Three Essays on the Labour Costs of Caring for Elderly Parents in Canada

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Abstract

Three Essays on the Labour Costs of Caring for Elderly Parents in Canada

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This dissertation consists of three chapters on the labour costs that workers face from caring for an elderly parent in Canada. The first chapter investigates the causal effect of weekly hours of care provision on the probability of being employed and work hours of children caregivers. I use the General Social Survey (GSS 2012) of Statistics Canada and restrict the sample to parental caregivers and non-caregivers. To start, I treat caregiving as exogeneous. However, an endogeneity bias may arise if some individual's unobserved characteristics are correlated with the hours of care variable and the employment outcomes at the same time. For instance, individuals, who prefer working as opposed to caring for elderly parents, are expected to provide less care hours. On the contrary, it can be also caregivers' ability to balance both work and care that induce a positive relationship between care hours and work. I use instrumental variable techniques to resolve endogeneity issues. Results show that a 10% increase in hours of care per week is associated with a 9.8 percentage points reduction in the probability of working for women caregivers compared to their counterparts' non-caregivers, whereas for men sample, the reduction is 11.6 percentage points. Results also suggest that care hours reduce the estimated weekly hours of work, for both men and women. A 10% increase in weekly care hours is associated with a decrease in weekly hours of work by 9.8% for men, and 1.6% for women sample.

The second chapter re-examines the same question in the context of two different types of informal care: personal and intense care. Helping frail parents with daily personal activities such as eating, bathing or toileting may require larger time commitments than helping them with chores. Moreover, personal care tasks are non-shiftable by nature because they are provided at specific times of the day. In contrast, chores such as cleaning the house and shopping or other organizational activities, can be done through the day or week. Using the same cross-sectional dataset as the first chapter, the study restricts the sample to parental and non-parental caregivers. To control for potential endogeneity bias, I consider three commonly used instruments in the litera-

ture; the distance to care-receiver, the health status, and age of the respondent's care receiver. Findings show that women and men who provide at least 15 hours of weekly care are less likely to be employed than other caregivers. Moreover, only women who help their parents with personal care are likely to reduce their employment probability. Findings also show that helping with both personal and intense care has no significant impact on estimated weekly hours of work.

The third chapter investigates the impact that parental caregiving has on retirement behaviour of caregivers in Canada and across Canadian regions based on Longitudinal International Study of Adults (LISA) from 2012-2016. The panel structure of the data allows me to use fixed-effect method to control for potential sources of endogeneity that arise from time invariant unobserved heterogeneity like preferences to care or work, ability to balance both activities, level of altruism and other hidden costs. To have a deeper look about the impact of parental care on retirement probability, I estimate two different intensities of care. Results show that only women who provide at least 20 hours of care are 5 percentage point more likely to retire than their counterpart parental caregivers who provide less than 20 hours of care and non-caregivers. Moreover, results indicate that the association between parental care and the probability of retirement varies across Canadian regions. The findings of the paper show that in regions like British Columbia, Quebec and Ontario, where home care expenditures as a percentage of health care expenditures are lower than the national average, parental caregivers are more likely to completely or partially retire. Care provision increases the probability of retirement of parental caregivers living in Quebec by 6%, the effect is 5% in Ontario and 9.8% in British Columbia. Moreover, in-home parental care increases the probability of retirement by 10.5% in Quebec and 18.8% in British Columbia.

Finally, the results of this dissertation suggest that helping a frail elderly parent at home carries considerable costs that should be considered by policy makers when designing and funding public long-term care programs.

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Table of Contents

List of Tables

List of Figures

1 Working and Caring for Elderly Parents in Canada

1.1 Introduction

Canada's population is ageing and the share of seniors is expected to continue to rise as the large cohort of baby boomers enters and moves through their senior years. As they grow older, seniors become frail, vulnerable and more likely to have health problems. They need help with their activities of daily living like bathing, toileting, moving and eating. Consequently, the demand for long-term home care is rising.. While long-term home care helps the elderly maintain a better quality of life at home, the limited support available to family caregivers places a burden on the caregivers. It negatively affects the physical and mental health of caregivers as well as their finances, leisure and labour market participation (Hughes et al. (1999); Dunn and Strain (2001); Hassink and Berg (2011)).

To help meet growing elder care needs, policy makers are encouraging informal care in the community by promoting policies such as tax credits to family caregivers. Community and family care is more feasible for government budgets than institutional care. (Fast et al., 1999). On the other hand, the role of women in the society is changing as more women are nowadays participating in the labour force. According to statistics Canada, the labour force participation rate for women rose steadily from 24% in 1953 to 76% in 1990. It reached 82% in 2014 compared with 91% for men (Statistics Canada). Thus, the share of women in the labour force is increasing. At the same time, women are more likely to be engaged than men in informal care to an elderly (Ettner, 1995). According to statistics Canada, in 2012, about 54% of caregivers are women. Women are also more likely to spend more than 20 hours per week on caregiving tasks than their male counterparts (17% versus 11%) (Statistics Canada). Furthermore, formal care which is a substitute to informal care is expensive and only affordable by high income people.

Therefore, given the rising proportion of ageing population, the scarcity of publicly provided home care services, and the rising cost of paid formal care, elder care provision must rely completely or partially on home care provided by a family member. This paper tries to explore whether the provision of informal care to a parent results in loss of employment or reduction in hours of work of children caregivers in Canada.

In 2012, more than one quarter of the population in Canada (28%) reported looking after a senior with age-related needs. This number is expected to increase over the next thirty years. Between 2007 and 2012, the number of caregivers aged 45 and over increased from 760,000 to 4.5 million caregivers, representing a 20% increase in the number of caregivers over the five years. Nearly 60% of these family caregivers were women, and 57% of them were employed. Not only have they cared for parents but also for family, friends and neighbours as well (Statistics Canada 2012)

Although, the literature trying to investigate the causal effect between informal care and work is quite substantial, it suffers from significant issues. First, methodological concern is whether there exists endogeneity problem that leads to bias in the estimate of the causal relationship of informal care on employment of caregivers. In other words, do individuals self-select into caregiving responsibilities in the absence of employment opportunities, or do they give up work in order to engage in informal care? Literature draws mixed conclusion about the existence of the endogeneity problem. Old literature treated informal care as exogenous and ignores the endogeneity of care. However, recent literature, try different estimation strategies to address endogeneity, be it the use of instruments or the use of fixed effects techniques. Second, whereas much of the recent cross-sectional literature has focused on US and Europe, studies on the impact of informal care on employment of caregivers in Canada have been lacking. Canada has adopted policies to reduce long-term care costs since 1990 by encouraging informal care in the community. Moreover, Canada has in general higher level of female labour force participation than Europe and US. For these reasons, results from Europe and US cannot be generalized to the Canadian context. Third, there is a lack of consensus in the literature about the causal relationship between these two activities. Most of the studies look at the effect of caring either on hours of work or wages and whether the caregivers quit employment, but the results are conflicting. Given that the literature has not led to a consensus about the causal relationship between caregiving and labour market outcomes, there is no clear picture of the influence of caring on employment behaviour of caregivers.

This analysis tries to give a better understanding of how elder care responsibilities affect the labour market participation decision of children who provide long-term home care to an

elderly parent or parent-in-law in Canada. In particular, it seeks to extend the literature by examining the effect of eldercare on labour market decisions of children caregivers, using a Canadian cross-sectional sample of nationally representative working age individuals. With respect to spouses caregivers, although they make up a substantial share of informal care, they are usually elderly themselves. It is expected that their labour supply effects to be minimal in that group. Additionally, the study uses two-stage instrumental variable approach to control for the endogeneity bias that may arise if informal caregiving responsibilities themselves are determined partially by employment. For instance, unobserved characteristics like altruism, ability, preferences that may affect both caregiving and employment decisions may bias the estimate. Lastly, the paper considers two labour supply measures : labour-market participation and hours worked for both men and women separately. Most prior studies, are mainly conducted for women, who have been traditionally the main caregiver in the family ((Wolf and Soldo, 1994); (Ettner, 1995); (Carmichael and Charles, 2003);). However, as the share of female in the labour market increased steadily, it is fair to consider a greater proportion of men as basic parental helper.

The results of this paper show interesting findings. First, I find that there is a negative influence of caring on the employment status of men and women caregivers in Canada. If hours of care increase by 10% a week on average, the probability of labour market participation decreases by about 10 percentage point for women sample and 12 percentage point for men sample. Second, there is a substantial opportunity cost associated with reduced weekly work hours. Specifically, I obtain that a 10% increase in weekly care hours reduces weekly work hours on average by around 2% and 10% for women and men respectively. Furthermore, the hypothesis that informal care is exogenous is rejected in some specifications suggesting that when facing deteriorating health of their parents, children may choose depending on their preferences or time cost whether to provide care or not.

The paper proceeds as follows. In section 2, a literature review is discussed. In section 3, the data will be presented. In section 4, the empirical methods used in the paper are described. In section 5, the results are reported. The paper concludes with a summary and discussion of the results in section 6.

1.2 Literature Review

1.2.1 Labour Market Participation and Informal Care

The relationship between employment and caregiving has been studied widely in Europe and US. But the evidence provided by these studies is mixed and the direction of the effect of caregiving on labour market outcomes is ambiguous. On the one hand, some of the studies conclude that there exists a negative correlation between caregiving and labour supply decision (Ettner (1996); Ettner (1995); Crespo (2007); Heitmueller (2007); (Bolin et al., 2008); Lilly et al. (2010)). Ettner (1995) uses data from the Survey of Income and Program Participation (SIPP) for periods 1986-1988 and applies the instrumental variable (IV) technique to control for potential endogeneity of caregiving. Her analysis focuses on parental care only rather than own parents and parents in law. Her results show that corresidence with an elderly parent reduces the hours of work by 130 hours in 18 weeks period, whereas providing care to a nonhousehold parent for more than 10 hours a week reduces hours of work by 65 hours. The effect is more pronounced after applying instruments. Ettner does not find evidence that providing parental care leads women to cease employment. In subsequent analysis, and using data from the National Survey of Families and Households (NSFH) for the year 1987, Ettner (1996) shows that caregiving activities do not affect men's labour force participation (LFP) whereas it affects LFP of women who provide care to a parent not living in the household.

Looking at cross-sectional data, the Survey of Health, Ageing and Retirement in Europe (SHARE 2004), Crespo (2007) finds that provision of intensive care on a daily basis to an elderly parent has a negative effect on employment on European mid-life daughter caregivers. She shows that, under the non-exogeneity assumption, providing daily help to a parent causes a 30 percent reduction in daughters' probability of employment. Bolin et al. (2008) study same data (SHARE 2004) and find similar results: Under the exogeneity assumption, caregiving to a parent or parent-in-law is negative predictor of employment of women caregivers of ages 50 and over at the extensive margin. They find that under the exogeneity assumption, a 10% increase in weekly hours of care is associated with a 3.7 percentage point reduction in the employment probability for the full sample of men and women.

Separate analysis for men and women have also found that the effect is negative for both men and women. However, they are unable to test the hypothesis of exogeneity of caregiving because their instruments are weak. Moreover, Carmichael and Charles (1998), using the General Household Survey (GHS-1985) in UK, find evidence that carers caring for more that 20 hours a week are more likely to exhibit negative effect on labour market participation compared to other carers and non-carers. Carmichael and Charles (2003), in their study of the GHS 1990 survey, show that for the sample of women who care for at least 10 hours per week, there is a negative effect on employment that is more pronounced for women than for men. Heitmueller (2007), who uses the British Household Panel Study (BHPS 1991-2002), distinguishes between two groups of carers: co-residential and extra-residential carers. He finds that only co-residential carers reduce their employment. He also finds that those caring for more than 20 hours per week are more likely to reduce their employment by 26% than non-caregivers.

On the other hand, there are other studies that do not find any statistically significant relationship between caregiving and employment especially when the intensive margin is investigated. Yet, caregivers may increase their labour market participation if work offers respite from caregiving or if caregivers require additional income (Carmichael and Charles (1998); (Carmichael and Charles, 2003)). For instance, Wolf and Soldo (1994) use the same data as Ettner (1996) from NSFH and focus on a sample of married women who provide care to an elderly parent or parent-in-law. Selection into caregiving is identified by the use of parental health variables and the number of siblings. They find negative but insignificant relationship between employment of married women and care provision at both intensive and extensive margins. Moreover, Bolin et al. (2008) find little evidence of caregiving reducing weekly work hours for neither women nor men.

In Canada, little research has been done regarding this issue. Lilly et al. (2010) analyse data from the General Social Survey (GSS-2002) for a cohort of Canadians aged 45 and over. Their sample of caregivers is not restricted to parents. They find that after controlling for intensity of care, both primary caregivers men and women are less likely to work than either caregivers and non-caregivers. In their analysis, they define primary caregivers as those who care for an elderly family or friend for an average of around 15 hours per week.

Moreover, they do not account for endogeneity of care because of lack of instruments. With respect to hours of work, they find that among men, only those who provide more than 20 hours of weekly care reduce their work hours significantly. Among women, they do not find significant effect at any level of weekly threshold. Another study from Canada, Latif (2006), using the GSS 1996 (cycle 11) data, and employing a sample of parental caregivers and non-caregivers, finds that caregiving negatively impact the number of work hours for both male and female parental caregivers. However, the impact is statistically significant only for the female sample. He corrects for endogeneity bias using number of brothers and sisters, geographic proximity to mother (corresidence or not) and geographic proximity to father (corresidence or not) as instruments.

Given the scare evidence for Canada, this paper helps address this gap in by investigating the impact of caring on employment and hours of work of caregivers. It employs a newly large, nationally representative data from GSS 2012 - cycle 26, and uses a sample of parental caregivers and non-caregivers. In particular, I focus on caregiving for elderly parent and in-laws. Regarding the decision of providing care, I define a continuous variable that accounts for hours of care that the adult child spends helping his parents or in-laws. This is an advantage of the present paper with respect to other analysis that considers caregiving as a binary variable (Ettner (1996); Ettner (1995); Heitmueller (2007); Lilly (2011); Latif (2006); Crespo and Mira (2010)). With respect to labour supply behaviour, I focus on employment and weekly hours of work. Adult children who face the deteriorating health of a parent, may experience significant opportunity cost in terms of (reduced) hours of work and employment. Finally, the study also tries to correct for endogeneity bias by using instrumental variable approach.

1.2.2 Endogeneity of Care

The fact whether the decision to provide care to an elderly parent within a family is exogenously or endogenously determined is the concern of many researchers. Prior literature assumed that caregiving responsibilities are exogenous and are taken as given by the child. This literature found that the typical caregiver to a parent is an unemployed, single daughter living close to the parent. However, these studies assumed that caregiving does not depend

on the endogenous characteristics of the child caregiver such as employment status.

Theoretically, an individual maximizes his utility by choosing consumption and leisure subject to a budget and time constraint. If informal care is exogenous, and if the individual is obligated to devote a certain amount of his/her time in caregiving activities, then he/she is likely to reduce the total amount of time for all other activities, and the utility-maximizing level should decrease for both consumption and leisure. For instance, caregiving time is exogenous when the siblings decide to divide their times to parental care activities equally between themselves (Ettner, 1995). However, when the health of the elderly parent deteriorates while the adult child is employed, he must choose, depending on his preferences, between caring and working. Hence, family members must decide whether to stay in the labour force or whether to leave, whether to care or whether to engage in both activities. Thus, if the latter is the case they must choose to what levels of intensity.

That being said, the assumption of exogeneity of caregiving may fail for many reasons. It is easy to argue that not only caring responsibilities undoubtedly affect employment decisions, but also the labour market situation has also an impact on the care decision resulting in reverse causation. For instance, an individual might choose to provide care for a short period because he is meanwhile unemployed or looking for a job. Individuals may also become caregivers because they lack necessary employment skills due to past life events such as parenthood, illness or prior caring spells. Furthermore, formal care market exists and enables individuals to substitute formal care for informal care. Stabile et al. (2006) demonstrates that the likelihood of informal caregiving declines with the increased availability of publicly financed home care services. Consequently, those who are employed and climbing the experience ladder are more likely to substitute formal to informal care since they face a high opportunity cost of time. The negative impact of caregiving on labor supply might be overstated, if family members are able to purchase formal care to substitute for their own time. For instance, family members who provide less informal care may work more in order to purchase formal care substitutes. Furthermore, individuals whose time costs are lower than the costs of formal care will self-select into caregiving (Ettner (1995); Ettner (1996)). The older the individual gets, the more likely he becomes a caregiver since the general economic environment becomes less favourable (Heitmueller, 2007). In contrast, unobserved

characteristics, like ability, might influence both labour market participation and caregiving. For example, individuals with high unobserved ability may be more productive at both work and caregiving activities. Possibly, caregivers with high ability are capable to manage and balance their time between caregiving and work.

To solve the potential endogeneity bias of informal care in cross-sectional data, previous literature used instrumental variables. Instruments used in the literature was the geographic proximity to parent, number of siblings (Latif (2006)), health of parents and age of parents (Ettner (1995); (Bolin et al. (2008); Crespo (2007) and both parent living (Crespo, 2007)). In this paper, I use two instruments for informal care. In particular, the GSS database contains information on the living arrangement of the respondent's parents. That is whether they live at a distance of their parents or the number of parents who live in the household with the respondents. These indicators are used to identify the effect on informal care on labour behaviour of caregivers. A possible caveat of these instruments is that children who live far away from their parents have higher labour market attachment. For instance, after their studies people may leave to big dynamic cities because they have access to high-paying jobs there. Moreover, people who co-reside with their parents might be those with unobserved differences in labour market attachment.

To summarize: ability, preferences, time cost and formal care are not observed in the data. To deal with unobserved characteristics in cross-sectional data, instrumental variable approach is derived and the endogeneity of care on the employment decision is tested.

1.2.3 Home Care in Canada

Canada's population is aging and the share of seniors is expected to continue to rise as the large cohort of baby boomers that enter and move through their senior years. The number of home care recipients has increased by almost 100% from 1996 till 2006. Seniors prefer to stay in their own home, and at the same time governments encourage home staying since it is less expensive than other settings of care. Government spending on home care has increased but it remains a small component of the health care budget. Home care spending increased from 3.1% of total government spending in 1994-95 to only 4.2 percent in 2003-2004. Whereas the number of patients using government subsidized home care increased from 23.9

per 1,000 in 1994-95 to 26.1 per 1,000 in 2003-2004, representing an average annual increase of 1.0 percent.

In Canada, under the Canada Health Act, hospital or physician services are provided free of charge to Canadians. However, home care is not a legislated insured service. In fact, each jurisdiction (federal, provincial and territorial government) has developed its own unique way of administering and delivering home care. Hence, the structure and delivery of home care services differ from province to province. Health professional services and home nursing are fully covered by public funds and are usually provided through public home care programs. Home support services, such as assistance in eating, bathing, cooking and performing housework, may be covered by a mix of public and private sources and can involve user fees. But the public home care sector is experiencing a shortage of health care professionals and priority is given in some regions like in Quebec to recipients who have no informal caregivers. As a result, heavy demand for public home care services has resulted in waiting lists for certain services in some regions.

Provinces like British Columbia, Alberta, Saskatchewan, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland have income assessment to determine co-payments for home support services. Other provinces, Quebec and Manitoba, have no formal income tests. In Quebec, the priority of home support services is given to low-income people or people with no other options for care. In Manitoba, the oldest universal home care service in Canada, the priority of home care services is given to people with no other options for care and in consideration of other resources available. Ontario, Yukon and Northwest do not have a formal income assessment process for home support services. In addition to inadequate supply, the maximum amount of publicly insured home care provided to an individual differs between provinces. The upper limit is in Alberta ($3,000 per month), Nova Scotia ($2,200 per month), New Brunswick ($2,040 per month) and Newfoundland ($2,268 − $3,240 per month). Provinces differ also in the maximum number of hours for home support provision, such as Quebec 35 to 40 hours per week; Yukon 35 hours per week; Prince Edward Island 28 hours per week, British Columbia 30 hours per week and Ontario 80 hours in the first month and 60 hours thereafter (Stabile et al., 2006). However, some services may be available in theory but not in practice because of high demand and the associated eligibility restrictions

linked to system capacity. For instance, some elderly receive only one or two hours of assistance a week from professionals, which is sometimes not enough. But what matters to the frail elderly in Canada is to access the home care services they need, when they need them, at their own homes outside the hospital. What can government do?

Government can provide support and resources to facilitate the home care delivery i.e professional caregivers to the home and community. Moreover, it can afford more attractive working conditions for home support professionals because less attractive working conditions may adversely affect the recruiting of professionals and home support workers, and thus limits opportunities for providing home care.

1.3 Data and Characteristics of the Sample

1.3.1 Data

The analysis in this paper is based on data from Statistics Canada's 2012 General Social Survey (GSS). The GSS is a cross-sectional data with wide range of variables and is nationally representative. Over 23000 individuals were interviewed. The 2012 cycle - Caregiving and care receiving - gathered special information on individuals living in Canada who receive or provide care for a long term health condition, a physical or mental disability or problems related to aging. Besides caregiving data, the survey includes detailed demographic and employment information. Individuals who had reached the official retirement age of 65 are excluded from the original dataset, as well as those whose employment status is unknown. The paper focuses on informal care given to the respondent's elderly parents or parents-in-law whose age is 65 and over. Yet, caregiving to younger individuals is excluded from the dataset. The caregivers sample is restricted to parental caregiver aged between 15 and 64 and having at least one living parent or parent-in-law. Caregiving to other than a parent is eliminated from the dataset. As a result, the caregivers' sample consists of individuals who are aged 15-64 whose primary care receivers' age is over 65 years old. The sample consists of 10653 respondents, where 2534 individuals are parental caregivers and 8119 are non-caregivers. The female sample consists of 5795 women, 1454 are parental caregivers and 4341 are non caregivers. The male sample consists of 4858 men; 1080 are parental caregivers

and 3778 non-caregivers.

1.3.2 Informal Care

Informal care given to parents includes the following components: (1) personal care like dressing, bathing, eating, toileting; (2) practical household help like transportation, meal preparation; (3) household chores help with medical treatment like changing bandages, taking medications; (4) help with scheduling or coordinating care related tasks such as scheduling appointments or hiring professional help; and (5) help with paperwork like managing financial and legal matters. In the survey, the respondent is first asked if he/she had helped someone of the above kind who had problems related to ageing or long-term health condition during the last 12 months. If answering yes, the respondent is next asked to whom he/she had given the informal care and whether he is still providing care to them. Following that, the respondent is asked to give an estimate of the number of hours per week provided to that person[1]. The variable hours of informal care to parents is constructed out of these questions.

1.3.3 Employment

Two labour market outcomes are analysed in this study: The labour market participation (LMP) and the weekly hours of work. To obtain an estimate of weekly hours worked, the respondent was asked to state the number of hours per week that he/she usually works at his/her job. A self-reported weekly hours of work is created. For detailed information about the employment variables used in this study see the Appendix.

1.3.4 Other Explanatory Variables

Demographic information are collected on respondent's age, health status, marital status, education, having children less than 14 years of age, house ownership and regional control dummies (Quebec region as reference group). The descriptive statistics for the entire sample (caregivers to parent and non caregivers) are reported in tables 1.1 and 1.2.

[1]For detailed information about the variables see Appendix

1.3.5 Characteristics of the Sample

The sub-sample used for this research consists of all women and men respondents caregivers to a parent or parent-in-law and non caregivers of ages between 15 and 64, excluding those for whom the information is incomplete. In the analysis, informal care provision to the respondent's parent is considered. Biological parents, parents and parents-in-law as well are included in the study. Moreover, informal care provided to parents living outside or inside the household is considered in the analysis. Finally, the sub-sample of caregivers is restricted to respondents having at least one living parent or parent-in-law and who are still providing care for them at the time of the interview.

Since the focus of this paper is on the effects of informal caregiving on employment, the sample is restricted to non-retired individuals. The upper age limit of the sample is the age of 64. This research conducts separate analysis of male and female by age group for individuals between the ages of 15 and 64. Men and women differ in their family responsibilities which may reflect the observed gender differences in their labour market choices. Women according to Becker (1985) are less likely to devote effort to labour market activities than men primarily because of greater family responsibilities and lower level of marketable human capital. Fuchs (1971) argues that, female are more devoted to specialize in "home making" work which hinder their investment in human capital and hence their choice of jobs. Table 1.1 and 1.2 show weighted summary statistics used in the analysis for the sample, by gender. Whereas, approximately 75% of women caregivers and 79% of men caregivers in the sample are employed, only 70% of non-caregivers women and 78% of men non-caregivers are in paid work. The reason behind this difference in employment rates is that those who become caregivers are more educated, older, and thus have a longer attachment to the labour force on average than their counterpart non-caregivers in both samples. However, among those working, men parental caregivers work slightly more hours per week at their job than those non-caregivers (44 hours per week vs 42). Whereas for women sample, women parental caregivers work less than their counterpart non-caregivers (34 vs 36 hours per week). Furthermore, about 13 percent of women and 12 percent of men provide care to a parent or parent-in-law. On average, female caregivers provide 9.5 hours of care per week to a parent

	Women		Non Caregivers		Caregivers	
Variable Name	**mean**	**sd**	**mean**	**sd**	**mean**	**sd**
Employed	.7	.46	.7	.46	.75	.43
Weekly hours worked	34	12	36	11	34	12
Married	.64	.48	.63	.48	.77	.42
Child	.38	.48	.41	.49	.24	.43
Ownhouse	.81	.39	.79	.4	.88	.32
Healthy	.93	.26	.93	.25	.89	.31
High school	.12	.33	.13	.33	.072	.26
Cgep/diploma	.31	.46	.3	.46	.29	.46
Some college/university	.3	.46	.3	.46	.35	.48
Bachelor/Master's/Phd	.27	.45	.27	.45	.29	.45
age 15-24	.19	.39	.2	.4	.011	.1
age 25-34	.2	.4	.22	.41	.052	.22
age 35-44	.2	.4	.22	.41	.16	.37
age 45-54	.23	.42	.21	.4	.43	.5
age 55-64	.19	.39	.17	.37	.34	.48
Parental care	.13	.34	-	-	1	0
Weekly care hours	-	-	-	-	9.5	16
Lives with one parent	.056	.23	.053	.22	.069	.25
do not reside with parents	.91	.29	.93	.26	.81	.39

N= 5795 (4341 non-caregivers and 1454 caregivers to a parent). Statistics are weighted.

Table 1.1: Descriptive Statistics - Women Sample

and male caregivers provide 6.9 hours of care. Obviously, men exhibit much more rate of labour market participation than women. In addition to this, the relationship to caregiving and living arrangements is reflected by the difference in the percentage of respondents that replied that there is no senior living in the same household (*Liveaway*) between caregivers and non-caregivers. In particular, these percentages are higher for the sample of caregivers than the sample of non-caregivers. This shows that the children living in the same household as parents are more involved in elder care. On the other hand, the availability of alternative sources of care is measured by the variable *OneParent*. This variable indicates whether both parents live with the respondent, and if one of them gets frail, the burden of caregiving will lessen with the help from the other parent. However, if only one parent lives with the adult child, in this case, the odds of having to take care of the parent will probably increase. A substantially lower percentages reports to have lived with one parent for both samples. However, the descriptive statistics show that the proportion of caregivers who live with one parent is higher than the sample of non-caregivers for both samples.

