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Labour status and involuntary employment: family ties and part-time work in Spain*

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Abstract

The aim of the paper is a gender analysis of the extent to which part-time work represents an individual's preferred labor market situation. The work includes a theoretical model that delivers some predictions about the household's preferences over non-chosen employment states. Furthermore, it explores the impact of individual, family and job related variables on the probabilities of involuntary and voluntary part-time employment in Spain. The main empirical findings of the paper are: first, the model is sensitive to the chosen definition of (voluntary) part-time employment; second, there exist important gender asymmetries in labour market behaviour concerning the importance of the individual's education and family characteristics; third, the marital status and having small children are important determinants of a woman's probability of being voluntary part-time employed, whereas having grown up children or a temporary contract increases significantly a woman's probability of involuntary part-time employment.

Keywords: part-time work, involuntary employment, family ties and labour supply.

JEL Classification: C13, C25, J16.

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1 Introduction

It is a fact that women in most OECD countries work less hours in the market than men, specially married women. Theoretical models that try to explain this feature are based on the comparative advantage of women in home production, the bargaining decision making within the family or the role of identity in economic decisions. Despite the strong increase in female participation in most OECD countries, large cross-country discrepancies in the participation rates persist that can be explained to a large extent by differences in education, the functioning of labor markets, the existence of public policies to reconcile work and family and cultural attitudes. A related issue is the preference for part-time work since it allows not only a more efficient allocation of time between market work and family responsibilities but also a greater flexibility to gradually enter or exit the labor market. Nonetheless a worker's supply of part-time employment depends not only on their personal or family needs, it is often limited by disadvantageous labor contract conditions. The aim of the paper is the gender analysis of the extent to which part-time work represents an individual's preferred labor market situation. It includes a theoretical model that delivers some predictions about the household's preferences over non-chosen employment states and an empirical analysis of the employment status determinants of individuals that live with a partner (married or living as married) for the case of Spain.

Recent studies point out that men and women not only allocate their time between market and home duties in very different ways but also that there exist important differences across countries in time use and values that can be related to the existence of social norms or gender role attitudes (Burda, Hammermesh and Weil, 2008, and Fortin 2005). For example, in a sample of 14 EU countries Jaumotte (2004) documents the preferences of couples with small children over three working options, non-work, part-time and full-time, and compares these preferences with their actual patterns of employment. The traditional male breadwinner model (the man works full-time and the woman does not work) is, on average, preferred only by ten percent of the couples, although about 38 percent of them have it actually.[1] By countries, Spain has the largest preference for this kind of employment arrangement (19.7 percent, followed by France with 14 percent) and the United Kingdom is the only country in the sample where the actual rate of couples with both partners working full-time is larger than the the rate of couples prefering this pattern of employment. It is also remarkable that in all countries the rate of couples prefering the man working full-time and the woman working part-time is higher than the rate of couples with this employment arragement, which is indicative of the potential rise in participation that can arise from more and better jobs on a part-time basis.

The World Values Survey publishes, for example, the rate of agreement of some countries' population

[1] The study does not distinguish between inactive and unemployed women, so the actual non-participation option share should be lower, specially in high unemployment countries like Spain.

with statements like ‘When jobs are scarce, men should have more right to a job than women’. Thus, the individuals’ preference for a given family pattern of employment can be influenced by their concerns about traditonal gender roles attitudes towards family life and work. In this survey Spain has one of the largest rate of married (or living as married) male agreement with this statement, whereas this rate among married (or living as married) female is below the European average[2]. In this study, first we develop a model of the household where individuals have preferences about the family’s division of labor between market and home activities and provide sufficient conditions for a welfare ranking over the household’s possible employment patterns that is consistent with some features of the Spanish data. Moreover, we show that the individuals’ concerns about the traditional division of labor are crucial for the stability properties of the household’s employment pattern; in particular, under relative general conditions on the parameter space, we find that the man working full-time and the woman working part-time pattern can be stable only if the woman is more traditional than the man. The basic idea defining the household preferences is taken from Akerlof and Kranton (2000) and the endogenous determination of the man’s weight in the collective decision unit from Basu (2004).

In the empirical analysis we use the micro data from the Spanish Labor Force Survey (EPA) for the years 2000 and 2008 (although EPA is a rotating panel we focus on the comparative statics of involuntary employment). In the EPA data, as in the EUROSTAT data, involuntary part-time workers are those having a part-time job because they have not found a full-time one. First, we explore the implications of this and other extended definitions of involuntary employment and show that a definition based on the desire of working more hours combined with the reasons of having a part-time job improves the fit of the model by more than 50 percent, regardless of the gender, suggesting the importance of accounting properly for involuntary employment. Second, we analyze the relative importance of individual, family and job related variables on the probabilities of involuntary and voluntary part-time employment. We find that being married decreases (increases) the part-time and full-time employment probabilities of women (men) living with a partner, but that the presence of small children has a negative influence on the employment probability of women and non significant effect on the labor status of men.[3] Furthermore, we find that education attainment seems more relevant for the employment probability of a woman than for a man. Finally, we show that having grown-up children and a fixed term contract increases the probability of involuntary part-time relative to voluntary part-time employment by 22 and 60 percent, respectively.

[2] For instance, the percentage of married men that agree with this statment is 29 in Italy, 23.9 in Spain, 22.1 in Geramny, 20 in The United Kingdom, 17.1 in The Netherlands, 17 in France and 9 in Norway. In the case of married women these rates are 26 for Italy, 19.7 for France, 18.8 for Germany, 18 for The United Kingdom, 16.3 for The Netherlands, 16.1 for Spain and 6.1 for Norway.

[3] These results contrast with those of Blázquez-Cuesta and Ramos-Martín (2009) where having children aged under 12 and living with a partner do not increase the probability of working part-time.

