses take back their own property after the marriage is over. Any property owned by both spouses is considered to be owned in equal shares, unless there's proof that this isn't the case." "If a couple signed a marriage contract in front of a notary, the matrimonial regime is the one stated in the contract. If they did not sign a marriage contract in front of a notary, or if their marriage contract doesn't mention a matrimonial regime, then the regime depends on when they were married: Marriage before July 1, 1970: community of property Marriage on July 1, 1970 or later: partnership of acquests"

Summary of Marital Property Laws in Each Province in 1989 (Continued)

Ontario	Alberta	BC
Family Law Act (1986)	Matrimonial Property Act (1979)	Family Relations Act (1979)
1. "Equalization of the value of all property after deducting the excluded property, spouse's debts and liabilities, net property before marriage."	1. Presumption is the equal division of all property after deducting the excluded property. However, this equal division was not specified in the matrimonial property act of 1979. Distribution of marital property depends on a variety of factors.	1. "Equal division of family assets. Family assets: Property owned by one or both spouses and ordinarily used by a spouse or a minor child of either spouse for family purposes."
2. "Equal right to possession of a matrimonial home." (even though the matrimonial home is owned before marriage)	2. "The court may grant the exclusive possession of a matrimonial home."	2." No special provisions address entitlement to the matrimonial home. It is treated like all other property owned by the spouses."
Changed in 1986.	No significant change around 1989.	No significant change around 1989.
Ideal comparison not possible.	However, the rules of home division are unclear in the law. Ideal comparison not possible.	
Manitoba	NB	NFLD
Family Property Act (1977)	Marital Property Act (1980)	Family Law Act (1988)
1. "Right to accounting and equalization of assets. 'Asset' mean any real or personal property or legal or equitable interest ordinarily used for shelter or transportation or for household, educational, recreational, social or aesthetic purposes."	1. "Each spouse, upon application to the Court, is entitled to have the marital property divided in equal shares. 'Marital property' means family assets ordinarily used for shelter or transportation or for household, educational, recreational, social or aesthetic purposes."	1. "Either spouse is entitled to apply to a court to have the matrimonial assets divided in equal shares. 'Matrimonial assets' include all real and personal property acquired by either or both spouses during the marriage."
2. "Spouses each have an equal right to the use and enjoyment of their marital home."	2. "A spouse is equally entitled to any right of possession the other spouse has in a marital home, subject to an order for exclusive possession."	2. "Each spouse has a half interest in the matrimonial home owned by either or both spouses." (even if it is a pre-marriage asset)
No significant change around 1989.	No significant change around 1989.	Significant changed in 1990.
	However, it is a relatively small province. Ideal comparison not possible.	Ideal comparison not possible.

Summary of Marital Property Laws in Each Province in 1989 (Continued)

NS	PEI	Saskatchewan
Matrimonial Property Act (1980)	Family Law Act (1988)	Matrimonial property act (1979)
1. "Either spouse is entitled to apply to the court to have the matrimonial assets divided in equal shares. 'Matrimonial assets' include all real and personal property acquired by either or both spouses during the marriage."	1. "Equalization of the value of all the property after deducting excluded property, the spouse's debts and other liabilities, the net value of property that the spouse owned on the date of the marriage." (No mention of the family home if it is owned before marriage.)	1. "The matrimonial property or its value will be distributed equally between the spouses. 'Matrimonial property' means any real or personal property owned, or in which an interest is held by one or both spouses, or by one or both spouses and a third person at the time an application is made under this Act."
2. "Equal right of possession of matrimonial home. A spouse is equally entitled to any right of possession of the other spouse in a matrimonial home."	2. "Both spouses have an equal right to possession of a family home."	2. "Equal distribution of matrimonial home. Both spouses are, as between themselves, equally entitled to the right of possession of the matrimonial home."
Changed in 1989.	No significant change around 1989.	No significant change around 1989.
Ideal comparison not possible.	However, it is a relatively small province. Ideal comparison not possible.	

Note: The date listed under each province in the parentheses refers to the year when the marital property laws first entered into effect.