To have a clear understanding about the data, I divide the sample of men and women caregivers into 3 groups depending on the care intensity (1.3 and 1.4). The first group,

	Men		Non Caregivers		Caregivers	
Variable Name	**mean**	**sd**	**mean**	**sd**	**mean**	**sd**
Empl	.8	.4	.78	.41	.79	.41
Weekly hours of work	42	13	42	13	44	13
Married	.65	.48	.63	.48	.77	.42
Child	.35	.48	.33	.47	.25	.43
Ownhouse	.81	.39	.78	.41	.88	.33
Healthy	.93	.25	.92	.28	.89	.31
High school	.16	.37	.16	.37	.095	.29
Cegep/diploma	.34	.47	.33	.47	.36	.48
Some college/university	.23	.42	.23	.42	.26	.44
Bachelor/Master's/Phd	.27	.45	.28	.45	.29	.45
age 15-24	.18	.38	.12	.32	.0044	.066
age 25-34	.2	.4	.15	.35	.03	.17
age 35-44	.21	.41	.23	.42	.16	.37
age 45-54	.23	.42	.24	.43	.42	.49
age 55-64	.18	.39	.27	.44	.38	.49
Parent care	.12	.32	-	-	1	-
Care hours	-	-	-	-	6.9	12
lives with one parent	.067	.25	.046	.21	.066	.25
do not reside with parent	.93	.25	.96	.2	.89	.32

N= 4858 (3778 non-caregivers and 1080 caregivers to a parent).
Statistics are weighted.

Table 1.2: Descriptive Statistics - Men Sample

the mild care group, provides less than 10 hours of care to a parent or in-law per week. The second group, the moderate group of caregivers, provides between 10 to 20 hours of care for a parent. The last group, the intensive care group, provides more than 20 hours of care per week. With respect to the intensity of care, it is much more common for female caregivers to provide more than 20 hours of care per week (10 percent of women vs 6 percent of men). The majority of caregivers report helping their parent for less than 10 hours per week . Men provide more mild care: 81% of men help their parent for less than 10 hours per week while only 74% of women help their parents with mild care. This result shows that women are more involved in intensive caregiving activities than men. Recent literature finds that the caregiver's participation in the labour market becomes difficult if they help their elderly parent with more than 10 hours of care (Carmichael and Charles (2003); Ettner (1995)). Others, like Lilly et al. (2010), suggest that the threshold is 15 hours a week. Labour market participation rates are substantially lower among particular groups of caregivers who provide moderate or intensive care than their counterparts for both men and women sample. The distribution of care hours is highly skewed, the majority of respondents caregivers has

reported to provide help to a parent on average of 3 hours of their time per week. Whilst for the intensive care group, an average of 46 (men) and 48 (women) hours of care per week has been reported which is nearly equivalent to a full time job.

	Mild care		Moderate care		Intensive care	
Variables	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
Employed	0.79	1163	0.7	240	0.58	153
Weekly work hours	36	831	34	149	38	75
Weekly care hours	3.1	1164	14	240	48	153
Living with one parent only	0.035	1164	0.13	240	0.25	153
Live away from parents	0.87	1164	0.71	240	0.56	153
age 15-24	0.013	1164	0.0072	240	0	153
age 25-34	0.049	1164	0.024	240	0.12	153
age 35-44	0.17	1164	0.18	240	0.047	153
age 45 54	0.45	1164	0.41	240	0.41	153
age 55-64	0.33	1164	0.38	240	0.42	153

Table 1.3: Caregiving by intensity- Women Sample

	Mild care		Moderate care		Intensive care	
Variables	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
Employed	0.86	967	0.76	136	0.63	71
Weekly work hours	44	753	43	84	41	40
Weekly care hours	2.7	968	13	136	46	71
Living with one parent only	0.038	968	0.23	136	0.35	71
Live away from parents	0.92	968	0.59	136	0.5	71
age 15-24	0.0088	968	0.019	136	0.071	71
age 25-34	0.046	968	0.08	136	0.15	71
age 35-44	0.17	968	0.13	136	0.15	71
age 45 54	0.45	968	0.48	136	0.35	71
age 55-64	0.32	968	0.28	136	0.28	71

Table 1.4: Caregiving by intensity - Men sample

Another important finding in this descriptive comparison between the three groups of caregivers, is the relationship between living arrangements and patterns of family caregiving. It is clearly reflected by the difference in the percentage of children living in the same household or living away from an elderly parent between caregivers and non-caregivers and between groups of caregivers. The variable "One Parent" (living with only one parent) indicates that the child lives with only one parent and that he is the only source of care for his parent if the latter gets frail. Whereas if the child lives with two parents, this means that both parents are alive and one of them is more likely to take care of the other. The variable "Live away" indicates that the child does not live with his parent in the same household. He is likely to provide less care than if he corresides with them. In particular, the percentage of

caregivers living away from their parents is likely to be correlated with the intensity of care provided to the parent or parent-in-law. This is specially the case in the mild care group where 97 percent of female caregivers and 96 percent of male caregivers do not live with their parents. In the moderate care group 90% of women and 75% of men do not live with their parents. Specifically, those who provide more than 20 hours of care (intensive group), only 61% of men and 74% of women live away from their parents. This shows that children within the household are more involved in intensive elder parental care than the other two groups. Another important finding is that caregivers are middle aged men and women between 45 and 64. This age group is still employed and climbing the ladder of experience. At the same time they face the challenge of a disabled parent who needs long term care at home.

To conclude this section, the descriptive comparison between caregivers and non-caregivers for both men and women sample shows that there is a negative relationship between LFP and parental caregiving activities. This suggests that there is a trade off between caregiving and employment that may become evident once we control for other factors affecting labour market outcomes and caregiving.

Finally, since these results are only descriptive, I should study the issue of interest from a more serious view. In the next section the empirical methods and strategy are implemented in order to identify and estimate the effect I am interested in.

1.4 The Model

1.4.1 Econometric Specification

As mentioned above, the goal of the present research is to estimate the causal effect of providing care to elderly parents on LFP behaviour of people living in Canada. Therefore, two important issues arise in the empirical analysis of this question. First, would the hours of informal care indicator enter the LFP equation directly as exogenous variable? In other words, the decision to provide care does not depend on other characteristics of the child like employment status, time cost of care, altruism or ability. The second issue, which seems more realistic and appropriate to consider, is that both decision variables, employment and care provision, could be the result of the same decision process. In this situation, the exogeneity

assumption of the hours of care indicator would bias the estimated impact of caregiving on LFP.

I use a probit[2] model to analye the probability of being in paid employment assuming caregiving is exogeneous. OLS model is used when estimating hours worked conditional on being in paid employment. Weekly hours of work and weekly hours of care are logged in order to achieve a smoother distribution. The equation of the labour market outcomes may be written as:

$$prob(Empl_{\mathrm{i}}) = \alpha_{1\mathrm{i}} + \alpha_{2\mathrm{i}} ln(PC_{\mathrm{i}}) + \alpha_{3\mathrm{i}} X_{\mathrm{i}} + \epsilon_{\mathrm{i}};$$

$$ln(H_{\mathrm{i}}) = \beta_{1\mathrm{i}} + \beta_{2\mathrm{i}} ln(PC_{\mathrm{i}}) + \beta_{3\mathrm{i}} X_{\mathrm{i}} + \theta_{\mathrm{i}};$$

where PC_{i} hours of informal parental care (care provided to a parent or parent-in-law). X_{i} is a vector of socio-demographic factors like marital status (married vs others), education, children less than 14 years in the household, health status of the respondent (bad or very bad self-reported health vs all other), house ownership and regional dummies[3] (Quebec region as reference group). Married individuals are expected to work more than single individuals since they have greater financial responsibilities. The presence of children of age less than 14 is expected to negatively impact the employment of female and to reduce their work hours since child-rearing reduces the time available for paid work. The health status of the respondent is expected to positively influence the employment while the impact of region is uncertain. The age group of the respondents is used as a proxy for experience. Education and work experience are expected to affect positively the probability of being employed. Obviously, the caregiver is self-selected into caregiving to his/her parent if he/she is in good health but at the same time the health status of the caregiver is highly correlated with his income. Since income and health of the household might be correlated (Heitmueller, 2007), household income is excluded from the participation equation. Thus, an indicator of

[2]Since the dependent variable is dichotomous in the employment equation, the Amemiya Generalized Least Square (AGLS) estimator has been employed , which estimates a probit model with a continuous explanatory variable (Maddala (1983))

[3]The degree of public investment on home care services varies widely between the provinces and regions (Fast et al. (2001); Lilly et al. (2010)), a fact which is captured by regional dummies in the regression equation

household ownership is used as a proxy for household income. Moreover, the variable weekly wage is logged and added as an additional regressor in the equation where the dependent variable is worked hours.

1.4.2 Econometric issue

Endogeneity bias arises when some variables that can not be observed in the data affect both caregiving and employment outcomes. To correct for this issue, I use a two-stage regression with instrumental variables. In the first stage regression, the endogenous explanatory variable is treated as linear function of the instruments and the exogenous variables. In the second stage, the prediction (fitted-value) of hours of care variable from the first stage is included as explanatory variable in the main equation[4]. Thus, instrumental variable techniques will be used to correct for potential endogeneity bias if it exists. Following is the two steps empirical model to be estimated:

First-stage regression:

$$ln(PC_{\mathrm{i}}) = \beta_{1\mathrm{i}} + \beta_{2\mathrm{i}} OneParent + \beta_{3\mathrm{i}} liveaway + + \beta_{2\mathrm{i}} X_{\mathrm{i}} + \epsilon,$$

Second-stage regression:

$$prob(Empl_{\mathrm{i}}) = \beta_{1\mathrm{i}} + \beta_{2\mathrm{i}} ln(\hat{PC}_{\mathrm{i}}) + \beta_{3\mathrm{i}} X_{\mathrm{i}} + \theta_{\mathrm{i}};$$

$$ln(H_{\mathrm{i}}) = \beta_{1\mathrm{i}} + \beta_{2\mathrm{i}} ln(\hat{PC}_{\mathrm{i}}) + \beta_{3\mathrm{i}} X_{\mathrm{i}} + \psi_{\mathrm{i}};$$

In this model, the binary variables *Oneparent* and *liveaway* are the instruments. $\hat{PC}_{\mathrm{i}}$ is the Care hours predicted value from the first regression, $\mathrm{X_i}$ denotes the vector of socio-demographic variables, θ_{i} and ψ_{i} are the error terms.

[4]The computations were performed using PROBIT and IVPROB programmes in STATA, which provide asymptotically efficient standard errors.

1.5 Cross-Section Estimation

1.5.1 Choice of Instruments

To solve the endogeneity problem in cross-section data, instruments that are highly correlated with the caring decision but not correlated with the labour market participation are identified. Variables that are assumed to influence the amount of informal care provided, but not directly the labour market participation, are the health status of care receiver, the age of the elderly parent, whether the caregiver lives more than 100 km away from his parents, and the number of siblings. These instruments are widely used in the literature. However, they are not popular in the GSS 2012 dataset. Questions related to age and health of the parent are only asked to respondents who are caregivers. Thus, we do not observe the health and age of parents of non-caregivers in the sample.

Two instruments are derived from the data. The first one is the geographical proximity to the care receiver. The variable "liveaway" is a binary variable with value 1 if there is no senior living in the household with the respondent, and takes the value of 0 otherwise. Time cost may obviously increase with greater distance between the informal caregiver and the care-receiver, which is expected to decrease the amount of informal care provided. Again whether the individual lives near his parents or not, it is assumed to influence labour market status of the respondent indirectly via its effect on informal caregiving.

The second instrument used in this study is whether the respondent caregiver lives with one parent only. The rationale for including this variable as instrument is that, if both parents are alive and live with the child in the same household, workload on the respondent may lessen with additional help from one parent. That is if the other parent becomes frail (spouse/husband of the care receiver). Moreover, living with only one parent in the household increases the odds to informal care provision by the child. This is a binary variable which takes the value 1, if the respondent answers that he lives with only one parent in the household. Whereas it takes the value 0 if the respondent answers that he lives with 2 parents in the household or no parents.

1.5.2 Estimation Results

In this section, I estimate the impact of informal care hours on LFP under two different assumptions on hours of care (PC) indicator. First, I consider that caregiving activities are taken as given where the estimates assume the care hours (PC) regressor as exogenous. However, this assumption might not hold due to endogeneity bias and some measurement errors. Second, I estimate a two-steps instrumental variable regression that accounts for endogeneity of this decision variable.

Employment Table 1.5 presents the estimation results under the exogeneity assumption. In this regression, the dependent variable, *Empl* (yes=1, No=0), indicates whether the sample member is in paid work. Results are shown for men and women separately, and are very similar and broadly in line with expectations. For women, the employment probability is associated with age, education, health and owning a house, while the contrary is true for age greater than 54, being married, number of children less than 14. While increasing age for women reduced the likelihood of participation, it is positively correlated with labour force participation for men. Results for men show that being educated, having better health and increasing age increase the likelihood of participation. Regional effects are noted relative to the omitted category of the Quebec region. Most interestingly, however, providing hours of informal care to a parent was associated with a negative and significant effect on the employment probability for men sample only. For men, the effect was negative and significant -0.0246, while the corresponding effect for women was positive 0.00309 and non-significant. The effect in men sample is significant at the 1% level. The magnitude is slightly similar to Bolin et al. (2008), who find that the effect for men is -0.032 in Europe. If the assumption of informal care exogeneity holds, the results show that, for men, a 10% increase in weekly hours of informal care is associated with 2.5 percentage points reduction in the employment probability for men. However, estimates in this study may be biased due to the fact that informal care may be endogenous. My results could be biased due to unobserved covariates like unobserved ability that are likely to impact both employment participation and hours of care. Besides the ability to care, the error terms in the main equation measure on one hand, the child's preferences to working as opposed to care for elderly, and on the other hand, the

time cost of caring.

That being said, to test for potential endogeneity bias, an instrumental variable regression is conducted. The instruments used are whether the child lives with one parent only or not in the household and the distance to parents. The validity and reliability of the IV-estimates hinge on a number of factors. For instruments Z to be valid and appropriate, it must satisfy two conditions: (1) Instruments relevance and (2) instruments exogeneity. For the first condition to be satisfied, the instruments should be correlated with the endogenous variable in our case: the care hours (PC) variable (Corr(Z, PC)$\neq$ 0). For the second condition to be satisfied, Z must be exogenous. Hence, the instruments should affect the left hand side only through the endogenous variable, not through the error terms (epsilon) in the structural equation. In other words, Z has an indirect effect *Empl* and H though PC, but has no direct effect on the employment variables. Z is correlated with PC but uncorrelated with any other variables that can affect the dependent variable (*Empl* and H). To empirically test the exogeneity of care variable, I use the Smith Blundell test. This test rejects the null hypothesis of exogeneity of hours of care variable for both women and men sample (chi-square=15.8, p<0.01 ; chi-square=14.8, p<0.01 respectively). Furthermore, the first stage F-test rejects the null of weak instruments (F=162, p<0.01 for female vs F=168, p<0.01 for male). The Sargan chi-square test (Stata command overid and ivreg2) is conducted to check whether the instruments are properly uncorrelated with the error term. The test statistics is significant for male sample only at the 7% level and not significant for female sample (chi-square=3.64, p=0.07 for male vs chi-square =0.074, p=0.13 for female). Therefore, it is possible to accept the null hypothesis that the instruments are uncorrelated with the error terms for female sample and male sample. As a result, the included instruments seem to be strong and valid for both samples. One should note that the validity and strength of the instruments hinges on their variability. However, because of data limitations, the choice of instruments is restricted to the living arrangements of the elderly. A possible caveat in these instruments is that they are likely to be related to the unobserved error terms in the employment equation. Specifically, children living far away from parents may have higher labour force attachment. Moreover, those who decide to live with parents may be those with unobserved differences in labour market attachment.

Table 1.6 reports for women and men sample respectively the results from the first and second stage regression estimation. In particular, the table shows that hours of care reduce the probability of participating in the labour force. For both samples, we can see that this effect is negative and much stronger when endogeneity is taken into account. Specifically, the effect of "Care hours" changes sign for women and becomes more negative for both samples. While other coefficients remain remarkably unchanged, the magnitude of the marginal effect and the sign has changed for female sample. The effect is now negative and significant, -0.0984 for women. Thus, it is larger in magnitude and of opposite sign than the one I obtain when treating informal care as exogenous. The results show that an increase in 10% of hours of care per week is associated with a 9.8 and 11.6 percentage points reduction in the probability of working for both women and men caregivers respectively compared to their counterparts non-caregivers other things being equal.

Therefore, the difference between the results showed under these two different assumptions suggests that endogeneity bias exists. It also implies that the estimates under exogeneity assumption underestimate the effect of interest. The fact that the negative effect of employment status is stronger when accounting for the endogeneity is in line with results by (Crespo, 2007) and (Heitmuller and Inglis, 2007). Specifically, they use European data, respectively, and analyse the probability of being employed of caregivers.

Regarding the first stage regression or Care hours (PC) equation, I obtain the following. The instruments used are significant. Living away from a parent significantly reduces hours of care. However, living with one parent only is significantly and positively associated with hours of care. Results also show that married men and women are more likely to provide hours of care. It also shows that caregivers whose age group is between 45 to 64 are more likely to provide hours of care. Furthermore, having a child in the house less than 14, is significantly and negatively associated with care hours.

In sum, the results suggest that for both sample, informal care shows a negative and significant effect on the employment probability of parental caregivers. Moreover, the hypothesis that informal care is exogenous is rejected for both women and men.

VARIABLES	Women Probit(dy/dx)	Men Probit(dy/dx)
Care hours	0.00309	-0.0219***
	(0.00652)	(0.00698)
Married	-0.0356***	0.0550***
	(0.0133)	(0.0134)
Child	-0.0789***	0.0273*
	(0.0153)	(0.0149)
Healthy	0.152***	0.141***
	(0.0186)	(0.0168)
Cgep/College	0.135***	0.0974***
	(0.0188)	(0.0154)
College	0.230***	0.104***
	(0.0192)	(0.0173)
University	0.221***	0.118***
	(0.0198)	(0.0171)
Ownhouse	0.0706***	0.0903***
	(0.0147)	(0.0132)
Age 25-34	0.169***	0.209***
	(0.0287)	(0.0239)
Age 35-44	0.186***	0.254***
	(0.0290)	(0.0245)
Age 45-54	0.192***	0.272***
	(0.0284)	(0.0239)
Age 55-64	-0.0550*	0.0732***
	(0.0291)	(0.0252)
Atlantic	-0.0323	-0.0120
	(0.0204)	(0.0192)
Ontario	-0.00408	-0.00331
	(0.0167)	(0.0156)
Prairies	0.0367*	0.0455**
	(0.0192)	(0.0184)
BC	-0.00974	-0.00218
	(0.0206)	(0.0195)
Observations	5,795	4,858

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.5: Regression with dependent variable Paid Employment- GSS 2012-Marginal Effects

	Women		Men	
VARIABLES	First stage	Second Stage	First stage	Second Stage
Care hours		-0.0984***		-0.116***
		(0.0242)		(0.0237)
OneParent	0.666***		0.320***	
	(0.0632)		(0.0521)	
liveaway	-0.443***		-0.651***	
	(0.0425)		(0.0480)	
Married	0.0711***	-0.0275**	0.142***	0.0599***
	(0.0259)	(0.0132)	(0.0265)	(0.0132)
Child	-0.0808***	-0.0875***	-0.0675**	0.0155
	(0.0287)	(0.0148)	(0.0263)	(0.0149)
Healthy	-0.114***	0.132***	-0.104***	0.126***
	(0.0388)	(0.0193)	(0.0366)	(0.0174)
Cgep/diploma	0.132***	0.140***	0.102***	0.102***
	(0.0394)	(0.0184)	(0.0322)	(0.0152)
College	0.188***	0.235***	0.127***	0.110***
	(0.0403)	(0.0188)	(0.0349)	(0.0170)
University	0.168***	0.225***	0.0721**	0.119***
	(0.0413)	(0.0194)	(0.0343)	(0.0169)
Ownhouse	0.105***	0.0791***	0.108***	0.0988***
	(0.0292)	(0.0143)	(0.0265)	(0.0130)
Age 25-34	-0.0984*	0.140***	-0.0925*	0.198***
	(0.0580)	(0.0294)	(0.0494)	(0.0240)
Age 35-44	-0.0489	0.162***	-0.0949*	0.242***
	(0.0591)	(0.0294)	(0.0509)	(0.0247)
Age 45-54	0.225***	0.196***	0.117**	0.278***
	(0.0581)	(0.0278)	(0.0502)	(0.0235)
Age 55-64	0.131**	-0.0452	-0.0150	0.0734***
	(0.0605)	(0.0286)	(0.0533)	(0.0247)
Atlantic	0.123***	-0.0130	0.166***	0.00869
	(0.0397)	(0.0204)	(0.0368)	(0.0196)
Ontario	-0.0582*	-0.00689	0.0107	-0.000360
	(0.0323)	(0.0163)	(0.0292)	(0.0153)
Prairies	0.124***	0.0489***	0.124***	0.0573***
	(0.0367)	(0.0188)	(0.0335)	(0.0182)
BC	-0.0593	-0.0113	0.00719	0.00131
	(0.0402)	(0.0200)	(0.0371)	(0.0192)
Constant	0.863***		0.983***	
	(0.0922)		(0.0888)	
Observations	5,795	5,795	4,858	4,858
First stage F-test	162***		168***	
Smith-Blundell chi-square	15.8***		14.8***	
Overid Sargan test	0.074		3.64(p=0.07)	

Table 1.6: Two Stage Regression of Paid Employment

Hours worked The results from the weekly hours of work regressions, conditional on having a positive number of work hours, are reported in table 1.7. The results are shown for men and women separately. For women, the estimated marginal effect of informal care on hours worked, when treating informal care as exogenous is -0.0163 for women. The effect is negative and significant at the 10% level. The results suggest that for women sample, a 10% increase in weekly hours of informal care is associated with a decline of 1.6% in weekly work hours for women sample. Among women, having at least one child less than 14 years old negatively affects the hours of work, but age and being educated affect positively the weekly hours of work. However, for women sample, although the test shows that the instruments used are valid and strong, but I could not reject the exogeneity of informal care after including the instruments in the first stage regression. The Durbin-Wu-Hausman test could not reject the hypothesis that informal care hours are exogenous: chi-square=0.22, p=0.6 for female. In this specification, the hypothesis that the instruments are jointly equal to zero is not rejected (F=67, p<0.001). As a result, the OLS estimate for women sample is unbiased. For men, the effect of parental care on weekly hours of work is -0.023. The effect is statistically significant at the 1% level. Since both work and informal care hours are specified in log form, the estimate has an elasticity interpretation: a 10% increase in weekly hours of informal care given is associated with a decrease in weekly work hours by 2.3%. Among men, being married, highly educated and age are positively associated with hours of work; while having at least one child less than 14 may negatively impact the hours of work.

However, the Durbin-Wu-Hausman test is significant at the 5% level; the hypothesis that informal care hours are exogenous is rejected for men sample(chi-square=2.73 p=0.03). The hypothesis that the instruments are jointly equal to zero is not rejected (F=75 p<0.001) for men sample. However, the Sargan test for identifying restrictions does not reject the null hypothesis that the instruments could be validly excluded from the main equation (chi-square=1.4, p=0.23). Thus, the instruments are strong and the exogeneity of parental care hours is rejected in this specification. When instrumenting for caregiving, I find that informal care has a negative and significant effect on hours of work for working men. The effect is slightly higher for the TSLS model. The results suggest that a 10% increase in weekly hours of care is associated with about 9.8% decrease in hours worked per week among working

men.

To summarize: the effect of informal care on hours worked has a negative and significant effect on men and women caregivers in Canada. The effect is more pronounced for men than for women. These results underscore the importance of analysing the effects of caregiving by gender. Perhaps women respond more because they are more capable than men to juggle between their work and their caregiving activities. Men, on average, work more than 40 hours per week, which make it difficult for them to balance work and caregiving activities when the health of their parents deteriorates, due to scarcity of time. Another reason could be that the proportion of men in the sample who lives with their parents is higher than that of women, which might require them at times to reduce their hours of work to take care of their parents. (see table 1.4 and 1.3)

The negative and significant results for the influence of caregiving on hours of work for women are in line with previous findings (Johnson and LoSasso, 2000) and (Ettner, 1996). Ettner (1996), in their study of US data, finds under the exogeneity assumptions a non-significant reduction in hours of work. However, when accounting for endogeneity, this reduction is 12.6 hours of work and is very significant. Also, VanHoutven et al. (2013) find that care provision reduces only women's weekly work hours. Some earlier findings specified hours of work equations for all individuals, including those not in the labour force. These analyses would have been strongly influenced by the high proportion of individuals contributing zero hours to the labour market (Carmichael et al. (2008); Lilly et al. (2007)). In this study, the employment equation captured these effects and hours of work is conditional on employment. Another possibility is that the majority of caregivers provide less than 10 hours of care per week to a parent, which may allow further examination of the influence of caregiving intensity and type in future analyses.

VARIABLES	Women OLS	Men OLS
Care hours	-0.0163*	-0.0231***
	(0.00904)	(0.00872)
Wage	-0.144***	-0.145***
	(0.0108)	(0.0101)
Married	-0.0426**	0.0877***
	(0.0171)	(0.0157)
Child	-0.0926***	-0.0310**
	(0.0183)	(0.0152)
Healthy	0.0651**	0.00867
	(0.0300)	(0.0255)
Cgep/diploma	0.158***	0.112***
	(0.0318)	(0.0210)
College	0.209***	0.116***
	(0.0319)	(0.0225)
University	0.302***	0.0837***
	(0.0329)	(0.0222)
Ownhouse	0.0449**	0.0462***
	(0.0201)	(0.0163)
Age 25-34	0.537***	0.592***
	(0.0406)	(0.0324)
Age 35-44	0.588***	0.660***
	(0.0421)	(0.0336)
Age 45-54	0.592***	0.655***
	(0.0416)	(0.0335)
Age 55-64	0.445***	0.584***
	(0.0436)	(0.0354)
Atlantic	0.0416	0.110***
	(0.0264)	(0.0216)
Ontario	0.00923	0.0357**
	(0.0212)	(0.0169)
Prairies	0.0247	0.0867***
	(0.0241)	(0.0194)
BC	-0.0162	0.00889
	(0.0267)	(0.0222)
Constant	3.228***	3.340***
	(0.0618)	(0.0501)
Observations	3,262	3,099
R-squared	0.150	0.198

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.7: Regression with Dependent Variable Hours of Work - Conditional on Employment

	Women		Men	
VARIABLES	First stage	Second Stage	First stage	Second Stage
Care hours		-0.0374		-0.0979***
		(0.0454)		(0.0358)
OneParent	0.526***		0.235***	
	(0.0871)		(0.0679)	
liveaway	-0.437***		-0.678***	
	(0.0597)		(0.0630)	
Married	0.0976***	-0.0409**	0.146***	0.0930***
	(0.0327)	(0.0174)	(0.0320)	(0.0161)
logwage	0.00703	-0.144***	0.0374*	-0.144***
	(0.0206)	(0.0108)	(0.0203)	(0.0102)
Child	-0.117***	-0.0955***	-0.0732**	-0.0378**
	(0.0347)	(0.0192)	(0.0304)	(0.0156)
Healthy	-0.125**	0.0624**	-0.185***	-0.00363
	(0.0571)	(0.0305)	(0.0509)	(0.0263)
Cgep/diploma	0.123**	0.160***	0.129***	0.121***
	(0.0605)	(0.0321)	(0.0419)	(0.0215)
College	0.169***	0.212***	0.148***	0.126***
	(0.0607)	(0.0325)	(0.0450)	(0.0231)
University	0.152**	0.305***	0.0683	0.0886***
	(0.0626)	(0.0333)	(0.0444)	(0.0225)
Ownhouse	0.118***	0.0477**	0.0944***	0.0555***
	(0.0382)	(0.0209)	(0.0327)	(0.0170)
Age 25-34	-0.159**	0.533***	-0.143**	0.588***
	(0.0777)	(0.0416)	(0.0662)	(0.0327)
Age 35-44	-0.0967	0.585***	-0.157**	0.657***
	(0.0807)	(0.0425)	(0.0692)	(0.0339)
Age 45-54	0.146*	0.594***	0.0604	0.668***
	(0.0798)	(0.0417)	(0.0689)	(0.0343)
Age 55-64	0.0622	0.446***	-0.114	0.584***
	(0.0841)	(0.0435)	(0.0732)	(0.0357)
Atlantic	0.179***	0.0462*	0.177***	0.128***
	(0.0503)	(0.0281)	(0.0433)	(0.0233)
Ontario	-0.0417	0.00872	0.0265	0.0399**
	(0.0404)	(0.0212)	(0.0340)	(0.0172)
Prairies	0.129***	0.0275	0.138***	0.0983***
	(0.0458)	(0.0248)	(0.0388)	(0.0203)
BC	-0.0184	-0.0158	0.0327	0.0133
	(0.0510)	(0.0267)	(0.0444)	(0.0224)
Constant	0.920***	3.240***	1.004***	3.363***
	(0.135)	(0.0672)	(0.125)	(0.0517)
Observations	3,262	3,262	3,099	3,099
R-squared		0.148		0.179
First stage F-test	67***		75***	
Smith-Blundell chi-square	0.24		2.73***	
Overid Sargan test	0.99***		1.4	

Table 1.8: Two Stage Regression of Hours of Work - Conditional on Employment

1.6 Conclusion and Implication

Knowing that the population is ageing, informal care is an important pillar of the Canadian welfare system and will carry more weight in the future. Many informal caregivers work and carry the burden of helping an elderly parent for a long term. Around 26% of the women labour force and 23% of men labour force in Canada were engaged in informal care to a parent or parent-in-law in 2012.