The fact that part-time employment in developed countries is mainly concentrated on low educated women and low skilled occupations in the service sector is well documented, for example, by Manning and Petrongolo (2004). They also find that there exists an important wage penalty associated to part-time employment which can be explained to a large extent by the high degree of occupational segregation, being Spain one of the countries with the largest occupational segregation in female employment. Fernandez-Kranz and Rodriguez-Planas (2009) show that the part-time pay penalty in Spain is larger and more persistent in the case of women with fixed-term contracts, whereas O'Dorchai, Plasman and Rycx (2007) show that the part-time wage penalty of men in Spain is negligible. This and the positive association we find between involuntary part-time employment and fixed term contracts in Spain suggest that the part-time wage penalty can be responsible of a large fraction of Spanish involuntary employment.

Another important issue when considering part-time work as a preferred employment option is the possibility of switching from full-time to part-time employment during some periods of the life cycle without losing the skill level attachment of the previous full-time job. Moreover, the relation between part-time work opportunities and the presence of small children is crucial for the labor force attachment of many women and their job and life satisfaction of their families. These issues are analyzed for the case of Britain in Connolly and Gregory (2008), Paull (2008) and Booth and van Ours (2008), the case of Australia is analyzed in Booth and van Ours (2005), the case of Spain by Fernandez-Kranz and Rodriguez-Planas (2009) and the case of a developing country (Honduras) in López-Bóo, Madrigal and Pagés (2009). To our knowledge there is not an empirical study analysing the effect of the age of children on the probability of involuntary part-time relative to voluntary part-time employment. We find that in Spain having small children decreases by 50 percent the probability of involuntary part-time relative to voluntary part-time employment but, as already mentioned, the presence of children aged between 12 and 15 incecreases the relative probability of involuntary part-time by 22 percent.

The rest of the paper is organized as follows. In Section 2 we present some data about Spanish part-time employment trying to identify the main (individual and family) factors that shape the labor supply with a focus on individuals that live with a partner. In Section 3 we develop a model of the household. In Section 4 we conduct the empirical investigation and in Section 5 we conclude.

2 Some features of part-time employment in Spain

As in most OECD countries, part-time (PT) employment in Spain is concentrated on the female population. Figure 1 illustrates the marginal distribution of market hours per week during the first quarter of 2008. We can observe clearly that workweeks are concentrated around 40 hours, that there are practically no men

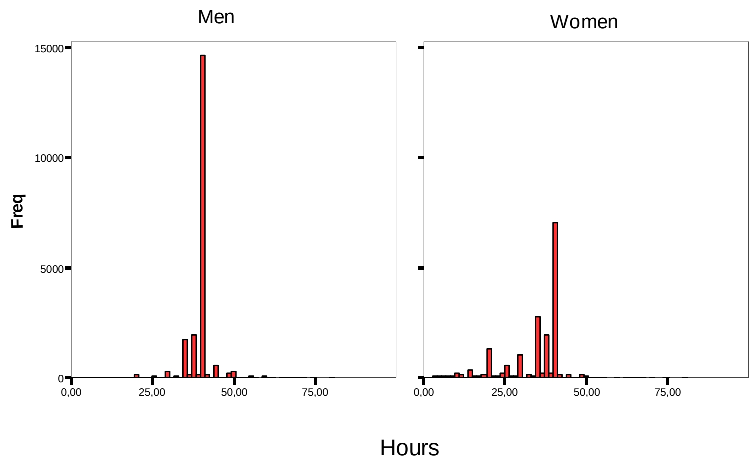

Figure 1: Distribution of worked hours per week

working less than 40 hours and that PT employment is much more frequent among women.

There are mainly two types of definitions for PT employment, objective —'a PT worker usually works less hours than those of a comparable full-time (FT) worker'— and subjective —the employee's spontaneous answer to 'what type of employment do you have, FT or PT?'—. In general it is not possible to establish a precise distinction between PT and FT since the standard workweek can vary from one country to another or from one activity to another. In this Section we follow the subjective definition used in the Spanish labor force survey, but in the empirical analysis of Section 4 we will extend this definition in several directions, including some working hours criterium. These extensions will try to capture, on the one side, the large heterogeneity and dispersion of PT employment relative to FT employment and, on the other, the voluntary or involuntary character of the labor situation.

To account for the heterogeneity of PT employment some authors distinguish between 'substantial' PT and 'marginal' PT, depending on the number of working hours per week (e.g. it can be considered marginal up to 19 hours and substantial from 20 up to 34 hours).

A feature in Table 1 is that men work more hours than women in all types of employment. One possible explanation to this fact is that women hold PT jobs for very different reasons than men do and this somehow conditions the type of labor contract they have. These reasons are reported in Table 2 and correspond to all possible answers to *'why do you have a part-time employment?'*. In each year box, the second and fourth columns report the gender distribution of a given answer (row) and the third and fifth show how often each

Table 1: Total worked hours per week, household's reference person or spouse

	Men		Women	
	2000	2008	2000	2008
FT				
mean	43.14	43.9	40.47	38.89
sd	7.92	8.09	6.73	6.77
PT				
mean	19.96	19.27	17.87	19.14
sd	6.06	7.07	6.72	7.10
Substantial PT				
mean	22.73	23.24	22.33	23.22
sd	3.20	3.55	3.07	3.66
Marginal PT				
mean	11.88	11.14	11.01	11.26
sd	4.05	4.74	4.33	4.70

Souce: EPA and own calculation.