Sources: https://www.educaloi.qc.ca/en/capsules/dividing-your-property-overview
https://www.educaloi.qc.ca/en/capsules/property-included-family-patrimony
https://www.educaloi.qc.ca/en/capsules/matrimonial-regimes-rules-managing-and-dividing-property
http://www.azranassocies.com/en/family-law-divorce-lawyer/quebec-matrimonial-regimes/
https://www.canlii.org/en/ab/laws/stat/rsa-2000-c-m-8/39267/rsa-2000-c-m-8.html#history
https://www.canlii.org/en/ca/scc/doc/1982/1982canlii155/1982canlii155.html?resultIndex=2
http://www.canlii.org/en/mb/laws/stat/ccsm-c-f25/latest/ccsm-c-f25.html?resultIndex=1
http://www.canlii.org/en/nb/laws/stat/snb-1980-c-m-1.1/latest/snb-1980-c-m-1.1.html?resultIndex=1
http://www.canlii.org/en/nl/laws/stat/rsnl-1990-c-f-2/latest/rsnl-1990-c-f-2.html?resultIndex=1
http://www.canlii.org/en/ns/laws/stat/rsns-1989-c-275/latest/rsns-1989-c-275.html
http://www.canlii.org/en/pe/laws/stat/rspei-1988-c-f-2.1/latest/rspei-1988-c-f-2.1.html
http://www.canlii.org/en/sk/laws/stat/ss-1979-c-m-6.1/latest/ss-1979-c-m-6.1.html
https://www.canlii.org/en/on/laws/stat/rso-1990-c-f3/latest

B.2 Data Summary of Married/Common-law Women using LFS data

Table B.2: Summary Statistics of Respondents' Basic Characteristics in Quebec and Other Provinces in Pre and Post Intervention Years with LFS Data

	Quebec				Rest of Canada (Ontario, Nova Scotia, Newfoundland and Labrador excluded)			
	Before 1989		After 1989		Before 1989		After 1989	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	38.95	12.08	40.10	11.56	38.93	12.14	39.97	11.51
High school or less %	71.09	0.45	54.40	0.50	63.61	0.48	49.87	0.50
First child 6 years or above %	48.95	0.50	47.72	0.50	47.61	0.50	47.35	0.50
No child %	36.39	0.48	38.37	0.49	37.19	0.48	39.12	0.49
Children under 5 years %	20.45	0.40	19.72	0.40	22.63	0.42	20.56	0.40
Labor force participation %	57.20	0.49	62.27	0.48	61.64	0.49	67.51	0.47
Hours of work (per week)	17.74	18.44	19.52	18.52	18.95	19.13	21.54	19.33

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

B.3 DiD Approach Summary and Tests

Table B.3: The Differences-in-Differences Framework for Married Women's Labour-Force Analysis

	before 1989	after 1989
Treatment Group (T)	Women married/cohabited before 1989 with children in Quebec (first children aged 6 years or above) Women married/cohabited before 1989 without children in Quebec (age > 40)	Women married/cohabited before 1989 with children in Quebec (first children aged 6 years or above) Women married/cohabited before 1989 without children in Quebec (age > 40)
Control Group (C)	Women married/cohabited before 1989 with children in other provinces (first children aged 6 years or above) Women married/cohabited before 1989 without children in other provinces (age > 40)	Women married/cohabited before 1989 with children in other provinces (first children aged 6 years or above) Women married/cohabited before 1989 without children in other provinces (age > 40)

Table B.4: Parallel Trends Assumption Test

	Hours worked	LFP Rate	Divorce/Separate Rate	Differential Education between Spouses
F-test	0.55	0.32	0.28	0.17
P-value	0.65	0.81	0.84	0.95

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

Table B.5: The Differences-in-Differences Framework for Divorce Transitions Analysis

	before 1989	after 1989
Treatment Group (T)	Both women and men who are married in the first survey month in Quebec (age > 18)	Both women and men who are married in the first survey month in Quebec (age > 18)
Control Group (C)	Both women and men who are married in the first survey month in the other provinces (age > 18)	Both women and men who are married in the first survey month in the other provinces (age > 18)