This research allows to understand about two important features that should be considered in future work: (1) There is evidence of endogeneity after including an instrumental variable technique in the model of paid employment for women sample caregivers. The instruments are strong; thus, selection bias may be a major concern for women sample on the extensive margin. Selection into caregiving is identified by whether the child lives with a senior parent at home and the number of parents who lives with the child. This result is similar to Crespo (2007) who analysed the 2004 Survey of Health, Ageing and Retirement in Europe (SHARE): she finds that the provision of care is negative and more pronounced after accounting for potential endogeneity. Furthermore, she concludes that the assumption of exogeneity underestimates the negative impact of caregiving on employment. Moreover, endogeneity bias is also detected at the intensive margin for men sample. (2) It is important to model the impact of caregiving on men and women separately. Women are the groups that are more likely engaged in elder care since they can easily substitute market to non market labour which is more difficult for men regarding their responsibilities.

In this environment, policy makers and government initiatives are at odds. On one hand, policy makers tend to cut on expenses on publicly provided home care services by encouraging the elderly to live in the community. On the other hand, it has been a priority for policy makers to increase labour force participation especially for women. As a result, the double burden of work and care affect the health and well-being of Canadian caregivers. However, current leave policies are likely not generous enough to meet these competing demands on workers' time. The 2015 federal budget did announce that it would extend, effective January 2016, the duration of the Compassionate Care Leave provisions from six weeks to six months. Unfortunately, it did not relax the criteria for which leave can be taken.

The leave is permitted only to care for a gravely ill family member. In October 2014, new employment standards came into effect in Ontario. The purpose of these new measures is to ensure that workers who need a leave of absence to act as caregivers to loved ones will not lose their jobs as a result. The Employment Standards Amendment Act (2014) includes Family Caregiver Leave that allows up to eight weeks of unpaid job protected leave for employees to care for a family member with a serious medical condition. Thus, the demand for informal care often last much longer.

Since the results of endogeneity test depend on the quality and strength of instruments, future studies on caregiving may look for better instruments. The instruments used in this test were weak among men when investigating the impact of caregiving on the probability of being employed of men caregivers. Possibly, because those men caregivers who decide to live with their parents may be those with unobserved differences in labour market attachment.

Finally, the results of this paper suggest that there is a negative causal effect on the extensive and intensive margin of paid employment for both men and women parental caregivers in Canada because of the limited leave policies in place. Moreover, informal care has a negative effect on hours of work of both men and women caregivers. Policies like increasing the provision of home care by the formal health and social care system could decrease the burden on informal children caregivers and increase labour force participation. However, this might not be a viable policy option in Canada already facing increasing expenditures for health and social care due to population ageing. Policies allowing more flexible hours for the care-giver in combining paid work and care-giving would be an option. Another, might be increased possibility of paid leave for caring for a senior parent. Such policies would lessen the burden on informal caregivers, while still meeting some of the demands for care in the homes by frail elderly.

1.7 Appendix

Variables	Description
Dependent Variable	
Participation rate	(1,0) 1 if participating in the labour market
Weekly hours of works	Usual number of hours per week spent in paid employment-Log(1+Weekly hours of work)
Independent variables	
Hours of Care	weekly hours of informal care reported by the caregiver-log(1+weekly hours of care)
Age	Age of individual
Age1 (15-24)	(1,0) age dummy (omitted reference group)
Age2 (25-34)	(1,0) age dummy
Age3 (35-44)	(1,0) age dummy
Age4 (45-54)	(1,0) age dummy
Age5 (55-64)	(1,0) age dummy
Female	(1,0) 1 if individual is female
Married	(1,0) 1 if individual is Married
Chidren < 14 years	1 if individual has children less than 14 years living in the household
Healthy	(1,0) 1 if individual is Healthy
Education	
Educ1-High School	(1,0) 1 if individual has a high school degree (omitted reference group)
Educ2-Cegep or diploma	(1,0) 1 if individual has a diploma degree
Educ3-College and University Diploma	(1,0) 1 if individual has a college degree or University Diploma
Educ4-University Degree	(1,0) 1 if individual has a university degree
House ownership	1 if individual owns a house
Regional Dummies	
Region1-Atlantic	(1,0) 1 if residing in Atlantic provinces (NB, NS,NL,PEI)
Region2-Quebec	(1,0) 1 if residing in Quebec(omitted ref group)
Region4-Ontario	(1,0) 1 if residing in province of Ontario
Region5-Prairies	(1,0) 1 if residing in Prairies provinces (Man,Sask,Alta)
Region6-British Columbia	(1,0) 1 if residing in British Columbia
Instruments	
Live with one Parent	(1,0)1 if the child reports that he lives with one parent only
Do not live with parents (Liveaway)	(1,0) if the child reports that he lives away from his parents

Table 1.9: Data Description

1.7.1 The Variables

Caregiving Variables Individuals are classified as **Caregivers** if:

1. They give an affirmative answer to one the following two questions:
   ICG-Q115:During the past 12 months, have you helped or cared for someone who had problems related to aging?
   ICG-Q110: During the past 12 months, have you helped or cared for someone who had a long-term health condition or a physical or mental disability? (Long-term health condition= more than 6 months).

2. They answer that they have helped their parents with at least one of the components discussed above. Individuals were classified as caregivers to a parent if they answer that they have provided care to a parent or a parent-in-law and that they are still helping them at the time of the interview.

The variable **Parental caregiver** is constructed out of two questions in the survey:

1. PRG-Q10GR: Relationship between respondent and his/her primary care receiver.

2. SPR-Q10 : Are you still helping your primary care receiver?
   If the respondent answers that he has provided care to a parent or a parent-in-law and that he is still helping his parents at the time of this survey. Finally, the variable **weekly hours of care** is estimated based on the answer to the following question:
   HAP-Q10: In an average week, number of hours of care or help provided by the respondent with basic daily activities of living like personal care, transportation, meal preparation etc.

Employment Variables The paper considers two labour market outcomes: and hours of work. These outcomes are derived from the following variables:

1. MAR-Q133: Were you employed or self-employed at any time last week?
   Employment is defined by whether the individual has done paid work in the week prior to the interview.

2. WHW-Q120C: How many hours per week you usually work in this job?

1.7.2 Testing for the Regressor Endogeneity

H0 : cov (PC,u) = 0

H1 : cov (PC,u) $\neq$ 0

Under H0: $\beta^{\text{OLS}}$and β^{2SLS} are consistent

$\beta^{\text{OLS}}$is more efficient

Under H1, only β^{2SLS} is consistent

- regress PC Z X predict v, residuals
- regress E PC v
- test v=0

1.7.3 Testing the Validity of Instruments

For IV analysis to generate consistent and asymptotically normal estimates, the instruments must be valid. The two requirements that the instruments must comply with in order for them to be valid are:

- Relevance: Ideally, not only do they correlate with the Xs but they can explain a large portion of the variation of X. That is, they are not weak instruments.
- Exogenous: They must be uncorrelated with the error term.

Testing the Relevance of Instruments In order to test for the relevance of instruments:

- Run the first stage regression with all Zs and Xs to isolate the parts of PC that is uncorrelated with epsilon the error terms of the model;

$$PC_{\text{i}} = \beta_{1\text{i}} + \beta_{2\text{i}} X_{\text{i}} + \beta_{3\text{i}} V_{\text{i}} + \beta_{4\text{i}} R_{\text{i}} + \beta_{5\text{i}} OneParent + \beta_{6\text{i}} liveaway + \psi,$$

- Run the joint hypothesis to test;

$$H_0 : \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$$

$$H_1 : \text{At least one of them does not equal to zero}$$

- The instruments are relevant if at least one of the six coefficient is nonzero. If the F-statistic is greater than >10, reject the null and conclude that our instrument(s) are highly relevant. If the F- statistic is <10, our instruments are weak.

A rule of thumb has been suggested that if an F-statistic of the first stage is below 10, this would be a signal of weak instruments (Staiger and Stock, 1997). An F-test of joint insignificance reveals that the instruments used in the regression predicted reasonably well in the first-stage regression (F=19.44 p<0.01 for female and F=13.77 p<0.01 for male). Not living with a parent or the number of parents living in the household does not affect the employment of the child, it is exogeneous and predetermined. I can conclude that ${\hat{\alpha}_2}^{\text{2SLS}}$ in the second stage regression is consistent. Now we obtain the second stage regression(TSLS):

$$E_{\text{i}} = \alpha_{1\text{i}} + \alpha_{2\text{i}}\hat{PC}_{\text{i}} + \alpha_{3\text{i}}X + \epsilon_{\text{i}},$$

Testing the Exogeneity of Instruments Since the model includes 2 instruments, the overid test is used to check for the exogeneity of the instruments. The hypothesis to be tested is the following:

- H_0: Are IV uncorrelated with the error terms in the structural equation?
- Run the TSLS regression to find the residuals ${\hat{\epsilon}_{\text{i}}}^{\text{2SLS}}$
- Regress the residuals on the instruments Z and the covariates X ;

$${\hat{\epsilon}_{\text{i}}}^{\text{2SLS}} = \theta_1 + \theta_2 OneParent + \theta_3 liveaway + \theta_4 X + \theta_5 V + \theta_6 R + v$$

- Compute the F-statistic testing that all instruments are exogenous:

$$H_0 : \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = 0$$

- J(Hansen's J statistics or Sargan test) = m* F

- Under the null, J is distributed

$$\chi^2_{(m\ -\ k)}{}^{5}$$

.

- If we fail to reject the null, then the hypothesis of the exogeneity of the instruments is accepted.

- If we reject the null, then, you have some evidence that one or both of the instruments are endogenous.

[5] m=number of instruments, k number of endogenous variable

2 The Effects of Informal "Care-Tasks" on Caregivers Employment

2.1 Introduction

The population of disabled seniors is growing fast and large in Canada, and the care they receive is often informal care from family and friends. Publicly funded services, should it be home or institutional care, are not able to meet the rising demand for care. Provinces facing high cost of health care, especially since 1990, reduced spending on the institution care system and encouraged the community-based alternative programs (Fast et al., 1999). The goal of such programs is to encourage the community to participate in informal care, and to enable seniors with health limitations and disabilities to stay in their own homes and communities. The cut in government spending has led to shortages in personal support workers and in the number of beds in long-term care facilities.

Nearly 3 in 10 people living in Canada are family caregivers and the number of elderly who potentially need help is expected to double in the next 30 years. Indeed, adult children are the main source of care provision to an elderly parent. In 2012, about 48% of caregivers reported providing care to an elder parent or parent-in law (Statistics Canada 2012). In fact, frail seniors prefer to remain at home and to be taken care of by their loved ones. Given that the majority of adult children helping their parents are still in their working years, providing care to a disabled parent at home may involve considerable costs. One of the costs incurred by caregiving activities is the employment-related cost. Worker productivity, income and employment-related benefits are affected when informal caregiving intervenes with caregivers' employment. However, current policy reform is driven largely by the argument that informal care is less costly than formal care, and that the hidden costs associated with informal care seldom enter into discussions about health care and social policy. Thus, the goal of this paper is to identify the source and magnitude of the employment costs associated with informal elder care and to inform ongoing policy debate.

The paper extends the literature by shedding light on the heterogeneity of informal care provided throughout the day. Despite substantial evidence that informal care and paid

work are substitute (Carmichael and Charles (1998); Heitmueller (2007); Ettner (1996)), the literature has not thus far considered the type of informal care being provided. The measure of informal care is usually determined in empirical studies by either asking the caregiver whether the care is provided daily, weekly and monthly, or by adding up the self-reported number of hours of care spent by the caregiver daily or weekly. This measure does not take into consideration the caregiving activities that need to be done at specific time of the day and possibly every day. For instance, helping a disabled elderly with daily personal activities such as eating, bathing or dressing may require larger time commitments than helping them with chores. These personal care tasks are measured not only by hours of care but also by the timing of care. Personal care tasks may be non-shiftable by nature because they are provided at specific times of the day. In contrast, chores such as cleaning the house and shopping or other organizational activities, can be done through the day or week. While literature considered daily or weekly levels of care provided to an elderly, an important dimension is omitted - namely the non-shiftable tasks determined by the increased needs of care at specific moments such as needs at mealtimes and when going to bed. Therefore, in addition to the number of care hours, there may be opportunity costs between the choice of providing care and the labour market participation from non-shiftable caregiving activities ((Hassink and Berg, 2011); (VanHoutven et al., 2013)).

The study considers two groups of caregivers: caregivers to a parent or in-law and caregivers to other seniors such as any family member, neighbour or friend. The hypothesis is that the costs incurred by a caregiver that helps his parents is larger than the cost to other family member due to the fact of the affectionate ties between the child caregiver and his parents. The study uses the General Social Survey on caregiving and care-receiving (GSS 2012) to explore the effect of different types and intensity of parental care on caregivers' labour force participation. I also control for endogeneity bias via instrumental variable approach, considering for unobserved individual characteristics that may impact both care types provided and employment behaviour such as ability for caregiving or attachment to labour force. For instance, adult children who are less attached to the labour force or who have poor labour market opportunities are more likely to become caregivers. The paper uses instruments widely used in literature such as distance to care-receiver, age of care receiver

and health of care-receiver.

The preview of the results shows that it is important to control for heterogeneous effects by care-tasks provided and by gender. Findings show that women and men who provide at least 15 hours of weekly care are less likely to be employed than other caregivers. The effects are negative and significant for both samples. Particularly, the effect is larger and more pronounced for women and men who provide intense care for an elderly parent. Moreover, only women who help their parents with personal care are significantly likely to reduce their employment probability. Findings also show that helping an elderly with both personal and intense care have no significant impact on estimated weekly hours of work of both sample.

The major policy implication of this issue is that the supply of professional home care services, in addition to support programs for informal caregivers, should not only relate to the amount of informal care provided but also to the nature of that care. Publicly provided home care services could then have an even greater positive external effect on labour market participation of informal caregivers if it covers non-shiftable activities.

The rest of the paper is as follows. Section 2 discusses the literature review. Section 3 presents the econometric model. Section 4 provides details about the data. Section 5 reports the results. Section 6 presents the conclusion.

2.2 Literature Review

The literature suggests that informal care giving comprises five stakeholders group: informal care-recipient, informal elder caregiver, families of informal caregiver, employers of informal caregiver, and the society. Each of stakeholder group has the potential to experience economic and non-economic costs. However, the importance and the source of this cost varies across stakeholders (Fast et al. (1999)). Figure 1 summarizes the hidden cost of informal elder care by stakeholder and type of cost. Benefits, mainly satisfaction, closed relationship with the care-receiver, substantial knowledge about ageing, understanding others, are also associated with providing informal care to the elderly.

There are employment-related costs that occur when caregivers forego employment opportunities due to their elder care responsibilities. It has been estimated that in 2012, about 48% of caregivers reported providing care to an elder parent or parent-in law and 70%

Summary of the Hidden Costs of Informal Elder Care by Stakeholder and Type of Cost

	Economic Costs (Standard of Living)			Non-Economic Costs (Quality of Life)		
	Employment Related Costs	Out-of-pocket Costs	Unpaid Labour	Physical Well-being	Social Well-being	Emotional Well-being
Care Receivers		✓	✓	✓		✓
Care Givers	✓	✓	✓	✓	✓	✓
Care Givers' Families	✓	✓			✓	
Care Givers' Employers	✓	✓				
Society		✓			✓	

Source: Fast et al. 1999

Figure 1: Summary of the Hidden Costs of Informal Elder Care by Stakeholders

were working at a paid job or business (Statistics Canada 2012). However, providing care may result in disruptions to normal work routines. Statistics Canada (2012) reported that about four in ten employed caregivers (43%) indicated that they arrived to work late, had to leave early, or take time off during the day to care for their ill family member or friend. This figure increased to 54% for those providing 20 or more hours of caregiving per week. An estimated 15% of employed caregivers reported cutting down on their regular weekly hours of work to accommodate the caregiving needs of family and friends. For instance, about one-quarter of caregivers providing help for more than 15 hours had to reduce their regular paid work hours.

A reduction in paid work hours may have consequences on both employee benefits and household income. Among employed caregivers who reduced their hours of work, 14% reported losing some or all of their benefits, such as extended health benefits, dental benefits, employer-provided pension, life insurance, and prescription drug plans. Closely related to income is career advancement. In 2012, 10% of employed caregivers turned down or did not even pursue a new job or promotion because of their caregiving responsibilities. Again, the more intense the caregiving responsibilities, the higher the likelihood of the caregiver postponing or forgoing career opportunities. However, accommodating employment to fulfill elder care responsibilities is likely to reduce Canada/ Quebec Pension Plan (CQPP) benefits, because the value of these benefits is based upon earnings and work history. Eventually, when informal elder care providers sacrifice current and future employment income to meet their

caregiving responsibilities, society at the macro level foregoes income tax revenues. It is also likely that caregivers will have less money with which to purchase goods and services which are produced, marketed, and sold by other Canadians whose earnings and expenditures will be reduced in turn.

The literature analyzing the relationship between employment and caregiving has not led to consensus concerning the causal relationship between these two activities especially on the intensive margin. Most studies have agreed on the negative relationship between informal care and the probability of being in a paid employment (Bolin et al. (2008); Crespo and Mira (2010); Heitmueller (2007)). There is less consensus concerning whether caregiving activities reduce the hours of work of employed caregivers. Bolin et al. (2008) and Marin et al. (2011) find little effect of caregiving reducing working hours. However, Ettner (1996) and Johnson and LoSasso (2000) find that in US, employed caregivers reduce their work hours. Furthermore, some papers have found evidence of reduction in wages (Carmichael and Charles (2003), Heitmuller and Inglis (2007)). The European studies find that the effect on work is negative and stronger for intensive caregivers than other caregivers ((Carmichael and Charles, 1998),(Carmichael and Charles, 2003); (Marin et al., 2011)). Coresidential caregiving has strong negative influence employment in Europe ((Heitmueller, 2007); (Marin et al., 2011)), whereas Ettner (1996) finds that only non-coresidential caregiving has negative effects on work of female caregivers in US. Some studies find stronger work effects for women caregivers compared to men (Carmichael and Charles, 2003) while others do not (Bolin et al., 2008).

In Canada, little has been done to investigate the relationship between caregiving and work behaviour. Lilly et al. (2010) using data from Statistics Canada 2002 General Social Survey (GSS) find a negative but insignificant effect of hours of care on work hours and wages for both women and men primary caregivers. The 2002 GSS data survey was limited to a cohort of Candians aged 45 and over. Since the authors are interested in caregiving to both family and friends, they do not correct for endogeneity bias in their study. They argue that the potential for endogeneity exists and is greater when analyzing hours of care variable rather than intensity variable. They present a model where caregiving is considered as exogenous. However, they recognize the potential limitation of this strategy. Their results

suggest that primary caregiving has a significant negative effect on LFP of caregivers. They also find that caregiving is not a significant predictor of hours of work and wages for either men and women. They also find that only men who contributed at least 20 hours of weekly care are significantly more likely to reduce their weekly work hours. However, if caregiving is endogenous, the estimates may be biased. The bias that arises if caregiving is correlated with unobservables in the labour market equation coefficients. For instance, persons who are working in the market may be expected to contribute less informal care, either because they prefer market rather than home production or because of higher time costs. In this case, informal care must be treated in the model as a potentially endogenous variable. Latif (2006) using the GSS 1996 (cycle 11) data finds that caregiving may negatively impact the number of work hours for both male and female sample. However, the impact is statistically significant only for the female sample. The author corrects for endogeneity bias using instruments as number of brothers, number of sisters, and corresidence with the parent.

This paper analyses the association between care-tasks and labour market outcomes of caregivers. The types of care provided to a parent and their timing may affect the weekly hours worked, employment, and retirement behaviour of caregivers. For instance, helping parents with personal care such as eating, dressing or bathing may require a larger commitment in terms of time than in providing chores (Hassink and Berg, 2011). Providing personal care is restricted to specific times during the day and can not be postponed or shifted over the day or between days. However, providing assistance with chores, for instance, cleaning the house and doing groceries, can be shifted over the week. Thus, this paper distinguishes between types and intensity of care provided and investigates the opportunity costs associated with these care tasks. VanHoutven et al. (2013) using the Health and Retirement Survey (HRS) offer a comprehensive analysis on caregiving with respect to types and intensity of care in US. After accounting for endogeneity, they find that there is no association between personal, chore and intensive care and hours of work for both men and women sample. They also find, after accounting for endogeneity, that women who help their parent with all types of care-tasks are less likely to be in a paid work. With respect to retirement, their result suggests that only women who help with chore care are more likely to retire.

To have a closer look at the association between elder care and labour market outcomes, caregiving is broken down into two tasks: personal and intense care. While Lilly et al. (2010) in their studies of Canadian data have examined intensity of care, the relationship between non-shiftable care tasks and the labour market outcomes of caregivers has not yet been explored in Canada.

Caregiving Facts and Figures in Canada In Canada, the most recent data on family caregivers are found in the General Social Survey (GSS 2012-Cycle 26) done by Statistics Canada on Caregiving and Care receiving. The GSS gathers data every five years on social trends. Its objective is to monitor changes in the living conditions and well-being of Canadians. The GSS was established in 1985 and targets all non-institutionalized Canadians in the ten provinces aged 15 and over. These are series of independent, annual, cross-sectional surveys. The respondents are contacted and interviewed by telephone. Cycle 26 is the fifth topic that deals with caregiving and care receiving, the first four having been conducted in 1985, 1996, 2002, 2007 (Statistics Canada 2012). The GSS-2012 cycle 26 provides a snapshot on the lives of caregivers and care receivers aged 15 and over in Canada. The data covers the ten provinces excluding residents of the Yukon, Norwest territories, Nunavut, and the full time residents of institutions. The available data from Statistics Canada suggests that the number of caregivers has grown with time. In 2012, about 28% of Canadians aged 15 years and older, provided care to a family member or friend with long-term health conditions, disability or ageing needs. 60% of these caregivers are in a paid employment. Whereas in 2002,[6] Statistics Canada reported that 16% of Canadian adults aged 45 to 64 were caregivers to almost 2.3 million seniors suffering from long-term heath disabilities (Granswick 2002); 77% of them were male employed and 63% were female employed in a full time or part-time job. That being said, the increased life expectancy, the decrease in fertility rate, delayed marriage and parenthood, aging baby-boomer, and changes in healthcare policies that encourages informal care, all these factors contributed to the increase in the number of employees with responsibilities for caregiving. In fact, the global population is becoming increasingly older,

[6]2002 survey was conducted on Canadians aged 45 and above. But Statistics Canada changed their sampling criteria over-time from individuals who were 45 to 65 years old to all Canadian 15 years aged and older

and preparing for an "ageing" society is the challenge of policy agendas of the 21st century. For instance, in Canada, from 1950 to 2010, the proportion of the population of elderly grew from 8% to 14%. Recent census data conducted by statistics Canada 2014 finds that Canadian aged 65 and older constitute 15.3% of the population (5.4 million seniors) while it is expected to reach 23% to 25% in 2036. Moreover, the proportion of children aged 14 and under increased only by 0.5% and the people aged 15 to 64 increased by 5.7% (statistics Canada 2011 census). By 2036, the number of seniors (65+) will more than double, while the number of individuals aged 80 and over will increase by 2.6 times. This increase of the proportion of seniors is the result of increased life expectancy, reduced fertility, and the large size of Canada's baby boom cohorts. This trend make it likely that the proportion of elderly who requires assistance from others will continue to grow over time in Canada.

The above data confirms that in the next decade, there will be a tremendous increase in demand for eldercare and that the government needs to devote more resources in this domain. The rise in demand for care increased the lengthy wait time for public health care services. It also increased the cost of nursing homes and other professional services (Johnson and LoSasso (2000), Kopecky and Koreshkova (2014)). Although living in the community is considered to be healthier for the elderly than being institutionalized, it is expected that unpaid care will increase the burnouts level of family informal caregivers. That is because families especially children provide a substantial part of elder care. However, studies confirm that there will be a shortage in the supply of informal care in the future due to later marriages, smaller family sizes, higher divorce rates and an increase in the number of women following an ambitious career rather than having children (Lesthaeghe (2010) and Heitmueller (2007)). Consequently, the burden of caregiving will fall on a smaller number of employed children. According to Statistics Canada, for each person aged 65 and older there were approximately eight working age person (15 to 64). Over time, this ratio has declined to reach 4.5 working-age persons for each person aged 65 and older. Furthermore, it is expected that in 2050, there could be only 2 working-age persons for each person aged 65 and older (Statistics Canada 2014).

2.3 Methods

As noted above, the goal of the present research is to estimate the effect of providing different type of care tasks on caregivers' employment and weekly hours of work. When estimating the probability of being in paid employment, a probit model is used. An OLS regression is conducted for worked hours equation.