Table 2: Reasons of having PT employment, gender distribution of a given reason (row), reasons distribution in each gender (column)

2000	Men		Women	
	Row	Col.	Row	Col.
Education, training	47.4	13.7	52.6	4.2
Illness	60.0	3.0	40.0	0.6
Family obligations	1.2	0.6	98.8	13.7
FT not found	22.0	22.5	78.0	21.9
FT not wanted	16.1	4.1	83.9	5.9
Type of activity	20.9	37.0	79.1	38.2
Other reasons	26.3	18.1	73.7	13.9
Unknown reason	13.1	0.6	86.9	1.7

2008	Men		Women	
	Row	Col.	Row	Col.
Education, training	42.8	26.2	57.2	8.5
Illness	43.8	4.5	56.2	1.4
Family obligations	5.4	3.4	94.6	14.3
Children care	1.4	1.2	98.3	17.5
FT not found	17.7	27.6	82.3	31.2
FT not wanted	14.7	10.0	85.3	14.2
Other reasons	34.0	26.3	66.0	12.4
Unknown reason	26.9	0.9	73.1	0.6

Souce: EPA and own calculation

Table 3: Searching options of the unemployed (workweek supplies) for a given gender (column), distribution of a given option by gender (row), percentage

2000	5,018 Men		7,090 Women	
	Row	Col.	Row	Col.
FT only	53.9	20.8	46.1	12.6
FT, PT	38.5	27.6	61.5	31.2
PT, FT	15.7	0.9	84.3	3.4
PT only	17.6	1.5	82.4	5.1
Any type	42.2	49.2	57.8	47.7
2008	**5,018 Men**		**7,090 Women**	
	Row	Col.	Row	Col.
FT only	52.2	57.0	47.8	47.0
FT, PT	38.5	6.9	61.5	7.7
PT, FT	15.6	0.6	84.4	1.7
PT only	19.9	6.1	80.1	13.3
Any type	41.4	29.3	58.6	30.4

Souce: EPA and own calculation

Table 4: Individuals living with a partner who want to work more hours, percentage

	2000			2008		
Hours	+34	20-34	1-19	+34	20-34	1-19
Men	0.9	14.8	43.1	6.8	17.5	44.6
Women	0.5	13.5	34.7	3.8	22.4	45.8
Women's share	18.5	73.6	86.8	26.4	87.8	91.9

Souce: EPA and own calculation

answer is given by men and women (col), respectively. For example, 47.4 percent of workers who have a PT job because they are undertaking some education or training program are men in 2000 and this share has fallen to 42.8 in 2008; whereas 13.7 percent of men and only 4.2 percent of women in 2000 have it for that reason. This table also reveals that having a PT job due to family obligations is mainly a women's motive, although in the last years more men have PT employment for this reason. The fact that most of PT workers that do not want a FT job are also women (around 83 percent in both years) goes probably in the same direction, since these data usually correspond to women being in households where men hold FT jobs. Moreover, the majority of workers that have a PT job because they have not found a FT one are also women.

Finally, unemployed workers have preferences about the type of workweek they want. Table 3 reports that the distribution of each searching option across genders has remained practically the same but the distribution of workweek supplies has experienced important changes for each gender. The categories *FT only* and *FT, PT* (i.e. FT as the first option) have become more and less important over the years, respectively. The same thing happens for the categories *PT only* and *PT, FT* (i.e. PT as the first option). In other words, preferences about workweek types have become more polarized. Thus, if we want to properly account for the determinants of the (voluntary) PT labor supply we have to start by specifying what do we understand by a (voluntary) PT worker (unemployed or employed). With respect to the unemployed we can say that she is a PT seeker (i.e., she is searching for PT only or for PT as the first option), but with respect to the employed there is not a clear cut between voluntary and involuntary. We can say that an involuntary PT employed worker is a worker with a PT job who wants to work FT or more hours, whereas a voluntary PT worker does not want a FT job. But then there can be a large number of PT workers who are neither voluntary nor involuntary. Table 4 illustrates the importance of the distinction between a free choice (voluntary) and a constrained (involuntary) employment situation. It shows that the percentage of workers who prefer to work more hours is quite high for people with 'marginal' PT and that the majority of workers who want to work more hours, both substantial and marginal PT, are women. In the empirical anlysis of Section 4 we try to solve this ambiguity combining the reasons of having a PT employment with a control variable for hours.

Next we present a model of the household where agents have some preferences about the traditional division of labor between market and home production trying to reproduce some of the facts reported in this section. The importance of traditional gender role attitudes in Spain is analyzed, for example, by Alvarez and Miles (2003) in the context of two-earner couples; they find that the unequal division of domestic work between wifes and husbands is mainly explained by gender-specific effects rather than by differences in their observable characteristics.

3 A model of the household

The models of the household that try to explain why men spend more time in market work than in house work relative to women are based on the comparative advantage of women in home production, the bargaining decision making within the family or the role of identity in economic decisions. Here we adopt one of the simplest possible environments and assume that men and women have the same productivity at home but they can have different (exogenous) productivities in the market and different tastes about the household's traditional pattern of employment. The basic idea is taken from Akerlof and Kranton (2000), we suppose that there is some social attachment to the man breadwinner model and that actions against this pattern can have a utility cost. Moreover, we assume that agents relative weight in the household decision unit depends

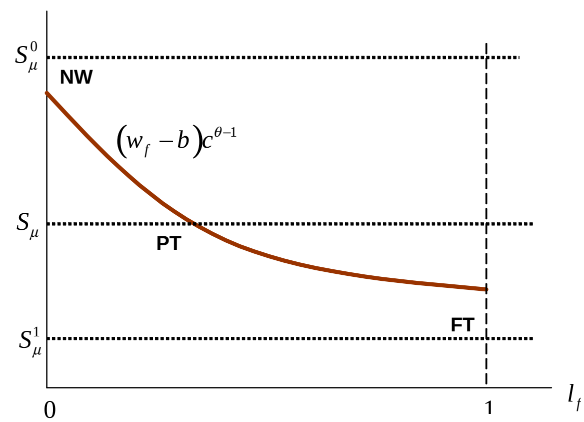

Figure 2: The woman's labour supply, three possible outcomes depending on the type of household and the level of the weighting factor.

on market income as in Basu (2004).

