# Female Labour Supply with Time Constraints

by

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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Doctor of Philosophy
in
Applied Economics

Waterloo, Ontario, Canada, 2013

# Author's declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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# Abstract

The Italian labour market seems unable to allocate a significant fraction of the working age population efficiently. The gap between the employment rate in Italy and in the other developed economies is foremost attributable to the low employment rates of youth, seniors and women. The low employment rates of these three groups are due to several factors limiting both labour demand and labour supply. For women in particular, constraints on the allocation of time play a crucial role in determining labour supply behaviour. In this thesis we try to understand how non-standard time constraints may affect the behaviour of women, and their labour supply in particular.

In the first chapter we study how the constraints on work-schedules affect the time allocation of workers in Italy. For a large fraction of employed individuals the work schedule is very rigid, as a consequence of outdated industrial relations. In order to understand whether constraints on the work-schedule produce significant effects on the allocation of time of wage/salary workers in Italy, we exploit the intrinsic differences between them and self employed workers. In fact, one of the main features of self-employment is the greater control over the days worked and daily hours of work. We use the last wave of the Italian time use survey (2008-2009) to provide evidence that the distribution of hours of work of self-employed workers is much more dispersed than that of wage/salary workers and that average standard deviation of their daily minutes of work within a week is significantly larger. Then we show that self-employed workers respond more to shocks affecting the value of leisure. We show that on sunny days the increase of leisure and the reduction of work are significantly larger for self-employed workers. We address whether unobservable characteristics, such as preferences for leisure and for outdoor activities in particular, determine this differential response and find no evidence for this. We interpret the differential response to weather shocks as a consequence of the time constraints on work-schedules. This evidence is relevant for female labour force participation since in Italy a large fraction of women choose not to work because they would otherwise not be able to reconcile family and work responsibilities.

In the second chapter we study the Added Worker Effect (AWE). The retrospective questions provided by the new labour force survey allow identification of transitions between labour market states in a 12 month time-window. Since we are able to identify the reason for the husband's job loss, we distinguish between transitions associated with low or high income losses. We find that both the wife's probability of joining the labour force and that of finding a job increase when the husband is dismissed or he is forced to quit his job for health reasons, two cases of usually high income losses. Moreover, we estimate the wife's full transition matrix between labour market states and we find that the loss of a job by a husband increases the probability that his wife will enter the

labour force. Finally, we provide some descriptive evidence that time constraints can also impact the magnitude of the AWE. Focusing on mothers with young children, we show that the estimated AWE is positively correlated with the regional provision of child care services.

The third chapter is based on the time use files of the Canadian General Social Survey. We study how Sunday shopping deregulation changed the time allocation of women, with a particular focus on those with children. The empirical analysis relies on the provincial variation in the time of the policy change. Our results suggest that women with children, who usually face stringent time constraints, respond to the policy change by substituting weekday shopping with Sunday shopping. The amount of time these women save from doing shopping on weekdays allows them to increase their minutes of work. On Sunday, shopping increases at the expense of leisure. The main result of this chapter is that the labour supply of mothers may change even when non-obvious constraints on the allocation of time change.

# Acknowledgements

With their acknowledgements PhD candidates usually express gratitude to a long list of people. I decided to be grateful only to those who really helped me: myself, my supervisor Dr. John Burbidge for his guidance and support, Dr. Mikal Skuterud for his well-defined suggestions and his willingness to share some of his knowledge of microeconometrics, and Dr. Lutz-Alexander Busch for the always very stimulating conversations. I would also like to thank Dr. Kevin Milligan and Dr. Martin Cooke for their insightful comments and suggestions.

The journey through the process of writing this thesis was an achievement itself and I am confident that it will act as a springboard for future challenges. *Effugere non potes necessitates, potes vincere.*

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# Introduction

Economics studies the efficient allocation of scarce resources. Time is a scarce resource, and most decisions in human life, such as education, family creation and dissolution, parenthood, labour supply and retirement, are strongly related to the use of time. Time is not only limited in its endowment, but it is also limited in the way it can be allocated. For instance, a certain amount of sleep is unavoidable, regardless of preferences and of the desire to allocate time to other activities. Timing of work is also constrained by production technologies, often requiring complementarity of production factors. Leisure activities are also constrained by the need of synchronization with other people and by the service hours of most facilities. In Italy labour-market regulations are outdated and impose further and presumably unnecessary constraints on the allocation of time. A better understanding of these constraints may be a necessary step in reforming the Italian labour market.

From 2000 until 2011 the average annual growth rate of real GDP per capita in Italy was the lowest among the OECD countries. Over this period Italy was the only OECD country that experienced a negative average growth rate (-0.1 per cent). Canada grew 0.9 per cent per year; Germany 1.2. Until 2011 the average growth was higher even in a more fragile economy such as Greece (0.8 per cent). Discussing all factors accounting for the particularly poor performance of the Italian economy is beyond the scope of this thesis. We focus on the labour market, a key weakness of the Italian economy. In 2011, before the recent further worsening of the Italian economy, the employment rate was 56.9 per cent, 8 percentage points below the OECD average. In the same year the employment rate in Canada was 72 per cent. The gap between Italy and other developed economies is attributable to the low employment rates of youth, seniors and women. In 2011 the employment rate of individuals aged 15-24 in Italy was 23.1 per cent; in Canada it was 54.5 and the OECD average was 42.8. In the same year, the employment rate for individuals aged at least 65 was 5.6 per cent in Italy, about a third of the number for Canada and for the OECD average. The female employment rate in Italy was 47 percent, much lower than in Canada (70.6 per cent) and the average of OECD countries (58.8 per cent).

These low employment rates are due to a multiplicity of factors limiting both labour demand, such as high labour cost and low productivity, and labour supply. For women in particular, constraints

on the allocation of time play a crucial role in determining labour supply behaviour. In Italy the provision of services helping mothers reconcile work and family obligations is meagre; flexible few hour jobs for youths who want to invest on post-secondary education are also scarce. Finally, for workers at older ages it is not possible to reduce the number of hours worked, and the only option available when they want to reduce work is retirement.

In this thesis we try to understand how nonstandard time constraints may affect the behaviour of women, and their labour supply in particular. In the first chapter we study how the constraints on work schedules affect the time allocation of workers in Italy. Regulations that shape industrial relations in Italy were enacted during the 1970s, when manufacturing and assembly lines played a central role in the economy. This kind of economy required high levels of synchronization of capital and labour, and of different groups of workers. Therefore, work schedules were rigid and the fraction of jobs offering nonstandard hours was low. With the reduced importance of assembly lines this regulation is outdated. In order to understand whether these constraints produce significant effects on the allocation of time of wage/salary workers in Italy, we exploit the intrinsic differences between self-employed and employed workers. In fact, one of the main features of self-employment is the greater control over the days worked and daily hours of work. We use the last wave of the Italian time use survey (2008-2009) to provide evidence that the distribution of hours of work of self-employed workers is much more dispersed than that of wage/salary workers and their average standard deviation of daily minutes of work within a week is significantly larger. Then we show that self-employed workers respond more to shocks affecting the value of leisure. In particular, we exploit the information on the exact day of the interview, which is an uncommon feature for this kind of data, and we match it with precise weather data. We show that on sunny days the increase of leisure and the reduction of work are significantly larger for self-employed workers. We address whether unobservable characteristics, such as preferences for leisure and for outdoor activities in particular, determine this differential response. Studying the allocation of time on non-working days we find no evidence of different preferences between the two groups of workers. Therefore, we interpret the differential response to weather shocks as a consequence of the time constraints on work schedules. The main result of the first chapter is that wage/salary workers in Italy face tight time constraints and they find it difficult to reallocate their time when shocks occur. This evidence is relevant for female labour force participation since in Italy a large fraction of women choose not to work because they would otherwise not be able to reconcile family and work responsibilities.[1]

[1] One question of the 2008-2009 Italian time use survey reports that about 37 per cent of women above age 25 never worked. Almost 40 per cent of those women declare that the inability to reconcile child care and work obligations was the main reason for not working.

In the second chapter we study the Added Worker Effect (AWE), which may have been an important determinant of the recent increase in female labour supply in Italy. By AWE we refer to the increase in the labour supply of married women due to their husband's job loss. A rich literature on the AWE has developed, but its results are mixed. The main factors determining a change in the wife's labour supply in response to their husband's job loss include the magnitude of the income loss and the inability, due to borrowing constraints, to smooth this loss over the life cycle. In Italy several conditions coexist that should lead to a significant AWE: large increase in the unemployment rate for married men, increase in long term unemployment, tight borrowing constraints, and low female labour force participation. Between 2007 and 2012 the probability that a married man lost his job grew from 1.9 to 4.7 percent. The female participation rate in 2012 was 3 percentage points higher than in 2007. The retrospective questions provided by the new labour force survey allow identification of transitions between labour market states in a 12 month time window. Since we are able to identify the reason for the husband's job loss, we can distinguish between transitions associated with low or high income losses even without explicit income data. We find that both the wife's probability of joining the labour force and that of finding a job increase when the husband is dismissed or he is forced to quit his job for health reasons. Moreover, we estimate the wife's full transition matrix between labour market states and we find that the loss of a job by a husband increases the probability that his wife will enter the labour force. Finally, we provide some descriptive evidence that time constraints can also impact the magnitude of the AWE. Focusing on mothers with young children, we show that the estimated AWE is positively correlated with the regional provision of child care services, indicating that laxer time constraints indeed allow for large labour market effects.

The third chapter is based on the time use file of the Canadian General Social Survey. We study how the relaxation of one particular constraint limiting the allocation of time changed the behaviour of women, with a particular focus on those with children. Since the mid-1980s Canadian provinces have deregulated Sunday shopping. We develop existing theoretical models of the extension of shopping hours by adding heterogeneity in time costs. These costs can be thought of as the time spent on unavoidable activities, such as certain forms of child care. The introduction of this source of heterogeneity makes clear that busy individuals are likely to be those who respond most to Sunday shopping deregulation. The empirical analysis relies on the provincial variation in the time of the policy change. Our results suggest that women with children, who usually face stringent time constraints, do respond to the policy change by substituting weekday shopping with Sunday shopping. The amount of time these women save from doing shopping on weekdays allows them to increase their minutes of work, while on Sunday shopping is done at the expense of leisure. The main result of this chapter is that the labour supply of mothers may change even when non-obvious constraints on

the allocation of time change. At the beginning of 2012 the Italian government passed a set of norms that aimed to increase the competitiveness of the Italian economy. Among these reforms there was the complete deregulation of shopping hours and Sunday shopping. The Italian data do not yet allow us to study whether this policy change produced effects similar to those we find for Canada. To some extent, it is hard to believe that wage/salary workers in Italy would significantly respond in terms of time of work, since, as discussed in chapter 1, their work schedule is very rigid. However, they may benefit from the deregulation of shopping hours through the reduction of the congestion costs that they currently pay doing shopping in the busiest hours. Self-employed women, who account for about 20 per cent of working women, may on the other hand also change their labour supply behaviour. This topic is left for future research.

# 1 Self-employment and Constraints on the Allocation of Time

## 1.1 Introduction

In standard labour supply models the amount of work is chosen optimally, equating the wage rate to the marginal rate of substitution between leisure and consumption. A key assumption in these models is that individuals can choose any amount of work they want. This assumption is sometimes defended with the observation that individuals can choose among employers offering different hours of work (Bundell and MaCurdy, 1999). In some countries the number of offered schedules is high enough that the standard labour supply model may provide a good description of the agent's behavior. In other countries, such as Italy, the number of hours worked can be chosen among only a few options.

In dynamic frameworks it is also usually assumed that individuals can choose their optimal labour supply over the entire life and that they can adjust the desired amount of work at any moment of time, when unexpected shocks occur. However both these assumptions are unlikely to be satisfied in reality. As an example, the lengthening of the work life is associated with an increasing demand for part-time jobs at older ages (Loretto et al., 2005), but employers do not usually offer this kind of contracts to older workers. Short-run adjustments are also often costly for workers; their ability to respond to shocks modifying the desired (daily) labour supply substantially may be limited.

The allocation of time also depends on constraints on the timing of work and on inability to reallocate activities within a day. These constraints are relevant since productivity at work and enjoyment of leisure are not usually constant over a 24 hour period. Therefore, jobs with very strict hours might prevent individuals from taking advantage of hours when their productivity and enjoyment peak.

We address the relevance of some of these constraints on the allocation of time. In particular we focus on how lack of work-schedule flexibility affects short run adjustments of the time allocation. Using Italian time use data, we show that workers with weaker time constraints respond more to shocks affecting the value of leisure and labour supply. Italy is characterized by a heavily regulated labour market, which imposes restrictions on work schedules for a large fraction of wage/salary workers. However, Italy also has a very high self-employment rate. Exploiting the intrinsic differences

between employed and self-employed workers highlights the role of timing constraints on the overall allocation of time. The literature has often claimed that one of the main features of self-employment is the "*more control over the days and daily hours they work*" (Hamermesh, 1996). However, the literature on time use has mostly focused on evidence that self-employed individuals work longer hours, but not that they have more control over their time use. We explore this topic here.

Exploiting information on the exact day of the interview that is provided for the first time in the last wave of the Italian time use survey, we study how labour supply responds to weather shocks. Previous research for the U.S. found small average effects of weather on labour supply (Connoly, 2008). However, these small average effects may be due to overlooked time and timing constraints on the allocation of time faced by a large fraction of the working population. In fact, after documenting both the higher variability of hours of work among self-employed workers and the higher individual day to day variability of work, we show that self-employed workers respond much more to shocks affecting the value of leisure. We address whether unobservable characteristics, such as preferences for leisure and for outdoor activities in particular, determine this differential response. Studying the allocation of time on non-working days we find no evidence of different preferences between the two groups of workers. Therefore, we interpret the differential response to weather shocks as a consequence of the time constraints on work schedules.

The analysis provides relevant welfare implications, suggesting that welfare of workers would be increased if they could allocate time more flexibly, keeping constant the total amount of hours worked. On the side of firms, for a lot of jobs it is not clear why increasing the flexibility of work-schedules should negatively affect productivity, in particular considering how new technologies have changed many tasks. In Italy, most of the rigidity of work-schedules is due to old laws that have shaped industrial relations since the 1970s. The core of these laws was passed when a large fraction of employment was in manufacturing where assembly line are prevalent and before computers completely changed jobs in the service industry. Existing regulations are overly-restrictive for current technology. Allowing for more flexible work-schedules could be beneficial both for firms and workers.

Understanding the relevance of constraints on the allocation of time is crucial for reforming the Italian labour market. Italy shows very low employment rates of women, youth and seniors. For all three categories a flexible work schedule seems to be particularly desirable. Women usually struggle to reconcile work and family obligations; youth might still want to have the opportunity to invest in human capital; seniors may wish to make work more compatible with their health needs.

Section 1.2 provides a short discussion of the related literature. Section 1.3 describes self-employment in Italy. Section 1.4 provides a detailed description of the data used for this work. Section 1.5 analyses work-schedule flexibility for self-employed and wage/salary workers. Section 1.6 contains the empirical specification adopted to estimate the differential impact of weather shocks on the allocation of time for the two types of workers. Results and robustness analysis are presented in sections 1.7 and 1.8. Section 1.9 concludes.

## 1.2 Literature

From a theoretical point of view, the seminal contribution of G. Becker (1965) clearly pointed out the relevance of the allocation of time for economic decisions. The first empirical studies on time use date back to the end of the 1970s (Juster and Stafford, 1991), but the recent improvements in the availability of (micro) data have stimulated new interest in the topic.

An aspect that has not received a lot of attention yet concerns the timing of human activities and its constraints. Hamermesh (2008) argues that individuals modify timing of activities in order to coordinate their time use. The prevailing interpretation is that coordination arises from input complementarity in production processes and synchronization of leisure (Hallbeg, 2003). Part of timing regularities across individuals are related to physiological constraints as well (Weiss, 1996).

Coordination of capital and labour, and among groups of complementary workers, imposes restrictions on work-schedules. In Italy work-schedules are heavily affected by the main law regulating industrial relations, the so called *statuto dei lavoratori*, passed in 1970. The dramatic technological changes that have occurred since then have presumably made work-schedules unnecessarily restrictive. Moreover, a large fraction of jobs and work-schedules are also regulated through collective agreement between the class representatives of the workers and of the employers (Eurofound, 2009).

All these constraints result in only few available work-schedules for wage/salary workers. Part-time contracts typically set hours per week at 18, 20, 24 or 30. Full time jobs usually allow 36 or 40 hours of work. Forms of flexibility trying to facilitate the balance between private and professional life are generally undeveloped as well (Platenga and Remery, 2009). For instance, in Italy it is not usually possible for a worker to reduce hours for specific needs of the family, or to take temporary leave to take care of an ill family member or career breaks. Time accounts are also very rare. Italy shows one of the most rigid regulations in terms of hours of work compared to the other main economies of the European Union (EU henceforth). Plantenga and Remery (2009) use an *ad hoc* module of the EU labour force survey collected for the year 2004 and show that in Germany more than 50 per cent of the working population have access to flexible working-time schedules (more than

60 per cent in Denmark). Italy and France show similar levels of access to flexible working-time schedules (about 30 per cent) In France 10.5 per cent of women work from home, but this is only 1.3 per cent in Italy.

In order to show that these time constraints matter we study how workers respond to shocks affecting their optimal allocation of time. If the response to such shocks were the same across workers with different constraints, we should conclude that these constraints do not matter much. However, using weather data as a source of exogenous shocks to the value of leisure, we find that the response is much larger among self-employed workers, who have more flexible work-schedules. Previous studies have already focused on the effect of weather on the allocation of time, in particular on labour supply and leisure (Connoly, 2008). Shi and Skuterud (2012) show that absenteeism increases when favorable weather conditions occur. These studies do not explicitly address constraints limiting the reallocation of time. This may explain why small effects are usually found. The relevance of time and timing constraints have been noted by Biddle (1988), who shows that a life-cycle intertemporal labour supply model is misspecified when estimated under the assumption that workers are unconstrained.

This chapter focuses on allocation of time of Italian workers, making use of the last wave of the Italian time use survey. Several studies have already used previous waves of this survey. Bloemen et al. (2010) present a detailed descriptive analysis of the allocation of time of Italian couples and reviews the main studies using the Italian time use survey. Other studies focused more on (macro) economic outcomes, such as Alesina and Giuliano (2010).

## 1.3 Self-employment in Italy

Among OECD countries, Italy has one of the highest self-employment rates. Several factors explain this outcome, such as the heavy regulation of product markets and a high labour income tax (Torrini, 2002). The very strict regulation of the labour market, which significantly limits the varieties of work-schedules, can also be a determinant of the high level of self-employment in Italy.

The conventional wisdom in most developed countries is that self-employment is beneficial for reducing poverty, increasing employment and female labour force participation, and supporting innovation (Blanchflower, 2000). Despite incentives trying to increase self-employment, it remains below 10 percent of total employment in most Western countries, such as Canada and the US (Table 1). In Italy self-employment represented more than 25 percent of total employment in 2010, with a higher incidence among men (30.3 percent). In Italy the share of self-employed workers is relevant in almost any sector. The service industry, commercial and non-commercial, accounts for a large fraction

of self-employment (Table 2), but a significant fraction of self-employed workers are also found in agriculture, manufacturing and construction.

Comparing self-employment across countries requires care since its definitions vary. The EU labour force survey defines self-employment to be "*workers running their own business without employing any other person*". The definition we use is broader and also includes individuals running small firms and employing other workers. This choice is consistent with the Italian experience, where a lot of small businesses employ some workers, and it is also consistent with the national legal framework defining self-employment.[2] We place self-employed workers into one of three groups: i) entrepreneurs, who run their own business with some employees; ii) professionals (doctors, lawyers, etc.) who may or may not employ other workers; iii) craft workers (artisans or farmers) who often run their business with the support of other family members.

A phenomenon that is important to be aware of when talking of self-employment in Italy is that in the last decade the country experienced a significant growth in the number of workers who are formally identified as self-employed, but whose work resembles quite closely a paid job. These workers typically work fixed hours, for only one "customer", and their job is very similar to the job done by the employees of their "customer" (employer). This phenomenon depends on increasing economic integration and on the rapid technological changes that have made some industries much more likely to be hit by shocks (ILO, 1999). Firms operating in countries with strict Employment Protection Legislation have therefore an incentive to satisfy some of their demand for labour through formally self-employed workers, who can be more easily dismissed if needed. The data allows us to identify these workers formally: in what follows they will be considered as paid-employees.

## 1.4 Data

This chapter is based on the most recent Italian Time Use Survey (TUS henceforth). The survey is conducted by the Italian Statistics Office (Istat), with a periodicity of about 5 years. The survey covers 12 consecutive months, February 2008 to January 2009. The scope of the TUS is to represent the allocation of time of the Italian population over the whole year. This is achieved through a complex sampling scheme, which makes the survey suitable for analysis on specific socio-demographic groups or on specific seasons. The survey follows the Guidelines on Harmonised European Time Use Surveys published in September 2002. It therefore meets Eurostat's standards.

[2] In Italy the principal normative source for the distinction between subordinate employment and self-employment (*Codice Civile,* CC) defines a self-employed worker as a person who 'undertakes to perform a work or a service for remuneration, mainly by means of his/her own labour and without a relationship of subordination to the client'. The main requirements for being considered self-employed are: i) absence of subordinate status; ii) professionalism; iii) non-occasional job.

The 2008/09 TUS is based on 18,000 households (41,000 individuals). Information is collected by self-reported diaries, indicating the exact time each activity begins and ends, where such activity is performed, and with whom (spouse, kids, friends, or colleagues). The sample is divided into three almost equal parts: week days (Monday to Friday), Saturdays, Sundays and holidays.

The Italian TUS comprises two files. The first is the usual episode file, common to most time use surveys. It collects the entire sequence of activities for each participant. By aggregating over similar activities it is possible to calculate the total daily allocation of time to work, domestic work, leisure, and sleep. More detailed aggregations are possible as well. The second file reports all episodes of work for seven consecutive days. The first of these seven days coincides with the diary day; then the next six days follow. It is important to remark that only for the first day the entire allocation of time over the 24 hours is provided. For the following six days only time and timing of market work are known. This second file offers a coarser allocation of time than the diary file, since answers are provided only in intervals of 30 minutes. Another relevant feature of the 2008/09 TUS is that the exact day of the interview is provided. We exploit this information – not available for earlier TUS – by matching each interview with weather data. Finally, different from most available time use surveys, all household members are interviewed, allowing for analysis of the intra-household allocation of time.

The aim of this chapter is to study how constraints on hours of work affect the overall allocation of time. Therefore, the sample is restricted only to workers. Moreover, since the main empirical strategy adopts weather data as the source for exogenous variation for the value of leisure, workers in industries where productivity is clearly affected by the weather are excluded (agriculture and tourism). The sample size reduces to 14,800 observations (Table 3). The sample is composed of about 25 percent of self-employed workers, matching very closely the share calculated from the labour force survey. Men represent about 60 percent of the sample and married individuals are 58 percent. Since self-employed workers are found in every industry and their incidence is high, the differential effect of weather shocks on labour supply between the two groups of workers is unlikely to be due to the concentration of the self-employed in services that display lower demand on sunny days. Single mothers whose time allocation might have been potentially be very interesting for further study represent only an insignificant fraction of the data set.

The weather data that are used for this chapter are taken from the most popular website for weather forecasts in Italy (www.ilmeteo.it). This web-site provides detailed historical data on daily weather conditions (http://www.ilmeteo.it/portale/archivio-meteo/). Data can be downloaded in a clean .csv format.

Italy is usually considered a country blessed by good weather. However, the orographic conformation of the country (rich in mountains) and its extension from North to South gives significant weather variation within a year and across regions. For instance it goes from only 0.09 percent of days with no precipitation in Emilia-Romagna on December 2008, to very dry summer in some of the Southern regions (Table 4).

For each respondent to the TUS the region where he/she lives is known. Italy is divided into 20 regions, some of them really small.[3] Each region has its own capital. We assume that all individuals in the same region are exposed to the weather occurring at the capital. This assumption is not particularly strong, due to the small size of regions and to the fact that these capitals are always the most populated cities in each region. With this approach, it turns out that 62 percent of observations in the sample experience good weather, 38 percent experience one of the following conditions: hail, fog, snow, snow storm, rain, showers, or combinations of them.

## 1.5 Flexibility of the work schedule

Flexibility of the work schedule is a concept involving more than just one dimension. The first way work flexibility may be defined refers to the actual possibility of workers choosing the preferred number of hours. Standard economic models assume that the choice set for the number of hours is convex, and agents can choose exactly the optimal amount of work. In reality however this is not always realized. Certain countries might have a less regulated labour market, leading to a denser choice set. In Italy the hours of work are heavily regulated and influenced by the agreements between unions and class representatives of firms. It turns that only a few work schedules are available to most employed workers. Typical part-time contracts set the amount of hours at 18, 20, 24 or 30. Full time jobs usually allow for 36 or 40 hours of work.

Looking at the empirical distributions of hours of work, we find strong evidence of the lack of available (offered) work-schedules. We first present the distribution of the usual (normal) hours of work per week. Information on the usual weekly hours of work is not derived by time use diaries, but is rather directly asked of TUS participants. The hours normally worked by the wage/salary workers are concentrated around the regulated hours. Women are much more likely to work part-time, whereas a large fraction of employed men work around 40 hours (Figure 1). The distribution of hours of the self-employed is on the other hand much more dispersed, even though some reference answers emerge at 48, 50, 55, 60, and 70.

[3] In our analysis only 19 regions are displayed. Val d'Aosta, the smallest region, is jointed with Piemonte, as common in most of the regional analysis in Italy.

Time use diaries provide a second source of information on the hours of work. For each individual the amount of work in the reference day (the day the diary is completed) is known as well as the number of days worked in a week. Using this information, and not considering individuals that are sampled on weekends, holidays or days off, we can impute the number of weekly hours of work (Figure 2).[4] Again the empirical distribution of the hours worked by the self-employed is more dispersed. Reference answers disappear, but still a very large fraction of the employed individuals work around 40 hours.

The distribution obtained through the diaries is however much more smooth than the distribution of normal hours of work, which implies that both employed and self-employed workers experience day to day changes in their amount of work. The day to day variation of time spent working is another dimension of schedule flexibility that we explore. In fact, showing that the distribution of hours worked by the self-employed is more dispersed is not enough to argue that they have more flexibility, since it does not tell us how easily work can be reallocated over different days of the week. Data on work episodes for the entire week, which the Italian TUS have, allow studying the reallocation of work within a week.

The first piece of evidence concerns the dispersion of hours of work during the week. The standard deviation of hours worked is larger for self-employed individuals in every single day from Monday to Friday (Figure 3). Both employed and self-employed workers show clear Monday and Friday effects: on these two days standard deviation of hours of work is higher, since workers are more likely either to take the day off or to leave (enter) work earlier (later). Second, looking at the average individual variability of daily minutes of work over the week we have a descriptive measure of work-schedule flexibility. The average standard deviation of daily minutes of work within the work-week for the self-employed is about 12.5 percent higher than for the paid-employed.

To conclude, all the presented descriptive statistics suggest that self-employed workers have more control over their allocation of time. The amount of hours of work does not peak at levels dictated by the law and they also show larger average reallocation of work within a week. In the following section we study whether this feature of self-employment is reflected in the overall allocation of time and in their response to shocks.

[4] Every person is asked the number of minutes worked in the reference day (call this $m_i$). Then it's asked how many days per week they usually work (call this $d_i$). Hence the imputed number of weekly hours $h_i$ is calculated as $h_i = \frac{m_i}{60} \times d_i$

## 1.6 Empirical Specification

### *1.6.1 Quality of Leisure: responses to a sunny day*

To estimate the differential impact of a shock on the allocation of time of workers with different degrees of flexibility, we study how time spent on each of the main time-use categories responds to weather shocks. Following the literature (Shi and Skuterud, 2012), we assume that good weather is associated with a higher value of leisure. When the state of nature is realized and the weather is known, labour supply should be adjusted according to the weather outcome. If the weather is better than usual, conditional on the region and on the season, leisure should increase at the expense of work.

An issue that is worth discussing is why good weather should significantly affect the allocation of time in a country with very temperate climate. In fact, as claimed in Shi and Skuterud (2012), the value of a sunny day is particularly high in countries, such as Canada, where the climate is not as temperate as in the Mediterranean. First, we define sunny days as those with no precipitation. Hence, it is reasonable to think that rain and snow affect the behavior of people more in countries where these conditions are relatively rare. Second, the value of a sunny day is also given by the available amenities: the response to weather conditions is unlikely to be the same in Toronto and in Vancouver. Almost all regions in Italy are on the sea, which is itself a valuable natural amenity. There is therefore no *a priori* reason to think that in Italy the average response to weather shocks is smaller than in other countries, where similar studies have already been conducted (US, Canada, The Netherlands).

Everything else equal, when the value of leisure increases the amount of work remains constant only if compensated by a wage increase. Since there is no day to day wage rate variation, an increase of the value of leisure should in principle be reflected in a reduction of work and in an increase of leisure. Workers with very rigid schedules may however find it difficult to adjust the amount of time worked to take advantage of a sunny day. As descriptive evidence presented in in section 1.5 suggests, paid-employed workers are on average more constrained with their allocation of time than the self-employed. Individuals running their own business have several options to reduce work and increase leisure: they can start work later, take a break during the day, have a lunch break longer than usual, and leave work earlier. Most of these options are normally not available to paid-employed workers.

We study the reaction of labour supply to weather conditions in two consistent settings, exploiting both the time diary and the file containing all weekly work episodes. The first approach is

very similar to the one adopted by Connoly (2008), and it identifies how the total amount of work in a day is affected by the weather. The second approach captures the dynamics, estimating the effects of weather changes on the day to day variation of work.

We begin presenting the first model. To capture the differential response to weather shocks between self-employed and wage/salary workers on the total allocation of time we estimate the following model:

$$w_{ji} = \beta_{j0} + \beta_{j1} self_i + \beta_{j2} sun_i + \delta_j self_i \times sun_i + X_i\theta_j + I_i\gamma_{j1} + M_i\gamma_{j2} + G_i\gamma_{j3} + \varepsilon_{ji} \quad [1.1]$$

Where $w_{ji}$ represents the amount of time expressed in minutes in activity $j$ (work, leisure, personal care) by individual $i$. The coefficient $\beta_{j1}$ captures the average effect of being self-employed, $\beta_{j2}$ represents the effect of a day with no precipitation (called sunny), $\delta_j$ is the interaction between the binary variable indicating self-employed workers and the binary variable indicating a sunny day. Therefore, $\delta_j$ captures the differential effect between self-employed and employed workers on a sunny day. When $\delta_j$ is negative and significant, it means that self-employed workers reduce time spent on activity $j$ more than wage/salary workers. We estimate clustered standard errors, allowing the error term to be correlated between observations within each region in each month.

In our model we include vectors *X* and *I* of individual characteristics (such as gender, age, education, presence of young children) and industry dummies. Since the effect of weather is highly heterogeneous across months and regions we also include month (*M*) and region (*G*) fixed effects. The inclusion of regional fixed effects is crucial, since southern Italy is characterized by better average weather and fewer hours of work per worker.

Model [1.1] is estimated for three main time use categories representing almost the entire 24 hour endowment: work, pure leisure and personal care (including sleep). Since time allocated to each activity cannot be negative, we adopt a Tobit specification, accounting for censoring at zero. The appropriateness of the Tobit model for time-use data analysis is an ongoing debate. Stewart (2009) shows that the adoption of a Tobit specification may lead to biased estimates when the reported zeros may not correspond to actual corner solutions. This problem is particularly relevant the focus is on infrequent activities and the horizon of analysis is longer than a single day (i.e. a year). In that case in fact the reported zeros do not correspond to individuals who never perform the activity of interest on the relevant time for the analysis (corner solutions). They rather correspond to measurement errors due to aggregation bias. In these cases an OLS specification is preferable (Stewart, 2009). In our case

the fraction of censored observation is however low (7 per cent for work, 3 per cent for leisure, no censored observations for personal care) and OLS estimates do not differ significantly. Estimates are therefore robust to the possible bias introduced by misspecified Tobit with time use data.