The first regression of the model estimates LFP as a function of personal care (PC) or intensive care (IC) and other control variables previously demonstrated to have influenced participation. The probit model for the probability of LFP indicated a binary variable with the value of one for those employed, and zero otherwise.

$$prob(Empl_{\mathrm{i}}) = \beta_1 PC_{\mathrm{i}} + \beta_2 X_{\mathrm{i}} + \epsilon_{\mathrm{i}}; (1)$$

$$prob(Empl_{\mathrm{i}}) = \beta_1 IC_{\mathrm{i}} + \beta_2 X_{\mathrm{i}} + \epsilon_{\mathrm{i}}; (2)$$

where $Empl_{\mathrm{i}}$ is the probability to being in a paid work or not for individual i. PC_{i} in equation (1) is a binary measure of personal care. It takes on the value of 1 if respondents help their care-receivers with personal care and 0 otherwise. IC_{i} in equation (2) is a binary measure of intense care. I takes on the value of 1 if respondents help their care-receivers with at least 15 hours of care and 0 otherwise. X_{i} is a vector of demographic and socio-economic factors, and ϵ_{i} is the vector of error terms.

$$prob(Empl_{\mathrm{i}}) = \alpha_1 PC_{\mathrm{i}} + \alpha_2 PC_{\mathrm{i}} * PCP_{\mathrm{i}} + \alpha_3 X_{\mathrm{i}} + \eta_{\mathrm{i}}; (3)$$

$$prob(Empl_{\mathrm{i}}) = \alpha_1 IC_{\mathrm{i}} + \alpha_2 IC_{\mathrm{i}} * ICP_{\mathrm{i}} + \alpha_3 X_{\mathrm{i}} + \eta_{\mathrm{i}}; (4)$$

Then, I re-estimate LFP distinguishing personal care (PC) from personal care to parent PCP, where personal care to parent occurred where PC=1 and PCP=1 in equation 3. Similarly, I distinguish intense care (IC) from intense care to parent (ICP), where intense care to parent occurred where IC=1 and ICP=1 in equation 4. In this way, the second part of the probit model, captures the incremental effect of being a personal (PC*PCP) or intense

caregiver (IC*ICP) to elderly parent, conditional upon being a personal (PC) or intense (IC) caregiver.

When estimating weekly hours worked, conditional on being on a paid employment, Ordinary Least Square (OLS) model is used. In this model, the weekly hours of work variable is logged in order to achieve smoother distribution. The OLS regression of weekly hours of work on PC and IC is represented in equations 5 and 6:

$$ln(H_{\mathrm{i}}) = \beta_{1\mathrm{i}} + \beta_{5\mathrm{i}} PC_{\mathrm{i}} + \beta_{3\mathrm{i}} X_{\mathrm{i}} + \theta_{\mathrm{i}}; (5)$$

$$ln(H_{\mathrm{i}}) = \beta_{1\mathrm{i}} + \beta_{2\mathrm{i}} IC_{\mathrm{i}} + \beta_{3\mathrm{i}} X_{\mathrm{i}} + \theta_{\mathrm{i}}; (6)$$

Where H > 0 if *Employed* $= 1$; H=0 if *Employed* $= 0$. In equations 7 and 8, I use the same interaction terms to capture the incremental effect of being personal and intense caregiving to parent:

$$ln(H_{\mathrm{i}}) = \alpha_1 PC_{\mathrm{i}} + \alpha_2 PC_{\mathrm{i}} * PCP_{\mathrm{i}} + \alpha_3 X_{\mathrm{i}} + \eta_{\mathrm{i}}; (7)$$

$$ln(H_{\mathrm{i}}) = \alpha_1 IC_{\mathrm{i}} + \alpha_2 IC_{\mathrm{i}} * ICP_{\mathrm{i}} + \alpha_3 X_{\mathrm{i}} + \eta_{\mathrm{i}}; (8)$$

where H_{i} denotes log hours of weekly work by respondent i conditional on being in a paid employment.

A major issue in that model is that care variables (PC, PCP, IC and ICP) cannot be treated as exogenous. Caregiving variables are endogenous when the error terms contain unobserved factors associated with the caregiver's opportunity costs that affect both caregiver's choice about employment and caregiving. These factors include preferences to employment or caregiving and ability of caregiving. Consequently, probit and OLS are not consistent and do not yield a causal effect from care variables on employment variables (*Empl* and H). Therefore, to solve endogeneity issues in cross-sectional data, I propose the use of instrumental variables that are correlated with the endogenous variables. A valid instrumental variable must meet two criteria: validity and exogeneity. First, an instrumental variable needs to

be relevant, so that it is strongly correlated with care variables. Second, an instrumental variable needs to be exogenous, so that it is uncorrelated with the error terms. Instruments are discussed thoroughly in section 4.3.

Furthermore, I control for socio-economic and demographic characteristics X_{i}, which include age, education, marital status, presence of children less than 14, household ownership and health status of the caregiver. The error term, a mean zero random variable, reflects the impact of unmeasured variables on the labour supply decision. The degree of public investment on home care services varies widely between the provinces and regions (Fast et al. (2001), Lilly et al. (2010)), a fact captured by regional dummies in the regression equation. Appendix A contains detailed definitions of the variables used in the model.

2.4 The Data

The data used in this study is from 2012 General Social Survey (GSS-cycle26) published by Statistics Canada. The research conducts separate analysis of men and women caregivers. The sample of caregivers is respondents aged 15 to 64 who help elderly and frail care-receivers whose age is over 65. Caregivers are defined as those who provide at least one hour of care per week to a disabled and/or frail elderly. The sample of this study comprises 4186 caregivers: 2696 parental caregivers and 1490 non-parental caregivers. Parental caregivers are caregivers who help providing care to a parent or parent-in law. Whereas the non-parental caregivers are those who care for family members (other than a parent), friends or neighbours. The sample analysed includes two sub-samples of women and men. This gives a total of 2478 female sample members and 1708 males.

2.4.1 Dependent Variables

The dependent variable consists of two self-reported labour market outcomes, taken from the GSS-cycle 26 data files. Anyone who reports that he/she is working for pay a week during the survey period (either for someone else or self-employed) is defined as employed, and the one who is not currently working, retired or looking for work is defined as not employed. To address the intensive margin of labour supply, I analyse the reported number

of hours worked per week among workers.

2.4.2 Explanatory Variables

Informal care is self-reported by GSS respondents. The GSS asks whether respondents provided help with long-term health conditions or problems related to aging over the past 12 months. The survey then asks if the respondent is still helping the care-receiver, who was helped and how many hours of care were provided by the respondent caregiver. A question on the type of care provided (i.e. helping the care receiver with eating, bathing, toileting, cleaning the house etc.) is then asked to all caregivers. Out of these questions, I derive the personal care variable and the parental care variable. The "Personal care" indicator takes on the value of one if the respondents still help their care-receivers in personal care activities on a daily basis, for instance, bathing, toileting, eating, and zero otherwise. Finally, I use information on hours of care provision to define "Intense care" variable which takes on the value of 1 if the caregiver provides 15 or more hours of care per week at the time of the survey and 0 otherwise. Personal care is a help provided to a care-receiver in particular hours of the day. The elderly demand for care increases at mealtimes and when going to bed. Personal assistance is an "unshiftable" care activity which should be done necessary at specific times of the day. Some caregiving activities may be shiftable over the day or between days like groceries, housework, cleaning, while other like personal care are provided. In economic terms, as intense care, non-shiftable types of informal care might involve an additional source of opportunity costs (Hassink and Berg (2011) and VanHoutven et al. (2013)). Thus, in my analysis, I distinguish between personal care, as well as the intensity provided.

The weekly hours worked and the employment models include the same set of control variables. However, the model with weekly hours worked as the dependent variable includes the weekly wage rate[7] as an additional control variable. Demographic variables include marital-status, age, education, self-reported health and an indicator of house ownership.

[7]To assess the respondent's wage rate, the respondent was first asked about his annual personal income. Second, he or she was asked about the number of hours a week he or she usually works at his or her job. The hourly wage was constructed by (1) multiplying the number of hours worked by 52 (the number of worked weeks per year) (2) the personal income was divided by the results.

Household characteristics contain whether there is a child under age 14 in the home. Regional dummies are added to capture differences in policies across regions.

2.4.3 Instrumental Variables

To solve the endogeneity problem in cross-section data, instruments that are highly correlated with the caring decision but not with the labour market participation are identified. Studies like Bolin et al. (2008), Ettner (1996), and Heitmueller (2007) have used care needs as instrumental variables. While care needs are correlated with hours of informal care, they are not correlated with labour supply. Bolin et al. (2008) and Ettner (1996) use the self-reported parent's health measure as care need in their study on parental caregiving. In these studies, the children assess the parent's health as mild, moderate or severe. Heitmueller (2007), whose analysis is not restricted on parental caregiving, uses the number of sick or disabled persons in the household as a measure of care-recipient's needs for care. This measure is only available for people who live with the care recipient in the same household. He uses the age of three closest friends as instruments for extra-residential caregiving. Moreover, Ettner (1996) uses the number of siblings, parent's age, and parent's marital status as additional instruments and Bolin et al. (2008) use parent's age, mother and father sick, the number of siblings and the distance to the parent's house as extra instruments.

In this study, I follow the literature by using the care needs as instruments. Variables that are assumed to influence directly the amount of informal caregiving, but not the labour market participation, are the health status, the age of the respondent's care-receiver and whether the respondent resides with the elderly or lives more than 100 km away. Obviously, the reason why an individual provides informal care is because his care-receiver is old and need help with the basic activities of daily living such as bathing, toileting, walking etc. Hence, the health status of the frail elderly is highly correlated with the caring decision (Ettner (1996)) and is qualified as an instrument. To evaluate the health of the care-receiver, the respondent was asked to rate his/her care-receiver's health whether it is mild, moderate or severe. A binary indicator that takes the value of 1 if a parent has severe health status is created and 0 otherwise. Since care need is an increasing function of age, the age of the care-receiver is another instrument to be used in this analysis. Other health characteristics

are expected to be captured by age, such as activity limitation, which may increase the demand for informal care. The age of the care-receiver (Bolin et al. (2008)) could only affect labor market participation status of the caregiver via its effect on informal-caregiving. The geographical proximity to parents is another instrument that is assumed to influence the labour-market status of the respondent. Time cost will obviously increase with greater distance between the informal caregiver and the care-receiver, which could be expected to decrease the amount of informal care provided. The binary variable "distance1" is created with the value of 1 if the respondent lives in the same house or, approximately less than 10 min away to his care receiver and 0 otherwise. It is expected that with greater distance, time costs for the caregiver increase, which may decrease the amount of informal care provided (Ettner (1996)). Again distance may influence labour market status of the respondent indirectly via its effect on informal care-giving.

In practice, it is often a good idea to have more instruments than strictly needed, because the additional instruments can be used to increase the precision of the estimates, and to construct tests for the validity of the overidentifying restrictions (which sheds some light on the validity of the instruments). The criteria in this paper for strong instruments is that the joint F-statistics for the excluded instruments in the first stage is above 10 (Staiger and Stock (1997). Moreover, the Sargan-Hansen test is used to test for the over-identification restrictions. The joint null hypothesis is that the instruments are valid, uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. If the Sargan test rejects the null hypothesis, then this is pretty clear evidence the model is misspecified. In this analysis, the Sargan test fails to reject the null hypothesis of the over-identification of the excluded instruments which means that the instruments are strong. A test whether the endogenous regressor can be treated as exogenous is also conducted. For this purpose, I use either the Smith Blundell or the Durbin-Wu-Haussman exogeneity test depending on the model.

In summary, the results of the instrumental variables are reported in tables 2.5 to 2.12. In some specifications, exogeneity is not rejected. This suggests that the results of the two-steps regressions are not consistent. In this case, results are presented treating care provision as exogenous.

2.5 Results

2.5.1 Descriptive Statistics

The characteristics of the sample are presented in tables 2.1, 2.2 and 2.3. Table 2.2 reports weighted descriptive statistics of both groups in the sample, by gender. Table 2.1 reports the proportions of men and women in the sample who provide care by type and intensity. About 54% of women and 61% of men provide parental care of any type. Most commonly, caregivers engage in chore assistance rather than personal care, and it is much more common for the female parental caregiver group to be personal caregiver (3%) compared to their counterpart male group (1.4%). The table also shows that a substantial proportion of caregivers provide "intense care" defined as at least 15 hours of care per week. However, for the non-parental caregiver sample, the table shows that the proportions are lower for each care-task and by gender.

In table 2.2, the proportion of parental caregivers who reported to be in a paid employment is higher than their counterparts non-parental caregivers (75% vs 67% for women and 83% vs 75% for men). The difference in employment rates are likely driven by a combination of demographic characteristics. For instance, among non-parental caregivers, the majority (81%) provides care to grandparents and their ages are between 15 to 25 that may be still unemployed (Table 2.4). Another reason could be that parental caregivers are more educated, older (83% belongs to the age group 45-54 and 75% to the group 55-64) and more attached to the labour force than their non-parental caregivers counterparts. Moreover, the percentage of parental caregivers who reported being married is remarkably higher than non-parental caregivers for both gender (77% vs 47% for women and 83% vs 46% for men). The reason for that difference is that the highest proportion of non-parental caregivers includes young individuals who provide care to their grandparent. Additionally, non-parental caregivers were slightly more likely to be healthy than parental caregivers for both samples.

Columns 2, 3 and 4 in table 2.3 show the average self-estimated care hours per week, the proportion working and the average weekly hours worked conditional on working. Women make much greater caregiving investments than their male counterpart; for instance women provided on average 27 h of care per week versus 24 h offered by men. Moreover, 25% of

women who help their elderly parent are engaged in intensive care (at least 10 hours of care per week), whereas 18% of men parental caregivers are engaged in intensive care. However, the proportion of men parental caregivers reporting caring for less than 10 hours of care per week is higher than that of female parental caregivers (70% women vs 78% men); women provided more intense care than men. These figures are consistent with the literature that women are more likely to be engaged in informal care than men. But also shows a substantial number of men caring as well. Obviously, for female caregivers employment rate steadily declines from 78% to 65% as the number of parental care hours increase. Surprisingly, the same pattern can be observed for the male sample, where the employment rate declines from 86% to 72%. For the whole sample of caregivers, women's participation rate is lower than men's participation rate (66% vs 75%). For those who are working, women in general work less hours per week than men (36 vs 44 weekly hours worked). However, among those who are working, their weekly hours of work are similar. Eventually, the table shows that participations are lower for caregivers with higher commitment to caring for both genders. The data shows evidence of correlation between heavier caring responsibilities and lower participation rate.

2.5.2 Main Results

The results examining differential effects by the various caregiving definitions (personal and intense care) from the models of paid employment and hours worked conditional on working are presented in this section. I was not able to reject exogeneity of the various measures of care provisions with respect to almost all the labour market outcomes of interest for men and women sample. However, the instrumental variable regressions are shown for all specifications. Endogeneity is only detected when instrumenting for women who help their elderly parents with personal care in the employment model. Thus, in this case, the use of probit regression would bias the estimates of the care variable. Results from two-steps probit regression are consistent for this specification only.

	Women	Men
Parental Caregiver (any type)	0.54	0.61
Personal caregiver	0.03	0.014
Chore caregiver	0.5	0.55
Intensive caregiver	0.12	0.11
Non-parental caregiver	0.46	0.4
Personal caregiver	0.03	0.003
Chore caregiver	0.39	0.34
Intensive caregiver	0.09	0.052
Observations	2478	1708

Table 2.1: Caregiving Frequency by Gender

	Women caregivers		Men caregivers	
	Parental	Non parental	Parental	Non parental
Employment	.75	.67	.83	.75
Hours of work/week[a]	36	33	43	41
Parentcare	1	-	1	-
Grandparent	-	.56	-	.55
Spouse	-	.047	-	.021
Family	-	.16	-	.077
Friends	-	.24	-	.35
Child<14	.24	.29	.28	.32
Married	.77	.47	.83	.46
Age 15-24	.01	.35	.013	.39
Age 25-34	.052	.26	.056	.21
Age 35-44	.16	.12	.17	.12
Age 45-54	.43	.1	.45	.15
Age 55-64	.34	.17	.32	.12
High school	.072	.13	.08	.17
Cgep/Diploma	.29	.32	.33	.37
College	.34	.29	.27	.25
University	.3	.26	.32	.2
Healthy	.9	.93	.9	.94
Ownhouse	.89	.84	.89	.87
Observations	1552	926	1144	564

Table 2.2: Characteristics of Adult Caregivers

[a]conditional on working

Intensity of care	Number of caregivers	Self-estimated Care hours per week	Proportion working	Average weekly hours worked
1- Female parental caregivers				
< 15 hours/week	1085	3	0.78	36
>= 15 hours/week	393	27	0.65	36
All parental Caregivers	1552	9	0.75	36
Nonparental caregivers	926	8	0.56	36
All subsample	2478	9	0.66	36
2- Male parental caregivers				
< 15	892	3	0.86	44
>= 15	207	24	0.72	43
parental Caregivers	1144	7	0.83	44
Nonparental caregivers	564	5	0.62	43
All subsample	1708	6	0.75	44

Table 2.3: Data Description by Intensity of Care

	15-24	25-34	35-44	45-54	55-64
Employment	.55	.87	.9	.87	.6
Hours of work/week	28	40	41	42	38
Providing care to:					
Parent	.042	.23	.65	.83	.75
Grandparent	.81	.57	.15	.015	.0015
Spouse	0	0	.0076	.0056	.048
Family	.046	.057	.049	.043	.067
Friends	.1	.14	.14	.11	.13
Observations	313	356	632	1370	1515

Table 2.4: Caregivers by Age Group

Paid Employment Tables 2.5 and 2.6 present the regressions on the probability of being employed for women and men caregivers. In these tables, the explanatory variables, any personal care (PC) and personal care to parents (PCP), are dummy variables. Column 1, in both tables, reports the results if PC is treated as exogenous. It indicates that providing personal care has a positive effect on the probability of working for men and women. This effect is not significant for both samples. A two-steps regression is used in order to test for endogeneity bias. Column 2, in both tables, reports the results. The instruments used are the severe health, age and the distance to care-receiver. In the first stage of the model, PC is regressed on the instruments and the control variables. In the second stage, the fitted value of the first stage is used to find out the probability of being employed. Although there is indication of endogeneity, instruments did not pass the overidentification test for female

sample (overid Sargan chi-square=6.45 (p=0.04). This suggests that the instruments used are weak and might be correlated with the error terms. It also emphasizes the difficulty in identifying meaningful instruments for this specification. Thus, results from the two-steps regression should only be treated as indicative. Regarding the male sample in table 2.6, the Smith-Blundell test did not reject exogeneity (chi-square (0.64 p=0.7). Thus, the coefficient of PC is exogenous and the result of column 1 in this table is not biased. Therefore, personal care has a positive effect on the probability of being in paid employment for both women and men sample (0.0127 and 0.0125 for men and women sample respectively). Yet, the effects are not significant.

Results of column 3 in both tables are reported treating personal care to parent (PCP) as exogenous. The sign is positive for PC and negative for PCP for both samples. Both effects are not significant. Regarding men sample, exogeneity holds since the Smith-Blundell test does not reject exogeneity. The effect is positive (0.0274) for PC and negative (-0.087) for PCP. Both effect are not significant at the conventional levels. With respect to women, exogeneity is rejected (Smith-Blundell test 11.14 p=0.001). This indicates that the results of column 3 are biased for female sample. Thus, a two-stage regression is conducted to correct for endogeneity bias. Column 4 in table 2.5 reports the results from the instrumental variable regression. After applying instruments, the sign is more pronounced and is negative and significant. It is also positive and significant for "personal care" (PC) variable. It shows that women who help their parent with daily personal care are 99.1 percentage points less likely to be employed than other caregivers.

Tables 2.7 and 2.8 represent the regressions where dependent variable is paid employment and independent variables are "intense care" (IC) and "Parental intense care"(ICP). The smith-Blundell test did not reject exogeneity of parental personal care for both male and female. This suggests that probit model is unbiased and its results can be consistently reported. With respect to " intense care" (IC) provision, I find that women are less likely to be employed. The effect is negative but not significant (-0.0213). Men are 7.4 pp significanly less likely to be employed than other caregivers. Regarding "Parental intense care", the effect is negative and significant for both samples. Results suggest that providing intense care to a parent reduces employment probability by 9.3 and 11.2 pp for women and men

respectively. These findings tend to be consistent with the literature. Heitmueller (2007) estimates that providing care for more than 20 hours a week reduces labour force participation by up to 26% while (Carmichael and Charles, 2003) finds providing 10 or more hours of care per week decreases the probability of employment by 0.32 percentage points for women in UK (Crespo, 2007). These results underscore the importance of analysing differential effects by the type of care provided and gender.

Consistent with the existing literature, being healthy and educated have a strong positive effect on the probability of being employed. For women and men, education and age are strongly positively associated with the probability of being employed. Many of these findings are consistent across all the definitions of informal care.

In summary, I conclude that only personal care provision to parents reduces the probability of being employed for women compared to other caregivers. Regarding intense care provision, helping a care-receiver with at least 15 hours of care per week reduces the probability of being in a paid employment for men caregivers only. However, caregivers men and women, who provide intense care to parents, are more likely to reduce their employment probability than other caregivers.

VARIABLES	Probit	IVprobit First stage	IVprobit Second stage	Probit	IVprobit First stage	IVprobit Second Stage
Personal care (PC)	0.0125		-0.257***	0.0173	0.120***	0.165***
	(0.0188)		(0.0906)	(0.0196)	(0.0118)	(0.0330)
Personal care*Parent (PC*PCP)				-0.0401		-0.991***
				(0.0475)		(0.215)
Married	-0.000504	-0.0389	-0.00270	-0.00115	-0.0168	-0.0123
	(0.0198)	(0.0291)	(0.0253)	(0.0199)	(0.0125)	(0.0239)
Child	-0.0358	0.0891**	-0.0173	-0.0350	0.0435***	0.00147
	(0.0264)	(0.0366)	(0.0343)	(0.0265)	(0.0157)	(0.0326)
Healthy	0.157***	0.00981	0.123***	0.157***	0.0104	0.113***
	(0.0269)	(0.0416)	(0.0360)	(0.0269)	(0.0179)	(0.0338)
Cgep/diploma	0.0906***	-0.0418	0.0826*	0.0899***	-0.00500	0.0794**
	(0.0322)	(0.0490)	(0.0422)	(0.0322)	(0.0211)	(0.0392)
College	0.181***	-0.0105	0.156***	0.180***	-0.0305	0.107**
	(0.0325)	(0.0498)	(0.0445)	(0.0325)	(0.0214)	(0.0450)
University	0.165***	-0.0574	0.156***	0.164***	-0.0199	0.130***
	(0.0336)	(0.0511)	(0.0477)	(0.0336)	(0.0220)	(0.0453)
Ownhouse	0.0303	-0.0161	0.0239	0.0306	-0.00163	0.0232
	(0.0248)	(0.0367)	(0.0312)	(0.0248)	(0.0158)	(0.0292)
Age 25-34	0.406***	-0.0551	0.358***	0.407***	0.0181	0.344***
	(0.0475)	(0.0811)	(0.0779)	(0.0475)	(0.0349)	(0.0707)
Age 35-44	0.530***	0.00874	0.518***	0.531***	0.0498	0.494***
	(0.0480)	(0.0784)	(0.0811)	(0.0480)	(0.0337)	(0.0725)
Age 45-54	0.488***	0.0938	0.488***	0.491***	0.0812**	0.480***
	(0.0443)	(0.0753)	(0.0704)	(0.0444)	(0.0324)	(0.0637)
Age 55-64	0.253***	0.116	0.300***	0.256***	0.0867***	0.320***
	(0.0472)	(0.0778)	(0.0674)	(0.0473)	(0.0335)	(0.0625)
Atlantic	0.0115	0.0299	0.0300	0.0132	0.0840***	0.107**
	(0.0351)	(0.0535)	(0.0457)	(0.0352)	(0.0230)	(0.0463)
Ontario	0.0626**	-0.0178	0.0510	0.0625**	0.00529	0.0552
	(0.0310)	(0.0463)	(0.0402)	(0.0310)	(0.0199)	(0.0373)
Prairies	0.0677**	-0.0261	0.0590	0.0678**	0.0271	0.0874**
	(0.0328)	(0.0493)	(0.0429)	(0.0328)	(0.0212)	(0.0394)
BC	0.0293	0.00536	0.0203	0.0297	0.0237	0.0427
	(0.0367)	(0.0549)	(0.0462)	(0.0367)	(0.0236)	(0.0435)
distance1		0.159***			0.0761***	
		(0.0399)			(0.0172)	
Severe		0.153***			0.0298***	
		(0.0258)			(0.0112)	
Ageparent		0.0627***			0.0250***	
		(0.0179)			(0.00773)	
Constant		0.103			-0.179***	
		(0.110)			(0.0474)	
Observations	2,432	1,338	1,338	2,432	1,338	1,338
First stage F-test		19			10.78***	
Smith-Blundell chi-square		19.74**			11.14***	
Overid Sargan test		6.45**			1.5	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.5: Regressions on employment probability (marginal effects and probit model)- Personal care - Female

VARIABLES	Probit	IVprobit First stage	IVprobit Second Stage	Probit	IVprobit First stage	IVprobit Second Stage
Personal care (PC)	0.0127		-0.0644	0.0274	0.207***	0.196
	(0.0341)		(0.181)	(0.0376)	(0.0157)	(0.189)
Personal care*Parent (PC*PCP)				-0.0817		-0.866
				(0.0836)		(0.916)
Married	0.0419*	-0.0553*	0.0557	0.0416*	-0.0125	0.0438
	(0.0245)	(0.0307)	(0.0368)	(0.0245)	(0.0136)	(0.0404)
Child	-0.000133	0.00926	0.0132	-0.00138	-0.0249*	-0.0115
	(0.0277)	(0.0298)	(0.0386)	(0.0277)	(0.0132)	(0.0448)
Healthy	0.0946***	-0.0220	0.136***	0.0933***	-0.0139	0.114**
	(0.0298)	(0.0349)	(0.0381)	(0.0298)	(0.0155)	(0.0500)
Cgep/diploma	0.0947***	0.0295	0.120***	0.0955***	0.0113	0.116***
	(0.0299)	(0.0398)	(0.0442)	(0.0299)	(0.0176)	(0.0430)
College	0.128***	0.0116	0.111**	0.129***	0.0132	0.110**
	(0.0326)	(0.0421)	(0.0466)	(0.0326)	(0.0186)	(0.0455)
University	0.116***	0.0572	0.165***	0.116***	0.00600	0.147***
	(0.0327)	(0.0424)	(0.0484)	(0.0327)	(0.0188)	(0.0506)
Ownhouse	0.0781***	0.0249	0.107***	0.0779***	0.00193	0.0957**
	(0.0277)	(0.0353)	(0.0379)	(0.0277)	(0.0156)	(0.0390)
Age 25-34	0.342***	0.115*	0.358***	0.342***	0.0115	0.333***
	(0.0469)	(0.0641)	(0.0729)	(0.0468)	(0.0284)	(0.0754)
Age 35-44	0.462***	0.132**	0.440***	0.462***	0.00721	0.406***
	(0.0441)	(0.0583)	(0.0654)	(0.0441)	(0.0259)	(0.0774)
Age 45-54	0.478***	0.0831	0.489***	0.479***	0.0151	0.456***
	(0.0395)	(0.0562)	(0.0606)	(0.0394)	(0.0249)	(0.0759)
Age 55-64	0.247***	0.0758	0.254***	0.247***	0.000825	0.223***
	(0.0448)	(0.0612)	(0.0714)	(0.0448)	(0.0271)	(0.0718)
Atlantic	0.0791**	-0.00372	0.0192	0.0808**	0.0390*	0.0549
	(0.0391)	(0.0478)	(0.0561)	(0.0392)	(0.0211)	(0.0649)
Ontario	0.0636*	-0.0134	0.0276	0.0630*	0.00478	0.0294
	(0.0347)	(0.0410)	(0.0492)	(0.0347)	(0.0182)	(0.0469)
Praries	0.129***	-0.0279	0.137**	0.131***	0.0377*	0.164***
	(0.0372)	(0.0454)	(0.0556)	(0.0372)	(0.0201)	(0.0548)
BC	0.0418	0.0269	-0.00945	0.0430	0.0311	0.0197
	(0.0400)	(0.0491)	(0.0562)	(0.0400)	(0.0217)	(0.0629)
distance1		0.108***			0.0273*	
		(0.0355)			(0.0158)	
Severe		0.0704***			-0.00525	
		(0.0230)			(0.0103)	
Ageparent		0.0903***			-0.0107	
		(0.0170)			(0.00763)	
Constant		-0.179*			-0.00785	
		(0.0917)			(0.0407)	
Observations	1,675	809	809	1,675	809	809
First stage F-test		14			2	
Smith-Blundell chi-square		0.64			0.57	
Overid Sargan test		1.07			0.3	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.6: Regressions on employment probability (marginal effects and probit model)- Personal care -Male