Table B.6: The Differences-in-Differences Framework for the Assortative Matching Analysis

	before 1989	after 1989
Treatment Group (T)	Couples married before 1989 in Quebec (age≤30)	Couples married after 1989 in Quebec (age≤30)
Control Group (C)	Couples married before 1989 in the other provinces (age≤30)	Couples married after 1989 in the other provinces (age≤30)

B.4 Robustness Checks

B.4.1 Common Law Analysis

The data used in this analysis is based on the Census, 1981, 1986, 1991 and 1996, which provide information on individuals' labour supply and marital status as well as their demographic characteristics in both pre-intervention and post-intervention periods. Table *B.7* below presents the Census summary statistics of our sample's basic characteristics of Quebec and the rest of Canada (with Ontario, Nova Scotia, Newfoundland and Labrador excluded), before and after the Civil Code amendment, separately.

We can see that the respondents in the Census show the similarity on their attributes with those in the LFS. After comparing the summary statistics of these two groups in

Table B.7: Summary Statistics of Respondents' Basic Characteristics in Quebec and Other Provinces in Pre and Post Intervention Years with Census Data

	Quebec				Rest of Canada (with Ontario, Nova Scotia, Newfoundland and Labrador excluded)			
	Before 1989		After 1989		Before 1989		After 1989	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Married %	56.39	0.50	48.68	0.50	60.83	0.49	57.32	0.49
Common-law %	6.56	0.25	13.51	0.34	4.61	0.21	6.80	0.25
Divorced/Separated %	5.77	0.23	7.75	0.27	6.46	0.25	7.82	0.27
Single %	24.59	0.43	23.72	0.43	21.32	0.41	21.72	0.41
Female %	51.56	0.50	51.61	0.50	50.51	0.50	50.91	0.50
Age	41.52	16.86	43.84	16.70	41.94	17.51	43.66	17.29
High school or less %	59.05	0.49	52.31	0.50	54.47	0.50	46.38	0.50
First child 6 years or above %	38.93	0.49	57.55	0.49	36.24	0.48	54.88	0.50
No child %	49.11	0.50	31.54	0.64	50.02	0.50	34.34	0.47
Children under 5 years %	22.06	0.41	35.52	0.48	23.63	0.42	36.60	0.48
Labour force participation %	65.01	0.48	65.88	0.47	69.09	0.46	70.28	0.46
Hours of work (per week)	20.74	21.12	20.83	21.00	24.11	23.38	23.98	22.90

Sources: Authors' calculations based on Canadian Censuses of population, 1981 - 1996.

the pre-intervention periods, we can see that, on average, Quebec has a slightly smaller proportion of married or divorced/separated people, and a slightly larger proportion of common-law or single people than the other provinces. The average hours of work and mean LFP rate in Quebec are slightly lower than those in the other provinces. Respondents' ages in these two groups are on average very similar. Overall, we may conclude that, before the Civil Code amendment, the Quebec sample shared attributes similar to those of the other provinces sample.

Table B.8: Proportion of population aged 18 and over that lived common-law, 1981-1996

	Common-law Rate				Difference	Difference
%	1981	1986	1991	1996	1986-1981	1996-1991
Quebec	5.22	7.84	11.99	14.95	2.62	2.96
Rest of Canada	4.34	4.85	6.35	7.22	0.51	0.87

Sources: Authors' calculations based on Canadian Censuses of population, 1981 - 1996.

Table B.9: Family Patrimony Rules Effects on Married Women's Labour Supply by Post-intervention Year with LFS Data

Intensive margin (Weekly hours worked)	T*(Year=1991)	T*(Year=1992)	T*(Year=1993)	T*(Year=1994)	T*(Year=1995)	N
			OLS			
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	
All married women	-0.31	-0.49	-0.67	-0.69	-0.34	252796
	(0.30)	(0.39)	(0.42)	(0.51)	(0.57)	
Married women in the labor force	-1.38***	-1.34***	-0.77	-0.71	-1.04	144952
	(0.35)	(0.43)	(0.52)	(0.61)	(0.68)	
Married women employed 6+ years	-0.74*	-0.92*	-0.95	-1.09	-1.10	64461
	(0.43)	(0.54)	(0.62)	(0.72)	(0.81)	
Extensive margin (Labor force participation)	T*(Year=1991)	T*(Year=1992)	T*(Year=1993)	T*(Year=1994)	T*(Year=1995)	N
			LPM			
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	
All married women	0.02**	0.01	-0.01	-0.01	0.01	252796
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, the age of their first child dummies, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