Consider a household composed by two productive adults, a woman and a man, each having a unit of productive time that can be allocated between house work and market work. They do not value leisure, but they are concerned about the traditional gender roles in the division of total family work. Agents obtain utility from the consumption of two goods, a market good and a home good. The former can also be used as an input in home production at zero cost. The latter is a public good inside the household, which cannot be traded in the market.

The home good, z, is produced according to the following technology:

$$z = A\left[k + b\left(2 - l_f - l_m\right)\right], \quad A,\, b > 0 \tag{1}$$

A is a measure of total factor productivity at home that can depend on a variety of factors like the number of dependent family members or anything influencing the social infrastructure of the family, like acces to child-care public services. The parameter b is the relative productivity of time in home production, which is assumed to be the same for the woman and the man. The variable k represents the amount of the market good used as an input in home production and the term $(2 - l_f - l_m)$ is total time employed in home production, where l_f and l_m represent the woman's and the man's labor market supplies, respectively.

The time and budget constraints faced by the household are, respectively:

$$0 \le l_i \le 1, \quad i = f, m, \tag{2}$$

$$c + k = a + w_f l_f + w_m l_m. \tag{3}$$

Where c represents total household's consumption of the market good, a and w_i are the exogenous non-labor income and real wage of adult i, $i = f$, m, respectively.

A household or a family is a decision unit whose objetive is to maximize a weighted sum of the individual utilities,

$$\mu U_m + (1-\mu) U_f, \tag{4}$$

subject to (1), (2) and (3). The weighting factor $\mu \in [0,1]$ represents the man's relative weight in the decision unit, to be explained below. The individuals' utility functions are identical except for a term that captures the personal concern about the traditional family:

$$\begin{aligned} U_i &= \frac{c^\theta}{\theta} + \delta \frac{z^\theta}{\theta} + s_i \cdot (l_m - l_f), \quad \delta > 0, \quad 0 < \theta < 1, \\ 0 &\leq s_i \leq 1, \quad i = f, m. \end{aligned} \tag{5}$$

That is, each individual cares about total household consumption of both goods in the same way, the term s_i represents the personal concern of individual i about the traditional family, which is captured by the term in brackets.[4] For simplicity we have also assumed that agents care about the family consumption of the market good instead of the private consumption of that good. Finally, δ and θ are positive parameters directly related, respectively, to the importance of the home good in an agent's utility and to the elasticity of substitution between c and z.

3.1 The household's labor supply

In this section we solve the problem of the household assuming that the weighting factor μ is given. Substituting (1) and (5) into (4), the problem of the household amounts to maximize

$$\frac{c^\theta}{\theta} + \delta \frac{\left[A\left(k + b\left(2 - l_f - l_m\right)\right)\right]^\theta}{\theta} + \left(l_m - l_f\right) S_\mu, \tag{6}$$

subject to (2), (3) and the non-negative constrains for c and k, where the term $S_\mu = \mu s_m + (1-\mu) s_f$ represents the household's concern about the traditional family. Note that S_μ depends on μ only if $s_m \neq s_f$, and increases with μ if and only if the man is more traditional than the woman $s_m > s_f$. Depending on the

[4] This term tries to capture the agreement with staments like 'Being a housewife is just as fulfilling as working for pay' found in Spain and other countries. See for example Fortin (2005).

value of wages, preferences and production parameters, there can be two kinds of scenarios: one in which the only input in home production is time and another one in which positive amounts of the market good are used as a home input. For concreteness, let us assume that the space of parameters implies the latter scenario.[5]

If individuals do not care about the traditional division of labor, $S_\mu = 0$, the solution to this problem implies that $l_j^* = 1$ whenever $w_j > b$, $l_j^* = 0$ whenever $w_j < b$, and $l_j^* \in (0,1)$ if $w_j = b$. Let us focus on the case $S_\mu > 0$ and $w_j \geq b$ for all j. The Kuhn-Tucker optimality conditions of this problem imply that it is always optimal that the man works full time in the market, $l_m^* = 1$, whereas the labor supply of the woman will be positive only if the marginal consumption utility gain implied by working an additional hour in the market is no less than S_μ. Formally, the woman's labor supply is given by

$$l_f^s = \begin{cases} 0 & if \quad S_\mu \geq Y_0 \\ l^* \in (0,1) & if \quad Y_1 < S_\mu < Y_0 \\ 1 & if \quad S_\mu \leq Y_1 \end{cases} \tag{7}$$

Where Y_0 and Y_1, given l_m^*, represent the marginal consumption utility gain of working in the market when $l_f = 0$ and $l_f = 1$, respectively, and l^* is the woman's PT labor supply:

$$Y_0 = (w_f - b)\left(\frac{1 + \delta(\delta A)^{\theta/(1-\theta)}}{l_m^*(w_m - b) + 2b}\right)^{1-\theta}, \tag{8}$$

$$Y_1 = (w_f - b)\left(\frac{1 + \delta(\delta A)^{\theta/(1-\theta)}}{l_m^*(w_m - b) + w_f + b}\right)^{1-\theta}, \tag{9}$$

$$l^* = \frac{1 + \delta(\delta A)^{\theta/(1-\theta)}}{S_\mu^{1/(1-\theta)}}(w_f - b)^{\frac{\theta}{1-\theta}} - \frac{(l_m^*(w_m - b) + 2b)}{w_f - b}. \tag{10}$$

The three options described in (7), non-work (NW), part-time (PT), full-time (FT) are illustarted in Figure 2. The decreasing curve represents the marginal consumption utility gain of working in the market. An increase in the total factor productivity parameter A will shift this curve upwards and tend to increase market time, whereas a rise in the individual's home productivity b will work in the opposite direction. The three horizontal lines represent three arbitrary levels of the household's concern about the traditional family that imply, respectively, three labor outcomes, NW, PT and FT. That is, everything else the same, less traditional families, low levels of S_μ, tend to assign larger values of l_f^s. Moreover, given the individuals' preferences about the tradition, the level of S_μ will rise (fall) with μ if the man (woman) is more traditional

[5] A sufficient condition for this to hold is that $(\delta A)^{1/(1-\theta)} a - 2Ab > 0$.

than the woman (man). Notice also that the optimal amount of the woman's market time is inversely related to the man's labor income and the level of non-labor income. A rise in $w_m l_m^* + a$ decreases the marginal utility of consumption and shifts downwards the downsloping curve in Figure 2, having a negative effect on the woman's labor supply.