VARIABLES	Probit	IVprobit First stage	IVprobit Second Stage	Probit	IVprobit First stage	IVprobit Second Stage
Intense(IC)	-0.0213		-0.958***	-0.0289	-0.107***	-0.0767**
	(0.0276)		(0.188)	(0.0276)	(0.0228)	(0.0337)
Intense*Parent (IC*ICP)				-0.0930***		-0.562***
				(0.0347)		(0.129)
Married	-0.00143	-0.00337	0.000736	-0.00598	-0.0295*	-0.0151
	(0.0198)	(0.0200)	(0.0205)	(0.0199)	(0.0166)	(0.0242)
Child	-0.0355	0.0262	0.0139	-0.0339	0.0392*	-0.0187
	(0.0264)	(0.0252)	(0.0325)	(0.0264)	(0.0208)	(0.0317)
Healthy	0.156***	0.00752	0.0379	0.150***	-0.0519**	0.0843**
	(0.0268)	(0.0286)	(0.0618)	(0.0269)	(0.0237)	(0.0369)
Cgep/diploma	0.0900***	-0.0195	0.00508	0.0880***	-0.0416	0.0681*
	(0.0322)	(0.0338)	(0.0558)	(0.0321)	(0.0279)	(0.0400)
College	0.180***	0.00719	0.0480	0.175***	-0.0623**	0.115***
	(0.0325)	(0.0343)	(0.0774)	(0.0325)	(0.0284)	(0.0446)
University	0.163***	-0.0506	-0.00205	0.158***	-0.0614**	0.126***
	(0.0336)	(0.0352)	(0.0916)	(0.0336)	(0.0291)	(0.0459)
Ownhouse	0.0305	0.0135	0.0211	0.0320	0.00999	0.0323
	(0.0248)	(0.0253)	(0.0270)	(0.0248)	(0.0209)	(0.0293)
Age 25-34	0.407***	-0.0166	0.0946	0.413***	0.0459	0.381***
	(0.0474)	(0.0558)	(0.166)	(0.0474)	(0.0462)	(0.0686)
Age 35-44	0.531***	0.0347	0.184	0.539***	0.0892**	0.543***
	(0.0480)	(0.0540)	(0.217)	(0.0480)	(0.0446)	(0.0693)
Age 45-54	0.490***	0.0430	0.178	0.505***	0.167***	0.539***
	(0.0443)	(0.0518)	(0.191)	(0.0444)	(0.0429)	(0.0613)
Age 55-64	0.257***	0.0842	0.163	0.272***	0.169***	0.361***
	(0.0471)	(0.0536)	(0.104)	(0.0473)	(0.0444)	(0.0635)
Atlantic	0.0116	-0.0160	-0.0123	0.0185	0.0864***	0.0791*
	(0.0351)	(0.0369)	(0.0390)	(0.0351)	(0.0305)	(0.0449)
Ontario	0.0623**	-0.0152	0.000744	0.0639**	0.0200	0.0662*
	(0.0310)	(0.0319)	(0.0421)	(0.0310)	(0.0264)	(0.0375)
Prairies	0.0680**	0.0119	0.0279	0.0697**	0.00893	0.0714*
	(0.0328)	(0.0339)	(0.0430)	(0.0328)	(0.0281)	(0.0399)
BC	0.0296	0.0154	0.0177	0.0306	0.00357	0.0267
	(0.0367)	(0.0378)	(0.0382)	(0.0367)	(0.0313)	(0.0437)
distance1		0.00641			0.160***	
		(0.0275)			(0.0227)	
Severe		0.0510***			0.0258*	
		(0.0178)			(0.0147)	
Ageparent		0.00409			0.0369***	
		(0.0123)			(0.0102)	
Constant		0.0257			-0.0928	
		(0.0758)			(0.0627)	
Observations	2,432	1,338	1,338	2,432	1,338	1,338
First stage F-test		51.4			16	
Smith-Blundell chi-square		4.8**			0.23	
Overid Sargan test		1.95			6.37**	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.7: Regressions on employment probability (marginal effects and probit model)- Intense care - Female

VARIABLES	Probit	IVprobit First stage	IVprobit Second Stage	Probit	IVprobit First stage	IVprobit Second Stage
Intense (IC)	-0.0672**		-0.511	-0.0741**	-0.0901***	-0.117**
	(0.0340)		(0.547)	(0.0340)	(0.0301)	(0.0481)
Intense*Parent (IC*ICP)				-0.112**		-0.194
				(0.0435)		(0.244)
Married	0.0391	-0.0377	0.0300	0.0339	-0.0637***	0.0396
	(0.0244)	(0.0264)	(0.0539)	(0.0245)	(0.0223)	(0.0409)
Child	-0.00237	0.00660	0.0138	-0.00403	0.0120	0.0133
	(0.0277)	(0.0256)	(0.0347)	(0.0276)	(0.0216)	(0.0383)
Healthy	0.0907***	-0.0154	0.111*	0.0867***	-0.0179	0.129***
	(0.0298)	(0.0300)	(0.0624)	(0.0297)	(0.0254)	(0.0390)
Cgep/diploma	0.0958***	0.0313	0.118***	0.0943***	0.0118	0.122***
	(0.0299)	(0.0341)	(0.0437)	(0.0298)	(0.0289)	(0.0436)
College	0.127***	0.0121	0.102**	0.124***	-0.0134	0.106**
	(0.0326)	(0.0361)	(0.0505)	(0.0325)	(0.0305)	(0.0472)
University	0.113***	0.00980	0.142**	0.109***	-0.0226	0.153***
	(0.0327)	(0.0364)	(0.0612)	(0.0326)	(0.0308)	(0.0485)
Ownhouse	0.0792***	-0.0270	0.0789	0.0793***	-0.000437	0.102***
	(0.0277)	(0.0303)	(0.0568)	(0.0276)	(0.0257)	(0.0375)
Age 25-34	0.344***	0.00358	0.307**	0.351***	0.0740	0.370***
	(0.0466)	(0.0550)	(0.122)	(0.0465)	(0.0465)	(0.0713)
Age 35-44	0.467***	-0.00242	0.370**	0.475***	0.0900**	0.450***
	(0.0439)	(0.0500)	(0.146)	(0.0438)	(0.0424)	(0.0635)
Age 45-54	0.481***	0.0232	0.429***	0.493***	0.116***	0.511***
	(0.0392)	(0.0482)	(0.143)	(0.0393)	(0.0408)	(0.0627)
Age 55-64	0.252***	0.0829	0.259***	0.263***	0.103**	0.283***
	(0.0446)	(0.0525)	(0.0647)	(0.0447)	(0.0445)	(0.0735)
Atlantic	0.0792**	0.0707*	0.0561	0.0868**	0.0908***	0.0465
	(0.0390)	(0.0410)	(0.0632)	(0.0391)	(0.0347)	(0.0612)
Ontario	0.0662*	0.0387	0.0445	0.0693**	0.0226	0.0357
	(0.0347)	(0.0352)	(0.0467)	(0.0347)	(0.0298)	(0.0492)
Prairies	0.132***	0.0776**	0.164***	0.135***	0.0561*	0.159***
	(0.0371)	(0.0390)	(0.0500)	(0.0371)	(0.0331)	(0.0553)
BC	0.0421	0.0144	0.00140	0.0457	0.0610*	0.00461
	(0.0400)	(0.0421)	(0.0531)	(0.0399)	(0.0357)	(0.0583)
distance1		0.0388			0.151***	
		(0.0305)			(0.0258)	
Severe		-0.0198			0.0331**	
		(0.0198)			(0.0167)	
Ageparent		0.0124			0.0289**	
		(0.0145)			(0.0123)	
Constant		-0.0129			-0.132**	
		(0.0787)			(0.0666)	
First stage F-test		16***			6	
Smith-Blundell chi-square		0.23			0.8	
Overid Sargan test		6.37***			0.43	
Observations	1,675	809	809	1,675	809	809

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.8: Regressions on employment probability (marginal effects and probit model)-Intense care-Male

Hours Worked The weekly hours of work regression is estimated conditional on those who are currently working for pay. With respect to personal care provision, results are shown in tables 2.9 and 2.10. For women sample, Columns 1 and 3 in table 2.9 display the results from a probit regression and columns 2 and 4 show the results of the two-steps regression after instrumenting for care variables. The Durbin and Wu-Haussman tests fail to reject the null of exogeneity of both care variables (Chi-square is 0.93 p=0.33 and 2.2 p=0.13 respectively for PC and PCP). This indicates that my results from the OLS model for this specification are not biased. However, the results of the IV regression are presented in columns 2 and 4. Consequently, if exogeneity holds, providing personal care has no significant effect on weekly work hours of women caregivers. Similarly, exogeneity is not rejected for male sample who provide personal care. Again, the Durbin and Wu-Haussman tests fail to reject the null of exogeneity of both care variables (Chi-square is 0.05 p=0.45 and 0.44 p=0.56 respectively for PC and PCP). The OLS regression in column 1 2.10 shows that providing personal care has negative impact on weekly hours of work of male sample. However, the effect is not significant.

With respect to intensity of care, exogeneity is rejected for intense care variables for both samples. Results are reported in tables 2.11 and 2.12. None of the tests confirm the presence of endogeneity. Results from the OLS regression show that helping an elderly with intense care has a negative effect on hours of work of caregivers. The effect is -0.0163 and -0.0499 for women and men caregivers respectively. The sign is negative, but not significant. When intense care is interacted with intense care to a parent (column 3), the effect is positive with 0.017 and 0.0448 for women and men respectively. However, providing intense care to a parent is negative (-0.0556 and -0.133 for women and men respectively). It is also negative for those who provide care to parent. This suggests that the negative effect for the variable IC is driven by those who provide intense care to elderly parents. These results are not significant. However, they could be informative. Literature from Europe finds that care provision has no significant effect on work hours of caregivers (Bolin et al. (2008), (Marin et al., 2011)). In this literature, caregiving variable is defined as binary variable and includes all care tasks. Further, VanHoutven et al. (2013), using 2SLS with fixed effect regressions of weekly hours, find no significant effect when helping elder parent with intense and personal

on weekly hours of work among male caregivers in U.S. However, their results suggest that care tasks reduce the weekly hours of work of female caregivers sample only.

In summary, the results when treating caregiving as exogenous suggest that providing "personal care" and "intense care" does not have significant impact on hours of work for both female and male sample. Also, being married and having a child showed a negative and significant impact on weekly hours of work. While being educated and age showed a positive and significant effect. Among men, being married, well educated and age are positively associated with hours worked.

VARIABLES	OLS	IV2sls First stage	IV2sls Second Stage	OLS	IV2sls First stage	IV2sls Second Stage
Personal care (PC)	0.0317		-0.178	0.0285	0.113***	0.111
	(0.0245)		(0.167)	(0.0255)	(0.0157)	(0.110)
Personal care*Parent (PC*PCP)				0.0299		-1.086
				(0.0653)		(0.864)
Married	-0.0549**	-0.0436	-0.0385	-0.0549**	-0.00514	-0.0384
	(0.0257)	(0.0394)	(0.0346)	(0.0257)	(0.0165)	(0.0382)
Child	-0.102***	0.112**	-0.0682	-0.103***	0.0323	-0.0523
	(0.0311)	(0.0471)	(0.0447)	(0.0311)	(0.0197)	(0.0529)
Healthy	0.191***	-0.0598	0.161***	0.191***	0.0449*	0.217***
	(0.0420)	(0.0630)	(0.0560)	(0.0420)	(0.0263)	(0.0699)
Cgep/diploma	0.193***	-0.261***	0.115	0.193***	0.0258	0.189**
	(0.0523)	(0.0784)	(0.0805)	(0.0523)	(0.0330)	(0.0802)
College	0.220***	-0.218***	0.140*	0.220***	-0.00343	0.172**
	(0.0520)	(0.0782)	(0.0775)	(0.0520)	(0.0328)	(0.0761)
University	0.377***	-0.253***	0.295***	0.378***	0.0222	0.362***
	(0.0541)	(0.0808)	(0.0821)	(0.0541)	(0.0340)	(0.0813)
Ownhouse	0.0726**	-0.0769	0.0256	0.0724**	0.00395	0.0426
	(0.0336)	(0.0519)	(0.0468)	(0.0336)	(0.0217)	(0.0505)
logwage	-0.279***	0.0186	-0.234***	-0.278***	-0.0236*	-0.263***
	(0.0180)	(0.0292)	(0.0254)	(0.0180)	(0.0122)	(0.0349)
Age 25-34	0.470***	-0.167	0.307**	0.470***	-0.00943	0.323*
	(0.0900)	(0.170)	(0.151)	(0.0901)	(0.0710)	(0.165)
Age 35-44	0.536***	-0.122	0.418***	0.536***	0.0238	0.463***
	(0.0911)	(0.170)	(0.150)	(0.0911)	(0.0712)	(0.165)
Age 35-44	0.540***	-0.0121	0.441***	0.539***	0.0476	0.494***
	(0.0889)	(0.167)	(0.145)	(0.0890)	(0.0699)	(0.166)
Age 45-54	0.339***	0.0220	0.237	0.338***	0.0607	0.300*
	(0.0909)	(0.170)	(0.147)	(0.0909)	(0.0710)	(0.173)
Atlantic	0.0483	0.110	0.0814	0.0465	0.102***	0.175
	(0.0468)	(0.0746)	(0.0664)	(0.0469)	(0.0312)	(0.113)
Ontario	0.116***	-0.0501	0.142***	0.116***	0.0189	0.170***
	(0.0406)	(0.0630)	(0.0553)	(0.0406)	(0.0263)	(0.0629)
Prairies	0.0691	0.0257	0.0524	0.0684	0.0382	0.0899
	(0.0439)	(0.0685)	(0.0593)	(0.0439)	(0.0286)	(0.0739)
BC	-0.00919	-0.0207	-0.0510	-0.0106	0.0518	0.0117
	(0.0490)	(0.0767)	(0.0659)	(0.0492)	(0.0320)	(0.0880)
distance1		0.134**			0.0447*	
		(0.0626)			(0.0262)	
Severe		0.151***			0.0292**	
		(0.0351)			(0.0148)	
Ageparent		0.0581**			0.0105	
		(0.0252)			(0.0105)	
Constant	3.500***	0.426*	3.671***	3.502***	-0.131	3.466***
	(0.124)	(0.226)	(0.220)	(0.124)	(0.0946)	(0.226)
Observations	1,325	729	729	1,325	729	729
R-squared	0.231		0.171	0.231		
First stage F-test		9***			3	
D-Wu-Haussman chi-square		0.93			2.2	
Overid Sargan test		4			2.4	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.9: OLS regressions on hours worked- Personal care-Female

VARIABLES	OLS	IV2sls First stage	Second Stage	OLS	IV2sls First stage	Second Stage
Personal care (PC)	-0.0245		-0.0832	-0.0101	0.154***	0.106
	(0.0368)		(0.228)	(0.0389)	(0.0181)	(0.200)
Personal care*Parent (PC*PCP)				-0.116		-0.954
				(0.104)		(1.313)
Married	0.104***	-0.0936**	0.140***	0.102***	-0.0237	0.122**
	(0.0284)	(0.0408)	(0.0509)	(0.0284)	(0.0163)	(0.0559)
Child	0.00605	0.00998	0.000814	0.00401	-0.0300**	-0.0275
	(0.0275)	(0.0374)	(0.0407)	(0.0275)	(0.0149)	(0.0574)
Healthy	-0.00749	-0.0370	0.0150	-0.00975	-0.0378*	-0.0179
	(0.0391)	(0.0511)	(0.0563)	(0.0392)	(0.0204)	(0.0753)
Cgep/diploma	-0.0467	0.0198	-0.1000	-0.0452	0.0171	-0.0883
	(0.0415)	(0.0624)	(0.0678)	(0.0415)	(0.0248)	(0.0727)
College	-0.0162	-0.00504	-0.107	-0.0158	0.0104	-0.102
	(0.0433)	(0.0646)	(0.0697)	(0.0433)	(0.0257)	(0.0730)
University	-0.0382	0.0625	-0.116	-0.0356	0.0329	-0.0940
	(0.0440)	(0.0651)	(0.0725)	(0.0441)	(0.0259)	(0.0818)
Ownhouse	0.0302	0.0218	-0.0290	0.0308	0.00861	-0.0258
	(0.0344)	(0.0494)	(0.0542)	(0.0344)	(0.0197)	(0.0564)
logwage	-0.236***	-0.0268	-0.121***	-0.236***	0.00218	-0.118***
	(0.0183)	(0.0253)	(0.0282)	(0.0183)	(0.0101)	(0.0288)
Age 25-34	0.235***	0.212*	0.0874	0.238***	0.0342	0.113
	(0.0713)	(0.109)	(0.130)	(0.0714)	(0.0434)	(0.133)
Age 35-44	0.272***	0.264**	0.0922	0.276***	0.0373	0.124
	(0.0704)	(0.105)	(0.129)	(0.0705)	(0.0419)	(0.133)
Age 45-54	0.278***	0.221**	0.0612	0.281***	0.0340	0.0848
	(0.0686)	(0.104)	(0.127)	(0.0687)	(0.0417)	(0.127)
Age 55-64	0.170**	0.212*	-0.00816	0.173**	0.0246	-0.00134
	(0.0722)	(0.109)	(0.134)	(0.0722)	(0.0437)	(0.125)
Atlantic	0.126***	0.0548	0.138**	0.129***	0.0399	0.174**
	(0.0453)	(0.0622)	(0.0686)	(0.0454)	(0.0248)	(0.0887)
Ontario	0.0680*	0.00969	0.113*	0.0682*	0.0146	0.126**
	(0.0395)	(0.0539)	(0.0586)	(0.0395)	(0.0215)	(0.0641)
Prairies	0.101**	0.00361	0.0789	0.103**	0.0412*	0.119
	(0.0423)	(0.0582)	(0.0632)	(0.0423)	(0.0232)	(0.0858)
BC	0.0490	0.0369	0.0414	0.0495	0.0184	0.0542
	(0.0477)	(0.0657)	(0.0724)	(0.0477)	(0.0262)	(0.0774)
distance1		0.0424			0.0130	
		(0.0475)			(0.0189)	
Severe		0.0735**			-9.51e-05	
		(0.0299)			(0.0120)	
Ageparent		0.0921***			-0.0179**	
		(0.0225)			(0.00911)	
Constant	4.115***	-0.234	4.003***	4.112***	-0.00987	3.969***
	(0.107)	(0.162)	(0.173)	(0.107)	(0.0648)	(0.187)
Observations	1,019	505	505	1,019	505	505
R-squared	0.195		0.098	0.196		0.017
First stage F-test		8***			2	
Wu-Haussman chi-square		0.05			0.44	
Overid Sargan test		3.15			2.5	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.10: OLS Regressions on hours worked- Personal care-Male

VARIABLES	OLS	IV2sls First stage	IV2sls Second Stage	OLS	IV2sls First stage	IV2sls Second Stage
Intense (IC)	-0.0163		-0.466**	0.0177	0.729***	-1.107
	(0.0423)		(0.235)	(0.0661)	(0.0181)	(0.805)
Intense* parent (IC*ICP)				-0.0556		1.474
				(0.0830)		(1.118)
Married	-0.0578**	-0.0181	-0.0454	-0.0587**	-0.0329***	0.0122
	(0.0258)	(0.0232)	(0.0354)	(0.0258)	(0.0112)	(0.0502)
Child	-0.101***	-0.0152	-0.0971**	-0.100***	0.0216	-0.121**
	(0.0311)	(0.0277)	(0.0418)	(0.0311)	(0.0134)	(0.0509)
Healthy	0.187***	-0.00409	0.165***	0.186***	-0.0236	0.206***
	(0.0419)	(0.0371)	(0.0558)	(0.0419)	(0.0179)	(0.0642)
Cegep/diplma	0.187***	-0.0702	0.140**	0.188***	0.0385*	0.112
	(0.0522)	(0.0461)	(0.0700)	(0.0522)	(0.0223)	(0.0825)
College	0.214***	-0.0857*	0.142**	0.214***	0.0212	0.149*
	(0.0520)	(0.0461)	(0.0717)	(0.0520)	(0.0223)	(0.0773)
University	0.371***	-0.0819*	0.306***	0.372***	0.0342	0.291***
	(0.0540)	(0.0476)	(0.0736)	(0.0541)	(0.0230)	(0.0844)
Ownhouse	0.0716**	0.00490	0.0417	0.0725**	0.0262*	0.00112
	(0.0336)	(0.0306)	(0.0460)	(0.0336)	(0.0147)	(0.0575)
logwage	-0.278***	0.00674	-0.233***	-0.278***	-0.0121	-0.219***
	(0.0180)	(0.0172)	(0.0259)	(0.0180)	(0.00828)	(0.0309)
Age 25-34	0.473***	0.122	0.398***	0.473***	-0.0140	0.372**
	(0.0901)	(0.1000)	(0.153)	(0.0902)	(0.0482)	(0.162)
Age 35-44	0.539***	0.119	0.505***	0.541***	0.0248	0.426***
	(0.0912)	(0.100)	(0.153)	(0.0913)	(0.0484)	(0.163)
Age 45-54	0.546***	0.148	0.518***	0.549***	0.0524	0.382**
	(0.0891)	(0.0985)	(0.152)	(0.0893)	(0.0476)	(0.169)
Age 55-64	0.347***	0.199**	0.329**	0.350***	0.0218	0.211
	(0.0911)	(0.100)	(0.158)	(0.0911)	(0.0484)	(0.164)
Atlantic	0.0525	0.0965**	0.116	0.0542	0.0157	0.0515
	(0.0468)	(0.0439)	(0.0710)	(0.0469)	(0.0212)	(0.0721)
Ontario	0.116***	0.0643*	0.179***	0.117***	-0.00194	0.156***
	(0.0406)	(0.0371)	(0.0574)	(0.0406)	(0.0179)	(0.0600)
Prairies	0.0706	0.0337	0.0658	0.0711	-0.000651	0.0521
	(0.0439)	(0.0403)	(0.0612)	(0.0439)	(0.0194)	(0.0651)
BC	-0.00825	0.0666	-0.00477	-0.00736	-0.00756	-0.0249
	(0.0491)	(0.0451)	(0.0710)	(0.0491)	(0.0218)	(0.0741)
distance1		0.221***			-0.0448**	
		(0.0368)			(0.0182)	
Severe		0.0373*			0.00193	
		(0.0207)			(0.00998)	
Ageparent		0.000457			0.00894	
		(0.0148)			(0.00714)	
Constant	3.513***	-0.0934	3.518***	3.510***	-0.0294	3.559***
	(0.124)	(0.133)	(0.193)	(0.124)	(0.0642)	(0.207)
Observations	1,325	729	729	1,325	729	729
R-squared	0.230		0.131	0.230		
First stage F-test		13.64***			3	
Wu-Haussman chi-square		3.6			2.28	
Overid Sargan test		1.15**			2.14	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.11: OLS regressions on hours worked- Intense care-Female

VARIABLES	OLS	IV2sls First stage	IV2sls Second Stage	OLS	IV2sls First stage	IV2sls Second Stage
Intense (IC)	-0.0499		-0.523	0.0448	0.828***	-2.794
	(0.0513)		(0.340)	(0.0943)	(0.0176)	(2.665)
Intense*Parent (IC*ICP)				-0.133		3.287
				(0.111)		(3.230)
Married	0.104***	-0.00910	0.130***	0.103***	-0.0538***	0.316*
	(0.0282)	(0.0309)	(0.0470)	(0.0282)	(0.0120)	(0.176)
Child	0.00528	-0.0162	-0.0105	0.00655	0.0262**	-0.0878
	(0.0275)	(0.0284)	(0.0430)	(0.0275)	(0.0110)	(0.101)
Healthy	-0.00803	-0.0739*	-0.0194	-0.00816	0.0288*	-0.0794
	(0.0391)	(0.0388)	(0.0628)	(0.0391)	(0.0151)	(0.117)
Cgep/diploma	-0.0492	0.00460	-0.105	-0.0474	0.0149	-0.159
	(0.0415)	(0.0474)	(0.0706)	(0.0416)	(0.0183)	(0.106)
College	-0.0193	-0.00677	-0.119	-0.0178	0.00615	-0.141
	(0.0434)	(0.0490)	(0.0731)	(0.0434)	(0.0190)	(0.0975)
University	-0.0424	-0.0300	-0.143*	-0.0400	0.00914	-0.166
	(0.0440)	(0.0494)	(0.0746)	(0.0441)	(0.0191)	(0.101)
Ownhouse	0.0286	-0.0357	-0.0489	0.0318	0.0679***	-0.261
	(0.0343)	(0.0375)	(0.0570)	(0.0344)	(0.0145)	(0.234)
logwage	-0.236***	-0.00389	-0.123***	-0.236***	-0.00609	-0.101**
	(0.0183)	(0.0192)	(0.0288)	(0.0183)	(0.00744)	(0.0407)
Age 25-34	0.234***	-0.0165	0.0861	0.239***	0.112***	-0.281
	(0.0712)	(0.0825)	(0.123)	(0.0713)	(0.0319)	(0.378)
Age 35-44	0.270***	0.00269	0.0998	0.276***	0.121***	-0.297
	(0.0701)	(0.0795)	(0.118)	(0.0703)	(0.0307)	(0.393)
Age 45-54	0.276***	-0.0302	0.0607	0.283***	0.142***	-0.402
	(0.0683)	(0.0792)	(0.117)	(0.0685)	(0.0306)	(0.461)
Age 55-64	0.168**	-0.00468	0.00841	0.175**	0.143***	-0.481
	(0.0718)	(0.0831)	(0.124)	(0.0720)	(0.0321)	(0.472)
Atlantic	0.127***	0.0415	0.164**	0.132***	0.0652***	-0.0710
	(0.0453)	(0.0472)	(0.0730)	(0.0456)	(0.0183)	(0.224)
Ontario	0.0688*	-0.0225	0.103*	0.0705*	0.0248	0.0307
	(0.0394)	(0.0409)	(0.0614)	(0.0395)	(0.0158)	(0.110)
Prairies	0.101**	0.0138	0.0890	0.106**	0.0586***	-0.110
	(0.0422)	(0.0442)	(0.0663)	(0.0424)	(0.0171)	(0.205)
BC	0.0513	0.0481	0.0698	0.0535	0.0403**	-0.0902
	(0.0477)	(0.0499)	(0.0774)	(0.0477)	(0.0193)	(0.161)
Constant	4.121***	0.107	4.086***	4.107***	-0.250***	4.812***
	(0.107)	(0.123)	(0.187)	(0.107)	(0.0477)	(0.810)
distance1		0.134***			-0.0164	
		(0.0360)			(0.0141)	
Severe		0.0465**			-0.00383	
		(0.0227)			(0.00882)	
Ageparent		0.0279			0.00482	
		(0.0171)			(0.00662)	
Observations	1,019	505	505	1,019	505	505
R-squared	0.196		0.018	0.197		
First stage F-test		6.44			1	
Wu-Haussman chi-square		1.9			1.8	
Overid Sargan test		0.73			0.5	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.12: OLS regressions on hours worked- Intense care-Male

2.6 Conclusion

The purpose of this paper is to estimate the causal effect of different types of care provision to a frail elderly on labour force participation status of caregivers in Canada. The focus on different types of care tasks is of relevance to determine whether caregivers who provide intensive and personal care face different trade-off in terms of labour market outcomes. Specifically, the analysis is performed comparing two groups of caregivers from the GSS 2012, a group who provides care to an elderly parent versus the other group of caregivers who provides care to a family member other than a parent, a friend, or a neighbour. Furthermore, I perform the analysis for men and women separately in order to test whether there are some divergent effects on caregivers depending on their gender.