The second model is derived by model [1.1] and identifies intertemporal adjustments of labour supply in response to weather changes. The intertemporal model allows us to exploit the longitudinal component of the Italian time use data, which is not usually provided in other similar surveys. This exercise also represents a robustness check for our previous and main estimation. Since for almost all working individuals in the survey the amount of work for seven consecutive days is provided, the data allow us to identify an explicit dynamic model, where work is shifted from today to tomorrow when the weather today is better than tomorrow. In principle a dynamic model of labour supply should use weather forecasts rather than actual weather. However, since the time horizon is only two days and weather forecasts are very accurate over short time intervals, the adoption of actual data seems to be not really problematic. From model [1.1] it is straightforward to derive the following dynamic model:

$$w_i(t+1) - w_i(t) = \beta_2 \Delta sun_i(t) + \delta self_i \times \Delta sun_i(t) + u_i \qquad [1.2]$$

The left hand side of equation [1.2] represents the difference between tomorrow's and today's work. For instance when individuals decide to work more tomorrow than today we have:

$$(w_i(t+1) - w_i(t)) > 0$$

In this framework we are interested in capturing the effect of the quality of the weather tomorrow relative to today. We define

$$\Delta sun_i(t) = sun_i(t+1) - sun_i(t)$$

Therefore:

$$\Delta sun_i(t) \begin{cases} > 0 \text{ when tomorrow better than today} \\ = 0 \text{ same weather today and tomorrow} \\ < 0 \text{ when today better than tomorrow} \end{cases}$$

The differential response between self-employed and employed individuals to weather changes on labour supply is captured by the coefficient $\delta$ of the interaction term. Since this model is derived by simple manipulation of model [1.1], the validity of its specification relies on the validity of

the specification of model [1.1]. In particular, we assume that the marginal effects of time invariant characteristics affect only the level of the dependent variable, but not its (day to day) variation. We have also estimated the intertemporal model including all control variables in [1.1], a specification that implies that the marginal effects of time invariant controls affect the daily adjustments. It turns out that almost all coefficients are highly insignificant.

## 1.7 Results

### *1.7.1 Main Results*

Table 5 reports the estimates of model [1.1] for the four activities covering almost the entire time endowment of a day (1,440 minutes). The first column of coefficients reports estimates for the model with minutes of market work as dependent variable. The second column of coefficients refers to domestic work. The third column of coefficients reports estimates of the model when minutes of leisure is the dependent variable. Here leisure is a broad category and it contains more than just those activities that are most directly affected by the weather, such as outdoor activities. In fact, weather conditions affect a wide range of recreational activities: outdoor activities are positively affected, but also museum visits, movie attendance, socializing with friends. Therefore, to capture the overall effect and to increase the precision of our estimates, we consider all leisure activities together. The fourth column of coefficients refers to sleep and personal care activities that should be only marginally affected by weather conditions.

In line with previous research (Hyytinen and Ruuskanen, 2007), we find that self-employed workers in Italy work longer hours than employed individuals. Since sleep and personal care do not differ significantly, the extra amount of work comes at the expense of leisure. Our estimates show that the effect of the weather on the allocation of time is relevant. The average effect of Sun (absence of precipitation) on daily minutes of work is significant in Italy. Market work of wage/salary workers is reduced by about 49 minutes on sunny days. Relative to the unconditional mean of daily minutes of market work for employed individuals, this means a 10.1 percent reduction. Since the interaction term $\delta$ is negative and significant, self-employed workers' reduction of work in sunny day is larger than that for wage/salary workers. The estimated effect of Sun on total work for the self-employed group is captured by the sum between $\beta_2$ and $\delta$. Hence, on sunny days self-employed workers reduce total work by 77 minutes, which means a 14.6 percent reduction relative to their unconditional mean of market work. On average self-employed workers work 112 minutes more per day than the paid-employed in rainy days ($\beta_1$). This gap is however reduced by 28 minutes on sunny days ($\delta$).

Hence when weather conditions are favourable self-employed individuals work about 84 minutes more than the paid-employed ($\beta_1 + \delta$). The differential effect of Sun on domestic work between self-employed and wage salary workers is on the other hand not significant, suggesting that constraints on work schedules are crucial for understanding the response of workers to weather shocks.

The reduction of paid work is mirrored in the increase of leisure. The conditional average increase of leisure due to the Sun is 13 minutes for wage/salary workers (equivalent to a 5 percent increase, relative to the unconditional mean). The interaction term $\delta$ is positive and significant, meaning that the increase of self-employed workers' leisure on sunny days is larger. The differential effect of Sun on leisure is in fact 19 minutes. Consistent with evidence on work, normally self-employed workers consume fewer minutes of leisure. The estimate for coefficient $\beta_1$ indicates that their leisure is on average 35 minutes lower. However, on sunny days this gap is reduced by about 19 minutes, resulting in only 16 minutes of difference between wage/salary and self-employed workers.

In short, these estimates tell us that self-employed workers enjoy less leisure, but the gap between the amount of their leisure and the amount of leisure enjoyed by the paid-employed workers is significantly reduced when favourable weather conditions are realized. We interpret this reduction as a consequence of the different degrees of work-schedule flexibility of these two types of workers.

Table 6 reports coefficients' estimates for the dynamic model described by equation [1.2]. The Tobit specification is now not required, since the daily variation in the amount of work ($w_i(t+1)$-$w_i(t)$) is not censored at zero and it can be either positive or negative. When comparing these results with Table 5, we have to keep in mind that the week diary reports only market work time. Therefore we cannot include domestic work in our dynamic specification.

This model confirms that the weather has a significant effect on the allocation of time, in particular on minutes of work. When weather tomorrow is better than today, work tomorrow is reduced and work today is increased, resulting in a difference of 26 minutes for wage/salary workers. Self-employed workers respond even more, with additional 32 minutes of difference between today's and tomorrow's work when weather tomorrow is better than today. The large magnitude of the estimated effect reflects not only adjustments on the intensive margin of work, but also adjustments on the extensive margin and the effect of weather conditions on commuting time.

These results support the idea that self-employed workers are more capable of modifying labour supply at time *t* relative to labour supply at *t+1*, confirming that wage/salary workers face significantly tighter time and timing constraints.

### *1.7.2 Other Results*

The response to good weather should in principle be stronger when sunny days are a scarce resource. In order to test whether the effect of favourable weather on labour supply is stronger in rainy months we estimate model [1.1] separately for rainy and sunny seasons. Table 4 shows the percentage of sunny days for each month in our sample.[5] Other than February 2008, that turned to be unusually dry, the other months follow an expected pattern, with a remarkably dry summers and rainy winters and springs.

We therefore divide the year in two periods: June to October plus February (sunny months) and the November to January plus March to May (rainy months). The exclusion of February from the sunny months does not change the results.

Table 7 reports estimates of effect of Sun on leisure time in the dry (column 1) and rainy season (column 3). During the rainy season, a sunny day significantly increases average leisure. The increase is about 28 minutes for wage/salary workers. The differential response of the self-employed is positive and significant, leading to an overall increase of leisure in sunny days of about 51 minutes. On the other hand, the effect of Sun vanishes in the summer. Since most of Italian workers take long vacations in July and August, these two months could potentially affect our estimates through a different underlying model. However, even after excluding these two months, the effect of favourable weather conditions is not significant in dry season.

Even exploiting regional variation in weather the effect of Sun on leisure is stronger when good weather is scarce. Table 8 shows separate estimates of model [1.1]: column 1 refers to individuals living in regions where in the month of their interview the probability of sunny days was above 0.6.[6] Column 3 reports estimates for the sample of observations for which such probability is below 0.6. Again we find that the amount of leisure time responds more to good weather in wet month/regions.

## 1.8 Robustness

Heterogeneous average preferences for different types of leisure might however drive our results and undermine the interpretation that the different response of self-employed workers is due

[5] Table [4] refers to percentage of sunny days calculated within the time use survey. The pattern is however very close to the actual National pattern calculated with weather data. This means that the date at which participants are interviewed is not affected by the weather.

[6] 0.6 was chosen since it is the average probability of Sun in our sample. Therefore we made the arbitrary choice of selecting individuals above and below the mean.

to higher work-schedule flexibility. Our analysis does not in fact rule out the possibility that individuals who enjoy more outdoor activities and who want to take advantage of good weather self-select into self-employment. In this section we try to address this issue. We first estimate again the differential response to the weather with respect only to employed individuals, exploiting different degrees of flexibility within the wage/salary group of workers. This analysis provides a partial answer to our concern about self-selection into self-employment. However it might still be the case that similar motives drive the choice of wage/salary workers between different types of work-schedules. We therefore show that on non-working days the allocation of time of employed and self-employed workers is almost identical, as identical is their response to weather conditions. This provides evidence against the rejection of the hypothesis that individuals with higher preferences for outdoor activities self-select into jobs with more work-schedule flexibility.

### *1.8.1 Different types of paid-employed workers*

So far we have studied the relevance of time constraints exploiting the intrinsic differences between employment and self-employment. It would be reassuring if differential responses to exogenous shocks emerged between wage/salary workers with different levels of work-schedule flexibility. These different levels of flexibility may arise because jobs are heterogeneous across industries and tasks or because of different levels of seniority across workers. It is however hard to identify exactly the heterogeneous levels of flexibility for paid-employed workers.

We exploit one of the questions asked of TUS participants. Every paid-employed worker is asked whether his/her job allows for a flexible work-schedule or not. According to the answers provided we can distinguish workers that can easily adjust their schedule, workers that can adjust it providing notice and workers that are almost incapable of modifying time and timing of work on a daily basis.

With model [1.3] we estimate the differential effect of Sun on work and leisure for paid-employed workers self-reporting different levels of flexibility. Since only a few workers can adjust their schedule with no notice, we pool together workers with and without notice requirement. Therefore we divide employed workers in two groups. The first group represents workers with some degree of labour flexibility. The second group represents workers who cannot make changes apart from vacation and sick days. The first group represents about 44 per cent of paid-workers. Paid-employed workers with flexible schedules are found in all industries and they are not clearly more concentrated among women (Table 9).

The estimated model is

$$w_i = \beta_0 + \beta_1 flex_i + \beta_2 sun_i + \delta flex_i \times sun_i + X_i\theta + I_i\gamma_1 + S_i\gamma_2 + G_i\gamma_3 + O_i\gamma_4 + \varepsilon_i \quad [1.3]$$

where *flex* is a binary variable indicating workers with flexible work-schedules. The other covariates are similar to those in previous models. Another difference is that we include a set of occupation dummies ($O_i$), that allows a finer description of wage/salary workers.

Table 10 reports estimates of model [1.3] for work and leisure. The average effect of Sun on work and leisure is only marginally significant after removing from the sample the self-employed workers and controlling for the provision of flexible schedules within the paid-employed workers group. Workers with flexible schedules work 29 minutes per day more. The main result is that the differential response to weather shocks is negative and significant, meaning that employed individuals with flexible schedules reduce work by 40 minutes more than those with little flexibility.

Similar insights emerge if we use minutes of leisure. The interaction term $\delta$ captures the differential effect of the weather; it is positive and significant. Even within the group of wage/salary workers, the increase of leisure in response to good weather is larger among those with more control over their hours of work. These experiments support our main results: labour supply responsiveness is significantly affected by time and timing constraints.

### *1.8.2 Allocation of time on non-working days*

In this section we try to argue that there is no clear evidence that self-employed and wage/salary workers differ in their preference for leisure and for good weather. This is needed in order to rule out the possibility that the different responses to weather shocks that we documented above are driven by preferences rather than by time and timing constraints. Our hypothesis is that if preferences are the same, the allocation of time, in particular the choice of the kind of leisure activity, and the response to weather shocks should be the same on non-working days, when constraints on the work-schedule do not hold.

To study whether the allocation of time differs between employed and self-employed individuals on non-working days we use a finer classification of leisure activities. We divide leisure into indoor and outdoor activities and socializing. Indoor activities are mainly sleep, time spent watching TV, playing videogames or surfing the web. Outdoor activities basically refer to any kind of outdoor sport. Socializing includes time spent with friends or relatives, and time spent visiting museums or watching movies.

It is important to make clear how we construct the non-working days. It is not enough to consider just days where time spent working is equal to zero. This is because the weather has effects also on the extensive margin, increasing the incentive to not work at all when favourable weather conditions occur. If employed and self-employed workers can exploit this margin differently, our exercise would be biased if we treated all days of no work the same. We need days that are normally non-working days, and such that weather does not affect labour supply.

Therefore, we restrict our sample to workers interviewed on weekends and reporting that they usually do not work on Saturday and Sunday. With regard to this sample we estimate, by a Tobit specification, whether the allocation of time and the effect of Sun differ between employed and self-employed workers. Table 11 reports estimated coefficients for outdoor and indoor activities, socializing and domestic work.

Even having sharply reduced the number of observations, the average effect of Sun remains significant. Outdoor activities and socializing increase when the weather is sunny. On the other hand, Sun causes a significant reduction of indoor activities and domestic work. Sleep (not reported) remains unaffected.

The estimated coefficients capturing the average effect of being self-employed are never significant. None of the five considered activities is systematically different between wage/salary and self-employed workers. Furthermore, the interaction term capturing the differential response of self-employed workers is also insignificant with respect to all activities. The increase of outdoor activities caused by the Sun is statistically the same for employed and self-employed workers. Similarly, the reduction of indoor activities or domestic work is the same.

There is therefore no clear evidence that tastes for outdoor activities and for good weather are any different between employed and self-employed individuals. This test may however lack power, since the sample used to obtain the main results of section [1.7] is larger. The rejection of the hypothesis that allocation of time on non-working days differs between the two types of workers is however not marginal.

### *1.8.3 Domestic work productivity: the case of shopping*

Having documented that self-employed workers have more control over their allocation of time, we describe differences in time spent shopping between the two types of workers. We argue in fact that individuals with more flexible schedules should in principle pay lower congestion costs, since they can choose a more efficient allocation of time.

For most activities related to home production it is really hard to measure productivity. Shopping however allows for some analysis of efficiency. Under the assumption that employed and self-employed workers consume on average similar bundles of goods and services, time spent shopping is an indicator of how productively such activity is carried on.

Shopping and commuting are two activities that are clearly affected by congestion costs. For instance, standard 9 to 5 workers pay very high congestion costs for both commuting and shopping. Individuals with less tight constraints on their allocation of time can adjust the timing of their activities is order to reduce congestion costs. Here we show that time spent shopping by self-employed workers is significantly lower than time spent shopping by paid-employed workers.

With respect to the whole sample, representing the Italian population, we first determine at what hours and on what days people are more likely to shop. The underlying assumption is that the higher the fraction of the population shopping at given time the higher the congestion cost. These costs can be seen in terms of efficiency (time input required for completing shopping), but also in terms of pleasantness.[7]

According to the 2008/09 TUS, Saturday is the day when stores are the busiest and almost 20 percent of the entire Italian population is shopping (Figure 4). From Monday to Friday, the peak is reached between 6 pm and 7 pm (about 12 percent), at the end of the standard work day. The fraction of population shopping Monday to Friday mornings is on the other hand much lower (the highest peak is just above 5 percent).

Comparing timing of shopping of the two types of workers, it clearly emerges that self-employed women are significantly less likely to do shopping when stores are busy. Figure 5 shows the fraction of women shopping in any 30 minute interval for week days. In the morning, when stores are less crowded, the probability of shopping is much higher for the self-employed. On the other hand, in particular around 6 pm, when people leave their jobs, employed women are more than twice more likely to do shopping than the self-employed. On the weekends, employed women do more shopping both in the morning and the afternoon (Figure 6).

In order to provide more evidence that self-employed workers actually spend less time shopping we estimate the following model:

$$w_i = \beta_0 + \beta_1 self_i + X_i\theta + I_i\gamma_1 + M_i\gamma_2 + G_i\gamma_3 + \varepsilon_i \qquad [1.4]$$

[7] When stores are busy shopping might also be less pleasant. However we do not consider this further source for congestion possible effect of congestion costs.

where *self* is a binary variable indicating self-employed workers, *X* is a vector of individual characteristics (gender, age, education, presence of young children). *I*, *M* and *G* are respectively industry, month and geographical area (regional) fixed effects. To describe congestion costs more accurately we consider separately the time spent shopping and the time spent driving to the store. In the first specification $w_i$ represents the number of minutes for shopping and in the second minutes spent driving to stores. Keeping the two activities together simply leads to bigger and more significant coefficients for $\beta_1$.

Model [1.4] is estimated by a Tobit specification, since almost two thirds of the sample reports zero time spent shopping on the reference day. Table 12 report the estimated coefficients. It turns out self-employed workers spend less time shopping, even controlling for a wide set of observable characteristics. Time spent driving to the store is significantly lower among the self-employed as well (-12 minutes). The shorter time needed for shopping and for driving to stores by self-employed workers suggest that they actually pay lower congestion costs.

The other coefficients confirm that women spend more time shopping. From Monday to Friday there is less shopping (-33 minutes) and December is the month with the highest average shopping time. We have also estimated the model separately for men and women. Self-employment is associated with significantly lower shopping time for both genders.

## 1.9 Conclusion

In this chapter we show that the allocation of time of workers is heavily affected by the work-schedule and its flexibility. Past research has often claimed that self-employed workers have more control over their use of time, but this hypothesis is rarely tested.

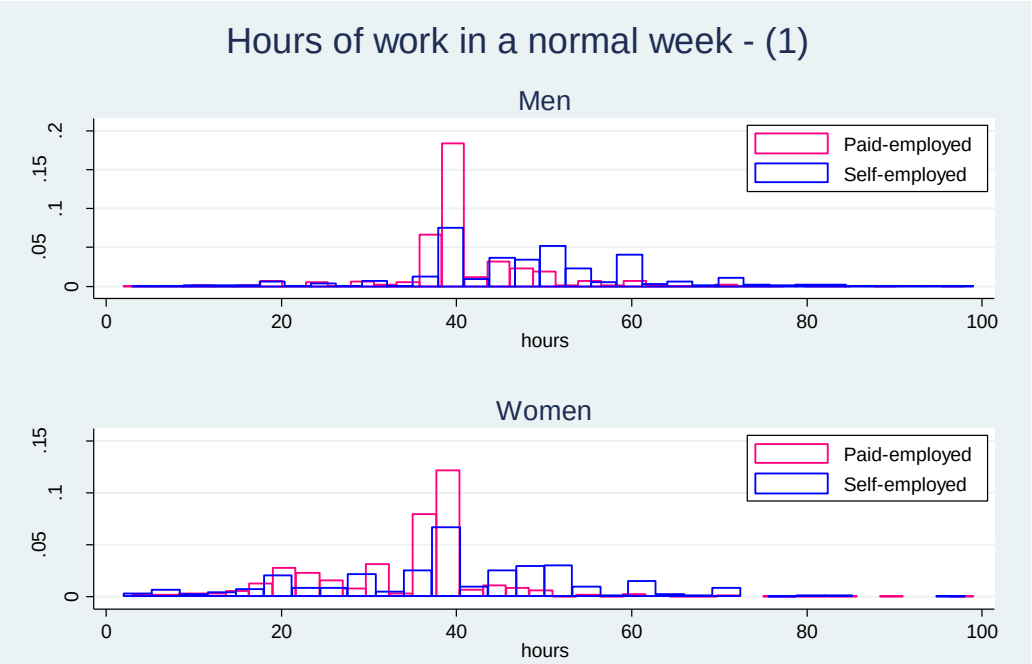
After providing descriptive evidence that self-employment is associated with higher dispersion of hours of work and larger day to day variation of minutes work, we test one of the main implications derived from more control (flexibility) over the allocation of time. We test in particular the differential response between employed and self-employed workers to an exogenous shock affecting the value of leisure, hence affecting labour supply. We find that when favorable conditions for leisure occur, self-employed workers reduce work and increase leisure much more than the paid-employed. In order to rule out the possibility that this result is due to other unobservable differences between wage/salary and self-employed workers, we test the same hypothesis on only paid-employed individuals reporting different levels of work-schedule flexibility. The results are

confirmed. Moreover, we also study the allocation of time of employed and self-employed workers on non-working days. We find that there is no evidence of different preferences for leisure and Sun among the two groups.

The analysis suggests that time constraints significantly restrict agents' choices. Welfare of workers would be increased if they could allocate their time more flexibly, even keeping constant the total amount of hours worked. For firms, it is not clear why increasing the flexibility of work-schedules should negatively affect productivity in many jobs. In Italy, most of the rigidity of work-schedules is due to outdated regulations. Most laws shaping industrial relations were in fact passed when a large fraction of employment was in manufacturing and when computers had not completely changed jobs in the service industry. Understanding the relevance of constraints on the allocation of time is important for reforming the Italian labour market and to encourage greater labour force participation of women, youths and seniors.

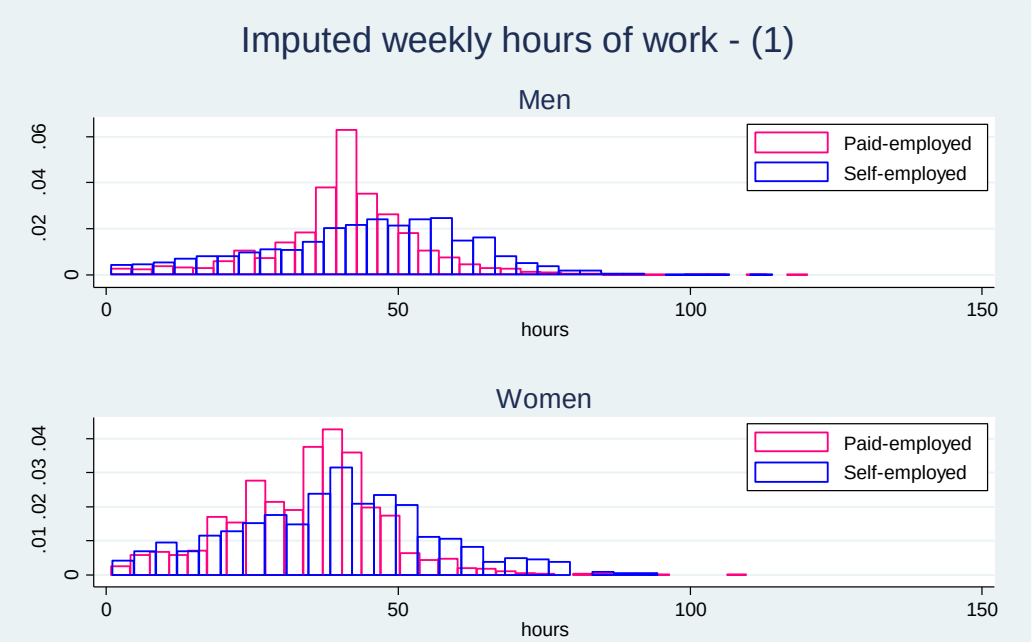
## 1.10 Tables and Figures

**Figure 1: Distribution of hours of work in a normal week**



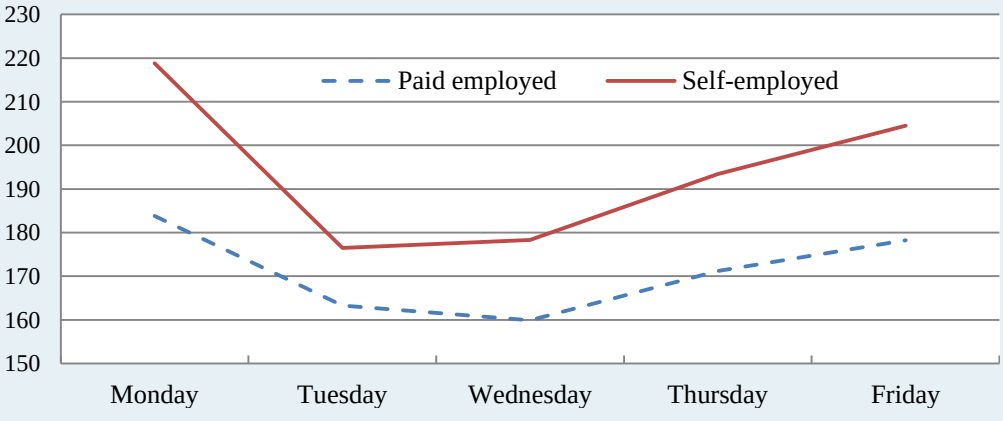

Source: 2008-09 Italian Time Use Survey
(1) The number of hours of work in a normal week is self-reported by the participants to the survey

**Figure 2: Distribution of weekly hours of work imputed by time use diaries**



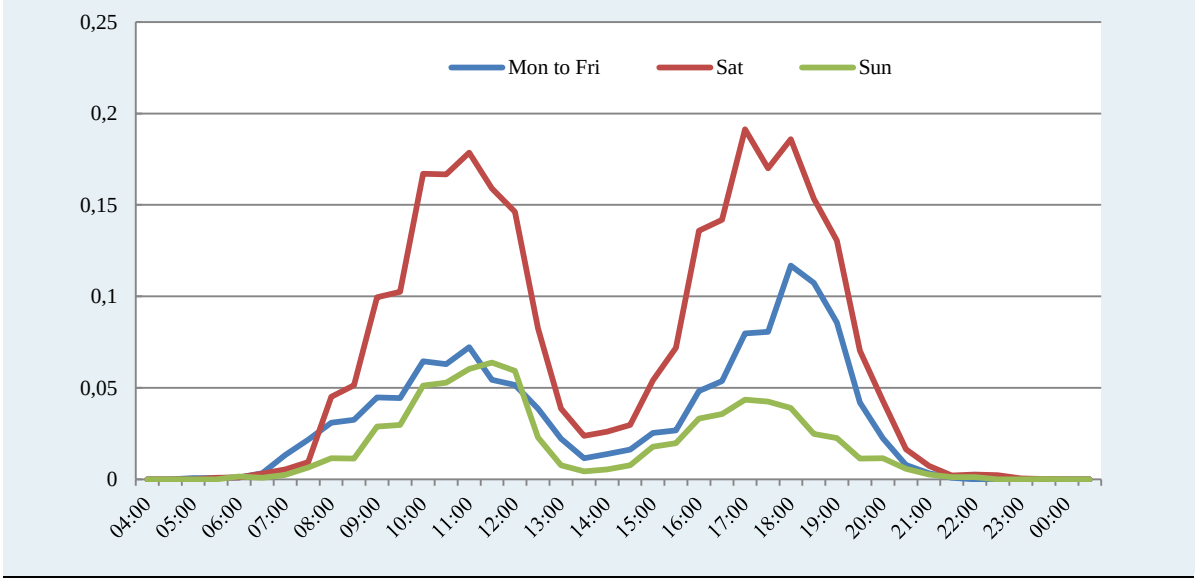

Source: 2008-09 Italian Time Use Survey
(1) Number of hours of work derived by the time use diaries: the number of reported minutes on the main work is divided by 60 and multiplied by the usual number of work-days in a week

**Figure 3: Daily standard deviation of minutes of work**



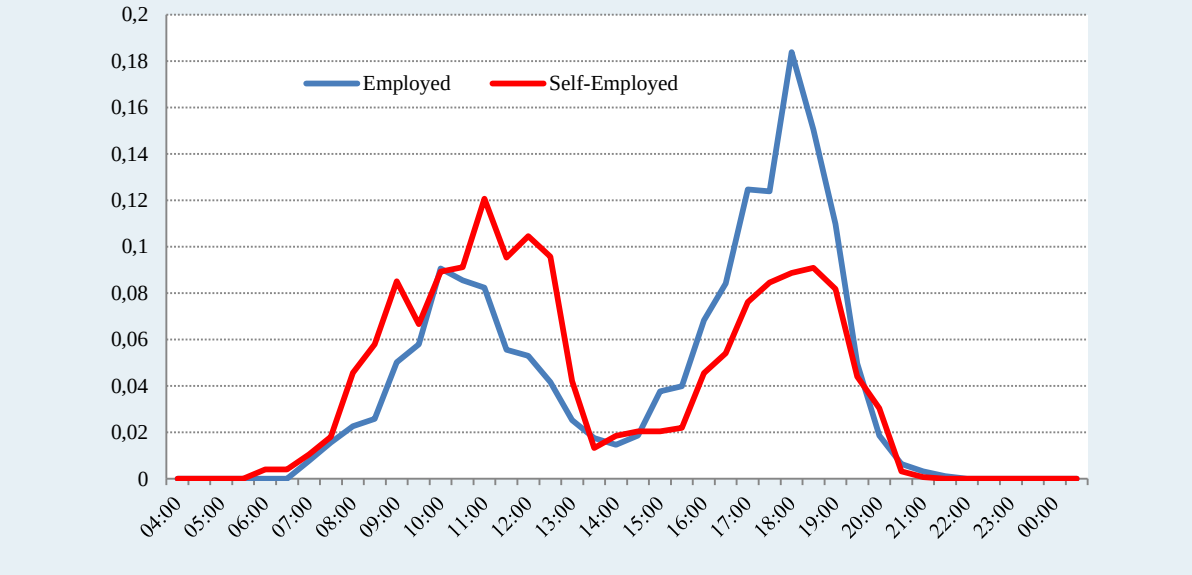

Source: 2008-09 Italian TUS.