B.4.2 Alternative Policy and Falsification Checks

Table B.10: Family Patrimony Rules Effects on Married Women's Labour Supply with Control for Presence of a Newborn

Intensive margin (Weekly hours worked): T*After	OLS	Tobit	Heckman	UQ Median	N
	Coefficient	Coefficient	Coefficient	Coefficient	
All married women	-0.43	-0.37***	-0.60	0.18	252796
	(0.27)	(0.07)	(0.39)	(1.91)	
Married women in the labour force	-1.42***	-1.57***	-0.99***	-0.68***	144952
	(0.31)	(0.33)	(0.29)	(0.24)	
Married women employed 6+ years	-0.70*	-0.71*		-0.14	64461
	(0.37)	(0.37)		(0.29)	
Extensive margin (Labour force participation):	LPM	Logit			
	Coefficient	Coefficient			
All married women	0.01	0.05			252796
	(0.01)	(0.04)			

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a newborn or not, whether they have a high school degree or less, the age of their first child dummies, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

Table B.11: Family Patrimony Rules Effects on Married Women's Labour Supply by Husbands' Labour Force Status

Intensive margin (hours worked): T*After	Employed Husband	N	Unemployed Husband	N	Out of labour force Husband	N
	OLS		OLS		OLS	
All married women	-0.50	189261	0.20	14257	0.23	45044
	(0.31)		(1.27)		(0.60)	
Married women in the labor force	-1.40***	122236	-0.81	8291	-1.17	12217
	(0.32)		(1.37)		(1.07)	
Married women employed 6+ years	-0.72*	54932	1.79	2646	-1.83	6256
	(0.40)		(1.54)		(1.13)	
Extensive margin (LFP):	Employed Husband	N	Unemployed Husband	N	Out of labour force Husband	N
	LPM		LPM		LPM	
All married women	0.01	189261	0.02	14257	0.02	45044
	(0.01)		(0.04)		(0.02)	

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, the age of their first child dummies, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

Table B.12: Family Patrimony Rules Effects on Married Women's Labour Supply among House Owners

Intensive margin (Weekly hours worked): T*After	OLS	Tobit	Heckman	UQ Median	N
	Coefficient	Coefficient	Coefficient	Coefficient	
All married women	-0.53	-0.70	-0.43	-0.72	215277
	(0.33)	(0.58)	(0.41)	(1.13)	
Married women in the labour force	-0.94***	-1.04***	-0.65**	-0.09	125980
	(0.35)	(0.37)	(0.33)	(0.26)	
Married women employed 6+ years	-0.74*	-0.75*		-0.23	59590
	(0.39)	(0.39)		(0.31)	
Extensive margin (Labour force participation):	LPM	Logit			
	Coefficient	Coefficient			
All married women	0.00	-0.01			215277
	(0.01)	(0.04)			

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, the age of their first child dummies, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

As an additional robustness check, we impose a "false" treatment in 1989 among single women in Quebec and explore their responsiveness to this policy change using the LFS, 1985-1995. The age restriction (age $>$ 30) is imposed due to the childless social assistance reform in Quebec which is mentioned before. Also, we excluded women who indicate they are full-time students to avoid capturing labour supply effects associated with seasonal part-time work fluctuations.

Table B.13 indicates the effects of Quebec's family patrimony rules on single women's labour supply using Equation 2.2 at both intensive and extensive margins (T_{ip} takes value

1 for single women living in Quebec, while takes value 0 for single women living in the other provinces.). As we expected, single women in Quebec did not respond to the family patrimony rules since the coefficients of $T_{ip} * After_t$ are small and statistically insignificant in all the estimations.