Results from the estimation of the models show important findings. First, I find that personal care provision to an elderly parent, be it intense or personal care, has a negative and significant impact on a women's probability of working. However, intensive care assistance, be it to parent or other family members or friends, reduces the probability of being in paid employment for men. My findings of the negative effect of intense care provision on the probability of working are in line with most studies in the literature. VanHoutven et al. (2013) find that intense care has negative and significant effect on work hours of women caregivers in US but do not have effect on men caregivers. The second notable finding is that providing at least 15 hours of care has no significant effect on the hours of work of caregivers. Findings of the paper are somehow different from the evidence shown in Lilly et al. (2010). In their study of Canadian data from GSS 2002, Lilly et al. (2010) find that only men who provide at least 15 hours of weekly care marginally reduce their hours of work, however those who provide at least 20 hours of care reduce significantly their weekly hours of work. Their sample includes caregivers and non-caregivers. It includes caregivers to parents, family, friends or neighbours as well.

The results of this paper allow to learn about three important features. First, I find endogeneity evidence for women providing personal to parents on the probability of being in paid work. I do not find evidence of endogeneity after including instruments across many of the specifications analysed in this paper. Thus selection bias may not be a major concern

for these specifications. Second, it is important to break down caregiving by care tasks and intensity when LFP is investigated. For male caregivers, only intensive care has a slightly negative impact on the probability of working, while providing assistance with personal and intense care have a significant negative effect on the probability of employment of women caregivers. Finally, it is important to model separately the effects of caregiving on men and women to help us understand the full relationship between caregiving and labour market across gender.

Therefore, this paper confirms and quantifies that care provision to a parent is further a burden on the caregiver in terms of lost productivity in Canada. Specifically, providing intensive and personal care that represent the highest burden on caregivers and policy should focus on assisting these tasks. More generous publicly provided home care professionals that are targeted to help with these tasks might have a greater positive impact on the labour market supply of caregivers and on the well-being of the care receiver as well.

2.7 Appendix

Variables	Description
Dependent Variable	
Participation rate	(1,0) 1 if participating in the labour market a week before the interview
Weekly hours of works	Usual number of hours per week spent in paid employment-Log(1+weekly hours worked)
Independent variables	
Personal care	(1,0) 1 if individual helps with personal care
Parent Personal care	(1,0) 1 if individual helps with parental personal care activities
Intense care	(1,0) 1 if elder care at least 15h a week
Parent intense care	(1,0) 1 if individual helps with parental intense care activities
Age	Age of individual
Age1 (15-24)	(1,0) age dummy (omitted reference group)
Age2 (25-34)	(1,0) age dummy
Age3 (35-44)	(1,0) age dummy
Age4 (45-54)	(1,0) age dummy
Age5 (55-64)	(1,0) age dummy
Female	(1,0) 1 if individual is female
Married	(1,0) 1 if individual is Married
Chidren < 14 years	1 if individual has children less than 14 years living in the household
Healthy	(1,0) 1 if individual is Healthy
Education	
Educ1-High School	(1,0) 1 for high school degree (omitted ref)
Educ2-Cegep or diploma	(1,0) 1 if individual has a diploma degree
Educ3-College and University Diploma	(1,0) 1 for college degree or University Diploma
Educ4-University Degree	(1,0) 1 if individual has a university degree
House ownership	1 if individual owns a house
Regional Dummies	
Region1-Atlantic	(1,0) 1 if residing in Atlantic provinces (NB, NS,NL,PEI)
Region2-Quebec	(1,0) 1 if residing in Quebec (omitted ref)
Region3-Ontario	(1,0) 1 if residing in Ontario region
Region4-Prairies	(1,0) 1 if residing in Prairies provinces (Man,Sask,Alta)
Region5-British Columbia	(1,0) 1 if residing in region of British Columbia
Instruments	
Age of the parent	Age group of the care receiver
Severe	(1,0) 1 if the individual reports that the health of the care receiver is severe
distance 1	(1,0) if the individual lives (same house or same building)with the care receiver

Table 2.13: Data Description

3 The Impact of Intensive "Parental Care" on Caregivers Retirement Decision - Evidence from a Three-Wave Panel Study

3.1 Introduction

It is expected that 22% of Canada's population will be aged 65 and over in 2030 (Statistics Canada 2014). An aging population has a substantial impact on the country's labour market as well as the health care system. As of 2017, Canada has introduced policies that defer the Old Age Security (OAS) benefits in order to induce people to work more rather than to retire early. Canadians become eligible for OAS benefits at age 65, but for every month they defer the benefits, the payment increases by 0.6 percent. As a result, if one defers ones payment for up to five years (until one turns 70), one can enjoy an increase of up to 36 percent. This policy implicitly expects that individuals will not retire early and will work longer.

At the same time, because of the advance of medicine and technology, seniors live longer outside the hospital with more disabilities. Once discharged from hospitals, they need intense assistance with their activities of daily living such as walking, bathing and toileting. This help may last for several years. Formal care assistance provided by the government be it institutions or home care[8] assistance is costly. To reduce long-term care (LTC) costs in terms of LTC beds and social support workers, government has encouraged aging-at-home strategies which are highly dependable on informal care giving in the community ((Lilly et al., 2010)). Strategies to reduce public expenditure have shifted dependent seniors' needs from the formal to the informal sector. This results in more-burdened caregivers facing emotional and employment costs to satisfy their caregiving responsibilities (Fast et al., 1999).

That being said, it is important to understand how these two policies, one promoting later retirement and the other engaging people into provision of informal care, are appropriate

[8]Home care services provide an alternative to stay in long-term care institutions. Also, they help to prevent hospitalization and to reduce the length of a patient stay in an acute care facilities through the provision of post-hospitalization support and care. Home care services include (1)Home health care (nursing care and health service) (2) Home support services (personal care, housework, meals, shopping)

and suitable with each other. This is significantly important because the majority of informal caregivers to a parent are near the age of retirement and are working at the same time. Statistics Canada reported that 16% of Canadian adults aged 45 to 64 were caregivers to almost 2.3 million seniors suffering from long-term heath disabilities (Granswick 2002). It is estimated that 83% caregivers were male and 72% were female aged 45 to 65 employed in a full time or part-time job in Canada (Lilly, 2011). These caregivers are heterogeneous in their intensity of caregiving responsibilities, demographic profiles and employment patterns.

Early studies that have investigated the impact of caregiving on retirement have had conflicting findings. This is due to data limitations and the definition of caregiving variable. For instance, these studies did not take into consideration the weekly hours of care which is a good measure for caregiving intensity. Informal caregiving intensity was defined by daily, weekly or monthly help rather than hours of care. Accounting for weekly hours of helping a dependent elderly is important to measure the intensity of care. Recent findings indicate that there is a significant relationship between the intensity of care and labour force participation (Crespo and Mira (2010), Heitmueller (2007), Lilly et al. (2010) VanHoutven et al. (2013)). A further concern in this literature is that it studies US and European data and that little has been done in Canada. Moreover, uncertainty lies in whether the burden of caregiving leads actually to retirement, or whether people become caregivers because they are retired. Studies from US are concerned of caregivers who take early retirement to look after a loved one. When an employee retires earlier in order to care of a family member, on the one hand his pension earnings are lower, and on the other hand, the government and employer have to pay him earlier pension that anticipated. This implies that early retirement is costly for both caregiver and government. Little has been done in Canada in terms of the impact of retirement on caregivers. Eventually, exploring whether caregiving leads to retirement in Canada and understanding the direction of causality behind caregiving is the focus of this study.

That said, the present paper tries to provide more evidence about how informal caregiving is related to retirement status with a special focus on Canada and on differences in the effects among Canadian regions. I use the Longitudinal International Study of Adults (LISA 2012-2016) to explore how the different intensity of informal care on male and female

caregivers' are associated with the retirement status of people aged 45 and older in Canada. Focusing on provinces and regions is motivated by the fact that there is considerable institutional variation between regional home care planning and delivery models. In addition to cultural and demographic differences that may be of importance when studying informal care and retirement outcomes. For instance, some provinces in Atlantic and prairies regions are characterized by generous home care spending and are commonly referred to rely more on informal care from volunteers in the community like family, neighbours and friends. Specifically, Prairie is characterized by having the youngest population of any region in Canada and above average provincial health care budget devoted to home care. However, regions like Quebec and British Columbia, per capita public spending on home care is below the national average and the percentage of population older than 65 is high (18.3%) (Canadian Institute for Health Information 2018).

Thus, it seems rather natural to ask the question whether there are differential effects of informal care to a parent on retirement decision of caregivers among regions. A hypothesis would be that the potential effect of parental care on retirement decision of children caregivers is more severe in regions where home care[9] expenditures is below national average with the generosity of home care services being a substitute of parental informal care (Stabile et al., 2006). In addition, my work contributes to the growing literature on the effects of caregiving on caregivers retirement behaviour and adds to the still relatively limited Canadian evidence by examining effect across regions. To the best of my knowledge, this study is the first to look at retirement status of parental caregivers in Canada and across Canadian regions using longitudinal context.

A preview of the findings shows that care provision in general to a parent or in-law has a negative and significant effect on retirement behaviour of children caregivers. However, providing more than 20 hours of care per week has a positive and significant impact of the retirement decision of children caregivers especially for women sample. The influence of parental care provision is, however, found to differ between regions: The positive effect on the retirement probability is found to be stronger in Quebec and British Columbia than in

[9]Home Health Care: nursing care and health services and/or Home Support Services: personal care, housework, meals, shopping and respite care

other regions.

The remainder of this paper is organized as follows. In Section 2, I give a brief explanation of the long term care in Canada. In section 3, a review of the literature is laid out. Section 4 introduces the empirical approach. Section 5 describes the data and the variables of interest. Section 6 discusses the estimation strategy and section 7 presents the results. Section 8 concludes.

3.2 Long Term Care in Canada

Canada's health care system was created 50 years ago where the population was just over 20 millions and life expectancy was approximately 71 years. The population now on average count of over 30 millions and on average Canadians live 81 years (Canadian Medical Association 2016). Canada's health care system is not performing well. Throughout the system, patients, especially seniors, face a long waiting time and discontinuity of care. They are discharged from hospitals, because of the high cost of staying in hospital. These seniors demand large amount of care and resources when coming home. Although there are some publicly provided home care services by professionals but these are not sufficient. Thus, the burden at home relies on informal care provided by family members especially children.

Caregivers' support, especially financial assistance, is an important element in caring for seniors. Provincially, Nova Scotia and Manitoba are the only provinces to provide financial support for low income family caregivers (CMA 2016). However, there are some financial supports provided at the federal level to all provinces like Family Caregiver Tax Credit, Caregiver Tax Credit, and Compassionate Care Benefit. But not all caregivers benefit from these financial aids because of restricted eligibility requirement (i.e. in Quebec priority is given to seniors to have no informal caregiver residing at home or who have very low income). Moreover, because of lack of information, not all eligible Canadian caregivers are fully utilizing those financial supports that do exist.

There are differences between provinces and regions not only in terms of the share of health expenditures on home care services but also on the methods used to access these services. The method by which seniors gain access to home care services varies across provinces. Provinces rely on a standard assessment to admit the individual to home care

services which vary from province to province. While some provinces require physician referrals, nurses in other province can request access to home care services. However, in some provinces the care recipients themselves may self-refer.

	65+	**85+**
Ontario	751.10	2311.70
Quebec	472.99	1719.42
Manitoba	863.11	2766.58
Alberta	645.43	2320.28
Saskatchewan	-	-
British Columbia	591.20	2126.62
New Foundland and Labrador	683.94	1899.71
Prince Edward Island	422.06	1130.91
New Brunswick	1388.99	3587.32
Nova Scotia	731.1	1918.3

Table 3.1: Home Care Expenditure by Age (2000-2001) - per Capita Dollar - Provincial Expenditure

Table 3.1 (Statistics Canada 2002) shows the existing differences in provincial expenditure[10] on home care services for individuals aged 65 and older for year 2000-2001. In 2001, Ontario spent $751 per senior above 65 years old, Quebec spent $472.99 and British Columbia spent $591. Expenditure per senior is highest in New Brunswick and lowest in PEI. After New Brunswick, Manitoba spends the most on home care for person above the age of 65. In Newfoundland and PEI per capita expenditures is low. This gap does not necessarily translate into a lesser level of service for the provinces inhabitants, since labour costs are lower than those in most other provinces. Furthermore, community spirit and support from friends and family are probably stronger in environments such as Prince Edward Island and Newfoundland. Similarly, in Saskatchewan volunteer community agencies play a key role in the home care support services.

[10]includes nursing care and support services. Support services include personal care, housework, meals, shopping and respite care delivered to a client at home because of illness or physical impairment.

Province	Year 2001-2002
Atlantic	
Newfoundland	3.56%
PEI	2.48%
Nova Scotia	4.28%
New Brunswick	7.55%
Prairie	
Manitoba	4.37%
Saskatchewan	3.08%
Alberta	2.87%
Quebec	2.91%
Ontario	3.94%
BC	2.99%
Average	3.54%

Table 3.2: Fraction of Provincial Health Care Budget Devoted to Home Care

Table 3.2 reports the share of total public health expenditures allocated to home care for year 2001-2002. Similar trends are found in the share of public health care money devoted to home care and spending per elderly individual. While the average share of health care expenditure devoted to home care services in Prairie region is 3.44%, it is 4.47 in Atlantic region. In Quebec, the proportion of health care spending devoted to home care is 2.91%, below the national average, the same is true of per capita expenditures which is below the national average too (Statistics Canada 2002). In BC, home care spending is 2.99% of total health care expenditures, while in Ontario it is 3.94%. Moreover, heavy demand and shortage of health professionals have resulted in long time waiting list in some regions (i.e. Quebec and Ontario).

That said, in Canada, home care spending as a percentage of health care expenditure is not equally distributed across provinces. In 2015, figure 2 shows that on average, 36% of total government expenditures on health care went to provincial and territorial health expenditures. At the top of health spending as a proportion of total provincial program spending was Manitoba with 46% and Nova Scotia 46% with Quebec the lowest at 30%. In particular, the share of health care spending per capita is highest for seniors. They consume more than 45% of all public-sector health care dollars spent by provinces and territories (Canadian Medical Association 2016). Population ageing is estimated to increase

the health care costs at 0.9% per year. But, the proportion of public-sector health care dollars spent on Canadian seniors has not changed significantly over the past decade. It increased slightly from 44.6% in 2006 to 44.8% in 2016. However, during the same time period, the percentage of seniors in the population grew from 13.2% to 16.5% (Canadian Institute for Health Information 2018). Moreover, table 3.16 shows that in Atlantic, Quebec and BC regions, the proportion of population older than 65 is higher than in Prairie and Ontario regions. This suggests that Prairie and Ontario regions have younger population than other regions.

Given the differences across regions in terms of spending on home care services, cultural and demographic differences, and the methods to gain access to these services, it is important to control for regional differences when assessing the impact of helping and elderly parent on retirement status of the caregiver. Stabile et al. (2006) find that the generosity of home care services is correlated with a decline in informal caregiving. One hypothesis to be tested in this paper is whether the generosity of home care services reflected in more spending per elderly individual may affect the probability of retirement of caregivers.

3.3 Literature Review

Previous research on the relationship between labour force participation and caregiving status has received much attention because of the considerable time spent on informal caregiving and the potential reduction in the caregivers labour market outcomes. These studies focused mostly on labour market outcomes like labour force participation, work hours and wages. Respondents did not explicitly self-identify as retired in their samples. Retirement is indirectly addressed in these studies as part of labour force non-participants of retirement-age individuals (Bolin et al. (2008); Carmichael and Charles (2003); Marin et al. (2011); Heitmueller (2007); VanHoutven et al. (2013)). While some studies considered caregiving intensity (Lilly et al. (2010); VanHoutven et al. (2013); Jacobs et al. (2014)) others addressed endogeneity concerns through panel data methods (Jacobs et al., 2017), or instrumental variable approach using cross-sectional data (Bolin et al., 2008). This literature has concluded that caregivers tend to quit the labour force, especially when they provide intensive hours of care.

The influence of caregiving on retirement outcomes is not explored extensively in the literature, and the findings lack consistency. Some studies have found that caregivers, especially parental caregivers, were less likely to retire than non-caregivers (Schils (2008); Kubiceck et al. (2010)), while others have found a positive relationship with retirement (Jacobs et al. (2017); Meng (2012), VanHoutven et al. (2013); Jacobs et al. (2014)).

With fewer exceptions, most of the reviewed papers have not taken into consideration caregiving intensity or did not control for potential endogeneity of caregiving. Meng (2012) studies the transition to retirement of caregivers in Germany. She controls for caregiving intensity using continuous hours of care. She also takes into account time-invariant unobserved heterogeneity through the inclusion of random effects. However, this approach implies strong assumptions where the omitted variables are independent of other explanatory variables in the model. She concluded that caregiving is positively associated with retirement but did not find a relationship with intensity of care. It could be because she did not account for different caregiving intensity threshold. VanHoutven et al. (2013) look at the relationship between caregiving and labour force participation including retirement. They look at different intensity and care measures. The authors use the Health and Retirement Survey (HRS)(1992-2008) and treat endogeneity by using both time-invariant and time-variant instruments through the use of fixed-effects two-stage-least squares. Taking into consideration the hours of care and care tasks, the study finds that intense parental care is not significantly related to retirement. Possibly because HRS data measures of intensity of care is defined by those who provide 1000 or more hours of care over a two years period, which make it difficult to differentiate the highest intensity caregivers. Another drawback for this study is the exclusion of non-parental caregivers. The inclusion of non-parental caregivers in the sample is important because mature adults who are close to retirement are more likely than younger caregivers to care for other family members like spouses, siblings, and friends. Furthermore, early literature investigated intensity threshold ranging from 10 to as high as 20 hours per week of care, and found that these threshold must be reached in order that caregiving significantly influences labour force participation (Carmichael and Charles (2003); Lilly et al. (2010); Ettner (1996); Ettner (1995)).

The conclusions of the relationship between caregiving and retirement outcomes are

inconsistent possibly because of the different definition of retirement. Meng (2012) defined retirement as any individual who was not working and was earning a public pension. VanHoutven et al. (2013) used self-identified retirement status as a definition of retirement. Jacobs et al. (2017) differentiated between different paths to retirement like disability or unemployment paths or retirement and returning to work. They defined retirement as individuals who were not in the labour force between the ages of 30-44 and 55-69, who self-report as retired, and who are not working any hours in the labour force. Possibly, the different and diverse definitions to retirement is likely to affect and provide inconsistent estimates of the effect of caregiving on retirement behaviour.

Findings, in the international literature, show that individuals are likely to drop out from their work when they are faced with higher intensity of care shock (Johnson and LoSasso (2000); (Bolin et al., 2008)). Therefore, it is important to address intensity of care and account for potential endogeneity to retirement outcomes as well. Few studies (VanHoutven et al., 2013), (Jacobs et al., 2017) addressed these insights to retirement outcomes and the findings with respect to caregiving intensity and retirement outcomes were mixed.

I add to the existing literature by investigating newly and highly representative Canadian longitudinal data that considers a broader pool of care-recipients who are more likely to receive care from retirement-aged caregivers; which also allow me to observe individuals over a longer time period. Moreover, my paper contributes to a better understanding of the caregiving decision by carefully taking into consideration unobserved individual characteristics that do not vary with time and might affect both retirement and caregiving behaviour of the individuals in Canada. It also allows for heterogeneous effects of caregiving by studying different dimensions of the intensity of care and its impact on retirement behaviour of caregivers in Canada. Finally, this paper is the first study to investigate the effects across regions. It seeks to find out whether caring to an elderly parent and in-home care have differential effects on retirement decision across Canadian regions.

3.4 Conceptual framework and Endogeneity

Assume that an individual has an elderly parent with caregiving needs. The theory of individual time allocation can be used to help conceptualize how a retirement-aged in-

dividual might make trade-offs between time spent working and time spent on leisure and other activities, like informal caregiving. Because time is scarce, the individual who helps an elderly parent can either reduce the time spent working, decrease the time spent on leisure activities or quit his work (Carmichael and Charles (2003); Jacobs et al. (2014)). Alternatively, the individual could increase his working hours either to pay for formal care, to have a break from his caregiving activities, or to earn extra income to pay for expenses associated with caregiving such as transportation, deliveries, health goods and various home accommodations. If the hours of care provided publicly are not enough to satisfy the needs of the care recipient, the burden of caregiving on the child would be increased. So, the caregiver might either reduce his/her leisure time or hours of work to fulfill the needs of the parents. Thus, predicting the association between caregiving and retirement status is unclear.

However, even if empirically there is a positive relationship between caregiving and retirement, this does not confirm that caregiving has led the individual to retire or quit his job. This is due to potential source of endogeneity that could bias the estimates. Reverse causality is a concern if an individual has lower attachment to labour market and strong preferences to caregiving. This individual may quit his job and become caregiver due to the lower opportunity cost of time (Jacobs et al., 2017). Alternatively, individuals who are unemployed or homemakers are more likely to become caregivers.

To help address the potential endogeneity, I use two different empirical strategies. The first one used is the across-person fixed effect model. The objective of this model is to control for time-invariant unobserved heterogeneity. The intent of the model is to control for any variable that might affect caregiving and retirement that is not observed or measured in the data. For instance, preferences to care or work, ability to balance both activities, altruism and other hidden costs. However, fixed effect does not control for unobserved characteristics that vary with time, and the data does not include strong instruments that vary with time to correct for the endogeneity bias. A health shock to a parent may change the child's time cost and impact both caregiving and retirement over time. To avoid this kind of time-varying endogeneity, literature used parents' sickness[11] and parents died during the survey

[11] A proxy for caregiving

period [12] as a time varying instruments for caregiving (VanHoutven et al., 2013) (Jacobs et al., 2017). However, the LISA data lacks information about time-varying instruments. Consequently, the results from the fixed effect specification could be biased because of the possible correlation between caregiving and time variant variables that are not observed in the data.

A second technique used is the probit regression with lagged parental care variable that is intended to compare individuals to each other. This method tests the effect of last wave's (2014) parental care on the decision of retirement of caregivers the current wave (2016). This analysis is conducted treating each observation as unique. Individuals are compared to each other at a certain point in time, for instance in 2016, given that they were or were not caregivers in the previous wave (i.e 2014). This model is used to determine whether there are significant differences between individuals with respect to retirement decision and caregiving. I expect that in this model, adult children caregivers have already taken the decision (i.e whether to completely retire, partially retire or stay) in the previous wave, depending on their parent's health status and dependency. Including some other financial factors like the ability to satisfy their financial needs when retired or partially retire. Thus, using lagged parental variable helps reduce the endogeneity of caregiving (Bellemare et al., 2017). However, I should note that the results from such regressions may still suffer from endogeneity even though the fact that the sample is on those employed in wave 1 corrects for some of these concerns.

3.5 Data and Sample Selection

I use the Longitudinal International Study of Adults (LISA) data which consists of 3 waves (2012-2016). The LISA is a sample survey, with a stratified multi-stage, multi-phase design. The sample was drawn in 2011 by selecting dwellings from 2011 Canadian Census of Population data, and is therefore a representation of the population at that time. The first LISA interviews took place in late 2011 and early 2012. This is a nationally representative survey sponsored by Employment and Social Development Canada (ESDC) and administered by Statistics Canada. The data covers the population living in Canada's ten

[12] A proxy for termination of caregiving

provinces and examines changes in Canadian society over time[13]. LISA was developed in 2012 to provide longitudinal information on labour market, education, training, skills and family experiences of respondents every two years. The baseline interviews collect information from approximately 34,000 Canadians age 15 years and over from more than 11,000 households. However, only wave 2 and wave 3 contain information on caregiving activities. The LISA data collection instrument contains five parts, comprising both survey components and administrative data components: the household roster, the questionnaire component, The PIAAC component[14] (Programme for International Assessment of Adult Competencies wave-1 only), the income component[15], the historical administrative[16] (T4 slips), and the pensions[17] data component.

The main objective of the study is to understand the impact of caregiving on retirement's behaviour over time. To do that I eliminate observations from wave 1 (2012) because the survey does not ask about caregiving assistance in that wave. As such I focus on the last 2 waves. However, in the base case analysis, I use wave 1 to observe respondents who were in the labour force so that I limit the definition of "retired" to individuals who were employed in wave 1 and who self-identify as retired or partially retired in waves 2 or 3. The reason why only employed individuals is considered in the analysis because in contrast to unemployed, employed individuals may face the choice to retire to ease their time constraints to provide care. Therefore, including unemployed individuals would not help to answer my research question.

There are some limitations that the reader must keep in mind. First, data has been

[13]Excluded from the survey's coverage are those living in Canada's territories, as well as those who at the time of Wave 1 were: living on reserves and other Aboriginal settlements in the provinces; official representatives of foreign countries living in Canada and their families; members of religious and other communal colonies; members of the Canadian Armed Forces stationed outside of Canada; living full-time in institutions, for example, inmates of correctional facilities and chronic care patients living in hospitals and nursing homes; or living in other collective dwellings. Altogether these exclusions represent approximately 2% of the population.

[14]PIAAC is an OECD initiative to assess skills and competencies of working-age adults across 26 countries, including most EU countries, Canada, the US and Australia

[15]Detailed family and individual earnings, transfers and income information is available from the T1 Family File (T1FF) dating back to 1982.

[16]provides historical and contemporary information for respondents about their income (T1FF), about their earnings and employers. These data are available starting in 2000

[17]Pension plan information from the Pension Plan in Canada (PPIC) file is also available commencing in 2000.

collected for only three waves, of which, two waves are used to observe change variables which represent change in retirement and caregiving behavior over time. A longer time horizon would be more insightful in observing persistent change in retirement behavior of caregivers. Second, there is some possibility of self-reporting bias since most of the key information are self-reported. Self-reported data may include measurement errors and bias the estimates.

3.5.1 Sample Selection Criteria

The analysis is conducted on individuals aged 45 and over. This age range is chosen for a number of reasons. First, the retirement question was administered to people 45 and over possibly because people at that age start thinking of retirement. Second, it is estimated that most caregivers are aged 45 and over (Lilly, 2011). Third, although age 70 is the typical latest age to which individuals can postpone public and private pension benefits to collect deferred retirement incentives (Service Canada, 2013), ages above 70 are included in the sample. This category does not affect the estimates because only 1% of the sample of this age range falls into the parental care category. Additionally, for the retirement status regression, I limit the sample to those observed to have worked in wave 1. Respondents who do not work in wave 1 are eliminated from the sample. Table 3.3-3.5 show details of wave 2 sample selection where caregivers are observed for the first time.