**Figure 4: Timing of shopping (1) – entire population**



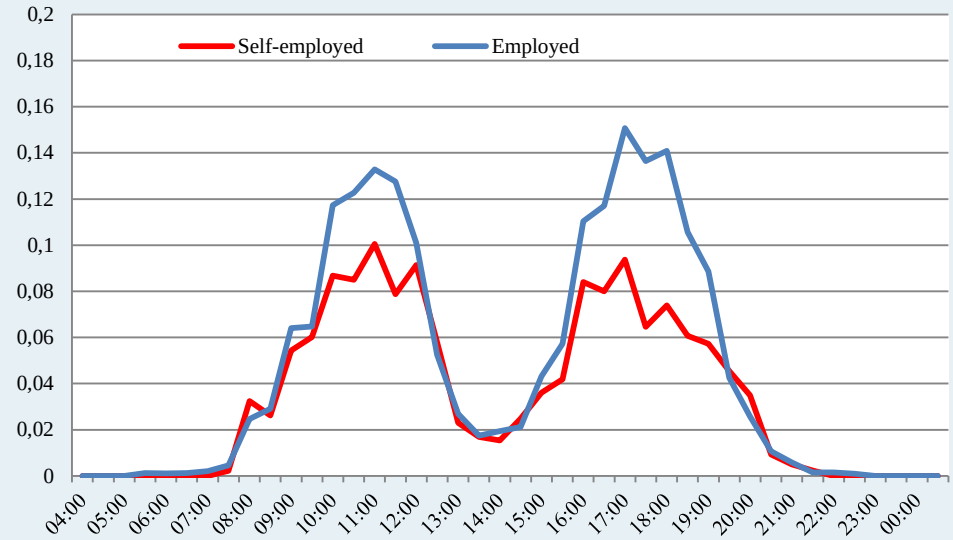

Source: 2008-09 Italian TUS. – (1) Share of the population reporting shopping activity for each 30 minutes interval of the day

**Figure 5: Timing of Monday to Friday shopping (working women) (1)**




Source: 2008-09 Italian TUS. – (1) Share of the population reporting shopping activity for each 30 minutes interval of the day

**Figure 6: Timing of weekend's shopping (working women) (1)**




Source: 2008-09 Italian TUS. – (1) Share of the population reporting shopping activity for each 30 minutes interval of the day

**Table 1: Self-employment rates as a percentage of total employment**

| Country | 1990 | 2000 | 2005 | 2010 |
|---|---|---|---|---|
| Canada | 9.5 | 10.6 | 9.5 | 9.2 |
| France | 13.2 | 9.3 | 9.1 | na |
| Germany | na | 11.0 | 12.4 | 11.6 |
| Italy | 28.7 | 28.5 | 27.0 | 25.5 |
| Sweden | 9.2 | 10.3 | 9.8 | 10.9 |
| United Kingdom | 15.1 | 12.8 | 12.9 | 13.9 |
| United States | 8.8 | 7.4 | 7.5 | 7.0 |
| OECD total | na | 17.7 | 16.8 | na |

Source: OECD data

**Table 2: Distribution of self-employed workers across industries**
*(percentage points)*

| | LFS | TUS | Difference |
|---|---|---|---|
| Agriculture and fishing | 9.1 | 11.3 | -2.2 |
| Mining | 0.1 | 0.5 | -0.4 |
| Manufacturing | 12.5 | 11.5 | 1.0 |
| Construction | 11.6 | 10.7 | 0.8 |
| Commerce | 26.2 | 25.3 | 0.9 |
| Whole non-commercial service industry: | 40.6 | 40.7 | -0.1 |
| - *Health and education services* | 5.4 | 5.4 | 0.0 |
| - *Public administration and defense* | 0.4 | 0.8 | -0.4 |
| - *Other services* | 34.8 | 34.5 | 0.3 |
| **Total** | 100 | 100 | |

*Source: Italian LFS (2004, 2008), Italian TUS (2002/03, 2008/09)*

**Table 3: Sample descriptive statistics – 2008-09 Time Use Survey**

| | Mean | Standard Deviation |
|---|---|---|
| Share of men | 0.592 | 0.491 |
| Age | 41.8 | 10.920 |
| **Occupation**: | | |
| Share of self-employed workers | 0.248 | 0.432 |
| Share of wage/salary workers | 0.752 | 0.432 |
| *Share wage/salary workers with flexible schedule* | *0.422* | 0.494 |
| **Industry:** | | |
| Public Administration and Defense | 0.095 | 0.293 |
| Oil and mining industry | 0.011 | 0.106 |
| Manufacturing | 0.195 | 0.396 |
| Construction | 0.104 | 0.305 |
| Commerce | 0.164 | 0.370 |
| Health and education | 0.156 | 0.363 |
| Other services | 0.275 | 0.446 |
| **Education** | | |
| Primary education | 0.363 | 0.481 |
| High school diploma | 0.468 | 0.499 |
| University degree | 0.169 | 0.375 |
| Number of household members | 3.337 | 0.952 |
| **Marital status** | | |
| Married | 0.581 | 0.493 |
| **Presence of children in the household** | | |
| Married individuals | | |
| Share of individuals with kids in age 0-5 | 0.248 | 0.432 |
| Share of individuals with kids in age 6-13 | 0.332 | 0.471 |
| Non Married individuals | | |
| Share of individuals with kids in age 0-5 | 0.054 | 0.227 |
| Share of individuals with kids in age 6-13 | 0.053 | 0.226 |
| Share of single mothers | 0.008 | 0.092 |
| **Geographical distribution** | | |
| North West | 0.254 | 0.435 |
| North East | 0.236 | 0.425 |
| Centre | 0.192 | 0.394 |
| South | 0.223 | 0.416 |
| Sicily and Sardinia | 0.096 | 0.294 |
| Share of days with no precipitation | 0.621 | 0.485 |

Number of observations: 14,879
Source: 2008/09 Italian TUS

**Table 4: Sample shares of days with absence of precipitation per Month and Region**

| Region | February 2008 | March 2008 | April 2008 | May 2008 | June 2008 | July 2008 | August 2008 | September 2008 | October 2008 | November 2008 | December 2008 | January 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Piemonte - Val d'Aosta | 0.73 | 0.58 | 0.40 | 0.38 | 0.38 | 0.47 | 0.91 | 0.53 | 0.79 | 0.56 | 0.53 | 0.36 |
| Lombardia | 0.59 | 0.66 | 0.57 | 0.28 | 0.46 | 0.46 | 0.86 | 0.65 | 0.33 | 0.27 | 0.13 | 0.17 |
| Trentino Alto Adige | 0.74 | 0.82 | 0.53 | 0.66 | 0.56 | 0.55 | 0.86 | 0.63 | 0.89 | 0.63 | 0.70 | 0.85 |
| Veneto | 0.50 | 0.25 | 0.31 | 0.30 | 0.52 | 0.71 | 0.71 | 0.77 | 0.77 | 0.50 | 0.48 | 0.49 |
| Friuli Venezia Giulia | 0.75 | 0.46 | 0.58 | 0.33 | 0.74 | 0.64 | 0.73 | 0.68 | 0.76 | 0.41 | 0.59 | 0.76 |
| Liguria | 0.75 | 0.40 | 0.58 | 0.40 | 0.56 | 0.91 | 0.95 | 0.61 | 0.68 | 0.33 | 0.75 | 0.70 |
| Emilia Romagna | 0.70 | 0.33 | 0.47 | 0.51 | 0.53 | 0.82 | 0.79 | 0.67 | 0.71 | 0.51 | 0.09 | 0.17 |
| Toscana | 0.71 | 0.40 | 0.47 | 0.65 | 0.49 | 0.86 | 0.97 | 0.74 | 0.87 | 0.56 | 0.28 | 0.70 |
| Umbria | 0.87 | 0.51 | 0.59 | 0.71 | 0.72 | 0.86 | 0.94 | 0.62 | 0.92 | 0.25 | 0.53 | 0.43 |
| Marche | 0.56 | 0.52 | 0.50 | 0.74 | 0.58 | 0.88 | 0.93 | 0.45 | 0.87 | 0.62 | 0.21 | 0.43 |
| Lazio | 0.72 | 0.27 | 0.66 | 0.83 | 0.92 | 0.84 | 0.98 | 0.67 | 0.63 | 0.44 | 0.36 | 0.73 |
| Abruzzo | 0.77 | 0.54 | 0.64 | 0.62 | 0.68 | 0.96 | 1.00 | 0.39 | 0.81 | 0.40 | 0.46 | 0.44 |
| Molise | NA | 0.73 | 0.64 | 0.86 | NA | NA | NA | NA | NA | NA | NA | NA |
| Campania | 0.68 | 0.51 | 0.56 | 0.73 | 0.81 | 1.00 | 1.00 | 0.78 | 0.85 | 0.49 | 0.40 | 0.49 |
| Puglia | 0.92 | 0.71 | 0.57 | 0.90 | 0.93 | 0.97 | 0.99 | 0.44 | 0.79 | 0.61 | 0.69 | 0.33 |
| Basilicata | 0.43 | 0.59 | 0.44 | 0.64 | 0.67 | 1.00 | 0.91 | 0.28 | 0.65 | 0.47 | 0.70 | 0.37 |
| Calabria | 0.90 | 0.68 | 0.71 | 0.85 | 0.69 | 0.97 | 0.95 | 0.36 | 0.73 | 0.44 | 0.52 | 0.24 |
| Sicilia | 0.80 | 0.71 | 0.86 | 0.81 | 1.00 | 1.00 | 1.00 | 0.47 | 0.75 | 0.54 | 0.57 | 0.39 |
| Sardegna | 0.73 | 0.65 | 0.72 | 0.59 | 0.88 | 0.79 | 0.99 | 0.60 | 0.84 | 0.52 | 0.59 | 0.41 |
| National Average | 0.72 | 0.54 | 0.56 | 0.59 | 0.67 | 0.79 | 0.92 | 0.59 | 0.75 | 0.50 | 0.48 | 0.47 |

**Notes**: all the available forms of precipitations are considered: hail, fog, snow, snow storm, rain, showers, or combinations of them. So a sunny day will be defined as a day when none of these conditions occur.

**Table 5: Tobit estimates (time of work and leisure) and OLS estimates (Sleep - no censoring occurring). All dependent variables are expressed in minutes.**

| | Market work | | Domestic work | | Leisure | | Sleep and personal care (OLS) | |
|---|---|---|---|---|---|---|---|---|
| | **Coefficients** | **s.e.** | **Coefficients** | **s.e.** | **Coefficients** | **s.e.** | **Coefficients** | **s.e.** |
| Sun | -49.07** | (23.13) | 5.343 | (4.543) | 12.90** | (6.361) | 6.676 | (4.802) |
| Self-employed | 111.5*** | (22.43) | -23.92*** | (5.921) | -35.24*** | (7.099) | -4.327 | (5.527) |
| Interaction ($\delta$) | -27.92* | (15.66) | -5.554 | (7.560) | 19.13** | (8.437) | 2.766 | (6.136) |
| Female | -118.3*** | (9.868) | 189.9*** | (4.303) | -79.72*** | (3.475) | -6.118** | (2.640) |
| Married | 1.714 | (15.60) | 49.80*** | (4.891) | -26.66*** | (4.981) | -2.242 | (3.976) |
| Kids 6-13 years | -10.52 | (16.78) | 30.03*** | (4.873) | -9.773** | (4.542) | -5.916 | (1.789) |
| Kids<=5 years | -54.05*** | (16.86) | 113.5*** | (5.083) | -47.31*** | (5.061) | -4.700 | (1.080) |
| # of hh members | 4.843 | (7.816) | -6.373*** | (2.208) | 1.855 | (2.388) | -2.930** | (0.0129) |
| Age | 5.220 | (3.561) | 11.74*** | (1.235) | -6.301*** | (0.987) | -2.668** | (1.080) |
| Age^2 | -0.0802* | (0.0443) | -0.106*** | (0.0139) | 0.0789*** | (0.0116) | 0.0219* | (0.0126) |
| **Education dummies** | | | | | | | | |
| University | -15.66 | (21.01) | -10.22* | (5.368) | 16.97*** | (5.156) | 1.346 | (4.724) |
| High-school | -33.95** | (14.90) | 7.273* | (4.421) | 6.406 | (4.425) | -2.213 | (4.073) |
| Less than h-s | | | (omitted) | | (omitted) | | (omitted) | |
| **Industry dummies** | | | | | | | | |
| PA & Defense | -23.22 | (21.67) | 9.455 | (6.368) | 12.67* | (6.809) | -11.66** | (5.637) |
| Commerce | 127.7*** | (20.77) | -22.41*** | (5.382) | -21.18*** | (6.159) | -20.68*** | (5.623) |
| Construction | -39.44 | (24.52) | -8.069 | (6.392) | 14.98** | (7.512) | 8.042 | (5.595) |
| Manufacturing | 17.09 | (20.56) | 21.21*** | (5.642) | 0.167 | (6.329) | -22.18*** | (4.420) |
| Oil and mining | -61.77*** | (18.86) | 12.74** | (4.984) | 9.707* | (5.713) | 1.457 | (4.379) |
| Other services | 51.51 | (55.07) | 3.817 | (18.88) | -34.94** | (14.93) | -7.959 | (12.14) |
| Health&edu | (omitted) | | (omitted) | | (omitted) | | (omitted) | |
| **Month dummies** | | | | | | | | |
| January | -6.248 | (29.47) | -6.871 | (6.688) | 10.52 | (11.13) | 15.91*** | (5.713) |
| February | 40.65* | (21.99) | -10.96 | (8.414) | 0.780 | (8.798) | 1.024 | (5.484) |
| March | 12.29 | (21.19) | -4.401 | (7.199) | -6.672 | (8.391) | 15.34** | (6.756) |
| April | -2.745 | (30.29) | -6.692 | (7.560) | -5.477 | (9.836) | 12.81* | (6.640) |
| May | 54.13 | (35.34) | -2.838 | (7.356) | -8.501 | (12.18) | -4.180 | (6.121) |
| June | -0.230 | (23.93) | -14.85* | (7.944) | 12.22* | (6.835) | -3.417 | (5.519) |
| July | -15.46 | (24.06) | -21.22*** | (6.951) | 17.01* | (9.970) | 13.39** | (6.830) |
| August | -98.86*** | (24.12) | -17.35** | (8.508) | 51.11*** | (9.663) | -0.157 | (7.378) |
| September | 31.30 | (23.21) | -23.34*** | (7.391) | -1.441 | (7.626) | 9.770* | (4.994) |
| October | 42.09* | (24.38) | -14.96** | (7.515) | -10.92 | (6.760) | 8.000 | (7.038) |
| November | -24.35 | (29.27) | 1.871 | (9.339) | 1.995 | (7.374) | 14.81** | (6.767) |
| December | | | (omitted) | | (omitted) | | (omitted) | |
| **Region dummies** | | | | | | | | |
| Piemonte-VDA | 13.54 | (28.02) | 18.85* | (10.58) | -8.225 | (7.913) | -11.05 | (7.733) |
| Lombardia | -3.587 | (28.75) | 1.063 | (10.45) | 3.645 | (8.191) | -2.506 | (7.664) |
| Trentino | -34.14 | (30.49) | 4.817 | (12.07) | 12.78 | (8.434) | -6.929 | (8.745) |
| Veneto | 21.67 | (30.47) | 11.00 | (11.77) | -11.72 | (7.150) | -9.849 | (8.459) |
| Friuli | -11.18 | (43.82) | 33.52** | (13.17) | -9.006 | (11.80) | -6.576 | (9.355) |
| Liguria | 10.35 | (33.70) | 4.809 | (11.87) | 0.0847 | (10.52) | -14.57 | (12.16) |
| Emilia R | -10.62 | (27.81) | 8.430 | (11.57) | -11.76 | (7.696) | 0.00845 | (9.036) |
| Toscana | 16.17 | (28.88) | 5.164 | (10.64) | -4.253 | (9.748) | -4.554 | (9.652) |
| Umbria | 22.87 | (32.61) | 7.899 | (11.86) | -1.711 | (10.16) | -7.659 | (10.50) |
| Marche | -27.65 | (36.84) | 1.495 | (12.45) | 11.71 | (10.26) | -3.734 | (9.120) |
| Lazio | 61.65* | (36.66) | -9.351 | (10.60) | -19.41 | (12.09) | -6.603 | (9.207) |
| Abruzzo | 24.06 | (35.40) | -3.116 | (11.21) | -7.234 | (11.63) | -1.693 | (11.35) |
| Molise | 61.79** | (28.39) | -10.12 | (13.20) | -2.853 | (8.998) | -18.72 | (11.99) |
| Campania | 96.11*** | (30.76) | -40.98*** | (11.86) | -12.13 | (9.880) | -13.86* | (8.202) |
| Puglia | 80.29** | (34.02) | -30.46*** | (10.94) | 3.901 | (12.16) | -27.81*** | (10.46) |
| Basilicata | 36.16 | (29.91) | -14.41 | (15.38) | -4.403 | (10.23) | -14.85* | (8.718) |
| Calabria | 34.26 | (35.28) | -29.54** | (14.04) | 5.377 | (10.34) | -6.940 | (7.794) |
| Sardinia | 33.70 | (28.62) | -22.02* | (12.02) | -3.064 | (9.891) | 6.684 | (8.794) |
| Sicily | (omitted) | | (omitted) | | (omitted) | | (omitted) | |
| Constant | 161.5** | (81.29) | -453.0*** | (29.64) | 505.8*** | (23.93) | 781.5*** | (23.39) |
| Observations | 12,780 | | 12,780 | | 12,780 | | 12,780 | |

Clustered standard errors in parentheses. Clusters represent regions and months. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 6: OLS estimates of the effect of sun on intertemporal labour supply (Equation 2).**

| | $w_i(t) - w_i(t-1)$ | |
|---|---|---|
| | **Coefficients** | **Standard errors** |
| ΔSun(t) | -26.11*** | (6.514) |
| Self×ΔSun (-1) | -32.00** | (14.547) |
| Observations | 13,571 | |

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 7: Tobit estimates: weather effects on leisure on sunny and rainy months**

| | Leisure Sunny months | | Leisure Rainy months | |
|---|---|---|---|---|
| | **Coefficients** | **Standard errors** | **Coefficients** | **Standard errors** |
| Sun | -7.212 | (8.477) | 27.54*** | (8.126) |
| Self-employed | -36.34*** | (13.17) | -32.82*** | (8.088) |
| Interaction ($\delta$) | 13.89 | (14.89) | 24.26** | (10.23) |
| Female | -75.94*** | (4.941) | -83.71*** | (4.795) |
| married | -28.79*** | (6.836) | -24.06*** | (6.912) |
| Kids 6-13 years | -1.680 | (5.995) | -16.49** | (6.070) |
| Kids<=5 years | -53.19*** | (7.921) | -41.04*** | (3.312) |
| # of household members | 3.431 | (3.214) | -0.302 | (1.402) |
| Age | -7.778*** | (1.377) | -4.788*** | (1.653) |
| Age^2 | 0.0927*** | (0.0168) | 0.0641*** | (0.0160) |
| **Education dummies** | | | | |
| University degree | 35.45*** | (6.921) | 1.124 | (6.566) |
| High-school | 9.446 | (6.231) | 4.939 | (5.915) |
| Less than high-school | (omitted) | | (omitted) | |
| **Industry dummies** | | | | |
| PA & Defense | 26.71** | (10.39) | -0.339 | (8.601) |
| Commerce | -14.06* | (7.271) | -28.37*** | (8.992) |
| Construction | 22.13** | (11.16) | 6.773 | (9.634) |
| Manufacturing | 2.098 | (8.471) | -2.801 | (8.833) |
| Oil and mining | 7.343 | (6.958) | 11.71 | (8.519) |
| Other services | -44.81* | (24.90) | -30.97* | (18.25) |
| Health & education | (omitted) | (omitted) | (omitted) | |
| **Month dummies** | | | | |
| January | | | 9.571 | (11.32) |
| February | 11.79 | (9.003) | | |
| March | | | -7.986 | (8.031) |
| April | | | -7.268 | (9.907) |
| May | | | -10.29 | (12.01) |
| June | 21.20*** | (5.456) | | |
| July | 29.49*** | (7.836) | | |
| August | 66.94*** | (7.416) | | |
| September | 7.392 | (6.494) | | |
| October | | | | |
| November | | | 1.942 | (7.649) |
| December | | | | |
| **Region dummies** | | | | |
| Piemonte - Val d'Aosta | -1.216 | (9.428) | -16.57 | (10.28) |
| Lombardia | 4.912 | (8.632) | 1.041 | (10.77) |
| Trentino | 9.440 | (7.756) | 12.79 | (10.35) |
| Veneto | -5.620 | (5.479) | -15.13 | (10.83) |
| Friuli | 14.18 | (17.89) | -31.87** | (13.02) |
| Liguria | 2.646 | (9.171) | -1.472 | (15.93) |
| Emilia Romagna | 0.0830 | (8.403) | -22.71** | (9.860) |
| Toscana | 12.30 | (8.100) | -18.48 | (15.71) |
| Umbria | 8.057 | (12.78) | -6.604 | (14.19) |
| Marche | 23.85* | (13.19) | 0.883 | (13.95) |
| Lazio | 2.819 | (13.84) | -35.96** | (16.37) |
| Abruzzo | 12.50 | (14.87) | -25.74 | (16.93) |
| Molise | 29.77*** | (11.32) | -34.04** | (9.624) |
| Campania | 4.616 | (8.107) | -27.91* | (15.53) |
| Puglia | 19.57** | (8.354) | -11.69 | (21.85) |
| Basilicata | 12.78 | (14.94) | -23.86** | (10.87) |
| Calabria | 26.15* | (14.41) | -16.28 | (10.66) |
| Sardegna | 22.40* | (12.73) | -27.76*** | (10.56) |
| Sicilia | (omitted) | | (omitted) | |
| Constant | 517.2*** | (32.66) | 491.6*** | (34.35) |
| Observations | 6,438 | | 6,342 | |

Clustered standard errors in parentheses. Clusters represent regions and months. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 8: Tobit estimates: weather effects on leisure on sunny and rainy months/regions**

| | Leisure Dry month/regions | | Leisure Rainy month/regions | |
|---|---|---|---|---|
| | **Coefficients** | **Standard errors** | **Coefficients** | **Standard errors** |
| Sun | 11.58 | (9.458) | 13.65 | (8.402) |
| Self-employed | -13.76 | (14.45) | -46.62*** | (7.554) |
| Interaction ($\delta$) | 0.183 | (15.76) | 27.68** | (10.87) |
| Female | -81.51*** | (5.127) | -78.07*** | (4.608) |
| Married | -29.71*** | (8.606) | -23.66*** | (6.210) |
| Kids 6-13 years | -5.510 | (5.836) | -13.56** | (6.930) |
| Kids<=5 years | -40.92*** | (7.058) | -51.74*** | (7.267) |
| # of household members | -0.500 | (3.244) | 3.172 | (3.321) |
| Age | -5.946*** | (1.544) | -6.730*** | (1.326) |
| Age^2 | 0.0715*** | (0.0187) | 0.0864*** | (0.0149) |
| **Education dummies** | | | | |
| University degree | 19.56*** | (7.027) | 14.66** | (7.339) |
| High-school | 15.30*** | (5.261) | -1.713 | (6.728) |
| Less than high-school | (omitted) | | | |
| **Industry dummies** | | | | |
| PA & Defense | 29.51*** | (9.100) | -6.633 | (9.840) |
| Commerce | -24.66*** | (7.271) | -18.69** | (9.188) |
| Construction | 22.54** | (9.320) | 9.401 | (11.19) |
| Manufacturing | 5.511 | (7.483) | -4.939 | (9.363) |
| Oil and mining | 17.88** | (8.580) | 2.639 | (7.269) |
| Other services | -52.79*** | (20.43) | -17.26 | (21.93) |
| Health & education | (omitted) | | | |
| **Month dummies** | | | | |
| January | 18.18 | (21.27) | 1.673 | (12.32) |
| February | -4.910 | (16.57) | 4.980 | (10.00) |
| March | -11.53 | (17.99) | -1.265 | (9.159) |
| April | -36.63** | (16.13) | 2.702 | (9.412) |
| May | 3.034 | (15.98) | -14.05 | (13.60) |
| June | 14.95 | (14.39) | 6.042 | (7.554) |
| July | 25.15* | (15.01) | -4.507 | (16.74) |
| August | 50.19*** | (16.01) | | |
| September | -7.136 | (15.93) | 2.143 | (12.25) |
| October | -11.69 | (14.92) | -19.21** | (8.504) |
| November | -8.632 | (22.69) | 0.586 | (8.013) |
| December | (omitted) | | | |
| **Region dummies** | | | | |
| Piemonte - Val d'Aosta | -1.215 | (14.31) | -19.26 | (12.00) |
| Lombardia | 7.087 | (13.49) | -3.940 | (12.97) |
| Trentino | 8.430 | (9.818) | 27.29 | (17.31) |
| Veneto | -17.39 | (8.192) | -21.34* | (11.87) |
| Friuli | -9.949 | (16.87) | -24.09 | (16.52) |
| Liguria | -2.759 | (14.20) | -9.440 | (15.58) |
| Emilia Romagna | -13.65 | (11.05) | -22.36* | (11.56) |
| Toscana | -8.706 | (11.76) | -12.81 | (16.98) |
| Umbria | -15.62 | (15.21) | 0.0621 | (13.98) |
| Marche | 12.72 | (13.86) | -3.633 | (14.71) |
| Lazio | -3.488 | (14.19) | -44.10*** | (15.83) |
| Abruzzo | 8.843 | (13.19) | -38.96*** | (13.87) |
| Molise | 0.626 | (10.64) | | |
| Campania | -6.604 | (10.69) | -39.14*** | (12.16) |
| Puglia | 2.622 | (11.33) | -3.817 | (29.02) |
| Basilicata | 0.807 | (15.94) | -28.75** | (12.20) |
| Calabria | 9.931 | (13.37) | -9.430 | (15.50) |
| Sardegna | -7.577 | (10.85) | 6.406 | (15.19) |
| Sicilia | (omitted) | | (omitted) | |
| Constant | 505.3*** | (38.70) | 525.2*** | (32.38) |
| Observations | 6,762 | | 6,018 | |

Clustered standard errors in parentheses. Clusters represent regions and months. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 9: Share of paid-workers with flexible work schedules across industries**

| Industry | Men | Women |
|---|---|---|
| Mining | 0.54 | 0.76 |
| Manufacturing | 0.38 | 0.41 |
| Construction | 0.31 | 0.52 |
| Commerce | 0.47 | 0.40 |
| Health and education services | 0.45 | 0.35 |
| Public administration and defense | 0.49 | 0.61 |
| Other services | 0.52 | 0.50 |

Source: 2008/09 Italian TUS

**Table 10: Tobit estimates**
**Wage/salary workers with different levels of work-schedule flexibility**

| | Total work= market+domestic work | | Leisure | |
|---|---|---|---|---|
| | **Coefficients** | **Standard errors** | **Coefficients** | **Standard errors** |
| Sun | -9.368 | (11.37) | 9.249 | (6.290) |
| Flex | 29.29** | (15.17) | -13.33 | (8.234) |
| Interaction ($\delta$) | -40.10** | (18.09) | 18.73** | (8.927) |
| Female | 93.71*** | (8.346) | -80.81*** | (4.004) |
| Kids 6-13 years | 20.15*** | (7.651) | -10.48** | (4.450) |
| Kids<=5 years | 75.60*** | (9.125) | -49.88*** | (5.379) |
| Age | 5.560* | (3.115) | -5.839*** | (1.470) |
| Age^2 | -0.0567 | (0.0359) | 0.0713*** | (0.0171) |
| **Education dummies** | | | | |
| University degree | 6.326 | (10.43) | 1.672 | (7.261) |
| High-school | 12.72 | (12.98) | 1.029 | (5.415) |
| Less than high-school | (omitted) | | | |
| **Industry dummies** | | | | |
| PA & Defense | -40.87 | (28.75) | 5.272 | (7.335) |
| Commerce | -3.040 | (26.09) | -16.26*** | (5.937) |
| Construction | -62.45** | (26.48) | 8.624 | (9.258) |
| Manufacturing | -17.96 | (25.52) | -7.247 | (5.688) |
| Oil and mining | -73.12*** | (26.21) | 12.60** | (6.053) |
| Other services | omitted | | -28.14* | (16.65) |
| **Season dummies** | | | | |
| Winter | 18.13 | (14.57) | 7.141 | (5.622) |
| Spring | 47.45*** | (12.03) | -6.838 | (6.743) |
| Fall | (omitted) | | 24.98*** | (5.925) |
| Summer | 22.86** | (9.027) | | |
| **Region dummies** | | | | |
| Piemonte - Val d'Aosta | 3.241 | (20.84) | 0.382 | (8.515) |
| Lombardia | -15.14 | (21.92) | 10.69 | (8.801) |
| Trentino | -40.13* | (21.09) | 23.20** | (9.478) |
| Veneto | 7.352 | (22.85) | -0.845 | (8.319) |
| Friuli | 1.808 | (21.90) | -4.928 | (10.50) |
| Liguria | 1.440 | (22.47) | 12.83 | (9.650) |
| Emilia Romagna | -23.77 | (21.00) | 2.184 | (9.325) |
| Toscana | 7.938 | (21.54) | 3.740 | (10.73) |
| Umbria | -5.368 | (25.31) | 6.463 | (11.48) |
| Marche | -20.75 | (24.71) | 16.64 | (11.87) |
| Lazio | 7.753 | (36.68) | -14.00 | (13.55) |
| Abruzzo | 2.519 | (25.67) | 4.379 | (13.50) |
| Molise | 9.461 | | 17.16 | (10.46) |
| Campania | -12.06 | (23.46) | 1.423 | (10.47) |
| Puglia | -19.07 | (21.60) | 18.52* | (10.69) |
| Basilicata | -9.043 | (23.64) | 23.02* | (11.92) |
| Calabria | 7.649 | (23.74) | 8.319 | (13.65) |
| Sardinia | -6.282 | (20.39) | -6.288 | (12.30) |
| Sicily | (omitted) | (21.52) | | |
| **Occupation dummies** | | | | |
| Top management | -67.68 | (47.93) | 61.35* | (34.28) |
| Management | -76.61 | (46.45) | 60.07* | (33.58) |
| Primary and high-school teacher | -88.06* | (49.65) | 71.21** | (34.83) |
| Professor | -105.4** | (46.57) | 70.86** | (33.44) |
| Employee – white collar | -76.97* | (46.08) | 57.21* | (32.95) |
| Employee – blue collar | -41.00 | (47.64) | 40.48 | (34.42) |
| Worker on probation | -45.36 | (53.08) | 43.27 | (38.54) |
| Married | 35.91*** | (9.505) | -20.53*** | (4.838) |
| Part-time | -34.83*** | (8.556) | 15.22*** | (5.780) |
| Constant | 199.0** | (83.38) | 449.1*** | (46.39) |
| Observations | 11,190 | | 11,190 | |

Clustered standard errors in parentheses. Clusters represent regions and months. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 11: Tobit estimates, allocation of time on non-working days**

| | (1) **Outdoor leisure** | (2) **Socializing** | (3) **Indoor leisure** | (4) **Domestic work** |
|---|---|---|---|---|
| Sun | 26.41*** | 15.64** | -15.92*** | -12.72* |
| | (8.504) | (6.309) | (5.977) | (6.833) |
| Self-employed | 26.80 | 1.715 | -17.21 | -18.13 |
| | (17.51) | (12.47) | (13.03) | (15.06) |
| Interaction ($\delta$) | -4.664 | 10.87 | 16.51 | -30.81 |
| | (22.28) | (16.40) | (16.12) | (19.07) |
| Female | -45.95*** | -31.89*** | -80.59*** | 184.1*** |
| | (8.003) | (6.184) | (5.573) | (6.703) |
| married | -11.35 | -26.64*** | 0.135 | 56.96*** |
| | (10.45) | (7.577) | (7.453) | (8.542) |
| Kids 6-13 years | -3.786 | -2.460 | -10.55 | 28.39*** |
| | (9.985) | (7.255) | (6.741) | (8.309) |
| Kids<=5 years | -17.22* | -57.58*** | -13.46** | 132.4*** |
| | (10.19) | (7.132) | (6.774) | (8.806) |
| # of household members | -1.213 | 0.372 | 6.577* | -9.812** |
| | (4.678) | (3.425) | (3.402) | (3.810) |
| Age | 0.265 | -5.565*** | -0.572 | 11.55*** |
| | (2.450) | (1.947) | (2.030) | (2.077) |
| Age^2 | -0.000245 | 0.0443* | 0.0326 | -0.0963*** |
| | (0.0283) | (0.0227) | (0.0238) | (0.0241) |
| **Education dummies** | | | | |
| University degree | 25.76** | 6.255 | 9.030 | -23.74** |
| | (11.92) | (9.000) | (8.436) | (10.32) |
| High-school | 4.952 | -2.888 | 3.314 | -6.948 |
| | (8.860) | (6.715) | (6.491) | (7.299) |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| Industry dummies | Y | Y | Y | Y |
| **Region dummies** | | | | |
| Northern regions | -6.673 | -36.61*** | 14.56** | 26.33*** |
| | (8.758) | (6.908) | (6.177) | (7.872) |
| Southern regions | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | 20.84 | 367.9*** | 220.0*** | -415.3*** |
| | (57.06) | (42.97) | (45.32) | (47.27) |
| Observations | 3,453 | 3453 | 3,453 | 3,453 |

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 12: Tobit estimates. Dependent variables: time spent shopping in minutes and time spent driving for shopping in minutes.**

| | (1) Time shopping | | (2) Time driving for shopping | |
|---|---|---|---|---|
| | **Coefficients** | **Standard errors** | **Coefficients** | **Standard errors** |
| Self-employed | -23.23*** | (3.678) | -12.10*** | (1.769) |
| Female | 24.04*** | (3.032) | 13.58*** | (1.626) |
| Age | 5.115*** | (0.968) | 2.432*** | (0.389) |
| Age^2 | -0.0449*** | (0.0107) | -0.0200*** | (0.00462) |
| **Education dummies** | | | | |
| Less than high-school | -10.99** | (4.311) | -5.221** | (2.448) |
| High-school | -0.670 | (4.083) | -1.173 | (2.098) |
| University degree | (omitted) | | (omitted) | |
| **Industry dummies** | | | | |
| PA & Defense | -2.284 | (6.672) | 0.586 | (2.515) |
| Commerce | -12.52*** | (4.875) | -6.809*** | (2.110) |
| Construction | -9.076 | (5.610) | -2.913 | (2.603) |
| Manufacturing | -2.198 | (4.940) | -0.893 | (2.432) |
| Oil and mining | 7.616* | (4.351) | 3.889** | (1.980) |
| Other services | 1.661 | (13.12) | 3.580 | (6.591) |
| Health & education | (omitted) | | (omitted) | |
| Kids<=5 years | -0.0886 | (3.661) | 2.551 | (2.077) |
| Kids 6-13 years | 2.208 | (2.860) | -0.251 | (1.387) |
| **Region dummies** | | | | |
| Piemonte - Val d'Aosta | 10.24 | (7.498) | 4.173 | (3.744) |
| Lombardia | -3.308 | (7.587) | -1.785 | (3.533) |
| Trentino | -15.14** | (7.709) | -6.606* | (3.642) |
| Veneto | -1.745 | (8.677) | 0.0398 | (4.219) |
| Friuli | 2.080 | (9.233) | 2.173 | (4.292) |
| Liguria | -2.977 | (7.699) | -0.501 | (4.006) |
| Emilia Romagna | -1.036 | (8.045) | 0.328 | (3.683) |
| Toscana | -7.690 | (7.660) | -3.849 | (3.720) |
| Umbria | -4.765 | (9.997) | -1.970 | (5.354) |
| Marche | 2.968 | (9.069) | 1.249 | (4.343) |
| Lazio | 18.20 | (12.34) | 6.006 | (4.156) |
| Abruzzo | -1.190 | (7.676) | -2.297 | (3.930) |
| Molise | -10.10 | (9.828) | -5.674 | (4.529) |
| Campania | -4.443 | (8.721) | -1.082 | (4.152) |
| Puglia | -7.735 | (8.241) | -4.453 | (4.183) |
| Basilicata | -25.01*** | (9.502) | -7.721* | (4.688) |
| Calabria | -20.56*** | (10.43) | -8.234* | (4.782) |
| Sardinia | -3.732 | (7.642) | -2.434 | (4.096) |
| Sicily | (omitted) | | (omitted) | |
| **Month dummies** | | | | |
| January | -11.78* | (6.207) | -7.883** | (2.972) |
| February | -16.92*** | (6.823) | -10.69*** | (3.016) |
| March | -14.78** | (5.026) | -7.844** | (3.682) |
| April | -18.57*** | (5.061) | -9.499*** | (3.166) |
| May | -23.22*** | (6.526) | -13.55*** | (3.141) |
| June | -21.69*** | (5.483) | -13.12*** | (2.831) |
| July | -22.27*** | (5.419) | -11.65*** | (3.336) |
| August | -3.117 | (13.90) | -7.294** | (3.115) |
| September | -20.40*** | (4.421) | -11.98*** | (2.744) |
| October | -24.77*** | (6.722) | -12.10*** | (3.051) |
| November | -7.103 | (6.582) | -5.670* | (3.145) |
| December | (omitted) | | (omitted) | |
| Week-day | -33.25*** | (3.823) | -16.24*** | (1.777) |
| Constant | -161.1*** | (20.82) | -85.90*** | (9.247) |
| Observations | 14,879 | | 14,879 | |

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

# 2 The Added Worker Effect for Married Women in Italy

## 2.1 Introduction

Since the second quarter of 2008 the Italian economy has performed poorly: between 2008 and 2012 the country lost more than 6 percent of its real GDP (Figure 7). The consequences of this prolonged crisis on the labour market have been severe, with a significant worsening since the third quarter of 2011. In particular, 2012 was characterized by a significant surge of the unemployment rate (10.7 percent, 4.6 percentage points higher than in 2007). The increase in unemployment was associated with a sharp increase in female labour force participation: in the North it went from 59.7 in 2007 to 62.3 in 2012, in the South went from 36.6 to 39.3 in the same years. The increase in female labour force participation may be a manifestation of the Added Worker Effect (AWE, henceforth). By AWE we refer to the increase in labour supply of married women due to their husband's job loss.