Table B.13: Family Patrimony Rules Effect on the Single Women's Labor Supply with LFS Data

Intensive margin: T*After (Weekly hours worked)	All OLS	N	More-educated OLS	N	Ever worked full-time OLS	N
	Coefficient		Coefficient		Coefficient	
All single women	-0.46	30704	-0.37	14404	-0.74	19132
	(0.77)		(1.30)		(0.79)	
Single women in the labor force	-0.62	19573	-0.67	11690	-0.47	17712
	(0.74)		(1.01)		(0.69)	
Single women employed 6+ year	-0.09	8994	1.03	5612	-0.31	8828
	(0.66)		(0.81)		(0.56)	
Extensive margin: T*After (Labor force participation)	All LPM	N	More-educated LPM	N	Ever worked full-time LPM	N
	Coefficient		Coefficient		Coefficient	
All single women	-0.01	30704	0.01	14404	-0.01	19132
	(0.02)		(0.03)		(0.01)	

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: The full set of controls includes age dummies, whether they have children or not, whether they have children under five years, whether they have a high school degree or less, year-by-month fixed effects, province fixed effects, province-by-time fixed effects. Standard errors in parentheses are clustered at the province-by-time level.

Sources: Authors' calculations based on the Labour Force Survey (LFS), 1985 - 1995.

Appendix C

Appendix for Chapter 3

C.1 Full List of 102 CREA Boundaries for MLS (excerpted from Clark and Ferrer (2019))

MLS I: (1993-2010)

British Columbia:

Northern, Chilliwack, Fraser Valley, Kamloops, Kootenay, Northern Lights, Okanagan-Mainline, Powell River, South Okanagan, Vancouver, Vancouver Island, Victoria

Alberta:

Calgary, Central Alberta, Edmonton, Fort McMurray, Grande Prairie, Lethbridge, Lloydminster(AB), Medicine Hat, North Eastern Alberta, South Central Alberta, Alberta West

Saskatchewan:

Battlefords, SE Saskatchewan, Lloydminster (SK), Melfort, Moose Jaw, Prince Albert, Regina, Saskatoon, Swift Current, Yorkton

Manitoba:

Brandon, Portage La Prairie, Thompson, Winnipeg

Ontario:

Bancroft, Barrie, Brantford, Cambridge, Chatham Kent, Northumberland Hills, Cornwall, Georgian Triangle, Grey Bruce Owen Sound, Guelph, Hamilton-Burlington, Huron Perth, Kawartha Lakes, Kingston, Kitchener-Waterloo, London and St Thomas, Muskoka & Haliburton, Niagara Falls - Fort Erie, North Bay, Oakville-Milton, Orillia, Ottawa, Parry Sound, Peterborough & the Kawarthas, Quinte, Renfrew, Sarnia-Lambton, Sault Ste. Marie, Simcoe, Southern Georgian Bay, St. Catharines, Sudbury, Thunder Bay, Tillsonburg, Timmins, Toronto+Brampton, Durham Region, Mississauga, Orangeville, York Region, Welland, Windsor-Essex, Woodstock-Ingersoll

New Brunswick:

Fredericton, Moncton, Northern New Brunswick, Saint John

Nova Scotia:

Annapolis Valley, Cape Breton, Halifax-Dartmouth, Highland, Northern Nova Scotia, South Shore, Yarmouth

Prince Edward Island

Newfoundland & **Labrador**

Quebec:

Montreal CMA, Quebec City CMA, Estrie(Sherbrooke) CMA, Mauricie-Trois-Rivieres CMA, Outaouais(Hull) CMA, Saguenay-LacSaint-Jean CMA

Northwest Territories, Yellowknife, Yukon

Source: This list is excerpted from Clark and Ferrer (2019).

C.2 Analysis based on Married Males

Tables *C*.1 and Tables *C*.2 present the impact of changes in house prices on married men's labour supply among owners and renters, respectively. Overall, there is no strong evidences showing that changes in house prices have effects on married men's labour market

behaviours. It worth noting that the negative effects on males' labour force participation in Linear FE model (Column 3) of Tables C.1 are mainly driven by the elderly men who were at the edge of retirement. For instance, the sample (Column 3) is original restricted to men under 65 years old. Once I further restrict my sample to males under 64 years old in Column 4 of Tables C.1, these negative effects disappear. However, this is not the case among women because I also repeat my female labour supply analysis with this age restriction (age < 64) and the results are are very similar with before.