3.5.2 Dependent Variable

Retirement literature classifies individuals as retired if they report being retired and are not working any hours in the labour force. In line with this literature, the dependent variable is identified when individuals report themselves as completely or partially[18] retired. It is a self-reported variable extracted from the following question: "At the time of the survey, do you consider yourself completely retired or partially retired, or not retired". The question is asked to respondents whose age is 45 and older. For this measure, I categorize anyone who reported that are completely or partially retired as retired, with the remainder as not retired. In other words, the variable "Retire" is binary that takes the value of 1 if the

[18]LISA's definition of partially retirement includes those who self-identify as retired and either work part-time or report that they are looking for part-time job

respondents answer affirmatively that they are retired or partially retired and 0 otherwise. Overall, individuals are considered retired in wave 2 conditional on being employed in wave 1 when I first observe them.

3.5.3 Explanatory Variables

The main explanatory variable of interest in this paper pertain to informal caregiving. LISA asks if individuals help or care for family, friends or neighbours for a long-term illness, disability or aging at the time of the interview. This help may include helping with personal care, housework, driving them, shopping with or for them or anything else[19]. Then it asks the individuals about the relationship to their care-receiver and the age of care-receiver. As such, in the baseline specification, parental care variable takes a value of one when individuals who provide at least one hour of care per week to their elderly parents (age 65 and over). The intensity variables are derived from the following question: "How many hours spent on caregiving per week?" As the objective of this paper is to test whether higher intensity caregiving can impact the decision of the caregiver to retire, three caregiving variables pertaining to intensity are derived. I test intensity threshold of at least 10 hours, and at least 20 hours of care per week in 2 separate regressions. The literature identifies these intensity threshold at which working-aged individuals drop out of the labour force ((Carmichael and Charles, 2003), (Lilly et al., 2010), (Jacobs et al., 2017)).

3.5.4 Other Control Variables

The choice of retirement may depend on individual characteristics. Generally, life cycle theory shows that there is a positive association between retirement and age, mainly because the retirement income is higher at older ages, and because preference for leisure increases with age (Schils, 2008). Moreover, life cycle theory shows that bad health and early withdrawal from the labour force, are positively related, mainly because of reduced productivity. The individual self reported health status is controlled with self reported health dummy (1 if good or very good health, 0 for bad health). With respect to human capital indicator, theory is

[19]it asks the individuals to exclude paid help provided to clients or patients, or help provided on behalf of an organization

ambiguous about the effect of human capital on the worker's early retirement behaviour. On the one hand, high human capital may lower the individual's probability of retirement because the individual had spent more time and money investing in human capital which had led to higher earnings and had made leisure more expensive. On the other hand, higher wages tend to increase pension funds thus post-retirement income, which could lead to early retirement (Schils, 2008). Theory predicts an ambiguous effect of the presence of children less than 18 years in the household on the retirement decision of individuals. The effect can be negative because income is needed to cover the costs of such dependents, but it might also be positive since leisure time is needed to provide personal care, especially for women.

I also control for a number of demographic factors. Age dummies are included for those aged 45 to 54, 55 to 64, and 65 or older (when people at that age can collect Canada Pension Plan (CQPP)). Given the differences in caregiving intensity found in the descriptive analysis, I conduct separate analyses for men and women. Dummy variable for marital status is also included. To capture socio-economic status, I control for education level for the caregiver which might capture the capability of the caregiver to pay for paid informal care. To capture non-wage income, I include the amount of the yearly pension earned (CQPP) indicating the presence of other income sources aside from the respondents main income source. All regressions include provincial dummies to capture the institutional differences in the level of care provided by provincial governments. Wave dummies are included to capture any time trends.

3.6 Panel Data Estimation

3.6.1 Estimation Models

Most of the studies in the literature analysing the impact of informal care on labour market and retirement status are based on cross-sectional datasets. However, cross-sectional datasets do not capture changes in individuals' behaviours over time. The study uses panel data that is based on repeated observations of the same individuals, which is required for examining behavioural changes of retirement over time. Moreover, panel data structure helps reduce endogeneity bias associated with unobserved characteristics of individuals in

the sample. The model consists of two parts:

First, I estimate the effect of providing parental care on the retirement outcome of parental caregivers:

$$R_{\text{it}} = \alpha_1 PC_{\text{it}} + \beta_2 X_{\text{it}} + \alpha_{\text{i}} + \epsilon_{\text{it}}$$

where t= 2014 and 2016, R_{it} is the probability to retire or not for individual i at time t; PC_{it} is a binary measure of parental care; X_{it} is a vector of demographic, socio-economic, family and pension-related factors, α_{i} is a time-invariant individual specific error component, and ϵ_{it} is the vector of an individual idiosyncratic and time-varying errors. I model individuals' time-invariant unobserved heterogeneity as a fixed effect which allows α_{i} to be correlated with PC_{it} and X_{it}.

Then, I re-estimate retirement income as a function of caregiving intensity distinguishing between parental care (PC) in general, and two types of intensity (IC)(More than 10 hours and more than 20 hours), where intensity of care (IC) occur when PC=1 and IC=1. In this way, the following equation captures the incremental effect of being an intensive caregiver (CG x IC), conditional upon being a parental caregiver (PC). For example, the equation is used to distinguish between those who provide at least 20 hours of care ($IC = Care \geq 20$) from those who provide less than 20 hours of care, where providing less than 20 hours of care occur when PC=1 and IC=0.

$$R_{\text{it}} = \alpha_1 PC_{\text{it}} + \alpha_2 PC_{\text{it}} * IC_{\text{it}} + \beta_3 X_{\text{it}} + \alpha_{\text{i}} + \eta_{\text{it}}$$

Where $IC = IC \geq 10$ if children provide at least 10 hours of care, and $IC = IC \geq 20$ if children provide at least 20 hours of care per week. X_{it} is the vector of exogeneous variables; and η_{it} is a vector of unobserved characteristics.

The fixed effect allows to capture unobserved individuals characteristics such as preference to caregiving, labour market attachment that may affect both caregiving and retirement income, strong preference to retirement, ability and time cost of care. For instance, an adult with strong attachment to labour market, might be less reluctant to retire earlier than an adult with less attachment to the labour force. These unobserved preferences may influence individuals in their decision making which can lead to inconsistent parameter estimates in

linear models. Even when the preferences are not correlated with the covariates like strong preferences to retirement vs strong preferences to employment (Meng, 2012). However, there may be concerns that the individual and time-varying error ϵ_{it} that is correlated with the caregiving measures PC_{it}[20]. For instance, even after controlling unobserved heterogeneity for the type of person via fixed effect models, there may be concerns about time-varying shocks that also could impact both caregiving and retirement outcome such as getting fired, experiencing a promotion or a sudden health shock to a parent. To account for such time-varying endogeneity, literature used indicators such as the health of parents, the death of the parents and illness of parents as instruments that vary with time. However, most of the studies are not able to reject exogeneity of care (VanHoutven et al. (2013); Jacobs et al. (2017)). VanHoutven et al. (2013) in their study of HRS 1992-2008, they used time varying-instruments like having a parent or in-law ill, the recent passing of a parent or in-law as a termination of care provision. They find that these instruments are valid but are not able to reject the exogeneity of care on retirement status of caregivers. Jacobs et al. (2017), in their study of the American National Longitudinal Survey of Mature Women (NLSMW) from 1992-2003, also could not reject the exogeneity of care on retirement decision of women caregivers. They use the following indicators as instruments: last parent recently passed, respondent has single mother, and respondent has single father. The LISA data does not contain information on the time-varying instruments used in the literature. The only indicator available that might be used as instrument is the age of parent indicator, however this question is only observed for the parents of caregivers. That being said, and under the assumption that most or all the unobserved heterogeneity comes from time-invariant characteristics, fixed effects models will lead to consistent and unbiased estimates (Heitmueller, 2007).

3.6.2 Sample Characteristics

The sample is derived from the first wave where all respondents were employed in 2012. Respondents who were not employed or were retired in wave 1 are removed from the sample. Hence, the sub-sample consists of respondents of age 45 and over, who were in the labour force in wave 1. Tables 3.3-3.5 report the sample's weighted characteristics in year 2014 or wave 2

[20]For a detailed explanation of the model see Appendix.

when we start observing parental caregivers and their counterparts non-caregivers[21]. Table 3.3 summarizes the overall sample's characteristics in 2014 and by gender, where we begin to observe caregivers. Table 3.4 and 3.5 present the descriptive statistics by whether or not the individual is a parental caregiver during the observation period. The means and proportions are weighted by weights provided by LISA to make them nationally representatives.

Around 16% of respondents, aged 45 and over, who have not retired in the previous wave (wave1-2012) report they are completely or partially retired in 2014. Just over 18% of the sample are parental caregivers. Of these caregivers, 20% are female and 15% are male. Overall, individuals who are actually parental caregivers are actually slightly less likely to be retired than their non-caregiving counterparts (13% vs 17%). Furthermore, among those who are working, the weekly wage of parental caregivers is higher than that of non-parental caregivers. In general, the weekly wage for male is noticed to be higher than the weekly wage of female in all samples. The difference in retirement rates is likely driven by the fact that individuals who become caregivers to an elderly parent are younger, more educated, healthier, and have a longer attachment to the labour force. Table 3.4 reports proportions of men and women in the parental care sample who provide care by intensity. Most commonly, the majority of parental caregivers indicate they assist their parent with less than 10 hours of care per week rather than intensive care (more than 10 hours per week). About 62% of women and 74% of men provide less than 10 hours of care to their elderly parent per week. However, it is much more common for female caregivers to be intensive caregivers (38% provide more than 10 hours per week and 23% provide more than 20 hours per week) compared to male parental caregivers (26% provide more than 10 hours per week and 12% provide more than 20 hours per week). Overall, all respondents are married (78%) but the proportions of parental caregivers who reported being married is less than their counterparts non-caregivers (73% vs 79%). Moreover, a closer look at the sample shows that caregivers are younger than non-caregivers. 60% of parental caregivers' age ranges are between 45 and 55, 36% ranges between 55 and 65 and 4% are over 65. However, 53% of non-caregivers' age is between 45 and 55, 37% is between 55 and 65 and 10% is above 65. Just above 23% of the sample had a minor in the household, and on average the household income of

[21]Non-caregivers sample include caregivers to other than a parent or in-law

the parent sample is higher than their counterpart non-care sample. While most parental caregivers (95%) rated their health to as good or excellent, (93%)of non-caregivers reported to be in good and excellent health. Children caregivers were also better educated than non-caregivers, with higher rates of university education. This was also reflected in caregivers' higher levels of household income and wages. Caregivers were slightly younger and healthier than non-caregivers. With respect to the yearly pension, women earn less pension than men. Possibly, because women as a "natural caregiver" have usually contributed fewer service years to their retirement accounts than men which translates into lower pension benefits.

	(Whole Sample)		(Female)		(Male)	
	Weighted mean	St err.	Weighted mean	St err.	Weighted mean	St err.
Retire	0.16	0.01	0.16	0.01	0.16	0.01
Parent care	0.18	0.01	0.20	0.01	0.15	0.01
Care<10	0.12	0.01	0.13	0.01	0.11	0.01
Care≥10	0.06	0.00	0.08	0.01	0.04	0.01
Care≥20	0.03	0.00	0.05	0.01	0.02	0.00
Age(45-54)	0.54	0.01	0.56	0.01	0.53	0.01
Age(55-64)	0.36	0.01	0.35	0.01	0.37	0.01
Age(65+)	0.09	0.01	0.09	0.01	0.10	0.01
High School	0.10	0.01	0.09	0.01	0.12	0.01
Cegep	0.39	0.01	0.36	0.01	0.43	0.01
College/diploma	0.22	0.01	0.27	0.01	0.17	0.01
University	0.29	0.01	0.29	0.01	0.29	0.01
Female	0.50	0.01	1.00	.	-	.
Child	0.23	0.01	0.20	0.01	0.25	0.01
Wage	1002.55	20.28	826.21	22.58	1176.01	33.48
Married	0.78	0.01	0.74	0.01	0.82	0.01
Healthy	0.93	0.00	0.94	0.01	0.93	0.01
CQPP	1089.12	52.07	1012.20	72.65	1164.80	74.65
NFLabrador	0.02	0.00	0.02	0.00	0.02	0.00
PEI	0.00	0.00	0.00	0.00	0.00	0.00
NovaScotia	0.03	0.00	0.03	0.00	0.03	0.00
NewBrunswick	0.02	0.00	0.02	0.00	0.02	0.00
Quebec	0.24	0.01	0.23	0.01	0.24	0.01
Ontario	0.40	0.01	0.41	0.01	0.38	0.01
Manitoba	0.04	0.00	0.04	0.00	0.04	0.00
Saskatchewan	0.03	0.00	0.03	0.00	0.03	0.00
Alberta	0.10	0.01	0.10	0.01	0.11	0.01
BC	0.12	0.006	0.11	0.008	0.13	0.008
N	4934		2557		2377	

Table 3.3: Data Description - Whole Sample

	(Parentcare Sample)		(Female)		(Male)	
	Weighted mean	St err.	Weighted mean	St err.	Weighted mean	St err.
Retire	0.13	0.01	0.13	0.02	0.13	0.02
Parentcare	1.00	.	1.00	.	1.00	.
Care<10	0.67	0.02	0.62	0.03	0.74	0.03
Care≥10	0.33	0.02	0.38	0.03	0.26	0.03
Care≥20	0.18	0.02	0.23	0.02	0.12	0.02
Age(45-54)	0.60	0.02	0.60	0.03	0.61	0.03
Age(55-64)	0.36	0.02	0.37	0.03	0.34	0.03
Age(65+)	0.04	0.01	0.04	0.01	0.04	0.01
High school	0.05	0.01	0.05	0.01	0.04	0.01
Cegep	0.36	0.02	0.36	0.03	0.36	0.03
College/diploma	0.26	0.02	0.27	0.03	0.26	0.03
University	0.33	0.02	0.31	0.03	0.34	0.03
Female	0.58	0.02	1.00	.	-	.
Child	0.23	0.02	0.22	0.03	0.24	0.03
Wage	1136.49	50.20	950.77	61.07	1388.41	82.89
Married	0.73	0.02	0.70	0.03	0.77	0.04
Healthy	0.95	0.01	0.96	0.01	0.94	0.02
CQPP	715.19	113.35	777.59	163.39	630.55	148.86
NFLabrador	0.02	0.01	0.02	0.00	0.02	0.01
PEI	0.01	0.00	0.01	0.00	0.00	0.00
NovaScotia	0.04	0.00	0.03	0.01	0.04	0.01
NewBrunswick	0.03	0.00	0.02	0.00	0.03	0.01
Quebec	0.23	0.02	0.24	0.02	0.23	0.03
Ontario	0.37	0.02	0.39	0.03	0.34	0.04
Manitoba	0.03	0.00	0.03	0.01	0.04	0.01
Saskatchewan	0.03	0.00	0.03	0.01	0.02	0.01
Alberta	0.11	0.01	0.11	0.02	0.12	0.02
BC	0.14	0.015	0.13	0.02	0.15	0.02
N	897		534		363	

Table 3.4: Data Description - Parent Sample

	(Non-parental caregivers)		(Female)		(Male)	
	Weighted mean	St err.	Weighted mean	St err.	Weighted mean	St err.
Retire	0.17	0.01	0.17	0.01	0.16	0.01
Parent care	-	.	-	.	-	.
Care<10	-	.	.	.	-	.
Care≥10	-	.	-	.	-	.
Care≥20	-	.	-	.	-	.
Age(45-54)	0.53	0.01	0.55	0.02	0.51	0.02
Age(55-64)	0.37	0.01	0.35	0.01	0.38	0.01
Age(65+)	0.10	0.01	0.10	0.01	0.11	0.01
High school	0.11	0.01	0.10	0.01	0.13	0.01
Cgep	0.40	0.01	0.35	0.01	0.44	0.01
College/diploma	0.21	0.01	0.27	0.01	0.15	0.01
University	0.28	0.01	0.28	0.01	0.28	0.01
Female	0.48	0.01	1.00	.	0.00	.
Child	0.22	0.01	0.20	0.01	0.25	0.01
Wage	973.96	22.00	794.25	23.38	1139.09	36.29
Married	0.79	0.01	0.75	0.02	0.83	0.02
Healthy	0.93	0.01	0.94	0.01	0.92	0.01
CQPP	1168.94	58.31	1072.39	81.07	1257.67	83.60
NFLabrador	0.02	0.00	0.02	0.00	0.02	0.00
PEI	0.00	0.00	0.00	0.00	0.00	0.00
NovaScotia	0.03	0.00	0.03	0.00	0.03	0.00
NewBrunswick	0.02	0.00	0.02	0.00	0.02	0.00
Quebec	0.24	0.01	0.23	0.01	0.24	0.01
Ontario	0.40	0.01	0.42	0.02	0.39	0.02
Manitoba	0.04	0.00	0.04	0.00	0.04	0.00
Saskatchewan	0.03	0.00	0.03	0.00	0.03	0.00
Alberta	0.10	0.01	0.10	0.01	0.11	0.01
BC	0.12	0.007	0.11	0.009	0.13	0.01
N	4037		2033		2004	

Table 3.5: Data Description - Non-Care Sample

	Wave2	**Wave3**
Parentcare	0.18	0.17
Care<10	0.67	0.66
Care>10	0.33	0.34
Care>20	0.18	0.19

Table 3.6: Parental Caregivers' Distribution over Waves

Table 3.6 shows the distribution of parental caregivers and across different intensity of care over the two years. It is apparent that there is no significant change of the proportions of parental care and intensity between the two waves. The proportion of parental caregivers belonging to intense care groups slightly increased by 1% in just two years. Possibly, because parents are getting older in the third wave and need more hours of care consequently. In

contrast, parental care in general and lowest intense care experienced a slight reduction of only 1% in terms of caregivers' proportion.

3.6.3 Estimation Results

One of the principle question in this section is whether unobserved heterogeneity is present. To test this hypothesis, the standard *Hausman* test is conducted. The test was conducted to all coefficients of care types. Regardless of the care type, the *Hausman* test is rejected suggesting that the fixed effects estimation is better in all models. Hence, this result indicates that the care variables suffer from unobserved heterogeneity which is indeed a problem that should be controlled for through fixed effects estimation. Tables 3.7-3.9 outline the results of the fixed effect regressions for the full sample and for men and women separately. Column 1 in these tables shows the results of the retirement equations when parental caregivers are considered generally. Columns 2 and 3 show the results after controlling for caregiving intensity.

Column 1, in tables 3.7-3.9, indicates that the decision to retire is negative and significantly correlated with providing care to an elder parent for the full sample and for women sample only. Whereas, the retirement decision of women is negatively and significantly correlated with helping a parent, it is negative and insignificant among men. Women who help their elderly parent are significantly less likely to retire by 3 percentage point than their non-caregiving counterparts. Possibly, this might be due to the fact that the majority of caregivers provide less intense hours of care. Another reason for that could be the respite effect. This is also found by Carmichael and Charles (1998) for the United Kingdom, where caregivers decide to continue working to take break of their caregiving responsibilities.

In intensity models (Columns 2 and 3) of tables 3.7-3.9, results differ depending on the intensity of care provided. Tables reports that parental care is negatively associated with retirement for the 3 samples. The effect is -0.0248, -0.0171 and -0.0313 for full, male and female sample respectively. However it is only significant for full and female sample. In Column 2, where IC represents a threshold of care of at least 10 h, the effect is *economically* insignificant for this specification. However, the effect of parental caregiving remains negative in all models that control for intensity. After controlling for intensity in column 3, both the

whole sample and women sample show that helping and elderly parent with at least 20 hours of care affect positively the retirement decision of caregivers. Results suggest that adult children that provide care for their parents for more than 10 hours are significantly more likely to retire than either parental caregivers who provide less than 20 hours of care and non-caregivers. There is a significant and negative relationship between retirement and caring for less than 20 hours per week for either whole or women sample. Since the majority of caregivers provide less than 20 hours of care, the net effect of caregiving is negative and significant when considered generally as in model 1. Instead, the results from model 3 suggest that it is the incremental effect of being a caregiver for at least 20 hours that positively impact retirement decision. Women who provide at least 20 hours of weekly parental care are approximately 5 percentage point more likely to retire than those who provide less than 20 hours of weekly care for parents, and are 1 percentage point more likely to retire than their counterparts parental caregivers who care for less than 20 hours and non-caregivers. For the whole sample, the incremental effect is 2 percentage point. This result is similar to (Jacobs et al., 2017) who find that, after applying fixed effect methods, providing intense care increases retirement probability of women parental caregivers by 2 percentage points in the US.

To summarise, after controlling for unobserved heterogeneity, caregivers, who help their parents with at least 20 hours per week are more likely to retire for either the whole or women sample. The demand for caring for long hours is explicable because those who care for long hours are caring for more highly dependent seniors. Thus, helping a dependent elderly parent is likely to be greater in terms of time, as well as in terms of emotional and financial commitments.

With respect to other control variables, I find that younger individuals are less likely to report being completely or partially retired than people who are 65 and older. Meanwhile, those who report being in excellent or good health are less likely to retire. While receiving a CQPP is significantly positively correlated to retirement, weekly wage is negatively correlated to retirement.

	(1)	(2)	(3)
VARIABLES	Model1-whole sample	Model2	Model3
Parentcare	-0.0248*	-0.0268*	-0.0347**
	(0.0134)	(0.0151)	(0.0143)
Parent care*Care≥10		0.00617	
		(0.0210)	
Parent care*Care≥20			0.0536**
			(0.0263)
Age 45-54	-0.129***	-0.129***	-0.129***
	(0.0326)	(0.0326)	(0.0326)
Age 55-64	-0.101***	-0.101***	-0.102***
	(0.0272)	(0.0272)	(0.0272)
Age 65-plus (Ref)			
age2	0.000338**	0.000338**	0.000341**
	(0.000144)	(0.000144)	(0.000144)
CQPP	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Wage	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Married	-0.00495	-0.00489	-0.00422
	(0.0410)	(0.0410)	(0.0410)
Healthy	-0.0134	-0.0133	-0.0139
	(0.0183)	(0.0184)	(0.0183)
Child	0.0219	0.0219	0.0213
	(0.0202)	(0.0202)	(0.0202)
High school	0.0736	0.0738	0.0765
	(0.0594)	(0.0595)	(0.0594)
Cegeo	0.0139	0.0139	0.0146
	(0.0476)	(0.0476)	(0.0476)
College	0.0179	0.0178	0.0187
	(0.0446)	(0.0446)	(0.0446)
University(Ref)			
Number of id	5,943	5,943	5,943
Within R-squared	0.129	0.129	0.130

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.7: Fixed effects Linear Probability Models of Retirement Status, 2012-2016

	(1)	(2)	(3)
VARIABLES	Model1-Male Sample	Model2	Model3
Parent care	-0.0171	-0.0166	-0.0241
	(0.0206)	(0.0225)	(0.0214)
Parent care*Care≥10		-0.00191	
		(0.0321)	
Parent care*Care≥20			0.0556
			(0.0451)
Age 45-54	-0.0899**	-0.0899**	-0.0897**
	(0.0423))	(0.0423)	(0.0423)
Age 55-64	-0.0942***	-0.0942***	-0.0946***
	(0.0341)	(0.0341)	(0.0341)
Age 65-plus (Ref)			
age2	0.000401**	0.000400**	0.000401**
	(0.000194)	(0.000194)	(0.000194)
CQPP	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Wage	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Married	-0.00421	-0.00420	-0.00413
	(0.0616)	(0.0616)	(0.0616)
Healthy	-0.00167	-0.00166	-0.00345
	(0.0240)	(0.0240)	(0.0240)
Child	0.0169	0.0169	0.0157
	(0.0285)	(0.0285)	(0.0285)
High school	0.0908	0.0909	0.0911
	(0.0932)	(0.0932)	(0.0931)
Cegep	0.0699	0.0700	0.0690
	(0.0806)	(0.0806)	(0.0806)
College	0.0704	0.0706	0.0708
	(0.0780)	(0.0780)	(0.0780)
University(Ref)			
Number of id	2,875	2,875	2,875
Within R-squared	0.138	0.138	0.139

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.8: Fixed Effects Linear Probability model of men's retirement status, 2012-2016

	(1)	(2)	(3)
VARIABLES	Model1-Female Sample	Model2	Model4
Parent care	-0.0313*	-0.0333	-0.0426**
	(0.0178)	(0.0205)	(0.0193)
Parent care*Care≥10		0.00544	
		(0.0279)	
Parent care*Care≥20			0.0504*
			(0.0330)
Age 45-54	-0.172***	-0.172***	-0.173***
	(0.0510)	(0.0510)	(0.0510)
Age 55-64	-0.117***	-0.117***	-0.118***
	(0.0440)	(0.0440)	(0.0440)
Age 65-plus (Ref)			
age2	0.000193	0.000193	0.000197
	(0.000212))	(0.000212)	(0.000212)
CQPP	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Wage	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Married	-0.00647	-0.00636	-0.00503
	(0.0550)	(0.0550)	(0.0550)
Healthy	-0.0249	-0.0247	-0.0244
	(0.0280)	(0.0280)	(0.0280)
Child	0.0263	0.0263	0.0262
	(0.0286)	(0.0286)	(0.0286)
High school	0.0656	0.0661	0.0709
	(0.0803)	(0.0804)	(0.0803)
Cegep	-0.0240	-0.0238	-0.0222
	(0.0602)	(0.0602)	(0.0601)
College	-0.0205	-0.0204	-0.0191
	(0.0553)	(0.0553)	(0.0553)
University(Ref)			
Number of id	3,068	3,068	3,068
Within R-squared	0.139	0.139	0.140

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.9: Fixed Effects Linear Probability Models of Women's Retirement Status, 2012-2016

3.7 Cross-Section Estimation with Lagged Parent Care Variable

To further investigate how parental care affects the retirement behaviour of individuals for the whole sample and across different regions, I use regressions with lagged parental care

variables. Individuals who are observed in wave 2 to be parental caregivers, may already have taken the decision to completely or partially retired in wave 3 because of their caregiving responsibilities. In that case, the caregiving variable can be treated as exogenous. With respect to regions, I was not able to analyse the impact of intensity of parental care on retirement because of low number of observations. But, I use co-residence with a parent or living close to a parent as a proxy for intensity of care. Perhaps care at home indicates the severity of the health condition of the parent that might not be captured by hours of care. Corresidence with a parent and its impact on labour market participation of caregivers has been substantially analysed in recent literature. Heitmueller (2007) finds that caregivers who live with a parent are more likely to provide more intense hours of care and consequently more likely to quit their jobs. He also finds that endogeneity mainly happens in extra-residential and not co-residential care. Ettner (1995) finds that co-residing with a parent has the most significant influence on reducing labour supply of caregivers. She finds similar and slightly stronger effect when applying instrumental variable techniques. A lagged variable that measures in-home parental care is used to test whether the intensity of care or in other words living with a parent may influence the retirement decision of caregivers.