Among the OECD countries, Italy shows one of the lowest female labour force participation rates. In 2012 only 53.5 percent of women between 15 and 64 year participated in the labour force. Italy is also characterized by wide regional disparities: in the North the female participation rate is about 62.3 percent, 23 percentage points higher than in the South. The participation rate of married women in 2012 was 59 percent, a 3 percentage point increase over 2007. This increase is mostly due to the change in participation rates between 2011 and 2012. The economic crisis hit married men: in 2012 their unemployment rate was 4.7 percent, against only 1.9 percent in 2007, and the probability of transition from employment to unemployment more than doubled in a few years (Figure 8). In 2006 the probability of an employed married man becoming unemployed within 12 months was 1.5 percent; the same probability between 2011 and 2012 reached 3.6 percent. All these factors, together with the tight borrowing constraints that the current fragility of the banking system is imposing on Italian households, provide indeed conditions for finding a significant AWE. The literature shows mixed results, with some studies finding almost no AWE and other studies finding some AWE. Italy may therefore represent an upper-bound on the magnitude of AWE in countries around the World.

We address whether the AWE is a relevant phenomenon for the Italian economy by exploiting retrospective questions provided in the new labour force survey which begun in 2004. Retrospective questions allow the identification of transitions between labour market states. In particular we study how the wife's probability of joining the labour force and that of becoming employed are influenced by her husband's job loss. Moreover, unlike previous studies on the AWE, we estimate how the full transition matrix between labour market states is affected by the husband's job loss.

The dataset provides information on the reason for the husband's job loss. This information allows us to distinguish between expected and unexpected job losses. This distinction is crucial for estimating the AWE for two reasons. The first one is that when the husband's job loss is fully anticipated, likely we do not observe any change in the wife's behaviour after the husband's transition occurs. That is because she may have acted before the occurrence of the husband's transition. The second reason is the AWE depends on the magnitude of the income loss. For instance, when the husband retires the income loss is usually relatively small, whereas when he quits his job for a health reason the income loss is likely to be large. During a deep recession the identification of the AWE is easier. In fact, the occurrence of the husband's transition from employment to unemployment is more random than in normal times, when the job loss is more likely to hit workers with low productivity. Moreover, during recessions the magnitude of the income loss is larger, due to the longer unemployment spells.

Our results show that the husband's job loss significantly affects both the wife's probability of becoming employed and that of entering the labour force. In particular, the wife's probability of finding a job within a year increases by 2.1 percentage points when the husband is laid off. The probability of joining the labour force significantly increases by 3.4 percentage points. Large and statistically significant responses are also found when the husband quits his job for health reasons.

The estimated transition matrices show clear positive assortative mating between spouses. High skilled men with low risk of being laid off are more likely to marry high skilled easily employable women. The AWE is particularly relevant for participation in the labour force: the transition probability from unemployment to inactivity is significantly lower when the husband loses his job.

Finally, we also provide a description of one of the possible factors limiting a wife's response. In particular, focusing on mothers, we find positive and significant correlation between the magnitude of the AWE at the regional level and local provision of child care services.

In section 2.2 we present the relevant related literature. Section 2.3 contains information on the data used for the analysis and descriptive statistics of the selected sample. In section 2.4 we discuss the identification strategy. Section 2.5 shows the results for the AWE and transition matrices between labour market states. Section 2.6 discusses the role of child care services as a potential factor limiting wife's labour supply response. Section 2.7 concludes.

## 2.2 Literature

The theoretical framework for studying the increase in a married woman's labour supply in response to her husband's job is provided by an extension of the standard life-cycle model of labour supply with uncertainty (Stephens, 2002). The relevance of the AWE in a life-cycle model crucially depends on the magnitude of the income loss due to the husband's unemployment spell, on the family wealth and on the magnitude of income elasticity of labour supply in the short-run. When the labour market is efficient and unemployment spells are short, a significant response of the wife's labour supply is unlikely to be found since the household can smooth the income loss over the life-cycle. However, the literature has noted at least two possible mechanisms preventing the smoothing of the income loss. The first and more traditional mechanism is due to inefficiency of the financial market (Lundberg, 1985). If households face tight borrowing constraints, in particular when the main income recipient loses his labour income, the welfare cost of even short unemployment spells can be high, leading to a significant labour supply response of other household members. The second and more recently highlighted mechanism points out the role of consumption commitments, which magnifies the effect of even small inefficiencies in the financial market (Chetty and Szeidl, 2007). In fact, when a relevant fraction of total household expenditure cannot easily be reduced in the short term (consumption commitments) the welfare cost associated with unemployment is high, leading to larger income elasticity of labour supply than usually found in the literature (Blundell and MaCurdy 1999). The impact of credit constraints and consumption commitments are, however, mitigated by the generosity of unemployment benefits (Cullen and Gruber, 2000). Yet, unemployment benefits are temporary. Hence, even in the presence of rich unemployment benefits, the wife's response may be significant if she expects her husband's unemployment spell to be long. The role of credit constraints on the wife's labour supply have also been studied in a similar context under the "family investment hypothesis" (Cobb-Clark and Crossley, 2004). According to this hypothesis, a wife may join (temporarily) the labour force to allow her husband to invest in human capital. This hypothesis seems to be particularly relevant for

immigrants, whose skills are not perfectly transferrable across countries (Baker and Benjamin, 1997).

Formal unemployment benefits in Italy are not very generous: the replacement rate is 40 per cent for a period up to seven months. Moreover, only workers who have been employed for at least 52 weeks in the 2 years before the unemployment spell are eligible for receiving the benefit. However, formal unemployment benefit is not the most common form of assistance to individuals with temporary difficulties. The redundancy fund (*Cassa Integrazione Guadagni*) is currently the main program. It covers workers who are suspended from work for temporary difficulties of the firm. This program became the main way to support "workless" workers during the economic crisis started in 2008. We use the expression "workless workers" because individuals benefiting from the redundancy fund are actually still formally employed with their last employer, even though they often do not work at all (sometimes the redundancy fund is used to reduce temporarily the hours of work). For the majority of these workers the probability of returning to their job is very low, and their situation is very similar to that of unemployed individuals. The redundancy fund can however last for much longer than the regular unemployment benefit (in special cases even up to five years).

The empirical literature on the AWE presents mixed evidence. On the one hand, some of the studies find negligible impacts of the husband's job loss (Mincer, 1962; Heckman and MaCurdy, 1980 and 1982). However, these studies do not distinguish between partners who recently experienced job losses and those who are long-term unemployed. Without this distinction it is hard to estimate a pure AWE. More recent work, which uses the husband's actual transitions from employment to unemployment, finds a significant AWE in different countries: USA (Stephens, 2002), Canada (Morissette and Ostrovsky, 2009), Australia (Xiaodong, 2011).

Congregado et al. (2011) study the AWE after the big slump of the Spanish economy, which started in the third quarter of 2009. They exploit aggregate data to find that the AWE dominates the discouraged-worker effect when the unemployment rate is not too high. We try to exploit the recession that hit Italy almost at the same time as Spain. The deep and long recession has increased the incidence of job loss among husbands, which helps us identifying the AWE. Unlike Congregado et al. (2011), we use micro-data, which allows us to account for the other relevant socio-demographic factors affecting a wife's labour supply.

The study of the AWE sheds more light on the long lasting problem of low female labour force participation in Italy. Among the main factors for low female labour force participation in Italy we find the low-level of education of women, in particular till the 1990s, the lack of child care

services, and the culture[8] (Del Boca et al., 2000). Child care in Italy is heavily subsidized, and there are long queues for spots in child care facilities. When formal child care is not available, informal child care becomes the common substitute. Informal care is often given by grandparents. It is known that when one of them lives near the family, the demand for formal child care is significantly reduced (Del Boca et al., 2005). However, the recent reform of the retirement system (2011) and the demographic changes of Italian families, in particular the reduction of the average number of household members, could potentially limit the possibility of choosing informal child-care in the future. We explore the relation between the AWE and the child care services provision, which highlights one channel through which the welfare effects of future recessions could be larger. In fact, any factors limiting the ability of the wife to respond to income shocks hitting other family members reduce the effectiveness of marriage as an insurance mechanism.

## 2.3 Data

The Italian Labour Force Survey (LFS henceforth) is conducted by the National Statistics Office (Istat). Interviews are continuously carried out in every week of the year. The population of interest is household members above age 15. About 70,000 households are interviewed for a total of 125,000 individuals each quarter. The Italian LFS was radically changed at the beginning of the last decade, and the new series started on January 2004. We use 36 quarters of this survey, from January 2004 to December 2012.

According to the rotation scheme of the Italian LFS, individuals stay in the survey for two quarters, skip for one quarter and return for the fourth quarter of their survey year. Therefore the structure of the data permits the study of quarterly and yearly transitions. However, only the full file provides the identifier that allows tracking people through time. With the standard file available to us we can study only yearly transitions by means of retrospective questions. These questions focus mainly on labour force status. This is the main source of information we use, and it allows the analysis of a wife's labour supply response to her husband's job loss. Unfortunately, we can study only responses in terms of the extensive margin and within the one year time window provided by the data. This means that we cannot study responses on the intensive margin, such as the increase of number of hours worked by a wife when her husband is laid off.

[8] The role of family background and culture is studied by analyzing the labour supply behavior of a woman and the behavior of her mother (or mother in law).

Since our interest is the labour supply of married women, the dataset is restricted to married individuals. Pooling together all quarters from 2004 to 2012, we obtain 961,000 married couples. Table 13 reports the descriptive statistics for women conditional on husband's work status. As expected, strong evidence of positive assortative mating emerges (people do not get married randomly). When the husband is employed, 55 percent of women are employed as well, against only 39 percent when the husband is unemployed. The husband's and wife's probability of being unemployed are also positively correlated. Only 36 percent of women with unemployed husband have more than primary education, against 57 percent for women with employed husbands. The regional distribution of couples with unemployed husband is uneven, with about sixty percent of them living in Southern regions.

The data confirm well-known facts about Italian economy, which is characterized by wide regional differences in terms of income, employment rate, female labour force participation and education.

## 2.4 Identification

### *2.4.1 Added worker effect*

The literature defines the AWE in two ways. The first one defines AWE as the increase in the transition probability from "non-employment" to employment for married women whose husband experienced a recent job loss. By "non-employment" we mean both unemployed and inactive individuals. The second one defines AWE as the increase in the probability of participating in the labour force for inactive women in case of husband's job loss. Joining the labour force means moving from being inactive to employed or unemployed.

The first measure of AWE, which studies transitions into employment, is however directly affected by labour demand as well. During recessions, not only are husbands at higher risk of being laid off, but work opportunities for wives are also reduced. Transition from inactivity to activity is on the other hand less affected by labour demand, even though discouragement could also attenuate wife's labour supply response during recessions. In this work we estimate the response in terms of both probabilities. We also go a step further, estimating the impact of husband's job loss on the full transition matrix for the wife's labour market states.

The main challenge in estimating the impact of the husband's job loss on the wife's labour supply is the construction of a credible counterfactual, namely what would have happened if the

husband had not lost his job. If both the factual and counterfactual situations were observable, the AWE would simply be:

$$\gamma = Pr\left(E_i{}^t = 1 \middle| L^t{}_i = 1, E_i^{t-1} = 0\right) - Pr\left(E_i^t = 1 \middle| L^t{}_i = 0, E_i^{t-1} = 0\right) \quad [2.1]$$

Where $E_i{}^t$ is an indicator dummy equal to one when wife *i* works at time *t*, and equal 0 otherwise. $L^t{}_i$ indicates whether her husband experienced a job-loss between *t-1* and *t*. Therefore, $\gamma$ provides a measure of the AWE, since it captures the difference between the transition probabilities from "non-employment" to employment in case the husband loses his job and in case he does not.

However, we cannot observe both the factual and the counterfactual situation; therefore some identifying assumptions are required. Since the same individual cannot be observed in both states, we adopt the sample of women whose husband did not lose his job to construct the counterfactual needed for estimating the AWE. The validity of this approach relies on the assumption that the conditioning vector *X* of observable characteristics removes systematic differences between the two groups. In effect, we assume that estimates for the AWE are not biased by unobservable characteristics:

$$\gamma = Pr\left(E_i{}^t = 1 \middle| L^t{}_i = 1, E_i^{t-1} = 0, X_i\right) - Pr\left(E_j^t = 1 \middle| L^t{}_j = 0, E_j^{t-1} = 0, X_j\right) \quad [2.2]$$

where $i \in T$ represents the sample of treated women and $j \in C$ represents the control group (no husband's job loss).

Assuming that [2.2] holds and provides unbiased estimates of $\gamma$, we estimate the wife's transition probability by a *logit* specification. The model can therefore be written as:

$$\Pr\left(E_i^t = 1\right) = \frac{e^{z_i^t}}{1+e^{z_i^t}} \quad [2.3]$$

and

$$Z_i^t = \alpha + L_i^t\beta + X_i^w\theta^w + X_i^h\theta^h + \lambda_i + \mu_i + \varepsilon_i$$

where $X_i^w$ and $X_i^h$ represent respectively wife's and husband's characteristics, $\lambda_i$ represent regional fixed effects and $\mu_i$ year fixed effects. The vector $\beta$ captures the AWE for each of the reasons for the husband's job loss (retirement, family reasons, dismissal, and health problems). We allow the standard errors to be correlated at the regional level.

According to the theory, the AWE is increasing in the size of income loss and on how unexpected the husband's job loss was. In particular, fully anticipated husband's transitions from employment to "non-employment" may produce very little posterior responses, since the action may well take place before the husband loses his job. In order to account for this implication of the theory and for the fact that some transitions are associated with small (if any) income losses, the vector $\beta$ provides an estimate of the AWE for each reason for the husband's job loss. The Italian LFS provides detailed information on the reason why a working individual at time *t-1* is "non-working" at *t*, when the interview in carried on. The first element of $\beta$ caputres the effect of husband's retirement between *t-1* and *t*. Retirement is usually a fully anticipated transition. The second element of $\beta$ captures the effect of the husband's job losses due to family reasons. These also are likely to be quite anticipated, since we can imagine a joint decision between the spouses. Finally, the third and fourth elements of $\beta$ capture the effect of two types of job losses that usually are less anticipated: dismissal and health problems. Our main focus will be on cases when the husband is dismissed by the employer.

### *2.4.2 Full transition matrix*

The standard approach to the AWE relies on the estimation of the effect of the husband's job-loss on the two transition probabilities discussed above. However, we can imagine that the probability of transition between any two labour market states is affected by the husband's job loss. In this section we estimate the full transition matrix between labour market states for women experiencing, or not, husband's job loss.

The empirical methodology adopted in this section follows previous work that estimated transitions between types of jobs and labour market states for immigrants (Skuterud and Su, 2012) or self-employment dynamics (Kuhn and Schuetze, 2001). In particular, we estimate the effect of husband's job loss on the wife's full transition matrix between labour market states assuming that such dynamics are approximated by a first-order Markov process. This assumption implies that all the relevant dynamics can be represented by a 3x3 matrix, where the labour market states are employment, unemployment and inactivity at time *t-1* and at time *t*. Given our data, the lag between *t-1* and *t* is 12 months. This means that our data do not allow us to identify action that is taking place between *t-1* and *t*. For instance, if the husband loses his job between *t-1* but he finds the new job before *t*, this transition is not captured in the data and in our estimation. The main LFS file, which allows tracking individuals over quarters, would partially solve this problem. Similarly, we are not able to identify cases when the wife was employed for a short period between *t-1* and *t*.

Each element of the transition matrix is estimated by a multinomial logit, restricting the sample to individuals in each of the origin states separately. For instance, to estimate the transitions from employment in *t-1* to all other states in *t*, we restrict the sample to individuals who are employed at *t-1*. To estimate transitions from unemployment and from inactivity we similarly restrict the sample to individuals who happened to be respectively in each of the two states at *t-1*.

The specification of the multinomial logit includes a dummy indicating whether the husband lost his job between *t-1* and *t*, a vector of spouse's characteristics, region and year fixed effects. Since the group of women whose husband lost his job shows different average observable characteristics from women whose husband did not lose his job and we are interested in isolating only the AWE, we construct the transition matrices as follow. We first obtain the marginal effects evaluated at the overall sample mean for each initial state. Then we calculate the value of each element of the two transition matrices adopting the sample means of wives with non-laid off husbands for both groups. We sum the estimated marginal effect of $\beta$ (evaluated at the mean) to each element of the transition matrix referred to women whose husband lost his job. Therefore, the difference between the transition matrices of the two groups of wives is entirely attributable to the estimated AWE.

## 2.5 Results

We begin by discussing the wife's response to the different types of husband's job loss. We first consider transitions from "non-employment" to employment. Individuals that are non-employed are either unemployed or inactive.

Table 14 reports estimated coefficients of the *logit* model [2.3]. The first column of coefficients refers to transitions from "non-employment" to employment. The second refers to transitions from the state active to inactive. The first coefficient provides an estimate of the AWE when the husband is laid off; the second coefficient refers to cases when the husband stops working for health problems; the third and the fourth coefficients report AWE estimates when the husband retires or when he quits his job for family reasons.

One of the main predictions of the theory is borne out in these estimates. In fact, when the husband's transition from employment to non-employment is anticipated and the income loss is small, the estimated AWE is very small and statistically insignificant. In particular, when the husband retires there is no response in terms of wife's labour supply. Similarly, when the husband stops working for family reasons, the estimated AWE is not significant.

On the other hand, when the husband is laid off we find a significant increase in the wife's transition probability from non-employment to employment. The estimated marginal effect at the mean implies that women whose husband was laid off between *t-1* and *t* are 2.1 percentage points more likely to become employed between *t-1* and *t*.

When the husband quits his job for health reasons, we also find a significant increase in the wife's probability of becoming employed: the estimated marginal effect at the mean implies an increase of 2.6 percentage points. It's interesting that in this latter case the response seems to be stronger than in the case when the husband is laid off. This supports the hypothesis that the response is stronger the higher the expected income loss. In fact, the income loss associated with a severe health problem is likely to be larger than the income loss associated to an unemployment spell, even when long-term unemployment is frequent.

The other covariates exhibit the expected signs: the higher the education of the wife, the higher her probability of becoming employed between *t-1* and *t*. The probability of transition is also higher in Northern regions, where the labour market is more efficient. The magnitude of the response is decreasing in both partners' age.

We now consider whether the probability of participating in the labour force for inactive women is affected by the husband's job loss. Here we consider the AWE in terms of the transition probability from inactivity to either unemployment or employment. It should be remarked that we are not considering the formal definition of unemployment. According to the ILO definition of unemployment adopted in Italy, an individual is statistically considered unemployed if the following conditions are satisfied: i) he is job-less, ii) he states that he wants to work iii) he did active job search in the last 4 weeks, iv) he is willing to start working within two weeks. The literature has shown that these conditions tend to underestimate significantly the number of actually unemployed people (Jones and Riddell, 1999; Brandolini et al, 2006). I therefore require only the first two conditions for considering an individual as unemployed. This choice solves another problem that is often discussed in the AWE literature. The discouraged worker effect tends to act in opposite direction of the AWE and can lead to significant attenuation of these estimates. Discouraged people are individuals who would like to work, but they are not officially counted in the pool of unemployed since they do not actively search for a job. The Italian LFS permits the identification of both officially unemployed individuals and those who would like to work but who have not performed any active job search in the four weeks before the interview.

The second column of Table 14 reports coefficients affecting the wife's probability of transition from "inactive" to "active" for the same four cases as before. Even in this case the wife's transition probability is influenced only by the husband's job losses that entail substantial income losses. In fact, when the husband's transition is due to retirement or family reasons there is no significant response by the wife. Wlaid offhen we focus on husbands that have been laid off between *t-1* and *t* or husbands that have quitted their job for health problems, a significant AWE is found. In the first of these two cases, the marginal effect at the mean indicates that the probability for married women to enter the labour force increases by 3.4 percentage points when her husband is laid off. When the husband withdraws from the labour market is due to health problems the wife's transition probability increases by 6.2 percentage points.

When the husband experiences the reverse transition from unemployment to employment the effect on his wife's transition probability is negative and statistically significant. As predicted by the theory, when the husband finds a job his wife labour supply is reduced. The magnitude of the coefficient is small however, which points to some permanence in the AWE. It is therefore likely that the prolonged recession of the Italian economy will produce a permanent increase in female labour force participation.

### *2.5.1 Full Transition Matrix*

We now discuss the estimated 3x3 matrices describing the transition probability from any labour market states at *t-1* to any states in *t*, where the time window is one year. Table 15 refers to women whose husband did not lose his job, whereas Table 16 reports the estimated transition probabilities when the husband has lost his job. We should remark that these two tables differ only for the estimated effect of the binary variable indicating the husband's job loss, holding the other observable characteristics constant at the first group mean values. This isolates the AWE purging all other confounding factors, such as higher average education of the group whose husband does not experience a job-loss.

Looking at employed women at time *t-1*, the probability of still being employed one year later is higher when the husband is not laid off. This might seem a contradiction with the AWE, but probably it is capturing positive correlation between spouses' skills and employment shocks. The probability of going from employment to unemployment is significantly higher when the husband is laid off, leading to lower probability of moving toward inactivity. This indicates that the AWE is particularly relevant in terms of labour force participation, rather than in terms of employment.

Similar conclusions emerge when we compare women that are unemployed at *t-1*. The probability of finding a job is higher for the group whose husband did not lose his job, likely again due to matching between high productivity individuals. However, the probability of going from unemployment to inactivity is significantly lower when the husband is laid off (5.9 percent against 9.2 percent), consistent with the AWE hypothesis.

When we consider inactive women, the effect of husband's dismissal positively affects both the probability of moving to employment and to unemployment. In this case, where unobservable differences among the two groups of women are presumably less important, the AWE is found both in terms of transition toward employment and in terms of transition toward unemployment (active participation into the labour market).

Pooling together all years from 2004 to 2012 we are implicitly assuming that the Markov chain is time-homogeneous. This means that each entry of the matrix is time independent. This assumption might appear problematic, since the last four years have been characterized by a prolonged recession. However, between estimates for years before the crisis (2004-2008) and years after (2009-2012), the transition matrix changes only marginally. The main difference is found looking at women that are unemployed at *t-1*. In years 2009-2012 the probability of finding a job for unemployed women whose husband did not lose his job is lower the in the first 5 years under analysis (2004-2008), as expected given the poor performance if the Italian economy performance after the second half of 2008. Nevertheless, the probability of finding a job for unemployed women whose husband lost his job increases after 2008. In bad times the expected unemployment spell of the husband is longer, leading to a larger expected income loss. This can induce a reduction of wife's reservation wage and an increase of her search effort. Together these two responses may explain an increase of the transition probability from unemployment to employment even when labour demand is weak.

## 2.6 Barriers to wife's response

The literature on the AWE has not identified the different factors limiting changes in female labour supply. In this section we focus on one of the possibilities. We provide some descriptive evidence that the wife's response could be significantly limited by the quantity (and quality) of child care services offered.

Lack of child care services is one of the main established factors limiting female labour supply. Relative to the OECD average, women with children in Italy are significantly less attached to the labour market, particularly in Southern regions where child care services are meagre.

The presence of children in the household has ambiguous effects on the AWE. When the family suffers the husband's job loss, the presence of children could lead to a smaller response of mothers through additional constraints limiting her labour supply. But consumption commitments might be more relevant for families with children, leading to larger welfare loss due to the husband's unemployment. When young children require goods and services that cannot be easily reduced, the husband's job loss could induce a stronger response in a mother rather than in a woman with no children.

A point that should be made clear is that even if we do not know whether mothers are more or less responsive to husband's job loss than women with no kids, their response should be *ceteris paribus* larger in regions where more child care services are provided.

We first study whether mothers respond differently from wives with no children. To estimate the differential response between women with and without children, we estimate a model that is similar to [2.3], and include an interaction term indicating women with children whose husband lost his job between *t-1* and *t*. As recent studies pointed out, the interpretation of interaction terms in *logit* and *probit* models is often problematic (Ai and Norton, 2003; Berry et al., 2010). The main difficulty arises from the fact that each estimated coefficient and marginal effect in these non-linear models implicitly depends on the level of all other covariates. Therefore the sign and the statistical significance of the interaction term are often hard to interpret. To avoid these difficulties, we abandon the *logit* specification in favour of a linear probability model (LPM) including an interaction term. In particular, we include a dummy indicating whether one of the household member's age is less than 14 ($K_i$), and we interact this indicator variable with $L_i^t$, capturing whether the husband was laid off or not.

$$P_i^t = \alpha + \beta L_i^t + \delta K_i + \eta L_i^t \times K_i + X_i^w \theta^w + X_i^h \theta^h + \lambda_i + \mu_i + \varepsilon_i \qquad [2.4]$$

The interaction term's coefficient $\eta$ captures the differential between mothers and other married women with no children below age 14 in the family. The dependent variable of the estimated model is the transition probability from the state "inactive" to the state "active". Since we are interested in studying the role of child care services, we run separate regressions for Northern and Southern regions given the wide provision gap of such services between these two areas. This

also suggests focusing on the transition from state inactive to state active, since the labour market is much more efficient in the North. If we were focusing on transition from non-employment to employment our results would be heavily affected by the different development of the labour market between the two areas. In particular, North-South comparisons would be problematic given the wide differences in vacancy and unemployment rates. Table 17 reports estimates for model [2.4]. The first column refers to the whole country, whereas the second and the third columns report the coefficients for separate estimates for the North and for the South.

The interpretation of the parameter $\eta$ is complicated by the fact that we cannot control for different preferences for work between stay-at-home women with and without children. However, the positive and significant estimate of all three regressions suggests that when the husband loses his job, the response of the wife is stronger when the couple has children. This might also reflect the fact that the unemployed husband can look after the kids and make the constraints due to poor child service provision less important for the family.

On average women with kids tend to respond more to their husband's job loss: the estimates for the whole country of the interaction term reveal an increase of 2.97 percentage points relative to women with no children. The point estimate of the differential response is larger in the North than in the South. There are at least two competing explanations for this difference between the North and the South. The first one is related to selection into inactivity. The wide gap between the North and the South in terms of female labour force participation makes it likely that average unobservable characteristics of inactive women are significantly different in the two areas. The second reason is related to the provision of child care services, which is much higher in the North. Better child care services could explain why mothers respond more to the husband's job loss in the North.

Publicly available data do not allow the identification of the structural relation between child care service provision and female labour supply. However some descriptive analyses support the idea that the lack of these services poses relevant constraints on the magnitude of the AWE.

Italy, like other members of the European Union, receives resources from the Union's budget to reduce social regional gaps. These funds are called structural and cohesion funds and they are the financial tools implementing the European "cohesion policy". Several goals are set when these resources are assigned to each country. One of the goals that Italy had to pursue with the structural funds was to reduce the gap between the North and the South in terms of provided child care services. This objective is part of the more general target of increasing female labour supply in

the South. Among other conditions, the use of these funds requires the target to be measurable and its measures publicly available. Therefore, from the Department for Economic Development and Cohesion of the Italian Government, we can access regional data on one of the main measures for child care service provision, such as the day care coverage rate (percentage of children that can access free day care). This is indicator is available for each Italian region.

For each region we produce separate estimates of the AWE, restricting the sample only to women with children. As before, the AWE is measured in terms of the transition probability from the state inactive to active, in order to reduce the confounding role played by the different regional quality of the labour market. Figure 9 shows the correlation between the regional day care coverage rate and the estimated AWE at regional level. A positive correlation emerges, suggesting that child care services provision significantly affect labour supply responsiveness of married women when their husband is laid off. Among other implications, this suggests that lack of child care services also reduces the household's ability to minimize the impact of the husband's job-loss.

## 2.7 Conclusion

We study the labour supply response of married women to their husband's job loss. Exploiting retrospective questions of the new labour force survey, we identify transitions between labour market states in a 12-month time window both for the husband and for the wife. This explicitly allows the identification of the short-run response of the wife's labour supply to her husband's job loss. The study covers years 2004-2012. Starting from 2008, the performance of the Italian economy was negative, and about 6 percent of national GDP was lost in these 5 years. The labour market reflects the negative performance of the economy, with a sharp increase of unemployment and of the transition probability from employment to unemployment. For married men, this probability more than doubled between 2007 and 2012.

Consistent with the theoretical framework for the AWE, we find that only the unexpected husband's job losses associated with high income losses produce a significant change in the wife's labour force behaviour. When the husband retires or quits for family reasons, no significant effect is found, either before 2008 or after the economic crisis began. Conversely, when the husband is laid off or he stops working for health problems, the wife's response is positive and significant. We find a positive effect both on the wife's transition probability from non-employment to employment and from the state inactive to active. Between the North and the South we find a significant difference in the magnitude of the response studying only transitions toward

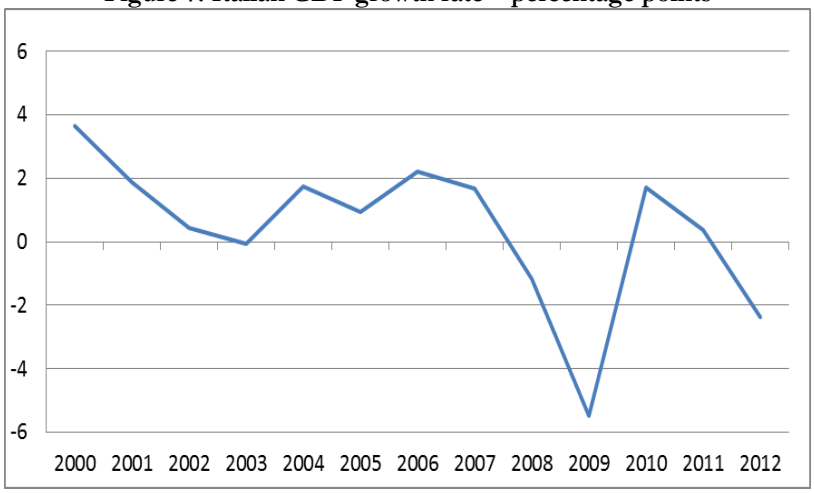
employment, whereas transitions in terms of labour force participation are not very different between the two areas. This seems to reflect the different quality of the labour market and it suggests that there is not clear evidence that the willingness to work is different between North and South. This result also reflects our choice to define as unemployed a larger pool of individuals than just those officially defined as unemployed. The discouraged worker effect is a much more severe problem in the South, where people tend to do less job search than in the North.

In addition to estimating the AWE in the traditional manner proposed by the literature, we also estimate the effect of the husband's job loss on the full transition matrix between labour market states of the wife. We find that AWE is particularly relevant in terms of labour force participation, since the husband's job loss clearly reduces the wife's transition probability from unemployment to inactivity. Clear evidence of positive assortative mating emerges as well.

Finally we focus on how the provision of child care services affects the AWE. Exploiting the significant regional variation in the provision of day care coverage, we find that mothers with children are much more responsive to their husband's job loss in regions where they can easily access day care services. This provides further motivation for reducing the gap in terms of child care services provision between the North and the South. In fact, our evidence suggests that the lack of child care services magnifies the welfare cost associated to job losses. Therefore, not only is it much harder to find a job and long term unemployment is more frequent in the South, but also the ability of the family to mitigate the welfare reduction due to the husband's job loss is lower.