Table C.1: Effect of House-price Shocks on Labour Supply of Married Men among Owners

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	Linear FE (age < 64)
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
House-price shocks (%)	-0.01	0.01		
	(0.02)	(0.03)		
Positive house-price shocks (%)			-0.11*	-0.09
			(0.06)	(0.06)
Negative house-price shocks (%)			-0.13*	-0.11
			(0.06)	(0.07)
Number of observations	58656			
Number of individuals		14049	14049	13504
(Pseudo) R-squared or Chi-squared	0.19	0.60	0.60	0.56
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (%)	-0.01	-0.02	-1.23	-0.15
	(0.35)	(0.02)	(1.43)	(0.29)
Number of observations	40595	40595	40595	40595
R-squared	0.01	0.01	0.01	0.01

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the wife's education dummies, the wife's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

Table C.2: Effect of House-price Shocks on Labour Supply of Married Men among Renters

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	
	(1)	(2)	(3)	
	Coefficient	Coefficient	Coefficient	
House-price shocks (%)	0.14	0.12		
	(0.15)	(0.15)		
Positive house-price shocks (%)			0.34	
			(0.33)	
Negative house-price shocks (%)			0.12	
			(0.22)	
Number of observations	3236			
Number of individuals		803	803	
(Pseudo) R-squared or Chi-squared	0.16	0.59	0.58	
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (%)	-1.16	-0.11	-0.73	-5.45
	(2.70)	(0.26)	(11.18)	(10.31)
Number of observations	2203	2203	2203	2203
R-squared	0.03	0.02	0.02	0.04

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the wife's education dummies, the wife's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

C.3 Analysis Excluding Large Urban Cities

Table C.3: Effect of House-price Shocks on Labour Supply of Married Women among Owners (Toronto, Montreal, and Vancouver are Excluded)

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	
	(1)	(2)	(3)	
	Coefficient	Coefficient	Coefficient	
House-price shocks (%)	-0.03*	-0.03*		
	(0.02)	(0.02)		
Positive house-price shocks (%)			-0.11***	
			(0.05)	
Negative house-price shocks (%)			-0.05	
			(0.07)	
Number of observations	57702			
Number of individuals		13768	13768	
(Pseudo) R-squared or Chi-squared	0.17	0.69	0.69	
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (%)	-0.07	0.01	-0.46	0.19
	(0.38)	(0.02)	(0.41)	(0.31)
Number of observations	40757	40757	40757	40757
R-squared	0.01	0.01	0.01	0.02

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level. Toronto, Montreal, and Vancouver are excluded.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

Table C.4: Effect of House-price Shocks on Labour Supply of Married Women among Renters (Toronto, Montreal, and Vancouver are Excluded)

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	
	(1)	(2)	(3)	
	Coefficient	Coefficient	Coefficient	
House-price shocks (%)	0.01	0.03		
	(0.13)	(0.13)		
Positive house-price shocks (%)			-0.01	
			(0.23)	
Negative house-price shocks (%)			-0.07	
			(0.21)	
Number of observations	2923			
Number of individuals		725	725	
(Pseudo) R-squared or Chi-squared	0.22	0.67	0.64	
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (%)	-0.35	-0.01	-1.03	1.35
	(1.81)	(0.04)	(5.15)	(2.43)
Number of observations	2048	2048	2048	2048
R-squared	0.03	0.01	0.01	0.04

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level. Toronto, Montreal, and Vancouver are excluded.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

Table C.5: Effect of House-price Shocks on Labour Supply of Married Women by Education among Owners (Toronto, Montreal, and Vancouver are Excluded)

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	
	(1)	(2)	(3)	
	Coefficient	Coefficient	Coefficient	
House-price shocks (Univ Degree)	-0.02	-0.02		
	(0.04)	(0.05)		
House-price shocks (No Univ Degree)	-0.04	-0.04		
	(0.03)	(0.03)		
Pos house-price shocks (Univ Degree)			-0.06	
			(0.17)	
Neg house-price shocks (Univ Degree)			-0.06	
			(0.12)	
Pos house-price shocks (No Univ Degree)			-0.12**	
			(0.06)	
Neg house-price shocks (No Univ Degree)			-0.05	
			(0.09)	
Number of observations	57702			
Number of individuals		13768	13768	
(Pseudo) R-squared or Chi-squared	0.16	0.69	0.68	
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (Univ Degree)	-0.02	0.01	-0.52	-0.27
	(0.92)	(0.05)	(0.76)	(0.79)
Δ House-price shocks (No Univ Degree)	-0.11	-0.01	-0.45	0.28
	(0.42)	(0.02)	(0.46)	(0.33)
Number of observations	40757	40757	40757	40757
R-squared	0.01	0.01	0.01	0.01