Given μ, our first exercise is to analyze the household's welfare ranking over all possible employment options, since the market outcome does not always coincide with the optimal allocation. Given (7), it is not difficult to show that when FT is optimal, PT employment is preferred to NW, and it is not possible that NW can be better than PT. But when working PT is optimal, NW can be better than FT or not. Proposition 1 summarizes these results.

Proposition 1 *Suppose that* $S_\mu > 0$, $w_i > b$, $i = m, f$. *Then, the household's preferences over the woman's employment options satisfy the following ranking:*
(i) If working FT *is optimal, then* $PT \succ NW$.
(ii) If working PT *is optimal, then* $FT \succeq NW$ *or* $NW \succeq FT$.

Comparing these implications of the model with the employment preferences reported in Table 3, we note that the model cannot explain why some individuals prefer working FT and at the same time they prefer NW over working PT (*'FT only'*), or why some individuals can be indifferent between working FT and working PT (*'any-type'*). The reason is that we are assuming that the FT and PT hourly wages are the same, but relaxing this assumption and assuming that there exists a PT pay penalty the model can generate these alternative rankings over all the employment options.[6]

3.2 The determination of the weighting factor

So far we have assumed that the man's weight in the collective decision unit, μ, was exogenous. In this section we suppose that at the beginning of the period the man offers an arbitrary level of μ (it can be equal to one, which gives him the maximum decision power, or it can be less than one, reflecting some initial conditions in the marriage contract), which is revised once agents face wages and decide the optimal allocation of time. In particular, focusing on the case $S_\mu > 0$, $w_i > b$ and given wages, we shall assume that μ is a decreasing and concave function of the woman's labor supply, $\mu(l_f)$, that takes values on the interval $[\underline{\mu}, \overline{\mu}]$, $0 \leq \underline{\mu} < \overline{\mu} \leq 1$.

Given wages and an initial level of μ, (7) determines the woman's labor supply, this optimal allocation of time can cause a change in the factor μ and the household will adjust l_f^s further if $s_m \neq s_f$. We follow Basu

[6] This implication does not depend on the specific functional form of our utility function, it only requires the household's value function being concave in l_f.

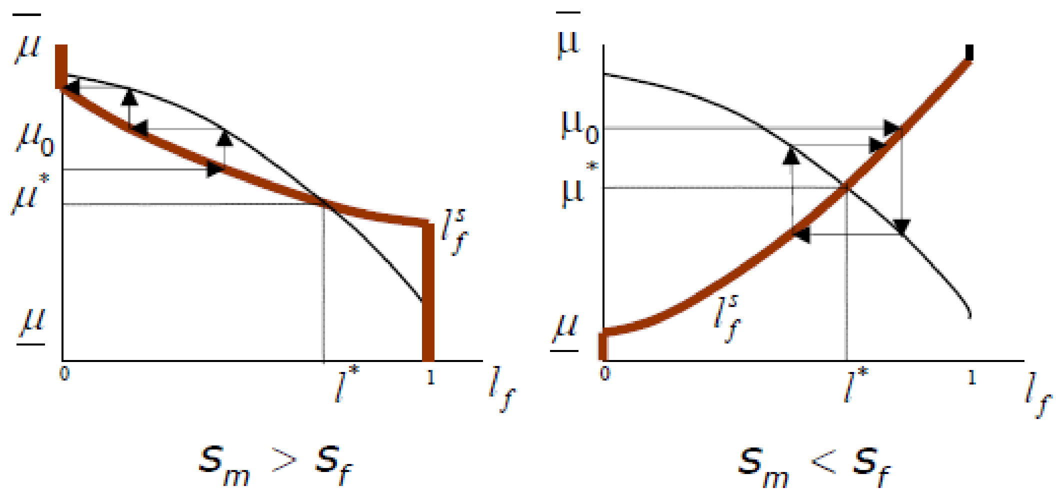

Figure 3: The determination of the weighting factor and the household's equilibrium

(2004) and define the equilibrium of the household as a stationary solution to this iterative process. That is, the process will continue until a pair $\left(l_f^*, \mu^*\right)$ is attained where l_f^* satisfies (7) for given μ^*, and $\mu^* = \mu\left(l_f^*\right)$. In other words, we can interpret the equilibrium of the household as the outcome of an iterative process in which current labor income determines tomorrow's distribution of power within the household (see Figure 3).

As we mentioned above, a fall in μ will shift a given line S_μ in Figure 2 downwards or upwards, respectively, depending on whether the man's concern about the tradition is stronger or weaker than the woman's. If the man is more concerned than the woman, $s_m > s_f$, the woman's labor supply will be non-increasing in μ. But if the woman is more concerned about the tradition than the man, a rise in μ will tend to increase her labor supply. For illustration purposes, consider two households with identical individual wages where the men work full time ($w_j > b$, $j = m, f$) and technologies except for the individuals' concern about the social tradition; in one household the man is more traditional than the woman and in the other the woman is more traditional than the man. In particular suppose that in each household the woman's labor supply is positive when the weighting factor is $\underline{\mu}$. Each panel in Figure 3 illustrates one possible dynamics of the weighting factor for a given initial value μ_0 in each type of household. The bold curves represent the relationship between l_f^s and μ obtained from (7), which is called the earnings-curve; and the thin decreasing curve represents the weighting function $\mu(l_f)$. So the intersection of both curves will determine the equilibrium of the household. The case illustrated in the left panel of Figure 3, $s_m > s_f$, shows three possible outcomes $(0, \overline{\mu})/NW$, $(l^*, \mu^*)/PT$ and $(1, \underline{\mu})/FT$, where the two corner solutions are (locally) stable and the interior solution is unstable. In contrast, the case illustrated in the right panel of Figure 3, $s_f > s_m$, where the labor supply is increasing in μ, shows that the PT equilibrium is unique and stable. The conditions for the uniqueness and stability of the household equilibrium are analyzed in the mathematical appendix. Here let us concentrate on the cases illustrated in Figure 3.