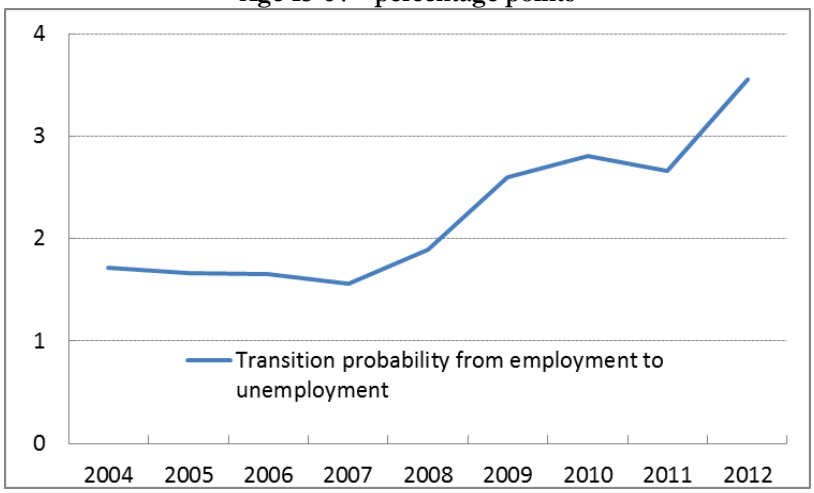
## 2.8 Figures and Tables

**Figure 7: Italian GDP growth rate – percentage points**




Source: IMF data

**Figure 8: Unconditional transition probability from employment to unemployment for married men Age 15-64 – percentage points**




Source: Italian labour force survey

**Figure 9: AWE and regional provision of day care**

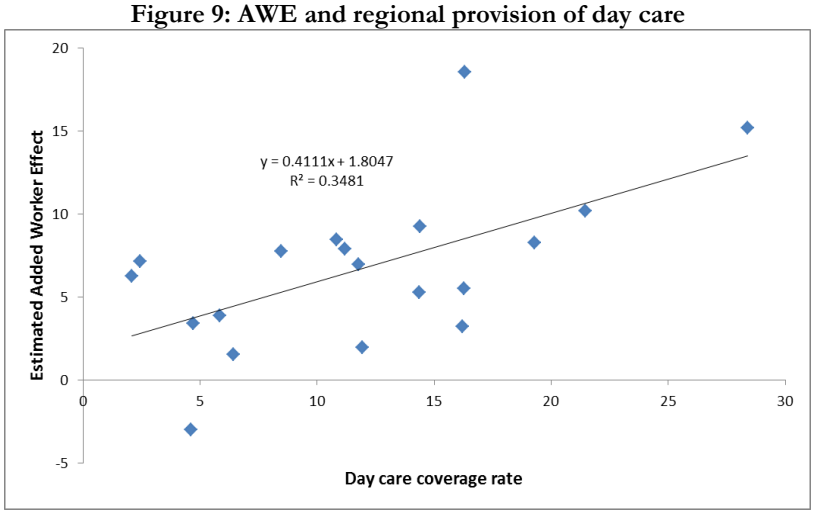


**Table 13: Descriptive wife's characteristics conditional on husband's employment status**

| | Employed husband | | Unemployed husband | | Inactive husband | |
|---|---|---|---|---|---|---|
| **Employment status** | | **St. Err.** | | **St. Err.** | | **St. Err.** |
| *Employed* | 0.55 | (0.0009) | 0.39 | (0.0049) | 0.29 | (0.0015) |
| *Unemployed* | 0.04 | (0.0003) | 0.14 | (0.0033) | 0.01 | (0.0004) |
| *Inactive* | 0.41 | (0.0009) | 0.48 | (0.0049) | 0.69 | (0.0016) |
| **Education** | | | | | | |
| *Primary* | 0.43 | (0.0009) | 0.64 | (0.0047) | 0.71 | (0.0015) |
| *High-school* | 0.43 | (0.0009) | 0.30 | (0.0045) | 0.24 | (0.0014) |
| *Univeristy* | 0.14 | (0.0006) | 0.06 | (0.0024) | 0.05 | (0.0007) |
| Household size | 3.47 | (0.0016) | 3.53 | (0.0096) | 3.10 | (0.0032) |
| Kid 0-5 | 0.27 | (0.0009) | 0.28 | (0.0045) | 0.05 | (0.0008) |
| Kid 6-14 | 0.37 | (0.0009) | 0.39 | (0.0048) | 0.10 | (0.0010) |
| **Age** | | | | | | |
| *15-24* | 0.01 | (0.0002) | 0.02 | (0.0016) | 0.00 | (0.0002) |
| *25-34* | 0.21 | (0.0008) | 0.25 | (0.0045) | 0.04 | (0.0007) |
| *35-44* | 0.39 | (0.0009) | 0.37 | (0.0048) | 0.09 | (0.0009) |
| *45-54* | 0.30 | (0.0008) | 0.28 | (0.0043) | 0.31 | (0.0016) |
| *55-64* | 0.08 | (0.0004) | 0.08 | (0.0024) | 0.55 | (0.0017) |
| **Area** | | | | | | |
| *North* | 0.46 | (0.0009) | 0.25 | (0.0044) | 0.43 | (0.0017) |
| *Centre* | 0.19 | (0.0008) | 0.14 | (0.0040) | 0.17 | (0.0014) |
| *South* | 0.34 | (0.0008) | 0.60 | (0.0051) | 0.40 | (0.0016) |

Source: Italian labour force survey - 2004/2012

**Table 14: AWE – Wife's transition probabilities.**

| | Transition from non-employment to employment | Transition from the state inactive to the state active |
|---|---|---|
| **Reason for the husband's job loss** | | |
| Dismissal | 0.448*** | 0.696*** |
| | (0.0582) | (0.0455) |
| Health problem | 0.513* | 1.050*** |
| | (0.291) | (0.259) |
| Retirement | -0.0502 | -0.00948 |
| | (0.134) | (0.147) |
| Other family reasons | 0.288 | 0.716 |
| | (0.637) | (0.552) |
| **Wife's education** | | |
| Less than high school | Omitted | Omitted |
| High school diploma | 0.502*** | 0.406*** |
| | (0.0291) | (0.0231) |
| University degree | 1.208*** | 1.064*** |
| | (0.0772) | (0.0622) |
| **Husband's education** | | |
| Less than high school | 0.0820 | 0.193** |
| | (0.0736) | (0.0770) |
| High school diploma | 0.173*** | 0.241*** |
| | (0.0447) | (0.0677) |
| University degree | Omitted | Omitted |
| **Wife's age** | | |
| 15-19 | 2.334*** | 3.122*** |
| | (0.687) | (0.406) |
| 20-24 | 2.123*** | 2.418*** |
| | (0.313) | (0.273) |
| 25-29 | 2.469*** | 2.558*** |
| | (0.268) | (0.249) |
| 30-34 | 2.556*** | 2.575*** |
| | (0.256) | (0.250) |
| 35-59 | 2.566*** | 2.522*** |
| | (0.231) | (0.246) |
| 40-44 | 2.402*** | 2.374*** |
| | (0.229) | (0.244) |
| 45-49 | 2.203*** | 2.091*** |
| | (0.208) | (0.237) |
| 50-54 | 1.878*** | 1.677*** |
| | (0.180) | (0.210) |
| 55-59 | 1.117*** | 0.919*** |
| | (0.229) | (0.188) |
| 60-64 | Omitted | Omitted |
| **Husband's age** | | |
| 20-24 | 1.279*** | 0.746*** |
| | (0.307) | (0.289) |
| 25-29 | 0.793*** | 0.458*** |
| | (0.250) | (0.176) |
| 30-34 | 0.708*** | 0.485*** |
| | (0.218) | (0.154) |
| 35-59 | 0.539*** | 0.370*** |
| | (0.193) | (0.139) |
| 40-44 | 0.415*** | 0.293** |
| | (0.147) | (0.128) |
| 45-49 | 0.296** | 0.176 |

| | | |
|---|---|---|
| | (0.138) | (0.122) |
| 50-54 | 0.1000 | 0.0504 |
| | (0.122) | (0.107) |
| 55-59 | 0.0250 | -0.0223 |
| | (0.113) | (0.111) |
| 60-64 | Omitted | Omitted |
| **Husband's industry at *t-1*** | | |
| Agriculture | 0.0783 | 0.0418 |
| | (0.103) | (0.0543) |
| Mining and Oil | -0.200** | -0.150** |
| | (0.0902) | (0.0639) |
| Manufacturing | -0.0988 | -0.0764* |
| | (0.0670) | (0.0409) |
| Construction | -0.230*** | -0.115* |
| | (0.0877) | (0.0652) |
| Commercial services | -0.0904 | -0.0266 |
| | (0.0607) | (0.0489) |
| Tourism | 0.000663 | 0.0237 |
| | (0.0503) | (0.107) |
| Transp. and telecomm. | -0.120 | -0.0683 |
| | (0.0938) | (0.0764) |
| Finance | -0.134** | -0.0201 |
| | (0.0630) | (0.0688) |
| Professional services | -0.0788 | -0.0302 |
| | (0.0719) | (0.0659) |
| PA & defense | -0.202*** | -0.0581 |
| | (0.0714) | (0.0640) |
| Education and health | -0.0373 | 0.0585 |
| | (0.104) | (0.0913) |
| Other services | Omitted | Omitted |
| Region fixed effects | Y | Y |
| Year fixed effects | Y | Y |
| Constant | -5.884*** | -5.463*** |
| | (0.232) | (0.209) |
| Observations | 335806 | 274399 |

Clustered standard errors in parentheses (by region) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 15: Conditional transition probabilities – Non laid off husbands**

| | Employed (t) | Unemployed (t) | Inactive (t) |
|---|---|---|---|
| Employed (t-1) | 0.959 | 0.025 | 0.016 |
| | (0.265) | (0.0162) | (0.0116) |
| Unemployed (t-1) | 0.198 | 0.710 | 0.092 |
| | (0.0864) | (0.0866) | (0.0391) |
| Inactive (t-1) | 0.024 | 0.026 | 0.950 |
| | (0.0191) | (0.0192) | (0.0355) |

Transition probabilities are predictions from three separate multinomial logit regressions (one for each origin state). Standard errors in parenthesis

**Table 16: Conditional transition probabilities – Laid off husbands**

| | Employed (t) | Unemployed (t) | Inactive (t) |
|---|---|---|---|
| Employed (t-1) | 0.909*** | 0.070*** | 0.021*** |
| Unemployed (t-1) | 0.182* | 0.759** | 0.059*** |
| Inactive (t-1) | 0.034** | 0.060*** | 0.906*** |

Transition probabilities are predictions from three separate multinomial logit regressions (one for each origin state). All predictions are made at mean values of the covariates for women whose husband did not lose his job. The transition probabilities of wives whose husband lost his job differ from those referred to wives with non-laid off husbands only by the estimated AWE (marginal effect of the AWE dummy). $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$ refer to the estimated coefficient of the AWE dummy.

**Table 17: Differential AWE between women with and without children**

| | (1) **Italy** | (2) **Northern and Central** | (3) **Southern** |
|---|---|---|---|
| L (husband's job loss) | 0.0135*** | 0.0102*** | 0.0177*** |
| | (0.00256) | (0.00348) | (0.00376) |
| Kids<14 | -0.00955*** | -0.0138*** | -0.00284 |
| | (0.00173) | (0.00268) | (0.00196) |
| Interaction | 0.0297*** | 0.0355*** | 0.0261*** |
| | (0.00593) | (0.0102) | (0.00732) |
| **Wife's education** | | | |
| Less than high school | Omitted | Omitted | Omitted |
| High school diploma | 0.0203*** | 0.0214*** | 0.0189*** |
| | (0.00135) | (0.00195) | (0.00178) |
| University degree | 0.0777*** | 0.0725*** | 0.0867*** |
| | (0.00394) | (0.00491) | (0.00628) |
| **Husband's education** | | | |
| Less than high school | -0.00263** | -0.00276 | 0.00623 |
| | (0.00133) | (0.00195) | (0.00381) |
| High school diploma | Omitted | Omitted | 0.00865** |
| University degree | -0.0170*** | -0.0200*** | Omitted |
| | (0.00259) | (0.00347) | |
| **Wife's age** | | | |
| 15-19 | Omitted | Omitted | Omitted |
| 20-24 | -0.0385 | -0.0397 | -0.0206 |
| | (0.0296) | (0.0387) | (0.0324) |
| 25-29 | -0.0282 | -0.0131 | -0.0275 |
| | (0.0294) | (0.0384) | (0.0323) |
| 30-34 | -0.0282 | -0.0155 | -0.0252 |
| | (0.0294) | (0.0384) | (0.0324) |
| 35-59 | -0.0326 | -0.0176 | -0.0331 |
| | (0.0295) | (0.0385) | (0.0325) |
| 40-44 | -0.0429 | -0.0316 | -0.0393 |
| | (0.0295) | (0.0385) | (0.0325) |
| 45-49 | -0.0574* | -0.0483 | -0.0505 |
| | (0.0296) | (0.0386) | (0.0326) |
| 50-54 | -0.0724** | -0.0669* | -0.0594* |
| | (0.0296) | (0.0386) | (0.0326) |
| 55-59 | -0.0882*** | -0.0833** | -0.0699** |
| | (0.0296) | (0.0386) | (0.0326) |
| 60-64 | -0.101*** | -0.0920** | -0.0866*** |
| | (0.0296) | (0.0387) | (0.0327) |
| Husband's age | Y | Y | Y |
| Husband's industry at *t-1* | Y | Y | Y |
| Region fixed effects | Y | Y | Y |
| Year fixed effects | Y | Y | Y |
| Constant | 0.046 | 0.195*** | 0.0870** |
| | (0.0311) | (0.0388) | (0.0352) |
| Observations | 286,759 | 144,995 | 141,764 |

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

# 3 Effects of Sunday Shopping Deregulation on the Allocation of Time

## 3.1 Introduction

Sunday shopping is the ability of retailers to operate stores on Sunday. Sunday shopping regulation varies around the World. In Europe, there are countries that still forbid Sunday shopping (like Belgium and Switzerland). In Canada, the process of Sunday shopping deregulation started in 1985, when the Supreme Court of Canada ruled that the existing regulation banning Sunday shopping (the Lord's Day Act) was against freedom of religion. Since then all Canadian provinces have passed laws permitting Sunday shopping. These changes did not happen however all at the same time, providing the opportunity of exploiting the provincial variation in the time of the policy change for the identification of its effects. A previous study by Skuterud (2005) determined the exact time of the policy change in each Canadian province. This study focussed on the effects of the policy change on firms' behaviour, in particular on labour demand. We focus on the effects of the policy change on the allocation of time and on time spent on paid work in particular. Among other consequences, Sunday shopping deregulation has in fact removed a constraint on the time allocation.

In this work we study the allocation of time of prime-aged individuals with and without children. The main reason that we study these two groups is that the introduction of Sunday shopping is a relatively small shock for people that can easily re-allocate their time. In this perspective, women with children are likely to be much more time constrained than women without children. Therefore, studying the effects of Sunday shopping on these two different groups helps the identification of the effects of relaxing such constraint on the allocation of time.

A similar work by Jacobsen and Kooreman (2005) analyses the effect on labour supply, on shopping, and on leisure of extending shopping hours in The Netherlands. However, probably due to the heterogeneity of their sample, they claim that extending shopping hours does not affect the total time devoted to work or leisure. This is the motivation for focussing on women with children,

since mothers usually face high time costs related to child care and they are therefore more likely to change their behaviour.

After developing a simple theoretical model showing how Sunday shopping deregulation should affect the allocation of time, and the amount of paid work in particular, we test the main predictions of the model using five waves of the time use file of the Canadian General Social Survey.

We find that after the introduction of Sunday shopping, individuals with children reduce the amount of weekday and Saturday shopping. The amount of time that is saved by moving some of the weekday and Saturday shopping to Sunday is used to increase market work. The response is however statistically significant only among women. Even though this difference between men and women could be due to several factors, the fact that men's labour supply is less elastic than female's likely accounts for their statistically insignificant response. Individuals without children that do not face the same tightness of their time constraints do not respond to the policy change. The robustness checks performed with data from the Canadian Labour Force Survey (LFS) support the idea that our results are not driven by the long-run increasing female labour force participation trend, which represents one of the main challenges and confounding factors for our analysis.

Our results suggest that even small additional constraints on the allocation of time can produce relevant changes in the behaviour of busy individuals. In particular, we interpret our results as another piece of evidence that the labour supply of mothers responds significantly to changes in these constraints, and that policy makers aiming to increase female labour supply should play close attention to relaxing these constraints.

Section 3.2 contains the literature review. In section 3.3 the theoretical model is developed. Section 3.4 describes the data set; section 3.5 explains the identification strategy; section 3.6 contains the results, which are discussed and further interpreted in section 3.7. Section 3.8 concludes.

## 3.2 Motivation – Literature review

The determinants of female labour supply and the performance of women in the labour market have been widely studied. Costa (2000) provides a detailed description of the long run increasing trend of female labour force participation. Among other factors, such as the change in the nature of most jobs or the change in social norms, the lower time input required for domestic work seems to be one of the most important drivers of the observed dramatic increase of female

labour force participation in most OECD countries. This mechanism leading to increasing market work of women is formally developed in a life-cycle framework by Greenwood, Seshadri, and Yorukoglu (2005). They showed how the adoption of labour-saving durables such as washing machines or vacuum cleaners accounted for almost 50 percent of the increase in female labour force participation that occurred during the last century in the United States.

Time affects the decision to have children as well. The cost of children is not just a monetary cost, but it also entails a large time cost. Greenwood, Seshadri, and Vandenbroucke (2005) attribute the baby boom to the adoption of the same time saving technologies that also contributed to the increase in female labour force participation. The technological progress in home production technology has reduced significantly the time cost of having children.

Attanasio et al. (2008) calibrate a life-cycle model addressing the relative ability of competing (but also complementary) explanations for the dramatic changes in labour supply profile in the US. Again, their results show that the reduction of child care cost is one of the most powerful driving forces for augmenting female labour supply. With reference to the Canadian experience, Baker et al. (2008) show that the reduction of child-care cost approved by the province of Quebec in the late 1990s had large and statistically significant positive effect on female labour supply.

All the above papers only implicitly or indirectly address how constraints on the allocation of time affect women's decisions. They however make clear, with an approach completely different from ours, the crucial role of time allocation and its constraints. They point out that anything that helps individuals save time or that improves efficiency of the time use can lead to large changes in behaviour.

Becker (1965) and Becker and Ghez (1975) developed an elegant theory that explicitly introduced the time dimension and its allocation into static and life-cycle models. The empirical work on the allocation of time was initially based on aggregate data, due to lack of detailed and reliable micro-data. However, since the mid-1980s many more micro-data sets have become available. Juster and Stafford (1991) explain the challenges related to reliable time use data collection (micro-data) and their analysis. In recent years the number of studies based on time use micro-data has increased significantly. The European statistics office (Eurostat) is trying to develop a harmonised (multinational) time use survey to make cross-country comparisons easier.

One of the less-explored issues on time use research is how timing constraints affect economic decisions. Hamermesh et al. (2008) is one of the few papers focusing on the importance

of timing. In particular he shows how the need for leisure synchronization affects agents' behaviour. We study how people respond to changes in the limitation of shopping hours. Jacobsen and Kooreman (2005) study how the extension of shopping hours from Monday to Friday changed the allocation of time in The Netherlands. They find only small effects of changing shopping hours. Even though they focus on married versus single individuals, they do not clearly highlight the role of children on their parent's allocation of time. Therefore they do not focus on the most severely time constrained group. However, the identification of a constraint relaxation is easier when focusing on individuals that are more severely affected by such constraint. The presence of children in the family dramatically reduces the degree of flexibility of time re-allocation. Therefore, focusing on couples with offspring can lead to better understanding of how the extension of shopping hours affects the allocation of time. Gruber and Hungerman (2008) study the effect of Sunday shopping deregulation on Church attendance in the US. They find that Sunday shopping caused a reduction in Church attendance through the increase in the opportunity cost of religious participation.

In this paper we study the effects of Sunday shopping deregulation in Canada on time use. In particular we focus on women with children, showing that the higher ability of allocating activities over the entire week induces an increase in labour supply. The reaction of women without children, who are less time constrained, is consistent with the findings of Jacobsen and Kooreman (2005).

## 3.3 The Model

To understand the effects of Sunday shopping deregulation on the allocation of time, we use a model similar to the model that Jacobsen and Kooreman (2005) use to describe the effect of longer shopping hours in The Netherlands. With some modifications to the original model, it is in fact possible to capture the effects of the policy change on three broad activities: market work, leisure and shopping. Denote by $M_t$ the time spent on market work, by $S_t$ the time spent shopping and by $L_t$ the amount of time devoted to leisure. Jacobsen and Kooreman (2005) split a day into day time and night time. Whereas, since we are analyzing the effect of Sunday shopping, we distinguish between weekdays including Saturday and Sunday. The following notation is adopted: $t = w$ indicates weekdays, $t = s$ indicates Sunday.

The main improvement of the model presented here is that we assume that each individual has a set of unavoidable daily activities that need to be done, both on weekdays and on Sunday.

Such activities can be thought as fundamental child or personal care. In particular, we assume that fundamental child care implies some fixed time costs.

We define by $K_{t,i}$ with $t = \{w; s\}$ the fixed time costs that individual *i* faces during weekdays or on Sunday. Therefore, defining with $T_w$ the total weekdays time endowment, we can think at $T_w - K_{w,i}$ as the disposable amount of time that individual *i* can allocate to market work, leisure or shopping during from Monday to Friday. In this model leisure is whatever activity is left after paid work and shopping. Introducing domestic work explicitly would not change the insights of the model. We also assume that people can work only on weekdays. The effect of Sunday shopping deregulation on shift workers or on individuals that usually work on Sunday is in fact likely very different than on Monday to Friday (or Saturday) workers.

Following Jacobsen and Kooreman (2005), we assume that agents are homogeneous in terms of preference and productivity. However, we consider a dimension of heterogeneity, assuming that they differ in terms of disposable time (alternatively, in terms of fixed time costs). The disposable time for individual *i* on Sunday is denoted by $T_s - K_{s,i}$. We therefore assume the existence of two types of agents, with high fixed time cost $K_{s,i}^H$ and with low fixed time cost $K_{s,i}^L$.

Individual *i*'s maximizes following utility function:

$$U(C_i; L_{w,i}; S_{w,i}; L_{s,i}; S_{s,i}) = \alpha_C \ln C_i + \alpha_L \ln(L_{w,i} + L_{s,i}) + \alpha_S \ln(S_{w,i} + S_{s,i}) \quad [3.1]$$

With $\alpha_C + \alpha_L + \alpha_S = 1$

subject to the following constraints:

$$C_i \leq \omega M_{w,i} \quad [3.2]$$

$$M_{w,i} + L_{w,i} + S_{w,i} \leq T_w - K_{w,i} \quad [3.3]$$

$$L_{s,i} + S_{s,i} \leq T_s - K_{s,i} \quad [3.4]$$

$$(M_{w,i}; L_{w,i}; S_{w,i}) \in I_{w,i}^3 \quad [3.5]$$

$$(L_{s,i}; S_{s,i}) \in I_{s,i}^2 \quad [3.6]$$

where [2] says that total consumption cannot exceed earned salary. Condition [3] states the time budget during the week days and [4] gives the time constraint associated with Sundays. Constraints [5] and [6] are standard feasibility conditions, with:

$$I_{w,i}^{3} = [0, T_w - K_{w,i}] \times [0, T_w - K_{w,i}] \times [0, T_w - K_{w,i}]$$

And

$$I_{s,i}^{2} = [0, T_s - K_{s,i}] \times [0, T_s - K_{s,i}]$$

If Sunday shopping is not allowed, we have a further constraint $S_{s,i} = 0$. We begin by discussing the case in which Sunday shopping is permitted, which means $S_{s,i} \geq 0$. The assumed utility function implies that leisure on weekdays and on Sunday are perfect substitutes. The same is true for weekday and Sunday shopping. Even though the reasonability of this assumption is questionable, the only requirement for the model to convey the same message is that there is substitutability between weekdays' and Sunday's activities.

### *3.3.1 Solution with Sunday shopping*

Given the homothetic utility function, the optimal choice implies constant budget shares. It is easy to show that the solution is:

$$L_{w,i}^{*} + L_{s,i}^{*} = \alpha_L (T_w - K_{w,i} + T_s - K_{s,i})$$

$$S_{w,i}^{*} + S_{s,i}^{*} = \alpha_S (T_w - K_{w,i} + T_s - K_{s,i})$$

$$\frac{C_i^{*}}{\omega} = \alpha_C (T_w - K_{w,i} + T_s - K_{s,i})$$

In order to assess how time tightness affects the reaction to Sunday shopping deregulation, assumption 1 is imposed.

*Assumption 1: the low time fixed cost type is characterized by* $L_{w,i}^{*} + L_{s,i}^{*} \geq T_s - K_{s,i}^{L}$ *and the high time fixed cost type by* $L_{w,i}^{*} + L_{s,i}^{*} < T_s - K_{s,i}^{H}$.

Assumption 1 simply implies that agents with low fixed time cost want to consume more leisure than the total amount they can consume on Sunday. Therefore, they consume some leisure also on weekdays. On the other hand, the total amount of leisure consumed by high cost agents is less than the total Sunday's time endowment. In other words, on Sunday these agents allocate some time to other activities different from leisure. In our model the other possible Sunday activity is shopping.

Notice that this model does not make any prediction about the distribution of leisure and shopping over the week (weekdays vs. Sunday). It just gives the total weekly amount of time spent on each activity and it determines whether the amount of time available on Sunday is enough to satisfy leisure demand.

### *3.3.2 Solution without Sunday shopping*

If Sunday shopping is not allowed, a further constraint is imposed: $S_{s,i} = 0$. The inclusion of this constraint affects in a very different manner agents with $K_{s,i} = K_{s,i}^{L}$ and agents characterized by $K_{s,i} = K_{s,i}^{H}$. In fact, an individual with plenty of time does not change the total amount of time spent working, shopping and consuming leisure. They just re-allocate time over the week, devoting Sunday to leisure and performing shopping during the week. Since the total weekly amount of leisure demanded by individuals with low fixed time cost is larger than the total time endowment on Sunday, the policy change does not lead to any substitution between activities. In particular, individuals with low time cost that already devoted all of Sunday to leisure do not respond at all to the policy change.

On the other hand, people with high fixed time costs have to reduce the amount of time they work on the market. In fact, since now they cannot shop on Sunday, they have to do shopping during weekdays. This induces a reduction of the total amount of time devoted to paid work and it induces an increase of leisure. Notice that now individuals with tight time constraints consume leisure only on Sunday, since no other activities are allowed in that day and the total time endowment on Sunday exceeds their demand for leisure. This implies that high fixed time cost individuals are forced to over consume leisure, since they cannot do shopping. This kind of idea can be extended to activities other than shopping and to time other than Sunday. Whenever there are laws preventing some activities in specific days or hours of the day, this induces a potential welfare loss due to a less efficient allocation of time.

## 3.4 Data

Canadian time use data are collected as a separate file of the General Social Survey (GSS). The time use file of the GSS is released with a periodicity of about five years. The GSS is a survey providing information on social trends in Canada. The target population is individuals aged 15 and older, living in one of the Canadian provinces.

The time use file provides detailed information on how people living in Canada spend their time in a single day. Surveyed individuals are asked to compile a diary, reporting their activities every ten minutes, where and with whom. Aggregating this information over the day yields a precise description of daily time use. Since the survey is conducted over all 12 months and over the different type of days (weekdays, weekends, and holidays) it represents the allocation of time over the entire year, accounting also for seasonality. We use all available cycles of the survey: 1986, 1992, 1998, 2005 and 2010.

The time use survey provides detailed information on a wide range of activities. The level of detail has significantly changed over the years. Since 2005 the survey provides in fact much more detailed information in the list of activities recorded. However, to use all five surveys we aggregate into broad categories: market work, domestic work, child care, leisure, and shopping.

The aggregation into broad categories poses some theoretical challenges however. Standard economic models usually divide time into market work and leisure, meaning with the former any paid activity and with the latter everything else. More detailed analysis of time use requires at least a third category: domestic work. When domestic work is determined, time devoted to leisure should be purely recreational. The distinction between pure leisure and domestic work is however not always unambiguous, and it calls for some arbitrary choices. Activities such as gardening and playing with children could be considered either domestic work or leisure. The distinction between domestic work and leisure can be done following two different approaches. The first one, suggested by Robinson and Godbey (1999), is based on the ranking of activities for self-reported level of enjoyment: only the most enjoyable activities are considered as leisure. The second approach, more grounded in economic theory, is based on the degree of substitutability between market input and time input (Becker, 1965). Leisure is typically characterized by low substitutability between market and time input, whereas the time required for domestic activity can usually be substituted with market input. The classic example is represented by time spent watching live a soccer game and time required preparing dinner. The time needed for the soccer game is always not less than 105 minutes, no matter how expensive the TV is (market input). Time required to satisfy the need for food can, on the other hand, be significantly reduced buying cooked food (market input).

We focus on individuals aged 20-54 with and without children. This choice was made to avoid confounding factors such as retirement for older workers. The total sample size is 34,000 units (Table 18). The sample size might look quite large, however time use micro-data are quite noisy and our identification strategy requires splitting the sample between Sunday and other days,

and between the two genders, which leads in some cases to relatively small cell sizes. Table 19 reports the average allocation of time by gender and by presence of children in the household from 1986 to 2010. Over these 25 years some changes emerge. First of all, the contribution of men to domestic work has dramatically increased over this period. This change is registered for men with and without children. This finding matches similar trends in other developed countries (Ramey, 2008). Extra time in domestic work displaces market work and leisure for fathers, whereas men without children reduce only leisure.

Women, both mothers and other women with no children, have increased minutes of paid work. It's interesting that the increase in time at work has come mostly from the reduction of leisure. This means that the overall workload on women has increased in the last 25 years. This makes even more relevant the issue of efficient and flexible allocation of time. Looking at leisure trends of prime aged individuals, Canada behaves quite differently from the United States, where leisure has increased over the last 40 years (Aguiar and Hurst, 2007). Finally, we note that shopping represents only a small fraction of the daily allocation of time (from about 15 to about 40 minutes). Women do more shopping, but the time spent in such activity has decreased for all groups over this period.

Skuterud (2005) carefully identifies the date at which the regime switches likely occurred and Sunday shopping became widely available. Table 20 displays Skuterud's dates for the policy change in each province. These dates are consistent with evidence from the Canadian time use surveys. Table 21 shows the average fraction of the population spending at least one minute on Sunday shopping in provinces with and without Sunday shopping and the number of minutes spent shopping on Sunday. Even though this table shows that the law prohibiting Sunday shopping was not fully enforced, the policy change (deregulation) had a significant unconditional effect. We should however note two things that are problematic. First of all, in 1992 the gap between the two groups shrinks significantly, because of a sharp reduction of Sunday shopping in provinces where it was allowed. Second, in the last survey (2010), the gap is reduced due to the sharp increase in shopping in the only province left in which Sunday shopping was not allowed (Prince Edward Island). British Columbia is excluded from the analysis because the policy was implemented at the municipal level. This makes impossible to identify the time of the policy change at the provincial level.

Since the number of provinces not permitting Sunday shopping decreased over time, the control group used for estimating the effect of the policy change has also reduced. For observations

from the last wave the counterfactual is based only on individuals living in Prince Edward Island. However, even excluding the last wave of the survey from our estimate, when the counterfactual could be considered less credible, the main results that we are going to show in the next sections do not change.

## 3.5 Identification

Regression analysis with time use data requires some care since a large number of individuals report zero time allocated to several activities. This problem is even more relevant when focusing on very specific (disaggregated) activities, such as shopping. The time use literature has recently focused on the appropriate choice of the model to study the allocation of time (Stewart, 2009; Foster and Kalenkoski, 2013). Specifically the problem is whether zeros should be treated as pure corner solutions or as the observed outcomes of an infrequent activity. In the former case, models dealing with corner solution and censoring are appropriate. Several models deal with left censoring at zero such as Tobit I, Tobit II and double-hurdle models. Flood and Grasjo (1999) discuss how all these models perform in estimating labour supply for Swedish women. They show that when the data generating process is not fully known, a simple Tobit I model produces the least biased estimates. Since the index equation does not enter into the Tobit I, this model is in fact robust to misspecification of the index equation. On the other hand, using a Tobit II model can lead to large bias when the index equation is misspecified.

When the horizon of analysis is longer, OLS could lead to less biased results (Stewart, 2009). The horizon of the analysis is therefore very important. With a longer horizon (a month or even a week), for a large variety of activities reporting zero minutes in a single day it is hard to consider these observed zeros as actual corner solutions. For instance, an individual that is reporting zero shopping time in a day may well do some shopping over the entire week. The longer the horizon the less credible the assumption that zeros represent corner solutions. However, when the focus is on the allocation of time in a single day, zeros likely represent actual corner solutions. Therefore, when we study the allocation of time on Sunday, the adoption of a model that deals with corner solution seems therefore the preferable choice. For estimates on the remaining days of the week, on the other hand, the adoption of such models might be less convincing. Therefore, for the key results we will show both Tobit and OLS estimates, in order to make explicit that they do not depend on the choice of the model.

Identifying how Sunday shopping deregulation affected labour supply and the overall allocation of time of married individuals poses more challenges other than left censoring. In particular, since there is no province experiencing the opposite policy change and other changes presumably occurred over the considered span of time (1986 – 2010), our estimates could capture other long-run trends that are unrelated to Sunday shopping deregulation. For instance, female labour supply has increased in response to other policies that have been implemented in Canada (Baker et al., 2008). The increasing trend of female labour supply is not the only long run change. In fact, there is also the well documented secular decrease of market work for men (Costa, 1998), and the tendency for men to work more at home (Ramey, 2008).

These likely sources of bias are tackled through the use of provinces that never adopted a widespread deregulation of Sunday shopping as control group and through the inclusion of province specific time trends in our model. The effects of Sunday shopping deregulation are identified by jumps over a quadratic time trend.