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level. Toronto, Montreal, and Vancouver are excluded.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

Table C.6: Effect of House-price Shocks on Labour Supply of Married Women by Residences Location among Owners (Toronto, Montreal, and Vancouver are Excluded)

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	
	(1)	(2)	(3)	
	Coefficient	Coefficient	Coefficient	
House-price shocks (Urban)	-0.04	-0.04		
	(0.03)	(0.03)		
House-price shocks (Rural)	-0.04	-0.02		
	(0.04)	(0.04)		
Pos house-price shocks (Urban)			-0.13***	
			(0.05)	
Neg house-price shocks (Urban)			-0.06	
			(0.07)	
Pos house-price shocks (Rural)			-0.04	
			(0.12)	
Neg house-price shocks (Rural)			-0.01	
			(0.17)	
Number of observations	57702			
Number of individuals		13768	13768	
(Pseudo) R-squared or Chi-squared	0.16	0.69	0.69	
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.
	(1)	(2)	(3)	(4)
	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (Urban)	-0.20	0.01	-0.67	0.40
	(0.40)	(0.02)	(0.42)	(0.32)
Δ House-price shocks (Rural)	0.26	-0.01	0.08	-0.39
	(0.79)	(0.03)	(0.84)	(0.66)
Number of observations	40757	40757	40757	40757
R-squared	0.01	0.01	0.01	0.02

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level. Toronto, Montreal, and Vancouver are excluded.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

C.4 Analysis Including Movers outside REB

Table C.7: Effect of House-price Shocks on Labour Supply of Married Women among Owners (with Movers Included)

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	Linear IV	Linear IV FE
	(1)	(2)	(3)	(4)	(5)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
House-price shocks (%)	-0.04	-0.05		-0.05	-0.03*
	(0.03)	(0.03)		(0.03)	(0.02)
Positive house-price shocks (%)			-0.11**		
			(0.05)		
Negative house-price shocks (%)			-0.03		
			(0.08)		
Number of observations	65014			64805	
Number of individuals		15552	15552		15124
(Pseudo) R-squared or Chi-squared	0.16	0.68	0.68	0.16	0.02
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.	Linear IV
	(1)	(2)	(3)	(4)	(5)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (%)	-0.50	-0.01	-0.73**	-0.13	-0.52
	(0.40)	(0.01)	(0.35)	(0.29)	(0.42)
Number of observations	45756	45756	45756	45756	45576
R-squared	0.01	0.01	0.01	0.02	0.01

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level. House prices from the original REBs of women are the instrument of house prices they currently live for both movers and non-movers.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

Table C.8: Effect of House-price Shocks on Labour Supply of Married Women among Renters (with Movers Included)

Panel A: Labour Force Participation	LPM	Linear FE	Linear FE	Linear IV	Linear IV FE
	(1)	(2)	(3)	(4)	(5)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
House-price shocks (%)	0.01	0.05		-0.01	0.01
	(0.09)	(0.12)		(0.09)	(0.10)
Positive house-price shocks (%)			0.13		
			(0.39)		
Negative house-price shocks (%)			0.04		
			(0.31)		
Number of observations	3848			3835	
Number of individuals		956	956		918
(Pseudo) R-squared or Chi-squared	0.20	0.63	0.63	0.23	0.06
Panel B: Δ Hours of Work	OLS	UQ-Median	UQ-10th p.	UQ-90th p.	Linear IV
	(1)	(2)	(3)	(4)	(5)
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Δ House-price shocks (%)	0.36	0.01	1.25	1.32	0.43
	(1.62)	(0.04)	(1.69)	(3.60)	(1.73)
Number of observations	2662	2662	2662	2662	2651
R-squared	0.03	0.02	0.03	0.03	0.08