The arrows in Figure 3 show the direction of the iterative process starting at any arbitrary value of μ_0 in the interval $[\underline{\mu}, \overline{\mu}]$. When the equilibrium of the household is unique and stable (right panel), the initial condition does not matter, the man can initially offer the highest factor $\overline{\mu}$ or any other, this will determine an initial level of l_f^s through the earnings-curve, which in turn will point to a value of μ_1 on the weighting function, and so forth; this process gives values of μ and l_f^s that approach the PT stationary equilibrium (l^*, μ^*). Things are very different on the left panel of Figure 3. Here the equilibrium of the household depends on initial conditions. The PT stationary equilibrium (l^*, μ^*) can be attained only if the initial condition is μ^*; otherwise, the household converges to the NW equilibrium, $(0, \overline{\mu})$, if $\mu_0 > \mu^*$, or to the FT equilibrium, $(1, \underline{\mu})$, if $\mu_0 < \mu^*$.

In summary, for any given μ_0, we can have two households with the same level of S_μ and so with the same labor supply initially, but with very different employment patterns eventually, depending on the individuals' concern about tradition. For instance, given that 'family obligations' is mainly a women's reason of having PT employment, that the majority of PT workers that do not want a full-time job are women and that the majority of workers searching for a PT job are also women, we could conjecture that a large fraction of Spanish households with a FT/PT employment pattern is characterized by the woman being more 'traditional' than the man. We leave the empirical test of this interesting conjecture for future research. At the moment, we explore further the EPA data and analyze the importance of other observable characteristics in shaping the woman's labor supply.

4 The statistical framework

In this section we investigate the main determinants of the employment status of workers living with a partner, that are either household-heads or household-head's partners. We start with the estimation of an ordered model and discuss the implications of different specifications in the ordering of alternatives, and then proceed with a multinomial estimation. In this first stage we only consider individual and family characteristics as explanatory variables. In a second stage, we restrict the study to employed individuals and incorporate a set of market related variables as controls. In both cases we show the importance of accounting for involuntary PT employment in the classification of categories and the presence of important gender asymmetries in the determination of the employment situation.

4.1 Individual and family characteristics

The ordered model applies when there is a natural ordering of alternatives like the non-work, part-time work and full-time work analyzed above. In our theoretical framework individuals take wages and technologies as given and choose the employment supply option that maximizes their utility subject to their budget constraint. In the data, however, individuals have market employment status that can be different from their first-best option. So when using households' data we have to define the employment categories as close as possible to the natural (supply side) ordering given by (7). In the data we classify individuals according to the three employment alternatives following different model specifications. First, we follow a common practice strategy (see, for example, Bardasi and Gornick, 2002) and estimate a model where the category non-work includes the inactive individuals plus those that are unemployed (Model 1A). Then we drop from the sample those individuals that are unemployed and estimate a model where the non-work category only includes the inactive individuals (Model 1B). Finally, we also include the estimation results when we drop from the non-work category the inactive population and keep only the unemployed workers (Model 1C). Tables 5 and 6 report the estimation results for women and men, respectively. In both cases the PT and FT employment categories correspond to the EPA classification: employed individuals that declare themselves having a PT or a FT job, respectively.

The sample consists of individuals aged between 16 and 64 that live with a partner and are either the household's head or the partner of the household's head. The individual characteristics are age (and square age, as a control variable) and education (four different levels, primary, secondary first level, secondary second level and university), which are not only proxies for experience and productivity, they also can influence the age and number of children. The family variables are marital status (non-married includes single, divorced and widowed), the partner's employment, the partner's unemployment, age of children (six school-age intervals), the presence of other employed adults living in the household, and the presence of other adults older than 64. All the model specifications also include dummy variables for the Spanish regions which are not reported.[7]

The sign of each estimated coefficient in Tables 5 and 6 shows the direction of the change in the probability of falling in the end point rankings, non-work, part-time work or full-time work, when the explanatory variable changes. The probability of non-work changes in the opposite direction from the sign of the estimated coefficient. So all explanatory variables with a negative sign increase the probability of non-work and decrease the probability of full-time work. Models 1A, 1B, 1C have different sample sizes and dependent variables, so we cannot make comparisons, but Model 1C seems to perform worse than the other two. The reason is

[7] We have estimated all the models including instead the regional unemployment rates and found very similar results.

Table 5: Women Ordered Logit, alternative specifications for the non-work status, EPA definitions for PT and FT situations.