We begin by showing that Sunday shopping deregulation had a larger effect on the shopping behaviour of individuals with children. This group is more severely time constrained than its complement. We therefore estimate the differential impact of Sunday shopping deregulation on weekday shopping time (measured in minutes). In particular, after pooling together the available five cycles of the GSS, we estimate the following model:

$$S_i = \alpha_0 + \alpha_1 SUN_i + \alpha_2 K_i + \theta SUN_i \times K_i + X_i\beta + T_i\tau + y_i + p_i + \varepsilon_i \qquad [3.7]$$

where $S_i$ represents the daily minutes of shopping (Mon to Fri) done by individual *i*. The binary variable $SUN_i$ indicates whether Sunday shopping is possible for individual *i* (depending on the province and on the year); $K_i$ is equal to one if the family has at least one child. The parameter $\theta$ captures therefore the differential response of Monday to Saturday shopping between families with and without children to the introduction of Sunday shopping. Controls $y_i$ and $p_i$ are year and province fixed effects, and *X* is a set of individual and household characteristics, such as gender, age, education, employment status or household size. $T_i$ represents the quadratic province specific time trend. We also run the same regression on time spent shopping on Sunday, in order to show that busy individuals reallocate their time reducing weekdays shopping and increasing Sunday shopping.

After having shown that individuals with children free up some of the Monday to Saturday time endowment reallocating shopping to Sundays, we study how they change the overall allocation

of time. In order to do so, highlighting the difference between individuals with and without children, we estimate the impact of the policy change on four activities exhausting the time endowment, distinguishing for gender, for the type of household (with and without kids), and for type of day (week days plus Saturday vs. Sunday).

We estimate the following model

$$T_i^a = \alpha + \eta SUN_i + X_i\beta + T_i\tau + y_i + p_i + \varepsilon_i \quad [8]$$

where $T_i^a$ is the amount of time (measured in minutes per day) spent by individual *i* doing activity *a*. As before, $y_i$ and $p_i$ represent year and province fixed effects, *X* the vector of individual and household characteristics, and $T_i$ the province specific quadratic time trend. Since $SUN_i$ indicates whether Sunday shopping is possible for individual *i*, the coefficient $\eta$ captures the effect of Sunday shopping deregulation on the time spent on the considered activity *a*.

The data allows identification of the effect of Sunday shopping on a much more detailed variety of activities than those included in the theoretical model. Even though the main focus of our analysis is on paid work, we also study how other activities are affected. The rich variety of activities provided by the time use survey is reduced to only four main macro-activities. The first is market work, which includes time spent on any paid activity. Domestic work includes all activities for the care of the house and of other family members (child care is therefore fully included in it). Leisure includes sleep, personal care activities, outdoor and indoor pure leisure activities. The fourth activity is shopping time, which refers to time spent purchasing goods. Time spent for acquiring services is included in domestic work since it is not clearly affected by the Sunday shopping deregulation.

The main prediction of the model is that after introducing Sunday shopping, market work should increase for individuals with high fixed time cost, while it should remain the same for individuals with more disposable time. As pointed out by Heckman (1988), children and domestic work absorb some unavoidable amount of time. Therefore, comparing people with children to people without children captures the idea of comparing agents with lower disposable time (those with children) and agents with plenty of disposable time (those without children). In terms of the notation introduced above, this means that the average person with children is characterized by $K_{s,i} = K_{s,i}^H$, whereas the average person without children is assumed to be characterized by $K_{s,i} = K_{s,i}^L$.

Our analysis identifies the response on the allocation of time. Welfare comparisons between the two groups are on the other hand not directly allowed, since time commitments of children and domestic work are ultimately endogenous.

## 3.6 Results

We begin by discussing the differential impact of Sunday shopping deregulation between individuals with and without children on the time spent acquiring goods. Table 22 reports the estimated effect on Sunday (column 1) and on weekdays and Saturday (column 2). The estimate of the interaction term tells us the differential effect of Sunday shopping deregulation between the two groups. It emerges that the introduction of Sunday shopping induced a larger reduction in weekday shopping for individuals with children. The policy changed caused in fact a 17 minutes daily reduction in weekdays shopping for individuals with children, whereas it had very little effect on those with no children.

Column 1 refers to time spent acquiring goods on Sunday. The interaction term shows that the policy change had a larger effect on individuals with children (about 29 minutes). The picture that emerges is therefore consistent with the prediction of the theoretical model. In particular, individuals with higher fixed time cost respond to the introduction of Sunday shopping reducing weekdays shopping time, freeing up time for other activities, and increasing the amount of time spent doing shopping on Sunday. The response of individuals with lower fixed time costs is on the other hand much smaller and it is statistically insignificant.

Since Sunday shopping deregulation had a greater impact on the allocation of time for busy individuals, we now study how time spent on the other activities has changed in response to the analyzed policy change. In particular, we are going to show that women with children allocated some of the extra time to paid work. Freeing up busy women's time induces a labour supply increase.

Table 23 reports the estimated coefficients of model [8] describing the effect of Sunday shopping deregulation on the allocation of weekday time of women with kids. Consistent with the estimates of the interaction term on the full sample, it emerges that with respect to this group the introduction of Sunday shopping led to a reduction of weekdays shopping time (-20 minutes per day). The fewer minutes of shopping allowed the reallocation of time toward paid work. The other activities were not significantly affected. Since shopping time includes also the time spent driving to the stores, the reduction of weekday shopping seems to be compensated by the increase of Sunday

shopping. Our estimates suggest that the total weekly shopping time fell between 1986 and 2010, but part of this reduction was likely due to the lower amount of time spent driving to the stores. Table 24 refers to the Sunday allocation of time of mothers. The policy change seems to have dramatically changed the allocation of time on Sunday, causing a sharp increase in shopping time and a strong reduction of leisure. This is associated with an increase in domestic work, even though it is not statistically significant. Shopping and domestic work often move in the same direction because they are complementary activities, such as storing the purchased food. As predicted by the model for individuals with high fixed time costs, leisure consumed on Sunday registers a statistically significant contraction (-112 minutes). The increase in market work likely captures changes in labour demand due to the policy change and to the general increasing provision of different kind of services on Sunday.

The effect of Sunday shopping deregulation on women facing weaker time constraints is on the other hand very small. Our estimates show that Sunday shopping deregulation had no statistically significant effects on the allocation of time of women without offspring (Table 25 and Table 26). In fact, time devoted to shopping during the week does not decrease and time spent shopping on Sunday does not significantly increase. Consistent with the model, this suggests that less time-constrained individuals do not substitute weekdays (and Saturday) shopping with Sunday shopping and they don't free-up time that could be reallocated to other activities. As the model predicts, the amount of time spent working during the week, shopping and on leisure over all seven days of the week do not change. The negative effect of the policy change on Monday to Saturday shopping and the increase of market work for mothers is confirmed with an OLS approach (Table 32). The increase of market work is however marginally insignificant. Women with no kids result, similarly to Tobit estimates, not affected by the introduction of Sunday shopping.

The results for men complement the analysis of women's behaviour. Table 27 reports the impact of the policy change on the Sundays' time use of fathers, whereas Table 28 refers to weekday's and Saturday's. The introduction of Sunday shopping had an effect on fathers similar to the effect that we found for women with children. However, the increase of market work that comes with the decrease of shopping time from Monday to Saturday is not statistically significant. Our results also suggest that the introduction of Sunday shopping produced no changes in the behaviour of men without children, who are likely not affected much by this policy change.

## 3.7 Discussion and robustness

In general, the results presented in the previous section support the idea that legal (and technological) constraints limiting the allocation of time can have relevant welfare costs on busy individuals, such as mothers. Before Sunday shopping was permitted, agents with very busy weekdays were forced to over-consume leisure on Sunday. In fact, their ability to reallocate tasks from the very busy weekdays to the less busy Sunday was limited. Moreover, according to the model, restrictions on Sunday shopping induce a reduction of paid work on the weekdays. Hence, the inefficient allocation of time is associated with less paid work and lower income.

Several studies have sought to explain why female labour participation has increased so much over the last 40 years. Among other factors such as gender based discrimination, the role of the allocation of time has received a lot of attention. Following this stream of research, our analysis suggests that some women would be willing to work more if they could manage their time more flexibly. This can contribute to explaining why some policies aiming to increase female labour supply only through money transfers may have failed. In fact, if women face tight time constraints, given their home production technology, a (small) money transfer can be ineffective in raising their labour supply. Sunday shopping deregulation provides in this sense a reasonable framework for studying how improvements of time use flexibility (i.e. improvements of the home production technology) increase labour supply.

One of the problems in our analysis is that part of the increase in minutes of work on weekdays may be due to the effects of Sunday shopping on labour demand. Therefore, there is the risk that the estimated effects of Sunday shopping on market work are actually a mixture of demand and supply effects. In order to address this problem, we estimate equation [3.8] again, dropping from the sample workers in the retail industry. This industry is in fact directly affected by Sunday shopping deregulation. The positive effect of the policy change on minutes of paid work for women with children is confirmed, along with the other main results previously discussed (Table 31). However, precision decreases due to the smaller sample size.

Another concern is related to the fact that even though we are exploiting the provincial variation of the policy change and we include a province specific time trend, we might still be capturing some of the unrelated long-run increasing trend of female labour force participation. This worry is in part fueled by the large estimated coefficient for the effect of Sunday shopping deregulation on paid work. The Canadian Labour Force Survey (LFS) allows some, though limited, robustness checks. Since the main prediction of the model is that the policy change induced an

increase in weekdays' paid work for busy individuals (women with children), the most conservative way of testing this prediction is by restricting the sample only to employed women. Doing so, we study the effect of Sunday shopping deregulation only on the intensive margin, neglecting any effect on the extensive one. This strategy removes the effects due to the increasing trend of female labour force participation. The LFS permits studying how Sunday shopping deregulation affected weekly usual hours of work and weekly overtime hours. The same analysis cannot be performed with the time use data from the GSS because of sample size limitations. The evidence obtained from the labour force survey suggests that Sunday shopping deregulation affected usual hours of work, changing permanently the regular allocation of time over a week. The estimated increase is about 1 hour for women with children, against a statistically insignificant effect for women without children (Table 33). Therefore, even though the magnitude of the estimated effect is reduced and direct comparison between GSS and LFS estimates is not easy, we find consistent evidence supporting the predictions of the model exploiting both data sources.

## 3.8 Conclusion

We study how the progressive removal of bans limiting Sunday shopping in Canada affected the allocation of time. We are in particular interested in analyzing how constraints on the use of time influence behavior of certain groups and their welfare.

We first develop a simple model showing that tight time constraints may affect the allocation of time only for busy individuals that cannot easily reallocate time over the week. The lack of such ability is often due to unavoidable time consuming activities, such as child care. Therefore, we study in particular the allocation of time of women with and without children.

Using five different cycles of the Time Use File of the General Social Survey of Canada, we estimate the effects of the policy change on market work, domestic work, leisure, and shopping. Identifying the correct magnitudes of these effects requires some care since they can be biased by other contemporaneous changes, such as the increasing female labour force participation. We try to deal with this problem mainly by exploiting the provincial variation in the timing of the policy change.

The results show that when Sunday shopping is introduced, women with children reduce minutes spent on weekdays shopping and increase time spent on Sunday shopping. This reduction of weekday shopping allows an increase of time in paid work. On the other hand, no significant effects are found for women without children.

Paying careful attention to the details of time constraints offers a better understanding of the behaviour of certain groups of the Canadian population. In particular, our analysis suggests that time and timing constraints are a crucial determinant of female labour supply. Acknowledging and understanding the role of these constraints may help the design of more efficient policies aiming to increase female labour force participation.

At the beginning of 2012 the Italian government passed a set of norms that aimed to increase the competitiveness of the Italian economy. Among these reforms there was the complete deregulation of shopping hours and Sunday shopping. The Italian data do not yet allow us to study whether this policy change produced effects similar to those we find for Canada. It would however be interesting to study how shopping hours deregulation affects women's behaviour in a country such as Italy where female labour force participation is low, work-schedules are quite rigid, and social norms are probably very different from Canada. This topic is left for future research.

## 3.9 Tables and Figures

**Table 18: Descriptive statistics (weighted shares), Married individuals 20-59, Canadian Time Use Survey**

| | 1986 | 1992 | 1998 | 2005 | 2010 |
|---|---|---|---|---|---|
| Male | 0.50 | 0.49 | 0.50 | 0.50 | 0.50 |
| | (0.009) | (0.009) | (0.008) | (0.006) | (0.008) |
| Kids | 0.52 | 0.50 | 0.49 | 0.44 | 0.47 |
| | (0.008) | (0.009) | (0.008) | (0.006) | (0.008) |
| **Labour force status** | | | | | |
| Employed | 0.65 | 0.66 | 0.70 | 0.73 | 0.68 |
| | (0.008) | (0.008) | (0.007) | (0.005) | (0.007) |
| Inactive (not retired) | 0.18 | 0.14 | 0.11 | 0.12 | 0.13 |
| | (0.006) | (0.006) | (0.005) | (0.004) | (0.005) |
| Retired | 0.07 | 0.07 | 0.10 | 0.10 | 0.06 |
| | (0.001) | (0.002) | (0.002) | (0.001) | (0.001) |
| Other | 0.10 | 13.0 | 0.09 | 0.05 | 13.0 |
| | (0.002) | (0.002) | (0.002) | (0.0007) | (0.001) |
| **Province** | | | | | |
| Newfoundland | 0.024 | 0.023 | 0.021 | 0.019 | 0.017 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Prince Edward Island | 0.005 | 0.005 | 0.005 | 0.005 | 0.004 |
| | (0.0005) | (0.0005) | (0.0005) | (0.0003) | (0.0003) |
| Nova Scotia | 0.038 | 0.037 | 0.035 | 0.033 | 0.031 |
| | (0.002) | (0.002) | (0.002) | (0.0015) | (0.0016) |
| New Brunswick | 0.031 | 0.030 | 0.029 | 0.027 | 0.024 |
| | (0.002) | (0.002) | (0.002) | (0.001) | (0.0015) |
| Quebec | 0.302 | 0.312 | 0.284 | 0.272 | 0.263 |
| | (0.007) | (0.008) | (0.007) | (0.005) | (0.007) |
| Ontario | 0.406 | 0.410 | 0.437 | 0.451 | 0.453 |
| | (0.009) | (0.009) | (0.008) | (0.006) | (0.008) |
| Manitoba | 0.045 | 0.041 | 0.041 | 0.040 | 0.040 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Saskatchewan | 0.041 | 0.036 | 0.035 | 0.033 | 0.034 |
| | (0.002) | (0.002) | (0.002) | (0.0015) | (0.0017) |
| Alberta | 0.108 | 0.106 | 0.112 | 0.121 | 0.133 |
| | (0.005) | (0.004) | (0.004) | (0.0037) | (0.0055) |
| Observations | 5,878 | 5,273 | 5,993 | 10,497 | 6,927 |

**Table 19: Descriptive statistics - Allocation of time (minutes)**

| | 1986 | 1992 | 1998 | 2005 | 2010 | Var. % 1986 -2010 |
|---|---|---|---|---|---|---|
| **Individuals with children** | | | | | | |
| **Men** | | | | | | |
| Paid work | 389 (10.8) | 357 (11.6) | 394 (11.4) | 410 (8.8) | 372 (10.4) | -4.4 |
| Domestic work | 114 (5.2) | 167 (6.0) | 174 (6.3) | 170 (4.7) | 187 (5.8) | 64.0 |
| Shopping | 26 (2.3) | 17 (1.8) | 18 (1.6) | 16 (1.3) | 20 (1.6) | -23.1 |
| Leisure | 909 (10.2) | 898 (9.9) | 853 (8.9) | 844 (7.2) | 859 (8.8) | -5.5 |
| **Women** | | | | | | |
| Paid work | 166 (7.5) | 188 (8.0) | 215 (8.2) | 229 (6.5) | 220 (7.6) | 32.5 |
| Domestic work | 296 (5.2) | 311 (6.0) | 315 (5.6) | 308 (4.8) | 325 (5.9) | 9.8 |
| Shopping | 42 (2.5) | 29 (1.8) | 28 (1.6) | 29 (1.2) | 26 (1.5) | -38.1 |
| Leisure | 935 (7.4) | 911 (6.9) | 880 (6.7) | 874 (5.3) | 868 (6.3) | -7.2 |
| **Without children** | | | | | | |
| **Men** | | | | | | |
| Paid work | 310 (11.0) | 347 (10.6) | 341 (10.4) | 331 (7.4) | 313 (10.0) | 0.1 |
| Domestic work | 67 (3.5) | 79 (3.6) | 93 (3.7) | 95 (3.1) | 101 (3.8) | 50.7 |
| Shopping | 22 (1.9) | 13 (1.2) | 19 (1.6) | 19 (1.2) | 16 (1.5) | -27.3 |
| Leisure | 1039 (11.2) | 1000 (9.9) | 986 (9.6) | 994 (6.7) | 1008 (9.3) | -3.0 |
| **Women** | | | | | | |
| Paid work | 244 (10.0) | 269 (10.3) | 275 (9.3) | 308 (6.9) | 299 (8.9) | 22.5 |
| Domestic work | 172 (5.4) | 162 (5.6) | 157 (4.6) | 145 (3.3) | 142 (4.1) | -17.4 |
| Shopping | 32 (2.2) | 26 (1.9) | 28 (1.9) | 30 (1.4) | 26 (1.8) | -18.9 |
| Leisure | 996 (10.7) | 981 (9.1) | 979 (8.5) | 957 (6.1) | 973 (8.2) | -2.3 |

Source: Canadian Time Use Survey

**Table 20: Occurrence time of the policy change**

| Province | Date |
|---|---|
| Newfoundland | January 1998 |
| Prince Edward Island | Each December since 1992 |
| Nova Scotia | October -2006 |
| New Brunswick | August to December since 1992 |
| Quebec | January 1993 |
| Ontario | June 1992 |
| Manitoba | December 1992 |
| Saskatchewan | May 1988 |
| Alberta | November 1984 |

**Table 21: Sunday shopping diffusion**

| | 1986 | 1992 | 1998 | 2005 | 2010 |
|---|---|---|---|---|---|
| **Fraction on the population shopping at least 1 minute on Sunday** | | | | | |
| Sunday shopping not permitted | 0.12 | 0.15 | 0.14 | 0.17 | 0.31 |
| | (0.019) | (0.017) | (0.031) | (0.031) | (0.060) |
| Sunday shopping permitted | 0.18 | 0.25 | 0.35 | 0.33 | 0.36 |
| | (0.056) | (0.042) | (0.021) | (0.015) | (0.019) |
| **Average time of shopping on Sunday (minutes)** | | | | | |
| Sunday shopping not permitted | 8.7 | 8.5 | 7.2 | 6.5 | 28.0 |
| | (1.71) | (1.27) | (2.62) | (1.57) | (7.2) |
| Sunday shopping permitted | 13.2 | 12.1 | 27.5 | 29.4 | 31.5 |
| | (4.89) | (2.88) | (2.42) | (2.05) | (2.63) |

Source: Canadian Time Use Survey

**Table 22: Differential effect of Sunday shopping on individuals with and without children. Dependent variable: minutes of shopping**

| | Sunday | Weekdays and Saturday |
|---|---|---|
| SUN | 47.66* | -3.473 |
| | (26.29) | (9.167) |
| Kids | -11.10 | 20.15*** |
| | (15.31) | (5.160) |
| Interaction (SUNxKid) | 28.93** | -17.19*** |
| | (14.64) | (5.115) |
| Male | -14.56** | -40.34*** |
| | (6.482) | (2.632) |
| **Education** | | |
| Less than high-school | (omitted) | (omitted) |
| High-school | 15.79 | 21.75*** |
| | (10.05) | (3.537) |
| Post-secondary education | 42.51*** | 26.15*** |
| | (11.39) | (4.068) |
| **Labour force status** | | |
| Employed | 21.64** | -22.11*** |
| | (9.321) | (3.664) |
| Inactive (not retired) | -6.399 | 12.75*** |
| | (11.35) | (4.428) |
| Retired | -17.06 | 8.884 |
| | (27.39) | (10.94) |
| Unemployed | (omitted) | (omitted) |
| **Household size** | | |
| 1 member | 24.41 | 18.06*** |
| | (15.43) | (5.944) |
| 2 members | 28.54** | 13.22*** |
| | (12.93) | (5.109) |
| 3 members | 21.92* | 4.071 |
| | (11.94) | (4.667) |
| 4 members | 8.873 | 3.996 |
| | (11.50) | (4.470) |
| More than 4 | (omitted) | (omitted) |
| **Age dummy** | | |
| AGE2024 | (omitted) | (omitted) |
| AGE2529 | 11.00 | 13.26*** |
| | (12.77) | (4.993) |
| AGE3034 | 7.327 | 6.213 |
| | (13.60) | (5.150) |
| AGE3539 | -1.469 | 20.95*** |
| | (13.42) | (5.090) |
| AGE4044 | 5.598 | 22.11*** |
| | (13.26) | (5.218) |
| AGE4549 | -8.010 | 23.89*** |
| | (13.11) | (5.410) |
| AGE5054 | 60.40 | -33.59** |
| | (39.66) | (15.72) |
| **Province dummy** | | |
| New Brunswick | 60.40 | -33.59** |
| | (39.66) | (15.72) |
| Quebec | 10.71 | -30.92*** |
| | (23.85) | (10.77) |
| Ontario | 24.30 | -19.35* |
| | (23.25) | (10.21) |
| Manitoba | -12.67 | -18.04 |

| | | |
|---|---|---|
| | (28.72) | (13.42) |
| Saskatchewan | -22.63 | -25.56* |
| | (27.59) | (13.07) |
| Alberta | -1.798 | -23.11** |
| | (25.20) | (11.78) |
| Nova Scotia | -45.43 | -5.390 |
| | (30.96) | (12.31) |
| Prince Edward Island | 18.45 | -28.51* |
| | (45.23) | (17.22) |
| Newfoundland and Labrador | (omitted) | (omitted) |
| **Time trend** | | |
| Linear term | 14.09*** | 2.906 |
| | (5.189) | (2.191) |
| Quadratic term | -0.773*** | -0.142 |
| | (0.284) | (0.114) |
| **Province specific time trend** | | |
| **Linear terms** | | |
| New Brunswick | -5.174 | -3.475 |
| | (6.706) | (2.655) |
| Quebec | -14.32*** | -6.255*** |
| | (5.217) | (2.197) |
| Ontario | -8.805* | -2.667 |
| | (5.160) | (2.142) |
| Manitoba | -10.73 | -0.730 |
| | (6.925) | (2.649) |
| Saskatchewan | -13.91** | -2.353 |
| | (6.384) | (2.720) |
| Alberta | -13.07** | -2.005 |
| | (5.649) | (2.400) |
| Nova Scotia | -8.676 | -0.809 |
| | (7.378) | (2.822) |
| Prince Edward Island | -16.35 | -4.240 |
| | (12.16) | (3.141) |
| Newfoundland and Labrador | (omitted) | (omitted) |
| **Quadratic terms** | | |
| New Brunswick | -0.409 | -0.0548 |
| | (0.293) | (0.111) |
| Quebec | -0.716*** | -0.223** |
| | (0.229) | (0.0897) |
| Ontario | -0.440* | -0.0425 |
| | (0.228) | (0.0886) |
| Manitoba | -0.498 | 0.0651 |
| | (0.321) | (0.107) |
| Saskatchewan | -0.770*** | -0.0218 |
| | (0.276) | (0.109) |
| Alberta | -0.646** | -0.00959 |
| | (0.258) | (0.101) |
| Nova Scotia | -0.251 | -0.0172 |
| | (0.330) | (0.122) |
| Prince Edward Island | -0.747 | -0.104 |
| | (0.530) | (0.134) |
| Newfoundland and Labrador | (omitted) | (omitted) |
| Constant | -167.8*** | -63.98*** |
| | (38.44) | (15.01) |
| *N* | 4,955 | 29,608 |

Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

**Table 23: Effects of Sunday shopping on the allocation of time (minutes). Women with children – Monday to Saturday**

| | Shopping | Market work | Domestic work | Leisure |
|---|---|---|---|---|
| SUN | -20.04* | 75.55* | -20.53 | 7.335 |
| | (11.60) | (43.33) | (20.61) | (17.79) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 18.54*** | -51.38*** | 11.87 | 14.18** |
| | (4.436) | (16.92) | (8.014) | (6.624) |
| Post-secondary education | 15.11*** | -28.85 | -7.389 | 28.64*** |
| | (5.205) | (19.93) | (9.632) | (8.124) |
| **Labour force status** | | | | |
| Employed | -26.54*** | 531.0*** | -181.7*** | -97.85*** |
| | (4.996) | (22.66) | (10.56) | (8.340) |
| Inactive (not retired) | 2.586 | -142.4*** | -51.28*** | 95.07*** |
| | (5.138) | (26.00) | (10.89) | (8.940) |
| Retired | -5.645 | -50.22 | -37.97 | 79.66** |
| | (31.83) | (221.0) | (86.30) | (34.87) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | (omitted) | (omitted) | (omitted) | (omitted) |
| 2 members | -0.263 | 7.984 | 68.30*** | -77.17*** |
| | (7.129) | (27.20) | (14.35) | (11.62) |
| 3 members | -4.149 | 12.10 | 37.25*** | -50.37*** |
| | (4.778) | (19.16) | (9.119) | (8.177) |
| 4 members | -4.443 | 29.10 | 10.14 | -32.27*** |
| | (4.371) | (18.42) | (8.493) | (7.608) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | 16.34* | 34.75 | -35.42** | 17.25 |
| | (8.578) | (33.55) | (14.44) | (12.71) |
| AGE3034 | 16.28** | 46.78 | -36.30*** | 11.18 |
| | (8.235) | (31.46) | (13.86) | (12.13) |
| AGE3539 | 16.94** | 79.70** | -25.09* | -12.17 |
| | (8.208) | (31.39) | (13.92) | (12.17) |
| AGE4044 | 40.57*** | 73.05** | 8.735 | -49.64*** |
| | (8.311) | (31.91) | (14.16) | (12.23) |
| AGE4549 | 32.92*** | 62.64* | 10.05 | -58.94*** |
| | (9.008) | (34.23) | (16.07) | (13.34) |
| AGE5054 | 47.41*** | 60.79 | 34.09* | -82.27*** |
| | (10.59) | (41.23) | (18.84) | (14.80) |
| **Province dummy** | | | | |
| New Brunswick | -22.93 | -10.73 | 7.155 | 13.96 |
| | (20.91) | (86.66) | (47.02) | (37.00) |
| Quebec | -25.30* | -52.49 | 26.01 | -2.632 |
| | (13.48) | (48.97) | (24.59) | (21.28) |
| Ontario | -6.136 | -4.567 | -10.43 | 8.688 |
| | (12.26) | (47.02) | (23.11) | (19.94) |
| Manitoba | -26.68* | -6.781 | 33.06 | -15.90 |
| | (15.44) | (59.71) | (27.54) | (24.97) |
| Saskatchewan | 2.364 | -9.066 | 31.11 | -35.32 |
| | (16.58) | (58.84) | (30.03) | (25.42) |
| Alberta | 2.797 | -17.95 | 30.28 | -19.75 |

| | | | | |
|---|---|---|---|---|
| | (14.09) | (54.33) | (26.60) | (22.50) |
| Nova Scotia | -7.367 | -43.52 | 27.29 | 4.167 |
| | (15.40) | (61.14) | (28.93) | (24.50) |
| Prince Edward Island | -13.74 | 25.06 | 2.664 | -5.094 |
| | (23.11) | (87.23) | (40.29) | (31.41) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 0.298 | 5.025 | -2.747 | -0.981 |
| | (2.714) | (11.84) | (5.386) | (4.414) |
| Quadratic term | 0.0204 | -0.135 | 0.201 | -0.0900 |
| | (0.145) | (0.588) | (0.289) | (0.231) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -0.928 | -6.774 | -3.040 | 9.041 |
| | (3.607) | (15.51) | (7.862) | (6.038) |
| Quebec | -4.028 | -1.813 | -0.524 | 5.507 |
| | (2.838) | (11.87) | (5.342) | (4.342) |
| Ontario | 0.173 | -1.436 | -1.365 | 5.381 |
| | (2.683) | (11.66) | (5.227) | (4.254) |
| Manitoba | 0.912 | -2.415 | 3.365 | 2.164 |
| | (3.299) | (13.56) | (6.049) | (5.134) |
| Saskatchewan | 2.579 | -5.884 | 1.242 | 4.614 |
| | (3.526) | (13.92) | (6.497) | (5.332) |
| Alberta | 2.622 | -3.357 | 2.595 | 0.691 |
| | (3.043) | (12.86) | (5.888) | (4.774) |
| Nova Scotia | -0.0985 | -13.86 | 6.610 | 3.180 |
| | (3.693) | (14.80) | (6.622) | (5.706) |
| Prince Edward Island | 0.0875 | -3.303 | 0.996 | 3.496 |
| | (4.310) | (17.26) | (7.338) | (6.279) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | 0.0621 | -0.391 | -0.135 | 0.470** |
| | (0.147) | (0.608) | (0.310) | (0.237) |
| Quebec | -0.117 | -0.0714 | 0.0189 | 0.283* |
| | (0.116) | (0.471) | (0.228) | (0.172) |
| Ontario | 0.0827 | -0.0630 | -0.00510 | 0.242 |
| | (0.112) | (0.465) | (0.227) | (0.170) |
| Manitoba | 0.182 | 0.000690 | 0.183 | 0.0714 |
| | (0.139) | (0.544) | (0.258) | (0.204) |
| Saskatchewan | 0.198 | -0.180 | 0.0906 | 0.217 |
| | (0.141) | (0.551) | (0.269) | (0.209) |
| Alberta | 0.168 | -0.136 | 0.0533 | 0.0696 |
| | (0.129) | (0.520) | (0.258) | (0.197) |
| Nova Scotia | 0.0536 | -0.437 | 0.271 | 0.136 |
| | (0.161) | (0.615) | (0.287) | (0.239) |
| Prince Edward Island | 0.0531 | -0.172 | 0.0353 | 0.223 |
| | (0.185) | (0.685) | (0.308) | (0.259) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | -44.54** | -245.6*** | 202.1*** | 367.2*** |
| | (19.39) | (74.89) | (2.468) | (31.37) |
| *N* | 8,152 | 8,152 | 8,152 | 8,152 |