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level. House prices from the original REBs of women are the instrument of house prices they currently live for both movers and non-movers.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

C.5 Analysis based on Alternative House-price Shocks Measures

Table C.9: Effect of House-price Shocks on Labour Supply of Married Women among Owners (with Alternative House-price Shocks Measures)

	House-price Shocks Using AR(3)				**House-price Shocks Using AR(4)**				**House-price Shocks Using Price Level ($10,000)**			
Panel A: LFP	LPM	Linear FE			LPM	Linear FE			LPM	Linear FE		
						Coefficient						
	(1)	(2)			(1)	(2)			(1)	(2)		
House-price shocks (%)	-0.06**	-0.05**			-0.05*	-0.05**			-0.35*	-0.26		
	(0.03)	(0.02)			(0.02)	(0.02)			(0.20)	(0.18)		
Number of observations	58688				53067				64521			
Number of individuals		14649				14477				14822		
R-squared/Chi-squared	0.17	0.69			0.17	0.68			0.16	0.68		
Panel B: Δ Hours Worked	OLS	UQ-Med	UQ-10th	UQ-90th	OLS	UQ-Med	UQ-10th	UQ-90th	OLS	UQ-Med	UQ-10th	UQ-90th
						Coefficient						
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Δ House-price shocks (%)	-0.36	-0.01	-0.79	-0.05	-0.22	-0.01	-0.70	-0.03	-0.80	0.01	-2.65	0.87
	(0.44)	(0.02)	(0.49)	(0.32)	(0.44)	(0.02)	(0.50)	(0.31)	(4.64)	(0.13)	(3.60)	(3.21)
Number of observations	40770	40770	40770	40770	35656	35656	35656	35656	46167	46167	46167	46167
R-squared	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)

Table C.10: Effect of House-price Shocks on Labour Supply of Married Women among Renters (with Alternative House-price Shocks Measures)

	House-price Shocks Using AR(3)				**House-price Shocks Using AR(4)**				**House-price Shocks Using Price Level ($10,000)**			
Panel A: LFP	LPM	Linear FE			LPM	Linear FE			LPM	Linear FE		
						Coefficient						
	(1)	(2)			(1)	(2)			(1)	(2)		
House-price shocks (%)	-0.02	-0.04			-0.13	-0.10			-0.77	-0.37		
	(0.14)	(0.11)			(0.15)	(0.11)			(1.10)	(0.70)		
Number of observations	3234				2892				3587			
Number of individuals		836				827				851		
R-squared/Chi-squared	0.21	0.64			0.21	0.63			0.20	0.64		
Panel B: Δ Hours Worked	OLS	UQ-Med	UQ-10th	UQ-90th	OLS	UQ-Med	UQ-10th	UQ-90th	OLS	UQ-Med	UQ-10th	UQ-90th
						Coefficient						
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Δ House-price shocks (%)	-0.19	-0.01	0.25	1.93	-0.19	-0.02	-1.08	2.89	6.14	0.12	8.18	10.10
	(1.66)	(0.04)	(4.41)	(3.19)	(1.59)	(0.05)	(3.72)	(2.69)	(15.70)	(0.28)	(30.59)	(30.69)
Number of observations	2223	2223	2223	2223	1913	1913	1913	1913	2545	2545	2545	2545
R-squared	0.02	0.01	0.01	0.03	0.03	0.01	0.01	0.03	0.02	0.01	0.01	0.02

* Significance at 10% ** Significance at 5% *** Significance at 1%

Note: Linear regression coefficients at the extensive margin are multiplied by 100 for ease of interpretation. The individual and household controls include age, age squared, education indicators, number of children, whether having children under five years, the husband's education dummies, the husband's labour force status dummies, immigrant status, whether having a disability at work. All of these control variables are lagged. Other controls include provincial unemployment rate, CMA population size, year fixed-effect, REB fixed-effect, and REB-by-year fixed-effect. Standard errors in parentheses are clustered at the REB level.

Source: Authors' calculations based on Canadian Survey of Income and Labour Dynamics confidential files and CREA MLS average house prices from Clark and Ferrer (2019)