	2000			2008		
	1A	1B	1C	1A	1B	1C
Age	0.186* (0.0126)	0.169* (0.0132)	0.071* (0.018)	0.139* (0.010)	0.136* (0.010)	0.012 (0.013)
Age2	−0.0026* (0.0001)	−0.0025* (0.0002)	−.0006* (0.0002)	−0.002* (0.0001)	−0.002* (0.0001)	−.00005 (0.0002)
Edu2	0.235* (0.033)	0.258* (0.034)	0.135* (0.048)	0.413* (0.033)	0.424* (0.034)	0.339* (0.047)
Edu3	0.912* (0.036)	1.029* (0.038)	0.641* (0.053)	1.036* (0.034)	1.072* (0.035)	0.820* (0.048)
Edu4	2.00* (0.042)	2.162* (0.045)	1.358* (0.060)	2.033* (0.040)	2.097* (0.041)	1.544* (0.055)
Married	−0.336* (0.091)	−0.397* (0.097)	−0.050 (0.114)	−0.3201* (0.043)	−0.423* (0.046)	−0.031 (0.051)
Em.par.	0.211* (0.049)	0.195* (0.050)	0.065 (0.073)	0.468* (0.037)	0.472* (0.037)	0.135* (0.056)
Un.par.	0.069 (0.079)	0.182* (0.082)	−0.574* (0.106)	0.350* (0.068)	0.638* (0.074)	−0.517* (0.082)
Child1	−0.535* (0.042)	−0.709* (0.045)	−0.114* (0.057)	−0.697* (0.035)	−0.819* (0.037)	−0.492* (0.043)
Child2	−0.417* (0.039)	−0.473* (0.041)	−0.254* (0.053)	−0.362* (0.032)	−0.399* (0.033)	−0.319* (0.040)
Child3	−0.332* (0.031)	−0.353* (0.032)	−0.298* (0.042)	−0.139* (0.030)	−0.145* (0.031)	−0.144* (0.039)
Child4	−0.144* (0.031)	−0.154* (0.033)	−0.171* (0.044)	−0.074* (0.032)	−0.066* (0.033)	−0.118* (0.043)
Child5	−0.179* (0.037)	−0.218* (0.038)	−0.091** (0.053)	−0.015 (0.038)	−0.012 (0.039)	−0.042 (0.054)
Em.other	0.055 (0.079)	0.058 (0.037)	0.047 (0.054)	0.046 (0.038)	0.023 (0.039)	0.055 (0.053)
Adult65	0.136* (0.051)	0.108* (0.052)	0.330* (0..081)	−0.034 (0.052)	−0.057 (0.053)	0.201* (0.081)
LIMIT_1	4.080* (0.2975)	3.153* (0.313)	1.141* (0.420)	2.832* (0.234)	2.213* (0.250)	−0.895* (0.299)
LIMIT_2	4.452* (0.298)	3.563* (0.313)	1.992* (0.421)	3.479* (0.234)	2.921* (0.250)	0.585* (0.299)
Obs.total	33625	30725	15548	33477	31381	19807
Log likel.	−24958	−23049	−12785	−28976	−27025	−15727
Ps.R^2	0.118	0.141	0.053	0.122	0.137	0.048

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively; s.e. in parenthesis.

The dependent variable takes the value 0 if NW, 1 if PT, 2 if FT.

Table 6: Men Ordered Logit, alternative specifications for the non-work status, EPA definitions for PT and FT situations.

	2000			2008		
	1A	1B	1C	1A	1B	1C
Age	0.320*	0.312*	0.112*	0.296*	0.309*	0.107*
	(0.016)	(0.022)	(0.023)	(0.015)	(0.018)	(0.022)
Age2	−0.004*	−0.005*	−0.001*	−0.004*	−0.005*	−0.001*
	(0.00017)	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0003)
Edu2	0.351*	0.315*	0.429*	0.319*	0.298*	0.399*
	(0.046)	(0.058)	(0.063)	(0.042)	(0.049)	(0.068)
Edu3	0.574*	0.405*	0.761*	0.425*	0.286*	0.651*
	(0.049)	(0.060)	(0.072)	(0.045)	(0.050)	(0.074)
Edu4	0.990*	0.760*	1.060*	0.815*	0.611*	0.781*
	(0.061)	(0.070)	(0.091)	(0.056)	(0.062)	(0.089)
Married	0.646*	0.625*	0.831*	0.432*	0.422*	0.522*
	(0.122)	(0.174)	(0.140)	(0.062)	(0.078)	(0.079)
Em.par	0.062	0.129*	−0.153*	0.294*	0.412*	−0.196*
	(0.036)	(0.044)	(0.050)	(0.036)	(0.040)	(0.060)
Un.par	−0.847*	−0.547*	−1.070*	−0.394*	0.057	−1.047*
	(0.087)	(0.124)	(0.100)	(0.063)	(0.084)	(0.083)
Child1	0.027	0.418*	−0.099	0.086	0.217*	−0.087
	(0.071)	(0.126)	(0.079)	(0.060)	(0.081)	(0.073)
Child2	−0.107*	0.151	−0.179*	−0.021	0.049	−0.066
	(0.064)	(0.103)	(0.073)	(0.053)	(0.070)	(0.068)
Child3	−0.0007	0.101	−0.001	0.112*	0.164*	0.021
	(0.047)	(0.067)	(0.059)	(0.048)	(0.059)	(0.066)
Child4	−0.030	0.077	−0.064	0.092**	0.169*	−0.099
	(0.045)	(0.059)	(0.060)	(0.047)	(0.056)	(0.070)
Child5	0.280*	0.364*	0.096	0.149*	0.155*	0.089
	(0.047)	(0.054)	(0.070)	(0.052)	(0.058)	(0.088)
Em.other	0.016	−0.058	0.042	0.143*	0.140*	0.097
	(0.0424)	(0.049)	(0.067)	(0.052)	(0.058)	(0.087)
Adult65	0.058	0.072	−0.013	0.070	0.071	0.044
	(0.055)	(0.063)	(0.085)	(0.069)	(0.075)	(0.124)
LIMIT_1	4.583*	3.162*	0.823	3.555*	2.796*	−0.165
	(0.402)	(0.548)	(0.548)	(0.358)	(0.452)	(0.496)
LIMIT_2	4.676*	3.297*	1.036*	3.696*	2.982*	0.222
	(0.401)	(0.548)	(0.548)	(0.358)	(0.452)	(0.496)
Obs.total	33022	31271	28697	31294	30093	27330
Log likel.	−14272	−10573	−7986	−14052	−11315	−7207
Ps.R^2	0.194	0.270	0.064	0.151	0.207	0.035

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively; s.e. in parenthesis.