**Table 24: Effects of Sunday shopping on the allocation of time (minutes). Women with children – Sunday**

| | Shopping | Leisure | Domestic work | Market work |
|---|---|---|---|---|
| SUN | 95.87** | -112.1** | 10.74 | 270.1 |
| | (45.89) | (55.21) | (44.31) | (220.6) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 28.75* | 2.860 | 49.15*** | -121.6 |
| | (16.01) | (22.55) | (17.92) | (86.71) |
| Post-secondary education | 43.30** | -14.80 | 68.30*** | -83.59 |
| | (19.88) | (26.52) | (21.74) | (99.93) |
| **Labour force status** | | | | |
| Employed | 37.00** | -55.77 | 11.03 | 558.0*** |
| | (17.19) | (34.58) | (22.01) | (111.0) |
| Inactive (not retired) | 20.48 | -12.58 | 53.05** | 107.7 |
| | (18.11) | (34.68) | (22.44) | (117.7) |
| Retired | 56.92 | 304.4*** | -208.4*** | -2774.0 |
| | (40.48) | (56.21) | (36.28) | (.) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | (omitted) | (omitted) | (omitted) | (omitted) |
| 2 members | 11.49 | 117.8*** | -59.85** | -265.8* |
| | (25.48) | (32.35) | (27.95) | (142.0) |
| 3 members | 15.51 | 79.27*** | -28.15 | -233.1** |
| | (15.52) | (23.90) | (20.10) | (90.41) |
| 4 members | 14.07 | 38.20* | -10.50 | -123.0 |
| | (14.85) | (22.34) | (18.41) | (82.40) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | -5.799 | 10.05 | 42.28 | -247.5* |
| | (22.92) | (35.32) | (28.22) | (142.6) |
| AGE3034 | -19.25 | 17.25 | 19.13 | -140.1 |
| | (22.87) | (35.83) | (28.19) | (137.7) |
| AGE3539 | -1.012 | 20.91 | 19.00 | -135.3 |
| | (21.93) | (34.87) | (27.15) | (134.1) |
| AGE4044 | -6.011 | 35.39 | -37.82 | -59.93 |
| | (22.69) | (40.00) | (27.58) | (143.7) |
| AGE4549 | 12.30 | 93.73** | -41.78 | -242.4 |
| | (25.24) | (38.97) | (30.60) | (153.1) |
| AGE5054 | -38.82 | 87.56* | -36.07 | -112.1 |
| | (32.72) | (46.60) | (45.46) | (191.7) |
| **Province dummy** | | | | |
| New Brunswick | 86.75 | -65.84 | 47.13 | -786.4* |
| | (59.03) | (83.08) | (70.51) | (458.6) |
| Quebec | -11.92 | 68.07 | -32.30 | -242.3 |
| | (29.41) | (51.96) | (42.29) | (188.6) |
| Ontario | 0.361 | 91.68* | -48.92 | -384.3** |
| | (26.80) | (49.54) | (38.76) | (162.6) |
| Manitoba | -8.901 | 70.53 | -19.16 | -442.1** |
| | (35.15) | (56.86) | (46.51) | (217.1) |
| Saskatchewan | -18.40 | 204.0*** | -160.9*** | -338.9 |
| | (35.31) | (61.96) | (52.03) | (235.8) |
| Alberta | -29.67 | 39.98 | -95.37** | 27.49 |

| | | | | |
|---|---|---|---|---|
| | (31.80) | (57.04) | (45.85) | (186.9) |
| Nova Scotia | 20.60 | 39.41 | -63.67 | 104.8 |
| | (44.20) | (63.98) | (53.99) | (179.8) |
| Prince Edward Island | 46.02 | -86.98 | -23.33 | 20.94 |
| | (66.33) | (98.60) | (92.50) | (427.4) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 8.984 | -15.05 | 19.20** | -14.32 |
| | (7.470) | (11.15) | (8.704) | (43.13) |
| Quadratic term | -0.277 | 0.217 | -0.824 | 3.333 |
| | (0.439) | (0.623) | (0.514) | (2.525) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -8.311 | 11.93 | 1.396 | -163.4** |
| | (9.429) | (14.03) | (11.14) | (76.13) |
| Quebec | -19.84** | 16.52 | -12.15 | -2.792 |
| | (7.832) | (10.96) | (8.371) | (47.86) |
| Ontario | -9.115 | 26.01** | -20.63** | -45.62 |
| | (7.497) | (11.12) | (8.449) | (43.41) |
| Manitoba | -10.64 | 25.97** | -22.57** | -43.04 |
| | (11.71) | (12.48) | (10.83) | (56.52) |
| Saskatchewan | -13.96 | 32.44** | -38.79*** | 30.31 |
| | (9.186) | (14.62) | (11.25) | (65.01) |
| Alberta | -22.41*** | 19.41 | -27.38*** | 45.45 |
| | (8.574) | (12.07) | (9.530) | (49.12) |
| Nova Scotia | -3.721 | 25.55* | -18.58 | 1.032 |
| | (13.11) | (14.61) | (12.11) | (58.96) |
| Prince Edward Island | -18.80 | 5.342 | -11.59 | -23.06 |
| | (12.67) | (16.67) | (15.74) | (76.84) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | -0.573 | 0.625 | -0.0555 | -5.018 |
| | (0.431) | (0.556) | (0.454) | (3.148) |
| Quebec | -0.965*** | 0.594 | -0.606* | 1.561 |
| | (0.357) | (0.435) | (0.330) | (2.095) |
| Ontario | -0.332 | 0.917** | -0.925*** | 0.000436 |
| | (0.340) | (0.464) | (0.349) | (1.956) |
| Manitoba | -0.666 | 1.000* | -0.995** | 0.327 |
| | (0.497) | (0.522) | (0.469) | (2.476) |
| Saskatchewan | -0.813** | 1.038* | -1.539*** | 3.660 |
| | (0.408) | (0.604) | (0.439) | (2.769) |
| Alberta | -1.098*** | 1.018** | -1.188*** | 2.867 |
| | (0.409) | (0.495) | (0.382) | (2.271) |
| Nova Scotia | -0.189 | 1.143* | -0.873* | 1.343 |
| | (0.614) | (0.597) | (0.499) | (2.683) |
| Prince Edward Island | -1.052* | 0.278 | -0.576 | 1.148 |
| | (0.553) | (0.679) | (0.629) | (3.070) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | 119.6*** | 218.1*** | 179.4*** | 573.9*** |
| | (9.302) | (9.060) | (3.999) | (31.15) |
| *N* | 1,396 | 1,396 | 1,396 | 1,396 |

**Table 25: Effects of Sunday shopping on the allocation of time (minutes). Women without children – Monday to Saturday**

| | Shopping | Market work | Domestic work | Leisure |
|---|---|---|---|---|
| SUN | 11.74 | -56.04 | 28.84 | -3.622 |
| | (14.59) | (44.24) | (24.26) | (16.52) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 16.49*** | -20.59 | 22.62** | -8.563 |
| | (5.380) | (19.54) | (10.34) | (6.755) |
| Post-secondary education | 22.58*** | -12.20 | 26.93** | -22.65*** |
| | (6.118) | (22.63) | (12.62) | (7.728) |
| **Labour force status** | | | | |
| Employed | -7.569 | 556.5*** | -289.1*** | -34.23*** |
| | (4.658) | (18.64) | (9.399) | (5.724) |
| Inactive (not retired) | 20.65*** | -168.1*** | -66.38*** | 114.9*** |
| | (6.736) | (32.21) | (12.66) | (9.133) |
| Retired | 20.12 | -348.7*** | 1.023 | 48.54** |
| | (14.55) | (75.67) | (24.45) | (20.71) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | 11.88 | -33.62 | 33.84* | -21.12 |
| | (11.57) | (34.14) | (19.27) | (13.02) |
| 2 members | 11.88 | -51.81 | 41.08** | -11.70 |
| | (11.39) | (34.20) | (19.10) | (13.19) |
| 3 members | 7.227 | -47.29 | 39.02* | -19.24 |
| | (11.97) | (36.24) | (20.13) | (13.84) |
| 4 members | 15.83 | -71.61* | 51.78** | -17.04 |
| | (12.47) | (37.72) | (20.95) | (13.94) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | 10.23 | 15.93 | -43.04*** | 35.86*** |
| | (6.260) | (21.04) | (11.94) | (6.773) |
| AGE3034 | 11.84* | 12.86 | -38.91*** | 35.66*** |
| | (6.945) | (23.36) | (13.55) | (7.566) |
| AGE3539 | 6.223 | -18.88 | -48.57*** | 60.37*** |
| | (7.520) | (25.04) | (13.86) | (8.594) |
| AGE4044 | 6.878 | -5.925 | -68.68*** | 74.67*** |
| | (7.031) | (24.37) | (14.76) | (9.211) |
| AGE4549 | 20.65*** | -44.87** | -55.95*** | 81.67*** |
| | (6.317) | (20.81) | (11.84) | (7.895) |
| AGE5054 | 17.64*** | -38.75* | -59.35*** | 89.11*** |
| | (5.978) | (20.33) | (11.48) | (7.585) |
| **Province dummy** | | | | |
| New Brunswick | -6.203 | 51.53 | -3.548 | -18.18 |
| | (23.61) | (75.68) | (40.37) | (26.19) |
| Quebec | -29.26** | 127.8*** | -38.05 | -38.98** |
| | (13.93) | (48.20) | (24.42) | (15.89) |
| Ontario | -26.15** | 68.53 | -24.45 | -17.46 |
| | (13.15) | (44.15) | (22.25) | (15.19) |
| Manitoba | -20.11 | 90.02 | -17.70 | -17.45 |
| | (17.77) | (62.21) | (31.79) | (21.39) |
| Saskatchewan | -26.71 | -10.28 | 10.72 | 6.096 |
| | (17.55) | (57.32) | (29.67) | (21.63) |

| | | | | |
|---|---|---|---|---|
| Alberta | -32.80** | 63.84 | -5.460 | -31.50* |
| | (15.44) | (51.18) | (25.67) | (17.84) |
| Nova Scotia | -1.511 | 7.872 | -5.186 | -2.041 |
| | (16.13) | (58.40) | (28.99) | (20.07) |
| Prince Edward Island | -0.252 | -42.42 | 64.12 | -53.08* |
| | (24.10) | (76.54) | (40.21) | (27.90) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 0.701 | 11.12 | -1.684 | -0.740 |
| | (3.218) | (12.33) | (5.408) | (3.723) |
| Quadratic term | -0.00373 | -0.227 | -0.121 | -0.0876 |
| | (0.166) | (0.621) | (0.298) | (0.197) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -0.405 | -3.446 | -2.159 | 3.508 |
| | (4.331) | (15.13) | (6.803) | (4.601) |
| Quebec | -6.383* | 11.06 | -6.717 | -2.325 |
| | (3.436) | (12.82) | (5.574) | (3.781) |
| Ontario | -1.945 | -15.65 | 6.094 | 2.143 |
| | (3.335) | (12.26) | (5.304) | (3.654) |
| Manitoba | 0.0701 | -14.36 | 4.988 | 2.675 |
| | (4.080) | (14.80) | (6.962) | (4.571) |
| Saskatchewan | -1.449 | -13.42 | 5.268 | 4.931 |
| | (4.267) | (14.69) | (6.722) | (4.946) |
| Alberta | -3.276 | -22.10* | 11.53* | 1.557 |
| | (3.742) | (13.34) | (6.056) | (4.101) |
| Nova Scotia | -1.827 | -6.730 | -3.500 | 4.838 |
| | (4.560) | (15.80) | (7.712) | (5.201) |
| Prince Edward Island | -5.974 | -18.05 | 9.112 | -7.277 |
| | (4.816) | (16.73) | (8.236) | (6.393) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | -0.00858 | -0.318 | -0.118 | 0.227 |
| | (0.187) | (0.645) | (0.288) | (0.203) |
| Quebec | -0.276* | 0.319 | -0.321 | -0.0246 |
| | (0.147) | (0.537) | (0.233) | (0.157) |
| Ontario | -0.0340 | -0.637 | 0.185 | 0.120 |
| | (0.144) | (0.521) | (0.225) | (0.154) |
| Manitoba | 0.0512 | -0.627 | 0.134 | 0.161 |
| | (0.173) | (0.608) | (0.285) | (0.184) |
| Saskatchewan | -0.00653 | -0.398 | 0.116 | 0.213 |
| | (0.179) | (0.608) | (0.276) | (0.206) |
| Alberta | -0.134 | -0.811 | 0.392 | 0.0857 |
| | (0.164) | (0.575) | (0.267) | (0.177) |
| Nova Scotia | -0.113 | -0.291 | -0.246 | 0.242 |
| | (0.202) | (0.687) | (0.354) | (0.229) |
| Prince Edward Island | -0.251 | -0.850 | 0.119 | -0.170 |
| | (0.219) | (0.713) | (0.377) | (0.290) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | -81.80*** | -89.53 | 1137.6*** | 120.0*** |
| | (22.51) | (73.15) | (38.76) | (25.70) |
| *N* | 8,057 | 8,057 | 8,057 | 8,057 |

**Table 26: Effects of Sunday shopping on the allocation of time (minutes). Women without children – Sunday**

| | Shopping | Leisure | Domestic work | Market work |
|---|---|---|---|---|
| SUN | 29.04 | -19.19 | 40.88 | 219.4 |
| | (48.74) | (64.77) | (50.06) | (240.1) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 49.13** | 25.41 | 12.33 | -64.60 |
| | (19.73) | (28.75) | (18.03) | (94.55) |
| Post-secondary education | 75.02*** | 50.72* | -18.84 | -18.15 |
| | (22.77) | (30.23) | (21.23) | (104.6) |
| **Labour force status** | | | | |
| Employed | 51.15*** | -65.01*** | 16.13 | 238.0*** |
| | (16.60) | (22.54) | (17.93) | (87.82) |
| Inactive (not retired) | -15.15 | -17.33 | 36.22 | -244.0* |
| | (24.35) | (31.46) | (25.70) | (135.6) |
| Retired | -8.416 | 84.06** | -54.56 | -3227.7 |
| | (45.63) | (37.24) | (38.57) | (.) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | 0.341 | -14.08 | 98.42** | -120.4 |
| | (37.79) | (50.81) | (39.22) | (161.5) |
| 2 members | 1.854 | -2.315 | 112.0*** | -314.8** |
| | (35.62) | (51.67) | (38.60) | (153.8) |
| 3 members | 14.19 | -26.92 | 81.42** | -121.8 |
| | (41.42) | (54.14) | (41.19) | (167.8) |
| 4 members | 1.193 | -24.32 | 123.9*** | -235.6 |
| | (39.98) | (59.77) | (43.36) | (192.3) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | 8.828 | -23.41 | 66.21** | -210.5** |
| | (23.96) | (31.11) | (26.40) | (101.6) |
| AGE3034 | 9.091 | -21.08 | 64.99*** | -125.4 |
| | (23.42) | (27.69) | (21.66) | (112.1) |
| AGE3539 | 29.85 | -1.033 | 68.91*** | -277.0** |
| | (26.21) | (32.87) | (23.63) | (123.4) |
| AGE4044 | 8.593 | -52.03* | 105.7*** | -232.4* |
| | (26.76) | (30.53) | (24.68) | (130.2) |
| AGE4549 | -8.818 | -62.66* | 86.34*** | -122.6 |
| | (21.45) | (34.82) | (22.43) | (115.0) |
| AGE5054 | -3.056 | -20.33 | 91.32*** | -310.0*** |
| | (19.68) | (29.55) | (22.36) | (102.4) |
| **Province dummy** | | | | |
| New Brunswick | -26.29 | -88.74 | 185.9** | -154.1 |
| | (85.24) | (119.8) | (86.81) | (434.4) |
| Quebec | -10.70 | 109.3* | 13.80 | -447.4* |
| | (51.21) | (66.28) | (49.77) | (232.7) |
| Ontario | -8.436 | 42.47 | 52.34 | -403.3* |
| | (49.75) | (64.69) | (46.72) | (219.8) |
| Manitoba | -76.89 | 96.38 | 79.81 | -489.9* |
| | (59.52) | (78.66) | (60.58) | (269.0) |
| Saskatchewan | -26.26 | -22.52 | 76.50 | -225.1 |
| | (60.71) | (72.42) | (59.18) | (261.9) |
| Alberta | 2.472 | 31.44 | 56.03 | -372.2 |

| | | | | |
|---|---|---|---|---|
| | (51.92) | (68.28) | (49.40) | (234.8) |
| Nova Scotia | -60.47 | 6.392 | 73.06 | -176.2 |
| | (58.28) | (73.11) | (55.75) | (255.0) |
| Prince Edward Island | -88.87 | 166.4 | 44.39 | -228.4 |
| | (98.63) | (103.3) | (92.16) | (430.1) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 19.16* | 12.43 | -17.92 | 4.253 |
| | (11.23) | (14.62) | (11.37) | (52.65) |
| Quadratic term | -1.195** | -0.815 | 0.337 | 2.113 |
| | (0.602) | (0.749) | (0.604) | (2.539) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | 1.107 | -27.19 | 51.08*** | -115.7 |
| | (15.50) | (20.68) | (14.64) | (83.00) |
| Quebec | -17.15 | -7.365 | 18.19 | -16.16 |
| | (11.21) | (15.07) | (11.65) | (57.01) |
| Ontario | -13.08 | -5.526 | 22.82* | -56.29 |
| | (11.12) | (15.01) | (11.68) | (56.03) |
| Manitoba | -16.19 | -0.876 | 35.68*** | -88.76 |
| | (13.97) | (17.07) | (13.29) | (65.08) |
| Saskatchewan | -17.73 | 0.485 | 18.01 | -70.27 |
| | (14.15) | (18.39) | (15.21) | (66.84) |
| Alberta | -10.62 | -11.28 | 23.01* | -73.35 |
| | (11.69) | (16.64) | (12.01) | (58.01) |
| Nova Scotia | 4.078 | -24.11 | 25.74* | -26.95 |
| | (14.64) | (18.62) | (15.43) | (74.30) |
| Prince Edward Island | -29.73 | 20.24 | 23.62* | -102.0 |
| | (26.41) | (18.04) | (14.23) | (84.92) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | -0.113 | -0.723 | 1.687*** | -6.072* |
| | (0.671) | (0.832) | (0.630) | (3.369) |
| Quebec | -0.927* | -0.485 | 0.531 | 0.647 |
| | (0.477) | (0.631) | (0.522) | (2.193) |
| Ontario | -0.815* | -0.156 | 0.727 | -1.978 |
| | (0.493) | (0.632) | (0.538) | (2.190) |
| Manitoba | -0.786 | -0.0419 | 1.238** | -3.247 |
| | (0.592) | (0.690) | (0.570) | (2.588) |
| Saskatchewan | -0.926 | 0.198 | 0.366 | -2.996 |
| | (0.587) | (0.804) | (0.691) | (2.699) |
| Alberta | -0.540 | -0.668 | 0.652 | -3.034 |
| | (0.517) | (0.825) | (0.573) | (2.389) |
| Nova Scotia | 0.341 | -1.005 | 0.914 | -1.485 |
| | (0.652) | (0.797) | (0.682) | (3.169) |
| Prince Edward Island | -1.006 | 0.778 | 0.684 | -4.022 |
| | (1.111) | (0.779) | (0.601) | (3.694) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | -153.1* | 1180.9*** | -111.1 | -110.3 |
| | (81.27) | (108.0) | (84.85) | (362.8) |
| *N* | 1,310 | 1,310 | 1,310 | 1,310 |

**Table 27: Effects of Sunday shopping on the allocation of time (minutes). Men with children – Sunday**

| | Shopping | Leisure | Domestic work | Market work |
|---|---|---|---|---|
| SUN | 98.68** | -110.2** | 60.72 | -33.46 |
| | (41.46) | (51.79) | (43.04) | (209.0) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 3.061 | 2.888 | 59.02*** | -168.7** |
| | (22.82) | (26.31) | (19.19) | (80.73) |
| Post-secondary education | 41.33* | -19.19 | 80.78*** | -139.6 |
| | (22.71) | (29.83) | (22.47) | (91.55) |
| **Labour force status** | | | | |
| Employed | -7.635 | -93.99*** | 7.712 | 472.7*** |
| | (19.32) | (24.07) | (20.77) | (104.2) |
| Inactive (not retired) | -4.822 | -14.50 | -11.58 | 231.8 |
| | (35.58) | (47.57) | (46.55) | (176.8) |
| Retired | -672.2 | -0.908 | 16.36 | -2924.8 |
| | (.) | (76.86) | (132.6) | (.) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | (omitted) | (omitted) | (omitted) | (omitted) |
| 2 members | 49.93 | 26.29 | -3.852 | 49.19 |
| | (68.06) | (66.71) | (58.93) | (256.5) |
| 3 members | 29.62 | 37.95 | -57.56*** | 15.43 |
| | (18.56) | (27.11) | (20.77) | (85.60) |
| 4 members | -8.284 | 29.76 | -5.033 | -21.67 |
| | (17.91) | (24.52) | (20.74) | (79.21) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | -1.988 | 52.89 | -86.57* | -85.72 |
| | (58.77) | (115.7) | (44.19) | (407.1) |
| AGE3034 | 23.62 | 97.76 | -105.4*** | -134.4 |
| | (55.86) | (112.7) | (38.50) | (403.8) |
| AGE3539 | -22.05 | 102.6 | -107.9*** | -126.6 |
| | (55.72) | (113.5) | (39.74) | (408.4) |
| AGE4044 | -1.463 | 113.3 | -95.66** | -197.4 |
| | (56.10) | (113.8) | (40.29) | (407.9) |
| AGE4549 | -11.81 | 150.2 | -148.6*** | -231.0 |
| | (56.92) | (115.9) | (42.26) | (413.9) |
| AGE5054 | -6.428 | 116.5 | -161.4*** | -40.46 |
| | (57.85) | (116.5) | (45.41) | (413.5) |
| **Province dummy** | | | | |
| New Brunswick | 136.5* | -178.6 | 85.86 | 76.79 |
| | (82.41) | (117.9) | (102.2) | (375.4) |
| Quebec | 12.40 | 33.38 | -77.80 | 286.9 |
| | (62.58) | (69.15) | (52.07) | (241.7) |
| Ontario | 9.106 | 98.80 | -103.3** | 124.9 |
| | (61.45) | (64.62) | (43.52) | (234.5) |
| Manitoba | -13.38 | 156.5 | -104.2 | 47.25 |
| | (74.73) | (95.14) | (64.11) | (298.8) |
| Saskatchewan | -52.01 | -8.244 | -32.62 | 214.3 |
| | (69.23) | (79.10) | (60.95) | (279.9) |
| Alberta | -1.244 | 170.0** | -200.7*** | 257.1 |

| | | | | |
|---|---|---|---|---|
| | (68.27) | (86.08) | (57.26) | (294.6) |
| Nova Scotia | -130.0 | -165.6* | 29.49 | 538.7* |
| | (79.21) | (87.17) | (68.86) | (281.4) |
| Prince Edward Island | 123.2 | -129.8 | 62.70 | 140.7 |
| | (83.18) | (115.8) | (89.40) | (436.6) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 8.525 | -24.70* | 27.43*** | -52.46 |
| | (11.98) | (13.01) | (9.914) | (53.41) |
| Quadratic term | -0.174 | 1.017** | -1.004** | 2.466 |
| | (0.449) | (0.517) | (0.430) | (2.693) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | 5.286 | 14.86 | -14.58 | 13.88 |
| | (14.86) | (21.39) | (17.56) | (65.92) |
| Quebec | -6.289 | 23.10 | -27.38** | 29.23 |
| | (12.86) | (14.71) | (11.51) | (51.87) |
| Ontario | -3.056 | 23.45 | -24.99** | 24.27 |
| | (12.62) | (14.54) | (11.13) | (51.89) |
| Manitoba | -3.463 | 40.84** | -21.94 | -30.68 |
| | (15.85) | (19.59) | (14.43) | (63.23) |
| Saskatchewan | -15.31 | 17.68 | -26.52* | 15.90 |
| | (14.93) | (16.85) | (13.69) | (58.30) |
| Alberta | -8.002 | 42.34** | -40.54*** | 23.98 |
| | (14.26) | (18.52) | (14.04) | (61.36) |
| Nova Scotia | -14.01 | -1.911 | -27.57* | 92.03 |
| | (16.42) | (19.15) | (14.71) | (64.68) |
| Prince Edward Island | 175.6 | -8.490 | -23.85 | 207.2** |
| | (.) | (24.39) | (17.91) | (94.06) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | 0.182 | 1.045 | -0.742 | 0.325 |
| | (0.570) | (0.828) | (0.677) | (2.621) |
| Quebec | -0.203 | 1.102* | -1.142** | 0.447 |
| | (0.480) | (0.582) | (0.477) | (1.990) |
| Ontario | 0.0813 | 0.785 | -0.899* | 0.893 |
| | (0.471) | (0.598) | (0.480) | (2.027) |
| Manitoba | 0.214 | 1.470* | -0.734 | -1.686 |
| | (0.652) | (0.752) | (0.600) | (2.414) |
| Saskatchewan | -0.662 | 0.969 | -1.324** | 0.463 |
| | (0.620) | (0.662) | (0.572) | (2.227) |
| Alberta | -0.378 | 1.799** | -1.677*** | 0.753 |
| | (0.545) | (0.760) | (0.605) | (2.369) |
| Nova Scotia | -0.122 | 0.0494 | -1.484** | 3.175 |
| | (0.661) | (0.824) | (0.617) | (2.622) |
| Prince Edward Island | 5.260 | -0.0798 | -1.566** | 9.736** |
| | (.) | (1.109) | (0.769) | (3.976) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | 122.2*** | 227.6*** | 176.9*** | 553.4*** |
| | (9.524) | (6.443) | (5.357) | (27.54) |
| *N* | 937 | 937 | 937 | 937 |

**Table 28: Effects of Sunday shopping on the allocation of time (minutes). Men with children – Monday to Saturday**

| | Shopping | Market work | Domestic work | Leisure |
|---|---|---|---|---|
| SUN | -39.49** | 40.14 | -18.24 | -1.745 |
| | (20.04) | (40.23) | (19.80) | (24.81) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 16.97** | -23.31* | 14.25** | 10.98 |
| | (7.083) | (13.36) | (7.042) | (8.505) |
| Post-secondary education | 30.75*** | -23.39 | 27.67*** | 5.316 |
| | (7.935) | (15.20) | (7.739) | (9.564) |
| **Labour force status** | | | | |
| Employed | -37.64*** | 524.6*** | -98.09*** | -240.6*** |
| | (8.002) | (20.59) | (8.857) | (11.46) |
| Inactive (not retired) | -3.539 | -95.22** | 126.1*** | -72.83*** |
| | (13.73) | (40.04) | (17.30) | (19.19) |
| Retired | 6.356 | -398.8*** | 12.05 | 63.48 |
| | (27.37) | (136.8) | (41.10) | (59.18) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | (omitted) | (omitted) | (omitted) | (omitted) |
| 2 members | 15.57 | -55.32 | -16.58 | 56.68** |
| | (19.66) | (44.60) | (19.87) | (27.54) |
| 3 members | 10.74 | -25.57* | -12.52* | 28.91*** |
| | (7.470) | (14.57) | (7.513) | (9.180) |
| 4 members | 3.710 | -13.14 | -4.351 | 14.95* |
| | (6.802) | (13.65) | (7.029) | (8.479) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | 11.60 | 7.317 | 18.93 | -28.75 |
| | (20.99) | (41.57) | (18.69) | (24.70) |
| AGE3034 | 18.68 | 19.36 | 26.87 | -44.37* |
| | (20.15) | (40.34) | (17.81) | (23.83) |
| AGE3539 | 13.28 | 35.58 | 4.770 | -35.22 |
| | (20.01) | (39.88) | (17.67) | (23.63) |
| AGE4044 | 20.38 | 35.91 | -4.816 | -38.21 |
| | (20.11) | (40.07) | (17.87) | (23.68) |
| AGE4549 | 22.14 | 15.77 | -22.40 | -8.592 |
| | (20.50) | (40.84) | (18.24) | (24.32) |
| AGE5054 | 39.15* | -9.641 | -15.45 | 5.367 |
| | (21.24) | (42.81) | (19.45) | (25.41) |
| **Province dummy** | | | | |
| New Brunswick | -62.00* | 54.87 | -58.23* | 23.56 |
| | (33.81) | (73.02) | (33.71) | (44.38) |
| Quebec | -24.06 | 54.05 | -32.68 | -13.84 |
| | (21.49) | (49.02) | (23.25) | (29.80) |
| Ontario | -14.34 | 37.92 | -32.90 | 0.447 |
| | (19.72) | (46.90) | (21.76) | (28.91) |
| Manitoba | 18.04 | 7.866 | -26.43 | 12.64 |
| | (25.62) | (55.59) | (26.10) | (32.31) |
| Saskatchewan | -51.93** | 97.87* | -30.34 | -26.87 |
| | (24.91) | (55.35) | (25.91) | (34.55) |
| Alberta | -28.12 | 73.29 | -56.47** | 1.010 |

| | | | | |
|---|---|---|---|---|
| | (24.06) | (51.21) | (24.46) | (32.65) |
| Nova Scotia | 7.311 | 87.91 | -17.76 | -56.51 |
| | (25.49) | (61.75) | (27.11) | (37.90) |
| Prince Edward Island | -54.85 | 102.8 | -72.81** | 2.846 |
| | (35.76) | (74.95) | (34.93) | (45.96) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 5.141 | 2.811 | 5.548 | -5.850 |
| | (4.555) | (9.894) | (4.778) | (6.129) |
| Quadratic term | -0.358 | 0.0213 | -0.249 | 0.0744 |
| | (0.242) | (0.488) | (0.244) | (0.303) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -0.956 | -14.90 | -5.882 | 14.13* |
| | (5.774) | (12.39) | (5.818) | (7.685) |
| Quebec | -3.318 | 2.180 | -3.008 | 2.152 |
| | (4.713) | (10.10) | (4.897) | (6.220) |
| Ontario | 2.863 | -18.78* | -1.000 | 15.01** |
| | (4.543) | (9.818) | (4.763) | (6.146) |
| Manitoba | 5.156 | -5.713 | -2.680 | 4.664 |
| | (5.552) | (11.77) | (5.826) | (7.154) |
| Saskatchewan | -6.903 | 0.353 | -3.837 | 7.004 |
| | (5.746) | (12.23) | (5.906) | (7.593) |
| Alberta | 1.306 | -3.583 | -1.515 | 6.578 |
| | (5.199) | (10.70) | (5.255) | (6.751) |
| Nova Scotia | 5.909 | -4.383 | -1.432 | 2.724 |
| | (6.412) | (12.96) | (6.259) | (8.037) |
| Prince Edward Island | 4.177 | -17.05 | -4.914 | 19.28** |
| | (6.694) | (12.96) | (6.485) | (8.056) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | 0.146 | -0.707 | -0.170 | 0.516* |
| | (0.244) | (0.488) | (0.238) | (0.308) |
| Quebec | -0.0467 | 0.0982 | -0.0980 | 0.0877 |
| | (0.197) | (0.389) | (0.194) | (0.243) |
| Ontario | 0.269 | -0.775** | -0.0108 | 0.564** |
| | (0.193) | (0.382) | (0.191) | (0.243) |
| Manitoba | 0.313 | -0.104 | -0.159 | 0.104 |
| | (0.230) | (0.459) | (0.234) | (0.290) |
| Saskatchewan | -0.123 | -0.148 | -0.144 | 0.356 |
| | (0.237) | (0.472) | (0.236) | (0.296) |
| Alberta | 0.267 | -0.208 | 0.0537 | 0.222 |
| | (0.223) | (0.423) | (0.216) | (0.268) |
| Nova Scotia | 0.300 | -0.263 | -0.0934 | 0.193 |
| | (0.290) | (0.520) | (0.262) | (0.326) |
| Prince Edward Island | 0.340 | -0.819 | -0.101 | 0.825** |
| | (0.284) | (0.524) | (0.270) | (0.324) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | -47.26 | -153.6* | 306.4*** | 1038.0*** |
| | (37.46) | (83.63) | (37.70) | (50.05) |
| *N* | 5,659 | 5,659 | 5,659 | 5,659 |

**Table 29: Effects of Sunday shopping on the allocation of time (minutes). Men without children – Sunday**

| | Shopping | Leisure | Domestic work | Market work |
|---|---|---|---|---|
| SUN | 32.38 | 35.85 | 0.799 | -13.19 |
| | (49.36) | (65.44) | (42.19) | (212.1) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | -3.615 | 39.73 | -3.005 | -56.85 |
| | (17.29) | (26.45) | (15.86) | (83.43) |
| Post-secondary education | 14.64 | 11.95 | 4.688 | 86.34 |
| | (20.19) | (30.95) | (19.69) | (92.80) |
| **Labour force status** | | | | |
| Employed | -0.0106 | -86.21*** | 24.36* | 322.3*** |
| | (15.89) | (19.69) | (13.84) | (76.07) |
| Inactive (not retired) | -37.32 | -87.46 | 44.06 | 246.6 |
| | (32.66) | (54.82) | (33.96) | (197.1) |
| Retired | -56.17 | 66.83* | 34.17 | -779.9*** |
| | (38.38) | (36.72) | (33.13) | (256.2) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | 36.57 | -41.80 | -34.89 | 333.2* |
| | (30.15) | (43.13) | (34.34) | (179.3) |
| 2 members | 23.15 | -61.82 | -12.07 | 335.3* |
| | (30.29) | (42.71) | (33.90) | (179.6) |
| 3 members | 1.206 | -50.68 | -34.56 | 395.1** |
| | (32.21) | (43.35) | (33.70) | (180.5) |
| 4 members | 24.48 | -51.66 | -49.34 | 358.8* |
| | (32.96) | (48.45) | (34.85) | (188.4) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | 0.192 | 9.341 | 18.87 | -39.44 |
| | (18.84) | (27.67) | (17.33) | (88.99) |
| AGE3034 | 7.820 | -5.119 | 43.53** | -101.9 |
| | (20.80) | (31.30) | (21.67) | (97.33) |
| AGE3539 | 27.38 | -35.48 | 64.93*** | -87.03 |
| | (28.57) | (31.01) | (21.37) | (99.17) |
| AGE4044 | -46.05* | -16.25 | 46.29* | -30.87 |
| | (27.43) | (35.84) | (24.30) | (108.3) |
| AGE4549 | 20.81 | -23.25 | 114.7*** | -262.7** |
| | (24.53) | (30.53) | (24.67) | (103.0) |
| AGE5054 | -13.17 | -5.018 | 59.42** | -99.17 |
| | (22.21) | (32.55) | (23.48) | (98.13) |
| **Province dummy** | | | | |
| New Brunswick | 29.42 | 80.76 | 6.279 | -24.33 |
| | (75.15) | (126.7) | (80.93) | (419.1) |
| Quebec | 62.73 | -4.175 | -18.49 | 128.6 |
| | (43.36) | (79.83) | (36.25) | (297.7) |
| Ontario | 88.26** | 15.21 | 2.479 | 58.74 |
| | (42.37) | (77.23) | (32.91) | (290.6) |
| Manitoba | 40.54 | 31.59 | 24.51 | -104.0 |
| | (58.85) | (95.28) | (57.29) | (321.0) |
| Saskatchewan | -16.07 | -32.17 | 22.84 | 268.7 |
| | (50.85) | (94.13) | (43.49) | (330.1) |

| | | | | |
|---|---|---|---|---|
| Alberta | 44.56 | -127.0 | -10.44 | 444.1 |
| | (45.47) | (103.4) | (38.98) | (315.9) |
| Nova Scotia | -59.63 | 65.40 | 32.55 | -239.6 |
| | (56.21) | (98.10) | (77.41) | (337.1) |
| Prince Edward Island | -131.9 | 124.9 | 20.93 | 8.909 |
| | (179.3) | (138.5) | (112.6) | (438.5) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 8.937 | -3.579 | 7.174 | -14.22 |
| | (9.830) | (13.64) | (8.059) | (55.63) |
| Quadratic term | -0.649 | -0.0719 | -0.427 | 0.665 |
| | (0.565) | (0.735) | (0.500) | (2.784) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -24.11** | 17.71 | -1.906 | -21.37 |
| | (12.24) | (20.77) | (13.94) | (69.92) |
| Quebec | -9.540 | 4.341 | -15.92** | 47.75 |
| | (9.551) | (13.23) | (8.060) | (55.48) |
| Ontario | -9.211 | 14.18 | -7.482 | 17.28 |
| | (9.613) | (13.02) | (7.832) | (54.47) |
| Manitoba | -14.22 | 23.84 | -12.18 | -34.09 |
| | (12.98) | (16.93) | (11.46) | (61.79) |
| Saskatchewan | -10.84 | 2.276 | -3.985 | 54.02 |
| | (12.28) | (17.88) | (11.10) | (64.25) |
| Alberta | -8.482 | -12.25 | -11.53 | 68.62 |
| | (10.24) | (18.03) | (8.692) | (59.89) |
| Nova Scotia | -24.32* | 6.996 | -4.189 | -19.24 |
| | (13.25) | (18.16) | (14.04) | (70.15) |
| Prince Edward Island | -51.91 | 27.02 | -21.26 | 41.67 |
| | (36.58) | (33.61) | (37.08) | (81.73) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | -1.358** | 0.551 | -0.195 | 0.0118 |
| | (0.549) | (0.801) | (0.565) | (2.849) |
| Quebec | -0.546 | 0.191 | -0.719** | 2.234 |
| | (0.432) | (0.503) | (0.365) | (2.266) |
| Ontario | -0.594 | 0.533 | -0.481 | 1.583 |
| | (0.434) | (0.497) | (0.360) | (2.225) |
| Manitoba | -0.926* | 1.066* | -0.679 | -1.302 |
| | (0.548) | (0.610) | (0.464) | (2.551) |
| Saskatchewan | -0.655 | 0.0914 | -0.344 | 2.754 |
| | (0.556) | (0.675) | (0.506) | (2.592) |
| Alberta | -0.502 | -0.508 | -0.571 | 3.168 |
| | (0.474) | (0.761) | (0.417) | (2.590) |
| Nova Scotia | -1.001* | 0.152 | -0.392 | 0.501 |
| | (0.601) | (0.733) | (0.581) | (2.974) |
| Prince Edward Island | -2.117* | 1.078 | -1.234 | 2.150 |
| | (1.241) | (1.282) | (1.460) | (3.523) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | -213.4*** | 1246.7*** | 51.23 | -858.3** |
| | (70.37) | (101.6) | (60.82) | (377.1) |
| *N* | 1,312 | 1,312 | 1,312 | 1,312 |