The demand of caring for highly dependent people is more likely to be greater and longer in terms of time commitment. The severe the health of the parent the more dependent he is and the more help he needs in his activities of daily living. Moreover, the LISA dataset does not contain information on the degree of dependency of seniors. However, length of caring period might act as a proxy for degree of dependency of the elderly parent (Carmichael and Charles, 1998). Caregivers that had experienced the burden of fulfilling the needs of an elderly parent might be highly likely to decide to retire or partially retire during their caregiving period. Especially, if they live with the parent and have no alternative substitute of help, for instance, brothers and sisters or help provided by provinces through paid social support workers (Stabile et al., 2006). Moreover, those who have retired before their parents' health deteriorating and are thinking to come back to the market might be reluctant to work again due to their parents' illness. Even after the parents' recovery, adult children might be less willing to start a new career or continue in their jobs due to deterioration of their health as a result of caregiving responsibilities (i.e, depression, stress). Coe and Houtven (2009)

find that over time, caregiving episodes decrease self-rated health and increase symptoms of depression. Other studies find that the sign and magnitude of health effect are more pronounced with intensive caregiving and lower socio-economic background of caregivers (Schulz et al. (1997); Hirst (2005)). Therefore, the hypothesis to be tested here is whether previous episodes of caring may impact the probability of retirement of an individual, in other words whether providing care to a parent may impact the probability of retirement after two years period because of weak health of caregiver or continued periods of caring.

3.7.1 Estimation Models

This section investigates whether caregiving in Wave 2 of the data leads to retirement in the next wave (Wave3). For this purpose, I use lagged variable of parental care. Using a lagged variable may minimize the endogenous relationship between employment and caregiving ((Meng, 2012); (Bellemare et al., 2017)). Another reason why I use lagged parental care variable is to give individuals time to adapt to the new caregiving situation. When parents get frail and in-need of long-term care at home, in that case, the working child is obliged to take caring responsibilities more seriously. The caregiver's decision whether to completely or partially retire or not is already undertaken in the same period of caregiving and becomes exogeneous during the next period. However, if individuals take over care responsibilities because they plan to retire next year, the impact of care on retirement is still endogenous. Unfortunately, the LISA dataset lacks convincing instruments to estimate reliable causal effects for parental caregiving. I estimate the following model using a probit function:

$$\textit{Prob. to retire or not} = \beta_{1\mathrm{i}} + \beta_{2\mathrm{i}} PC_{\mathrm{i(t\text{-}2)}} + \beta_{3\mathrm{i}} X_{\mathrm{it}} + \theta_{\mathrm{ik}} \text{ ; where t is year 2016}$$

The coefficient β_2 measures the effect of parental care two years ago on the retirement status of caregivers, *ceterus paribus*. First, the regression equation using lagged parental care variable is run for the whole sample including all regions, then the regression is estimated for separate regions.

3.7.2 Estimation Results for the Whole Sample

Results for the whole sample are shown in table 3.10. I only look at the effect that last wave's care obligations have on the retirement decision in the following wave. The analysis is based on 4175 observations which represent 2183 women of which 480 are retired or partially retired over the observational period. For men, there are 1992 observations of which 427 report being completely or partially retired.

Column (1) reveals that having to look after a parent increases the probability of retirement by approximately 4.52% compared with an individual who does not have to help a dependent parent. Column (2) illustrates that women caregivers are 6.38% more likely to retire than their counterpart non-caregiver. In column (3), the effect of care on retirement is positive for men caregivers but it is not significant.

As the effects of caregiving in general increase but do not decrease the probability of retirement in this analysis, my finding is similar to Meng (2012). I find that caregiving in a previous year may affect positively the women's decision to retire or partially retire next year. However, like in Meng (2012), I do not find any significant effect of last year caregiving on the retirement probability for male sample.

Regarding control variables, being healthy, younger are negatively correlated with retirement. The presence of a child in the household is negatively associated with retirement most probably because the income from work is needed to cover the cost of the child. Moreover, being married is positively and significantly associated with retirement for the female sample as well as for the whole sample. Mainly, the effect is positive because of the income spillover of having a working spouse. With respect to provinces, I find that parental caregivers living in PEI, Ontario and Manitoba are significantly less likely to retire than their counterpart caregivers living in Quebec. In the next section, the effect of parental care on the retirement behaviour of caregivers across Canadian regions is investigated.

VARIABLES	All Sample	Female	Male
Parent care[a]	0.0452***	0.0638***	0.0202
	(0.0130)	(0.0170)	(0.0203)
Age 45-54	-0.0976***	-0.0765	-0.125**
	(0.0350)	(0.0499)	(0.0499)
Age 55-64	-0.00567	0.00687	-0.0251
	(0.0219)	(0.0321)	(0.0299)
age2	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
CQPP	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Wage	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)
Married	0.0563***	0.0820***	0.0215
	(0.0166)	(0.0217)	(0.0272)
Healthy	-0.0359**	-0.0373	-0.0262
	(0.0176)	(0.0258)	(0.0242)
Child	-0.0958***	-0.114***	-0.0778***
	(0.0233)	(0.0384)	(0.0300)
High school	-0.0323	-0.0373	-0.0331
	(0.0207)	(0.0309)	(0.0278)
Cegep	-0.0156	-0.0161	-0.0222
	(0.0135)	(0.0194)	(0.0189)
College	0.00159	0.00306	-0.00623
	(0.0145)	(0.0194)	(0.0223)
NFLabrador	-0.0140	-0.0222	-0.0137
	(0.0253)	(0.0335)	(0.0383)
PEI	-0.103***	-0.0764*	-0.143***
	(0.0353)	(0.0455)	(0.0550)
Nova Scotia	0.0180	-0.0189	0.0547*
	(0.0210)	(0.0290)	(0.0305)
New Brunswick	-0.0222	-0.0296	-0.0180
	(0.0236)	(0.0338)	(0.0331)
Ontario	-0.0296*	-0.0294	-0.0279
	(0.0168)	(0.0232)	(0.0241)
Manitoba	-0.0424*	-0.0504	-0.0344
	(0.0237)	(0.0324)	(0.0345)
Saskatchewan	-0.0347	-0.0696**	0.00150
	(0.0242)	(0.0326)	(0.0361)
Alberta	0.000888	-0.0329	0.0286
	(0.0199)	(0.0280)	(0.0281)
BC	-0.0311	-0.0295	-0.0343
	(0.0195)	(0.0273)	(0.0275)

Table 3.10: The Effect of Last Year's Parental Care on Retirement, 2012-2016 (Marginal Effects)

[a]lagged variable

3.7.3 Estimation Results by Country Regions

In order to test the impact of parental informal care provision on retirement probability of caregivers according to regions, the provinces are divided into 5 regions: (1) The Atlantic region includes Newfoundland and Labrador, Prince Edward Island (PEI), Nova Scotia and New Brunswick; (2) the Prairie region which includes Manitoba, Saskatchuwan and Alberta; (3) the Quebec region; (4) the Ontario region and (5) the British Columbia region. To investigate whether these effects differ between regions, the same probit regressions are estimated for the whole sample resulting in five regressions for separate regions.

One of the common eligibility requirements to access home care services across all regions is the lack or scarcity of informal caregivers to assist the care recipient. In other words if the frail senior lives with a family member, he has low priority to access home care services. Facing the obligations to care, the working child living with a dependent parent may choose to completely or partially retire. That being said, I run a regression to find out the effect of living with a frail parent (in-home caregiving) on the probability of retirement of children caregivers.

Tables 3.11 and 3.12 report the regression results. Providing care to an elderly parent is positively and significantly associated with the probability of retirement in Quebec, Ontario and BC. However, providing care to a parent, who co-resides or lives at a close distance to the child, increases the probability of retirement of children caregivers significantly in Quebec and BC only. In-home caregiving in Quebec increases the probability of retirement of the child by 10.5% then their counterpart out-of-home caregivers and non-caregivers. In-home caregiving in BC increase the probability of retirement of about 19% relative to out-of-home caregivers and non-caregivers.

In conclusion, the regressions across regions reveal that the effects of parental-care provision on retirement decision seem to differ to some extent between different regions of Canada. Further investigation is required to determine if public policies for long-term care explain these differences.

VARIABLES	Atlantic	Quebec	Ontario	Prairie	BC
parent care[a]	0.0949	0.0601**	0.0531**	0.0338	0.0988***
	(0.0615)	(0.0281)	(0.0264)	(0.0283)	(0.0381)
Age(45-54)	-0.0539	-0.115	-0.108	-0.170**	-0.0734
	(0.197)	(0.0802)	(0.0662)	(0.0743)	(0.109)
Age(55-64)	0.0559	0.00271	-0.0314	-0.0233	-0.0459
	(0.146)	(0.0510)	(0.0416)	(0.0461)	(0.0676)
Age 65-plus(Ref)					
age2	0.000	0.000***	0.000***	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CQPP	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wage	-0.00*	-0.00***	-0.00***	-0.00***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.103	0.0494	0.0282	0.0737**	0.161**
	(0.0920)	(0.0398)	(0.0316)	(0.0335)	(0.0651)
Healthy	-0.0387	0.00293	-0.0577*	-0.0493	-0.120**
	(0.119)	(0.0539)	(0.0335)	(0.0342)	(0.0521)
Child	-0.0322	-0.0189	-0.213***	-0.111*	-0.0738
	(0.0958)	(0.0470)	(0.0741)	(0.0593)	(0.0677)
High school	0.0188	-0.135***	-0.0126	-0.0288	0.207***
	(0.0993)	(0.0430)	(0.0490)	(0.0433)	(0.0665)
Cegep	-0.118*	-0.0472*	-0.00199	-0.0131	0.0970**
	(0.0707)	(0.0277)	(0.0271)	(0.0289)	(0.0407)
College	-0.0581	-0.116***	0.00694	0.00882	0.0815*
	(0.0638)	(0.0427)	(0.0261)	(0.0294)	(0.0438)
University(Ref)					
NFLabrador	0.134*				
	(0.0796)				
PEI	0.120				
	(0.0972)				
Nova Scotia	0.0650				
	(0.0680)				
New Brunswick(Ref)					
Manitoba				-0.0655**	
				(0.0316)	
Saskatchewan				-0.0597*	
				(0.0321)	
Alberta(Ref)					
Observations	178	867	967	934	431

Table 3.11: The Effect of Last Year's Parental Care on Retirement by Region, 2012-2016 (Marginal Effects)

[a]lagged variable

VARIABLES	Atlantic	Quebec	Ontario	Prairie	BC
In-home Caregiving[a]	0.00635	0.105**	0.0431	-0.0102	0.188***
	(0.0400)	(0.0481)	(0.0517)	(0.0439)	(0.0693)
Age(45-54)	-0.00982	-0.109	-0.218	-0.0816	-0.450**
	(0.146)	(0.172)	(0.191)	(0.147)	(0.225)
Age(55-64)	0.0235	0.00872	-0.140	0.0379	-0.186
	(0.0895)	(0.120)	(0.128)	(0.0958)	(0.152)
Age65-plus(Ref)					
age2	0.000***	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CQPP	0.000*	0.000**	0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wage	-0.000	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married	-0.01	0.159	0.0421	0.0587	0.176
	(0.0601)	(0.115)	(0.0806)	(0.0703)	(0.133)
Healthy	0.157**	-0.0109	-0.148*	-0.0104	-0.225*
	(0.0759)	(0.108)	(0.0820)	(0.0661)	(0.127)
Child	-0.0904	0.0175		-0.0706	0.0927
	(0.0867)	(0.0835)		(0.0885)	(0.124)
High school	-0.0123	-0.0295	-0.0451	0.150	0.353***
	(0.0782)	(0.0874)	(0.135)	(0.0975)	(0.125)
Cegep	-0.0667	-0.0342	0.0372	0.0615	0.129
	(0.0570)	(0.0554)	(0.0718)	(0.0654)	(0.0823)
College	-0.0112	-0.146*	0.0100	0.102*	0.168**
	(0.0551)	(0.0885)	(0.0671)	(0.0617)	(0.0847)
University(Ref)					
NFLabrador	0.0544				
	(0.0541)				
PEI	-0.0273				
	(0.0625)				
Nova Scotia	-0.0279				
	(0.0485)				
New Brunswick(Ref)					
Manitoba				-0.0706	
				(0.0610)	
Saskatchewan				-0.130**	
				(0.0632)	
Alberta(Ref)					
Observations	298	219	168	248	125

Table 3.12: The Effect of Last Year's In-Home Caregiving on Retirement by Region, 2012-2016 (Marginal Effects)

[a]lagged variable

3.8 Conclusion

The main motivation of this paper is to look at the effect of parental caregiving on children who are at risk of retiring in Canada. To investigate the effect of retirement as the caregiving status of the parental caregiving changes over time, the study is the first to use a new panel data (the LISA data) from Statistics Canada 2012-2016. Panel data methods are applied such as fixed effect method to control for potential sources of endogeneity that arise from time invariant unobserved characteristics and to more accurately estimate the causal effect of caregiving on retirement. Moreover, the paper uses cross-section lagged parental variable method to reduce endogeneity bias related to time-variant unobserved characteristics because of lack of convincing time-varying instruments in the dataset. The cross-section lagged parental care method is also used to investigate the effect across regions because of low number of observations. To best of my knowledge, this paper is the first to investigate the impact of parental care on retirement behaviour of caregivers in Canada using newly released panel dataset and panel data methods. Moreover, it is the first to investigate the effects across Canadian regions. The paper also considers care recipients (parents and in-laws) who are more likely to receive care from retirement-aged individuals.

The results indicate that these methodological differences are important in evaluating the effect of caregiving intensity on retirement. Whereas previous research does not confirm that intensity effect causes an individual to retire (VanHoutven et al. (2013); Meng (2012)), I find that there is a significant effect of providing intensive caregiving on retirement on both the whole and women sample. In the fixed effect regression, I find parental care provision does not affect children's probability of retirement, while only intensive care assistance increase the probability of being retired for women and whole sample of caregivers. In my sample, nearly 18% of parental caregivers provide 20 or more hours of parental care per week that increase the probability of being retired for women and the whole sample by approximately 1 and 2 percentage point respectively. One caveat in the fixed effect regression is that it is using only 2 waves which might not lead to the desired results because of short periods of observations. In the probit regression with lagged parental care variable, I find that parental care in general impact significantly and positively retirement. Possibly, because

lagged parental care variable may reduce endogeneity of care on retirement.

With respect to regions, I find that in regions like BC, Quebec and Ontario , where home care expenditures as a percentage of health care expenditures is lower than the national average, parental caregivers are more likely to completely or partially retire. In Prairie and Atlantic region where community support is stronger than other regions, the effect of caregiving on retirement is positive but not significant. These findings are consistent with Bolin et al. (2008) who find that the potential adverse effects of informal care on labour-market outcomes might be less severe in regions where norms favouring community and family support are stronger, since more acceptance will exist among employers and employees, for instance, when caring for ones elderly parents.

The study also finds that caregivers are heterogeneous in terms of intensity of care commitments, demographic profiles and labour force patterns. While 13% of the sample reports being partially or completely retired, most are able to balance their work and caregiving responsibilities because they provide low-intensity care. However, those who provide high-intense or in-home care are likely to be retired, especially women caregivers, suggesting that different policies are to be tailored for these two groups of caregivers. For the low-intensity caregivers, who are still working, a policy that favours more flexible work arrangement schedule is recommended, allowing more flexibility for the caregiver in balancing paid work and caregiving. Another option might be providing paid leave for caring for a dependent parent. For high-intensity caregivers, a combination of flexible schedule and more formal home care assistance is needed to help and encourage caregivers to stay at work and not think of retiring.

In general, my results suggest that strategies that encourage caregiving at home is not an option, due to its adverse effect on retirement decision of caregivers. An alternative would be to substitute informal care with publicly paid home care services to a greater extent (Stabile et al., 2006). Earlier studies from Europe have suggested that informal care and formal care in the home may be substitutes for each other Bolin et al. (2008). Such policy would possibly reduce retirement and lessen the burden on informal caregivers and possibly increase labour-market participation. At the same time, it helps in meeting some of the demands for care in the homes by frail elderly. I should note here that the publicly-provided

home care provided by the government has been decreasing for quite some time in many Canadian regions.

Canada is already facing increasing expenditures for health and home care services due to population ageing and technological advancements. Refocusing the government policies from providing formal care (at home or in institutions) to supporting informal caregivers has a potential not to create a burden on the government budgets if the policies encourage labour force participation of informal caregivers (who will then create extra tax revenues). Moreover, many seniors undoubtedly prefer to be cared by family. Thus, policies aimed at supporting parental caregivers and at the same time lowering the adverse labour-market effects as possible would certainly be preferable.

3.9 Appendix

3.9.1 Empirical Strategy

The empirical strategy is presented in the following section. I model retirement outcome with linear probability models with fixed effects The model is formalized as:

$$R_{\mathrm{it}} = \alpha_1 + \delta_1 D_{\mathrm{t}} + \alpha_2 PC_{\mathrm{it}} + \alpha_3 X_{\mathrm{it}} + c_{\mathrm{i}} + \epsilon_{\mathrm{it}};$$

where $i = 1...N$; $t = 1, 2$; $D_{\mathrm{t}} = 0$ for t=2014 and $D_{\mathrm{t}} = 1$ for t=2016 (time dummy)

R_{it}, the retirement decision, is function of parental caregiving activity, PC, individuals' socio-demographic characteristics, $\mathrm{X_{it}}$, an individual specific unobserved effect, c_{i}, and ϵ_{it}, the individual and time-varying error terms which are also called idiosyncratic errors since they change across time as well across individual (Woolridge, 2002). Furthermore, for each individual, data is collected at two time points, t=2014 and t=2016. For this reason, I allow the possibility that intercept, α_1, may be different at different time points, by adding, $\delta_1 D_{\mathrm{t}}$, to the model.

The equation of retirement is estimated by a fixed-effect model. The reason why I include the individual effect c_{i} in the model, is the unobserved effects that may affect caregiving and retirement in the model at the same time. It is the individual fixed effect, or the individual-specific error component which is allowed to be correlated with PC_{it} variable.

The time-invariant unobserved characteristics include the preference to work or preference to stay at home, altruism[22], ability[23], closeness to parent, and time cost to care. Whether the child choice is to provide care or not might be correlated with these unobserved effects (c_{i}). This is called the self-selection problem. Alternatively, the child might choose to help his elderly parent or not, based on characteristics that are unobserved in the data. Furthermore, I assume that these characteristics are constant over time especially for respondents over the age of 45. c_{i} can be written as:

$$c_{\mathrm{i}} = \mathbf{z'}_{\mathrm{i}}\eta = \eta_1 z_{\mathrm{i}1} + \eta_2 z_{\mathrm{i}2} + ...\eta_{\mathrm{q}} z_{\mathrm{iq}}$$

Then taking differences[24]:

$$\Delta R_{\mathrm{i}} = R_{\mathrm{i}2} - R_{\mathrm{i}1}$$

The unobserved (omitted) variable disappears and estimating β_2 with OLS is unbiased. The model becomes:

$$\Delta R_{\mathrm{i}} = \beta_1 + \beta_2 PC_{\mathrm{i}} + \beta_3 X_{3\mathrm{i}} + \Delta\epsilon_{\mathrm{i}}$$

where $E(PC_{\mathrm{i}}, c_{\mathrm{i}}) \neq 0$

$E(\epsilon_{\mathrm{it}}/PC, c_{\mathrm{i}}, X_{\mathrm{i}}) = 0;\ t = 1, 2, ..., T$

$PC_{\mathrm{i}} \equiv (PC_{\mathrm{i}1}, PC_{\mathrm{i}2}, PC_{\mathrm{i}3}, PC_{\mathrm{i}4}, ..., PC_{\mathrm{iT}})$

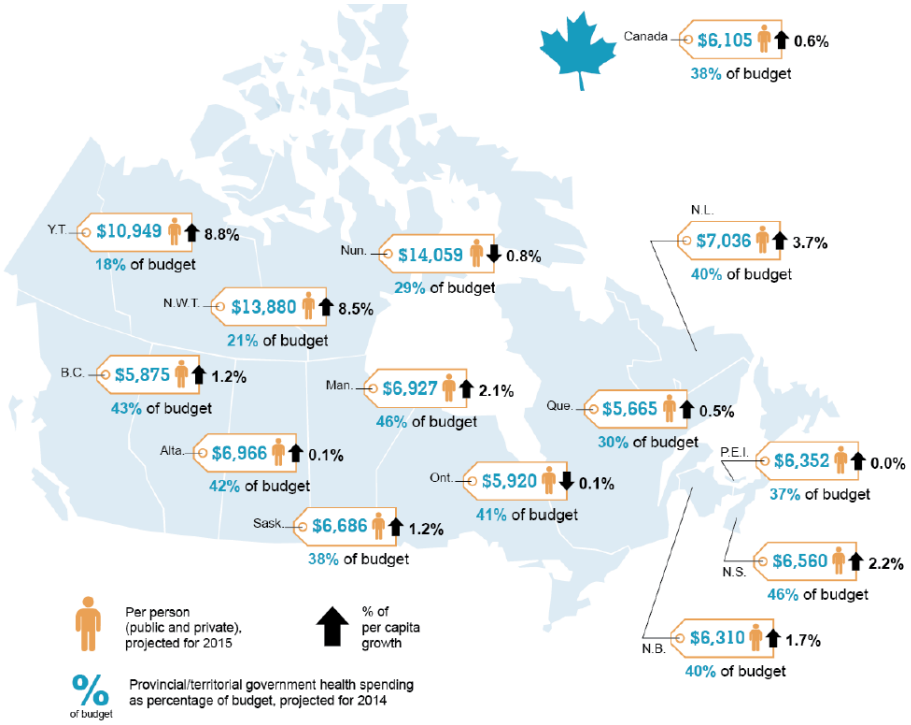
$X_{\mathrm{i}} \equiv (X_{\mathrm{i}1}, X_{\mathrm{i}2}, X_{\mathrm{i}3}, X_{\mathrm{i}4}, ..., X_{\mathrm{iT}})$

Fixed effects estimation assumes strict exogeneity of the explanatory variables conditional on the individual fixed effects, hence it is assumed that $\mathrm{E}(\mathrm{u_{it}}\ \mathrm{CG_i}) = 0$ and $\mathrm{E}(\mathrm{u_{it}}\ \mathrm{X_i}) = 0$, but allows for arbitrary correlation between the observed independent variables and $\mathrm{c_i}$. (Woolridge, 2002)

[22]children would choose to help their parent out of altruism

[23]Ability to balance work and caregiving activities at the same time

[24]Differencing eliminates all unobserved time invariant factors from the model



Source: National Health Expenditure Database- Canadian Institute for Health Information (CIHI)

Figure 2: Provincial/Territorial Government Health Spending per Person for 2015

Variables	Description
Dependent Variable	
Retire	(1,0) 1 if completely or partially retired
Independent variables	
Parent care	(1,0) 1 if individual provides care to his elderly parent
Care<10	(1,0) 1 if elder care less than 10 h per week
Care≥10	(1,0) 1 if elder care at least 10 h per week
Care≥20	(1,0) 1 if elder care at least 20 h of care per week
In-home caregiving	(1,0) 1 if individual lives with the parent (same house, building) or less than 10 minutes away to the parents
Individual Characteristics	
Age (45-54)	(1,0) age dummy
Age (55-64)	(1,0) age dummy
Age (65+)	(1,0) age dummy (Omitted reference group)
age2	age square
Female	(1,0) 1 if individual is female
Married	(1,0) 1 if individual is Married
Healthy	(1,0) 1 if individual is Healthy
Household Characteristics	
Chidren < 18 years	1 if children less than 18 years live in the household
Human Capital indicators	
High School	(1,0) 1 if individual has a high school degree (omitted reference group)
Cegep or diploma	(1,0) 1 if individual has a diploma degree
College and University Diploma	(1,0) 1 if individual has a college degree or University Diploma
University Degree	(1,0) 1 if individual has a university degree
Wage	Weekly wage
CQPP	Canada Quebec Pension Plan year 2013 for wave2 and 2015 for wave3
Institutional variables	
NF Labrador	(1,0) 1 if residing in NFLabrador
Quebec	(1,0) 1 residing in Quebec (omitted ref group)
Nova Scotia	(1,0) 1 if residing in Nova Scotia
New Brunswick	(1,0) 1 if residing in New Brunswick
Ontario	(1,0) 1 if residing in province of Ontario
Manitoba	(1,0) 1 if residing in province of Manitoba
Saskatchewan	(1,0) 1 if residing in province of Saskatchewan
Alberta	(1,0) 1 if residing in province of Alberta
British Columbia	(1,0) 1 if residing in province of British Columbia

Table 3.13: Data Description

Sample unit level	Wave 1	Wave 2	Wave 3
Household	16665	11458	11458
Response rate	72%	74%	-
Person	32133	32133	32133
Response rate	89%	66.7%	87.7%

Table 3.14: LISA Sample size

Province	Household
New Foundland and Labrador	594
Prince Edward Island	290
Nova Scotia	804
New Brunswick	711
Quebec	2318
Ontario	2557
Manitoba	859
Saskatchewan	803
Alberta	1259
British Columbia	1263
Total	11458

Table 3.15: LISA Wave 2 - Sample Household Size by Province

	NFL	PEI	NS	NB	Qc	On	Man.	Sas.	Alb.	BC
Total Population (Millions of people)	0.5	0.1	0.9	0.8	8.3	14	1.3	1.2	4.3	4.8
percentage of population older than 65 (%)	19.4%	19.4%	19.9%	19.9%	18.3%	16.7$	15.6	15.5%	12.3%	18.3%

Table 3.16: Total of Population/ Percentage of Population Older than 65 - Source CIHI - 2015

	(1) Atlantic		(2) Quebec		(3) Prairie		(4) Ontario		(5) BC	
	b	se	b	se	b	se	b	se	b	se
Retire	0.21	0.02	0.15	0.01	0.17	0.01	0.15	0.01	0.17	0.02
Parent care	0.21	0.02	0.18	0.01	0.18	0.02	0.16	0.01	0.20	0.02
Female	0.50	0.02	0.48	0.02	0.50	0.02	0.51	0.02	0.46	0.03
Age 45-55	0.53	0.02	0.57	0.02	0.52	0.02	0.55	0.02	0.50	0.03
Age 55-64	0.36	0.02	0.35	0.02	0.38	0.02	0.35	0.02	0.41	0.03
Age 65+	0.10	0.01	0.08	0.01	0.10	0.01	0.10	0.01	0.09	0.02
High school	0.12	0.01	0.13	0.01	0.11	0.01	0.08	0.01	0.10	0.02
Cegep	0.47	0.02	0.50	0.02	0.39	0.02	0.33	0.02	0.35	0.02
College/diploma	0.22	0.02	0.10	0.02	0.24	0.02	0.27	0.01	0.23	0.02
University	0.19	0.01	0.27	0.02	0.26	0.02	0.32	0.02	0.32	0.02
Child ¡18	0.20	0.02	0.23	0.02	0.20	0.01	0.25	0.01	0.19	0.02
Household income	85734.13	1643.23	89997.05	2013.50	119778.89	5705.52	113474.98	3277.23	106382.36	3873.23
Wage	782.50	28.69	928.26	33.59	1090.96	39.01	1046.03	40.70	1011.80	52.04
Married	0.80	0.02	0.75	0.02	0.81	0.02	0.76	0.02	0.82	0.02
Healthy	0.91	0.01	0.96	0.01	0.92	0.01	0.93	0.01	0.91	0.02
CQPP	1307.71	101.76	970.53	93.02	1171.86	103.71	1108.90	97.38	1006.69	154.99
N	1283		1096		1405		1355		584	

Table 3.17: Descriptive Statistics by Region - Wave 2 - Conditional on Being Employed in Wave 1

4 References

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