**Table 30: Effects of Sunday shopping on the allocation of time (minutes). Men without children – Monday to Saturday**

| | Shopping | Market work | Domestic work | Leisure |
|---|---|---|---|---|
| SUN | -1.967 | -21.01 | 13.61 | 4.670 |
| | (16.68) | (36.10) | (14.73) | (22.46) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 28.30*** | -40.41*** | 12.53** | 18.35** |
| | (5.863) | (12.95) | (5.000) | (7.804) |
| Post-secondary education | 45.70*** | -21.29 | 5.208 | 16.34* |
| | (6.630) | (14.77) | (5.670) | (9.093) |
| **Labour force status** | | | | |
| Employed | -18.00*** | 605.6*** | -35.19*** | -329.0*** |
| | (5.157) | (13.83) | (4.662) | (7.035) |
| Inactive (not retired) | 37.45** | -151.6*** | 87.48*** | -44.13** |
| | (14.71) | (49.75) | (15.61) | (18.90) |
| Retired | 42.76*** | -260.0*** | 43.19** | 12.44 |
| | (15.15) | (67.57) | (17.88) | (20.98) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | 13.84 | -26.43 | 33.29*** | 1.387 |
| | (14.47) | (29.38) | (10.69) | (17.37) |
| 2 members | 8.114 | -60.26** | 20.20* | 32.04* |
| | (14.50) | (29.25) | (10.71) | (17.21) |
| 3 members | -5.468 | -59.01* | 7.392 | 35.99** |
| | (14.98) | (30.50) | (11.10) | (17.90) |
| 4 members | -5.087 | -62.83* | 15.83 | 25.64 |
| | (15.86) | (32.23) | (11.91) | (18.76) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | 7.508 | 5.263 | 29.23*** | -31.22*** |
| | (7.271) | (15.71) | (5.931) | (9.670) |
| AGE3034 | 15.86** | 23.13 | 29.64*** | -40.99*** |
| | (7.661) | (16.76) | (6.249) | (10.53) |
| AGE3539 | 12.91 | -17.18 | 46.49*** | -41.04*** |
| | (8.657) | (18.57) | (7.274) | (11.64) |
| AGE4044 | 20.22** | 5.871 | 55.42*** | -55.48*** |
| | (8.627) | (19.12) | (7.579) | (11.63) |
| AGE4549 | 26.20*** | -18.56 | 66.68*** | -53.53*** |
| | (7.885) | (17.95) | (7.267) | (10.92) |
| AGE5054 | 15.38** | -31.62* | 56.71*** | -29.74*** |
| | (7.614) | (16.79) | (6.526) | (10.26) |
| **Province dummy** | | | | |
| New Brunswick | -46.50 | 34.50 | -12.81 | -11.08 |
| | (31.22) | (66.98) | (27.07) | (39.51) |
| Quebec | -40.55* | 6.494 | -29.41* | 26.19 |
| | (20.83) | (43.73) | (16.78) | (25.24) |
| Ontario | -36.53* | 35.27 | -36.13** | 13.11 |
| | (20.11) | (41.94) | (15.58) | (24.36) |
| Manitoba | -43.78* | -84.37 | -15.51 | 72.85** |
| | (25.17) | (53.00) | (19.81) | (30.84) |
| Saskatchewan | -27.94 | 50.05 | -29.62 | -3.505 |
| | (25.00) | (49.45) | (20.35) | (30.25) |
| Alberta | -54.88** | 56.58 | -42.99** | -1.520 |
| | (22.67) | (46.92) | (18.05) | (27.66) |

| | | | | |
|---|---|---|---|---|
| Nova Scotia | -40.09* | 19.51 | -1.615 | -6.036 |
| | (23.55) | (53.79) | (19.88) | (31.00) |
| Prince Edward Island | -33.97 | 86.76 | -43.11 | -9.846 |
| | (34.99) | (77.85) | (28.69) | (44.66) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 5.222 | 10.70 | 0.334 | -4.598 |
| | (4.294) | (9.398) | (3.803) | (5.560) |
| Quadratic term | -0.201 | -0.696 | -0.167 | 0.289 |
| | (0.212) | (0.470) | (0.187) | (0.278) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -11.11** | 1.576 | 3.252 | -3.445 |
| | (5.443) | (12.29) | (5.052) | (7.254) |
| Quebec | -10.08** | -2.883 | 4.520 | -1.016 |
| | (4.377) | (9.707) | (4.007) | (5.738) |
| Ontario | -7.036 | -5.320 | 4.315 | 1.375 |
| | (4.293) | (9.514) | (3.850) | (5.673) |
| Manitoba | -9.107* | -26.61** | 4.992 | 13.59** |
| | (5.181) | (11.40) | (4.427) | (6.876) |
| Saskatchewan | -4.582 | -4.512 | 5.833 | -0.847 |
| | (5.350) | (11.34) | (4.762) | (7.079) |
| Alberta | -11.69** | -11.52 | 2.736 | 7.393 |
| | (4.730) | (10.41) | (4.255) | (6.276) |
| Nova Scotia | -8.943 | -2.601 | 0.388 | 3.135 |
| | (5.487) | (12.43) | (4.938) | (7.444) |
| Prince Edward Island | -9.145 | 5.342 | -4.428 | 1.171 |
| | (6.380) | (14.82) | (6.014) | (8.470) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | -0.446** | 0.0215 | 0.140 | -0.145 |
| | (0.224) | (0.496) | (0.204) | (0.298) |
| Quebec | -0.412** | -0.156 | 0.196 | -0.0677 |
| | (0.179) | (0.396) | (0.165) | (0.235) |
| Ontario | -0.276 | -0.244 | 0.208 | 0.0296 |
| | (0.177) | (0.391) | (0.161) | (0.234) |
| Manitoba | -0.334 | -0.908** | 0.178 | 0.434 |
| | (0.210) | (0.460) | (0.181) | (0.280) |
| Saskatchewan | -0.201 | -0.238 | 0.294 | -0.0328 |
| | (0.216) | (0.460) | (0.193) | (0.290) |
| Alberta | -0.486** | -0.528 | 0.146 | 0.334 |
| | (0.198) | (0.431) | (0.180) | (0.261) |
| Nova Scotia | -0.346 | -0.158 | -0.0323 | 0.200 |
| | (0.235) | (0.519) | (0.207) | (0.315) |
| Prince Edward Island | -0.327 | -0.0315 | -0.0660 | 0.0634 |
| | (0.268) | (0.615) | (0.261) | (0.358) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | -106.8*** | -124.0** | 42.38* | 1203.8*** |
| | (29.36) | (62.56) | (23.19) | (37.27) |
| *N* | 7,740 | 7,740 | 7,740 | 7,740 |

**Table 31: Effects of Sunday shopping on the allocation of time (minutes). Women with children – No retail sector**

| | Sunday | | Weekdays | |
|---|---|---|---|---|
| | **Shopping** | **Leisure** | **Shopping** | **Market work** |
| SUN | 78.35** | -69.67 | -25.29** | 59.24 |
| | (39.00) | (46.53) | (11.75) | (38.85) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 29.69** | -6.510 | 19.26*** | -14.45 |
| | (13.73) | (16.99) | (4.496) | (14.59) |
| Post-secondary education | 39.81** | -26.83 | 15.68*** | 3.028 |
| | (16.32) | (20.39) | (5.254) | (17.27) |
| **Labour force status** | | | | |
| Employed | 18.77 | -48.89** | -25.42*** | 560.1*** |
| | (14.62) | (23.65) | (5.051) | (18.94) |
| Inactive (not retired) | 7.147 | -13.20 | 3.014 | -97.34*** |
| | (15.52) | (23.92) | (5.174) | (21.79) |
| Retired | -42.54 | 238.7*** | -5.040 | -93.84 |
| | (68.92) | (41.78) | (31.62) | (172.5) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | (omitted) | (omitted) | (omitted) | (omitted) |
| 2 members | -4.193 | 122.5*** | 1.024 | 14.89 |
| | (20.06) | (29.06) | (7.183) | (23.22) |
| 3 members | 8.579 | 77.07*** | -4.090 | 16.16 |
| | (13.45) | (20.00) | (4.827) | (16.46) |
| 4 members | 8.542 | 53.17*** | -5.079 | 18.75 |
| | (12.81) | (18.62) | (4.417) | (15.67) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | -17.57 | 2.155 | 16.84* | 29.96 |
| | (21.78) | (30.67) | (8.788) | (28.97) |
| AGE3034 | -34.14 | 28.25 | 14.63* | 39.58 |
| | (22.08) | (30.02) | (8.420) | (27.26) |
| AGE3539 | -23.59 | 29.86 | 16.32* | 69.71** |
| | (21.07) | (30.07) | (8.412) | (27.28) |
| AGE4044 | -13.97 | 45.20 | 39.92*** | 51.36* |
| | (21.79) | (31.67) | (8.499) | (27.66) |
| AGE4549 | 1.475 | 70.48** | 32.40*** | 35.64 |
| | (22.87) | (32.79) | (9.190) | (29.47) |
| AGE5054 | -36.21 | 110.8*** | 45.31*** | 71.30** |
| | (29.72) | (37.92) | (10.75) | (35.45) |
| **Province dummy** | | | | |
| New Brunswick | 55.15 | 17.84 | -29.36 | -18.56 |
| | (53.47) | (77.25) | (21.01) | (71.21) |
| Quebec | -10.27 | 90.13** | -23.29* | -61.73 |
| | (26.99) | (43.98) | (13.44) | (43.51) |
| Ontario | -5.893 | 83.90** | -4.814 | -34.78 |
| | (24.78) | (40.21) | (12.24) | (41.76) |
| Manitoba | -11.55 | 69.90 | -25.80* | -46.55 |
| | (31.41) | (50.05) | (15.40) | (52.55) |
| Saskatchewan | -27.28 | 182.4*** | 3.905 | -21.51 |
| | (32.63) | (52.74) | (16.61) | (54.82) |

| | | | | |
|---|---|---|---|---|
| Alberta | -28.15 | 48.25 | 4.631 | -29.94 |
| | (29.38) | (51.32) | (14.06) | (48.85) |
| Nova Scotia | -23.34 | 37.97 | -7.094 | -35.05 |
| | (38.17) | (58.21) | (15.45) | (55.15) |
| Prince Edward Island | 64.00 | -34.25 | -16.63 | -10.58 |
| | (58.56) | (86.98) | (23.36) | (78.58) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Time trend** | | | | |
| Linear term | 5.897 | -9.096 | -0.363 | 15.00 |
| | (6.624) | (9.676) | (2.729) | (9.361) |
| Quadratic term | -0.115 | -0.0466 | 0.0264 | -0.468 |
| | (0.380) | (0.514) | (0.145) | (0.469) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -6.231 | 13.96 | -1.282 | -16.16 |
| | (8.992) | (13.74) | (3.658) | (12.59) |
| Quebec | -16.47** | 11.66 | -3.071 | -10.07 |
| | (7.321) | (10.39) | (2.856) | (9.726) |
| Ontario | -8.060 | 15.82 | 1.136 | -13.48 |
| | (7.064) | (10.15) | (2.710) | (9.451) |
| Manitoba | -4.044 | 19.32 | 1.414 | -18.63 |
| | (9.731) | (12.17) | (3.341) | (11.40) |
| Saskatchewan | -10.81 | 29.38** | 3.935 | -14.40 |
| | (8.681) | (12.87) | (3.565) | (12.21) |
| Alberta | -10.44 | 11.92 | 3.583 | -13.05 |
| | (8.136) | (11.97) | (3.066) | (10.71) |
| Nova Scotia | -9.887 | 13.29 | 1.829 | -21.15* |
| | (11.91) | (14.19) | (3.779) | (12.80) |
| Prince Edward Island | 0.0145 | 2.089 | 1.881 | -19.16 |
| | (11.78) | (16.95) | (4.473) | (15.33) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| **Quadratic terms** | | | | |
| New Brunswick | -0.429 | 0.539 | 0.0605 | -0.799 |
| | (0.400) | (0.546) | (0.149) | (0.496) |
| Quebec | -0.809** | 0.350 | -0.0837 | -0.402 |
| | (0.338) | (0.419) | (0.117) | (0.378) |
| Ontario | -0.295 | 0.473 | 0.120 | -0.517 |
| | (0.324) | (0.427) | (0.113) | (0.371) |
| Manitoba | -0.353 | 0.717 | 0.192 | -0.665 |
| | (0.430) | (0.520) | (0.140) | (0.452) |
| Saskatchewan | -0.567 | 0.986* | 0.246* | -0.494 |
| | (0.394) | (0.511) | (0.143) | (0.477) |
| Alberta | -0.508 | 0.612 | 0.214* | -0.538 |
| | (0.388) | (0.482) | (0.130) | (0.427) |
| Nova Scotia | -0.403 | 0.539 | 0.142 | -0.852 |
| | (0.570) | (0.597) | (0.165) | (0.530) |
| Prince Edward Island | -0.226 | 0.0452 | 0.135 | -0.810 |
| | (0.495) | (0.693) | (0.191) | (0.612) |
| Newfoundland and Labrador | (omitted) | (omitted) | (omitted) | (omitted) |
| Constant | -136.0** | 937.2*** | -40.21** | -267.7*** |
| | (53.73) | (72.33) | (19.61) | (66.52) |
| *N* | 1,343 | 1,343 | 7,814 | 7,814 |

**Table 32: Effects of Sunday shopping on the allocation of time (minutes). Women with and without children – OLS**

| | Mothers | | Women with no kids | |
|---|---|---|---|---|
| | **Shopping** | **Market work** | **Shopping** | **Market work** |
| SUN | -11.47** | 29.18 | 7.676 | -31.47 |
| | (5.024) | (18.31) | (6.039) | (22.00) |
| **Education** | | | | |
| Less than high-school | (omitted) | (omitted) | (omitted) | (omitted) |
| High-school | 5.141*** | -10.64* | 4.355** | -13.03* |
| | (1.911) | (6.063) | (2.147) | (7.885) |
| Post-secondary education | 2.649 | -2.364 | 4.724* | -5.448 |
| | (2.198) | (8.052) | (2.426) | (9.819) |
| **Labour force status** | | | | |
| Employed | -8.857*** | 305.6*** | -3.630** | 336.0*** |
| | (2.154) | (7.432) | (1.824) | (6.571) |
| Inactive (not retired) | 2.477 | -25.51*** | 9.629*** | -35.63*** |
| | (2.294) | (6.977) | (2.940) | (7.941) |
| Retired | -2.639 | -28.90 | 11.14* | -48.71*** |
| | (12.91) | (47.11) | (6.748) | (12.43) |
| Unemployed | (omitted) | (omitted) | (omitted) | (omitted) |
| **Household size** | | | | |
| 1 member | (omitted) | (omitted) | 2.194 | -9.683 |
| | | | (4.091) | (17.38) |
| 2 members | -0.219 | 15.41 | 2.077 | -25.39 |
| | (2.891) | (11.54) | (4.007) | (17.17) |
| 3 members | 0.606 | 14.08* | 0.567 | -30.54* |
| | (2.043) | (7.773) | (4.229) | (18.13) |
| 4 members | -0.104 | 15.29** | 3.069 | -29.88 |
| | (1.888) | (7.339) | (4.491) | (18.99) |
| More than 4 | (omitted) | (omitted) | (omitted) | (omitted) |
| **Age dummy** | | | | |
| AGE2024 | (omitted) | (omitted) | (omitted) | (omitted) |
| AGE2529 | 4.632 | 7.355 | 3.959 | 9.881 |
| | (3.533) | (10.17) | (2.431) | (9.907) |
| AGE3034 | 5.065 | 8.654 | 2.771 | -0.430 |
| | (3.343) | (9.635) | (2.710) | (11.59) |
| AGE3539 | 4.881 | 21.58** | 2.381 | -8.934 |
| | (3.305) | (9.900) | (2.838) | (12.18) |
| AGE4044 | 11.73*** | 11.09 | 0.576 | -6.469 |
| | (3.435) | (10.30) | (2.607) | (11.62) |
| AGE4549 | 11.52*** | 4.277 | 6.557*** | -26.80*** |
| | (3.762) | (11.76) | (2.515) | (9.873) |
| AGE5054 | 15.54*** | 23.03 | 4.600** | -30.92*** |
| | (4.779) | (15.71) | (2.297) | (9.440) |
| **Province dummy** | | | | |
| New Brunswick | -1.473 | 27.68 | 6.740 | -5.545 |
| | (8.440) | (33.27) | (9.828) | (39.62) |
| Quebec | 1.937 | 8.091 | -3.780 | 30.33 |
| | (4.658) | (21.28) | (5.327) | (27.40) |
| Ontario | 5.920 | 16.79 | -2.713 | 35.79 |
| | (4.313) | (19.94) | (5.187) | (25.88) |
| Manitoba | (omitted) | (omitted) | (omitted) | (omitted) |
| Saskatchewan | 12.31* | 12.68 | -2.402 | -20.57 |
| | (6.570) | (28.41) | (6.870) | (32.04) |
| Alberta | 9.914* | 5.141 | -4.662 | 26.19 |

| | | | | |
|---|---|---|---|---|
| | (5.296) | (23.65) | (5.862) | (29.13) |
| Nova Scotia | 3.769 | 2.236 | 3.571 | 0.105 |
| | (5.581) | (26.99) | (6.709) | (31.50) |
| Prince Edward Island | 3.306 | 33.22 | 7.379 | -43.46 |
| | (10.00) | (38.91) | (9.720) | (43.05) |
| Newfoundland and Labrador | 12.03* | 23.08 | 6.022 | -27.75 |
| | (6.391) | (26.52) | (6.956) | (30.76) |
| **Time trend** | | | | |
| Linear term | 0.860 | -3.912 | 1.406 | -0.470 |
| | (1.177) | (4.132) | (1.421) | (4.893) |
| Quadratic term | -0.0571 | 0.139 | -0.0849 | 0.0991 |
| | (0.0504) | (0.161) | (0.0636) | (0.222) |
| **Province specific time trend** | | | | |
| **Linear terms** | | | | |
| New Brunswick | -0.546 | 4.714 | 0.0527 | 2.775 |
| | (1.707) | (5.965) | (1.897) | (6.650) |
| Quebec | -1.609 | 8.087* | -2.080 | 9.330* |
| | (1.366) | (4.787) | (1.505) | (5.527) |
| Ontario | -1.016 | 5.465 | -0.977 | -1.378 |
| | (1.364) | (4.687) | (1.489) | (5.281) |
| Manitoba | -0.166 | 2.589 | 0.269 | -5.970 |
| | (1.564) | (5.584) | (1.701) | (6.880) |
| Saskatchewan | 0.569 | 3.260 | -0.900 | -2.633 |
| | (1.793) | (6.645) | (1.812) | (6.794) |
| Alberta | 0.0519 | 4.296 | -1.312 | -7.313 |
| | (1.457) | (5.391) | (1.595) | (6.003) |
| Nova Scotia | (omitted) | (omitted) | -1.608 | 6.183 |
| | | | (1.947) | (7.023) |
| Prince Edward Island | -0.105 | 1.873 | -1.185 | -0.273 |
| | (2.063) | (7.551) | (2.133) | (7.990) |
| Newfoundland and Labrador | 0.519 | 8.365 | (omitted) | (omitted) |
| | (1.607) | (5.714) | | |
| **Quadratic terms** | | | | |
| New Brunswick | -0.00940 | 0.0621 | 0.00560 | 0.0564 |
| | (0.0705) | (0.229) | (0.0824) | (0.285) |
| Quebec | -0.0825 | 0.292 | -0.0906 | 0.319 |
| | (0.0622) | (0.197) | (0.0643) | (0.233) |
| Ontario | -0.0438 | 0.178 | -0.0238 | -0.0821 |
| | (0.0629) | (0.196) | (0.0638) | (0.227) |
| Manitoba | 0.0139 | 0.108 | 0.0284 | -0.228 |
| | (0.0748) | (0.232) | (0.0741) | (0.284) |
| Saskatchewan | 0.0293 | 0.101 | -0.0209 | -0.0471 |
| | (0.0774) | (0.267) | (0.0773) | (0.282) |
| Alberta | -0.00794 | 0.146 | -0.0700 | -0.229 |
| | (0.0613) | (0.209) | (0.0698) | (0.260) |
| Nova Scotia | (omitted) | (omitted) | -0.0778 | 0.263 |
| | | | (0.0851) | (0.304) |
| Prince Edward Island | -0.0146 | 0.0101 | -0.0347 | -0.000501 |
| | (0.0892) | (0.294) | (0.101) | (0.337) |
| Newfoundland and Labrador | -0.0112 | 0.302 | (omitted) | (omitted) |
| | (0.0722) | (0.230) | | |
| Constant | 20.65*** | 38.16 | 12.05 | 156.9*** |
| | (7.442) | (29.07) | (8.811) | (38.52) |
| *N* | 8,152 | 8,152 | 8,057 | 8,057 |

**Table 33: Effects of Sunday shopping on the allocation of time (hours). Women with and without children – Labour Force Survey data**

| | Sunday | Weekdays |
|---|---|---|
| SUN | 0.992*** | -0.208 |
| | (0.149) | (0.161) |
| Post-secondary education | 1.478*** | 2.783*** |
| | (0.0637) | (0.0594) |
| **Age dummy** | | |
| AGE2030 | 13.41*** | 8.607*** |
| | (0.0829) | (0.109) |
| AGE3040 | 15.15*** | 11.60*** |
| | (0.0713) | (0.113) |
| AGE4050 | 15.99*** | 11.10*** |
| | (0.0734) | (0.110) |
| AGE50UP | (omitted) | (omitted) |
| **Province dummy** | | |
| New Brunswick | 1.135*** | 0.354 |
| | (0.275) | (0.303) |
| Quebec | -1.376*** | -1.567*** |
| | (0.196) | (0.220) |
| Ontario | -1.587*** | -0.848*** |
| | (0.191) | (0.213) |
| Manitoba | -1.799*** | -0.381 |
| | (0.216) | (0.240) |
| Saskatchewan | -1.694*** | 0.517** |
| | (0.222) | (0.250) |
| Alberta | -2.034*** | 0.957*** |
| | (0.220) | (0.233) |
| Nova Scotia | -1.382*** | -0.815*** |
| | (0.233) | (0.255) |
| Prince Edward Island | 0.129 | -0.327 |
| | (0.308) | (0.350) |
| Newfoundland and Labrador | (omitted) | (omitted) |
| **Time trend** | | |
| Linear term | 0.0933*** | 0.0341 |
| | (0.0356) | (0.0476) |
| Quadratic term | -0.00736*** | -0.00598*** |
| | (0.00148) | (0.00168) |
| **Province specific time trend** | | |
| **Linear terms** | | |
| New Brunswick | 0.0148 | -0.00172 |
| | (0.0446) | (0.0557) |
| Quebec | -0.106*** | -0.0233 |
| | (0.0396) | (0.0510) |
| Ontario | -0.147*** | -0.137*** |
| | (0.0381) | (0.0495) |
| Manitoba | -0.0782* | -0.0562 |
| | (0.0438) | (0.0548) |
| Saskatchewan | -0.138*** | -0.0435 |
| | (0.0457) | (0.0570) |
| Alberta | -0.0946** | -0.0596 |
| | (0.0436) | (0.0531) |
| Nova Scotia | -0.165*** | 0.0363 |
| | (0.0492) | (0.0601) |
| Prince Edward Island | -0.244*** | (omitted) |

| | | |
|---|---|---|
| | (0.0532) | |
| Newfoundland and Labrador | (omitted) | 0.0523<br>(0.0623) |
| **Quadratic terms** | | |
| New Brunswick | -0.00520***<br>(0.00180) | -0.00439**<br>(0.00202) |
| Quebec | -0.00587***<br>(0.00159) | -0.00323*<br>(0.00178) |
| Ontario | -0.00671***<br>(0.00152) | -0.00584***<br>(0.00171) |
| Manitoba | -0.00503***<br>(0.00177) | -0.00441**<br>(0.00195) |
| Saskatchewan | -0.00963***<br>(0.00180) | -0.00432**<br>(0.00203) |
| Alberta | -0.00577***<br>(0.00174) | -0.00520***<br>(0.00188) |
| Nova Scotia | -0.00940***<br>(0.00202) | -0.000568<br>(0.00225) |
| Prince Edward Island | -0.0139***<br>(0.00215) | -0.00175<br>(0.00249) |
| Newfoundland and Labrador | (omitted) | (omitted) |
| Constant | 18.31***<br>(0.245) | 24.16***<br>(0.280) |
| *N* | 614,634 | 504,505 |

# Conclusion

The first years of the new millennium represent the lost decade for the Italian economy. Even before the almost continuous recession that has hit the country since the last months of 2008, the average annual growth rate of real GDP per capita in Italy was the lowest among the OECD countries. The problems with the Italian economy can be grouped under two titles: fiscal sustainability and long term growth. Since 2011 Italy has achieved a sizeable fiscal consolidation, having one of the lowest deficits to GDP ratios of the European Union at the end of 2012. The burden of debt remains however very high (around 130 per cent of GDP). Reforms to foster growth are on the other hand still lacking. The labour market is one of the key factors harming the long-term growth of the Italian economy. In the last decade labour productivity grew much less than in the other main European economies also as a consequence of low investment in new technologies (capital). The Italian labour market has been unable to allocate a significant fraction of the working age population efficiently. In 2011, the employment rate was 56.9 per cent, 8 percentage points below the OECD average. The gap between Italy and other developed economies is mainly attributable to the low employment rates of youth, seniors and women.

These low employment rates are due to a multiplicity of factors limiting both labour demand and labour supply. For women in particular, constraints on the allocation of time play a crucial role in determining labour supply behaviour. In Italy the provision of services helping mothers reconcile work and family obligations is meagre. In this thesis we try to understand how nonstandard time constraints may affect the behaviour of women, and their labour supply in particular.

In the first chapter we study how the constraints on work schedules affect the time allocation of workers in Italy. Regulations that shape industrial relations in Italy were enacted during the 1970s, when manufacturing and assembly lines played a central role in the economy. This kind of economy required high levels of synchronization of capital and labour, and of different groups of workers. Therefore, work schedules were rigid and the fraction of jobs offering nonstandard hours was low. With the reduced importance of assembly lines this regulation is outdated. In order to understand whether these constraints produce significant effects on the allocation of time of wage/salary workers in Italy, we exploit the intrinsic differences between self-employed and employed workers. In fact, one of the main features of self-employment is the

greater control over the days worked and daily hours of work. We use the last wave of the Italian time use survey (2008-2009) to provide evidence that the distribution of hours of work of self-employed workers is much more dispersed than that of wage/salary workers and their average standard deviation of daily minutes of work within a week is significantly larger. Then we show that self-employed workers respond more to shocks affecting the value of leisure. We show that on sunny days the increase of leisure and the reduction of work are significantly larger for self-employed workers. We address whether unobservable characteristics, such as preferences for leisure and for outdoor activities in particular, determine this differential response. Studying the allocation of time on non-working days we find no evidence of different preferences between the two groups of workers. Therefore, we interpret the differential response to weather shocks as a consequence of the time constraints on work schedules. The main result of the first chapter is that wage/salary workers in Italy face tight time constraints and they find it difficult to reallocate their time when shocks occur. This evidence is relevant for female labour force participation since a large fraction of women choose not to work because they would otherwise not be able to reconcile family and work responsibilities.

In the second chapter we study the Added Worker Effect (AWE), which may have been an important determinant of the recent increase in female labour supply in Italy. The main factors determining a change in the wife's labour supply in response to their husband's job loss include the magnitude of the income loss and the inability, due to borrowing constraints, to smooth this loss over the life cycle. In Italy several conditions coexist that should lead to a significant AWE: large increase in the unemployment rate for married men, increase in long term unemployment, tight borrowing constraints, and low female labour force participation. The retrospective questions provided by the new labour force survey allow identification of transitions between labour market states in a 12 month time window. Since we are able to identify the reason for the husband's job loss, we distinguish between transitions associated with low or high income losses. We find that both the wife's probability of joining the labour force and that of finding a job increase when the husband is dismissed or he is forced to quit his job for health reasons. Moreover, we estimate the wife's full transition matrix between labour market states and we find that the loss of a job by a husband increases the probability that his wife will enter the labour force. Finally, we provide some descriptive evidence that time constraints can also impact the magnitude of the AWE. Focusing on mothers with young children, we show that the estimated AWE is positively correlated with the regional provision of child care services.

The third chapter is based on the time use file of the Canadian General Social Survey. We study how the relaxation of one constraint limiting the allocation of time changed the behaviour of women, with a particular focus on those with children. Since the mid-1980s Canadian provinces have deregulated Sunday shopping. We develop a theoretical a model of that makes clear that busy individuals are likely to be those who respond most to Sunday shopping deregulation. The empirical analysis relies on the provincial variation in the time of the policy change. Our results suggest that women with children, who usually face stringent time constraints, respond to the policy change by substituting weekday shopping with Sunday shopping. The amount of time these women save from doing shopping on weekdays allows them to increase their minutes of work. On Sunday, shopping is increased at the expense of leisure. The main result of this chapter is that the labour supply of mothers may change even when non-obvious constraints on the allocation of time change.

The findings of this thesis contribute to the ongoing debate on one of the structural reforms that Italy needs to overcome the current difficulties. In particular, our results suggest that work schedule flexibility is valued by wage/salary workers and that the reforms of the labour market should take this factor into account. There is widespread consensus that the labour market in Italy needs a lower level of employment protection for permanent workers and it needs realignment between wages and productivity. The achievement of both these targets implies an unavoidable welfare loss for those who currently have a permanent job. However, taking full advantage of the new technologies that reduce the need for synchronization of production factors, this welfare loss may be mitigated by relaxing time constraints. This margin could also simplify bargaining with unions. Moreover, the adoption of new technologies would likely help restore labour productivity growth.

Second, our results suggest that new forms of work arrangements and an increase in work schedule flexibility would likely produce a significant labour supply response of women, youths and seniors, who are largely under-employed in Italy. For women in particular, all three chapters suggest that time constraints play a crucial role in determining labour supply behaviour. The relaxation of even non-obvious time constraints seems to produce significant responses. The reform of the labour market should therefore also induce more flexible forms of work. Work flexibility has a very bad reputation in Italy, since its meaning is associated only with the project of reducing employment protection. Bringing the value of time and the role of time constraints explicitly into the discussion may help to restore the reputation of work flexibility and it may be a small building block for the transition of Italy to a better-functioning economy.

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