The dependent variable takes the value 0 if NW, 1 if PT, 2 if FT.

Table 7: Alternative definitions for Voluntary and Involuntary PT and FT workers

	Voluntary PT and Involuntary PT
Definition 1	VPT: FT not wanted IPT: FT not found
Definition 2	VPT: FT not wanted IPT: other han FT not wanted
Definition 3	VPT: FT not wanted+ other reason if not want more hours IPT: FT not found + other reason if want more hours
Def. EPA	VPT: other than FT not found IPT: FT not found
	PT and FT Unemployment
All Def.	PTU: searching PT only + PT as first option
Definition 1	FTU: searching FT only
All but Def. 1	FTU: searching FT only + FT as first option + any type

that unemployment is mainly involuntary and so tying the non-work category only to this situation adds a lot of noise to the estimation procedure. In contrast, the non participation situation is mainly a voluntary choice, so including the inactive population in the non-work category provides a more natural ordering of the employment alternatives. It is worth noting that the effect of family characteristics on the employment probabilities is very different across genders, the marital status and the unemployment of the partner have opposite effects on the employment probabilities of men and women, respectively, whereas the presence of small children decreases the employment probability of women in all cases and has not a clear effect in the case of men. To explore the importance of an involuntary employment situation we propose to estimate the implications of different definitions of a worker's labor status. The ordered model estimation will help to choose the more suitable definition of employment categories.

Our aim is to find the profile of a (voluntary) PT worker, so we have to address two questions. The first one is how to classify the unemployed into PT or FT workers and the second one is how to decide when a PT employment situation is voluntary or involuntary. With respect to the first question, we can only use the options described in Table 3 to define the two unemployment categories, according with the job searching options. With respect to the second one, we can use at least two criteria, whether the worker would like working more hours or not (the hours criterium), the reasons of having a PT work (the reasons criterium, Table 2), or different combinations of the two. In all model specifications we assume that a FT employment status is voluntary and that the non-work category includes only the inactive. The PT and FT categories are modified to capture the unemployed's preferences about workweeks and the employed's voluntary or involuntary situation, respectively. The dependent variable will take the value 0 if the status is non-work, the value 1 if the status is voluntary PT employment or unemployment searching for a PT job, and the value 2 if the status is FT employment, involuntary PT employment or unemployment searching for a FT job.

Table 7 describes a selected group of the definitions used in the estimation. The distribution of the unemployed between PT and FT workers can be done using different classifications of the job searching options. From a worker's perspective, the five searching options can be ordered in different ways going from searching for PT only to searching for FT only. With respect to the distribution of the employed between voluntary and involuntary workers the official statistics identify the involuntary PT employment with the share of PT workers that have not found a FT job, so the voluntary PT employment share is just the rest of PT employment categories (see Table 2). According with this definition, those workers that have a PT job because the type of activity they develop or other reasons are classified as voluntary.[8] One way to solve this ambiguity using the reasons criterium is to define the voluntary PT employment as the number of workers

[8] Since 2004 the 'type of activity' developed is not listed as a possible reason of having a part-time job, and 'family obligations' is split into two different reasons, 'taking care of children and other dependent adults' and 'other family reasons'.

Table 8: Women Ordered Logit 2008, extended PT and FT definitions

	Def 1	Def 2	Def 3	EPA Def
Age	0.081*	0.081*	0.076*	0.081*
	(0.007)	(0.006)	(0.006)	(0.006)
Age2	−0.001*	−0.001*	−0.001*	−0.001*
	(0.00008)	(0.00008)	(0.00007)	(0.00007)
Edu2	0.235*	0.193*	0.203*	0.222*
	(0.022)	(0.020)	(0.020)	(0.019)
Edu3	0.632*	0.555*	0.544*	0.573*
	(0.023)	(0.022)	(0.021)	(0.021)
Edu4	1.285*	1.141*	1.136*	1.169*
	(0.027)	(0.026)	(0.024)	(0.024)
Married	−0.329*	−0.306*	−0.316*	−0.279*
	(0.031)	(0.030)	(0.028)	(0.027)
Em.par	0.249*	0.252*	0.246*	0.253*
	(0.024)	(0.023)	(0.022)	(0.021)
Un.par	0.428*	0.497*	0.523*	0.418*
	(0.047)	(0.044)	(0.042)	(0.042)
Child1	−0.516*	−0.427*	−0.542*	−0.491*
	(0.025)	(0.024)	(0.023)	(0.022)
Child2	−0.250*	−0.199*	−0.258*	−0.242*
	(0.022)	(0.021)	(0.020)	(0.019)
Child3	−0.079*	−0.058*	−0.081*	−0.077*
	(0.021)	(0.020)	(0.019)	(0.018)
Child4	−0.036**	−0.029	−0.024	−0.027
	(0.021)	(0.021)	(0.020)	(0.019)
Child5	−0.023	−0.010	−0.013	−0.014
	(0.023)	(0.024)	(0.023)	(0.022)
Em.other	0.022	−0.001	−0.002	0.010
	(0.025)	(0.024)	(0.023)	(0.023)
Adult65	−0.045	−0.067*	−0.056**	−0.045
	(0.034)	(0.033)	(0.032)	(0.031)
LIMIT_1	1.075*	0.917*	0.723*	0.982*
	(0.158)	(0.149)	(0.143)	(0.139)
LIMIT_2	1.220*	1.041*	0.999*	1.423*
	(0.158)	(0.149)	(0.143)	(0.139)
Obs.total	30131	33448	33448	33448
Log likel.	−21272	−23202	−27239	−29254
Ps.R^2	0.165	0.152	0.133	0.129

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively; s.e. in parenthesis.

The dependent variable takes the value 0 if NW, 1 if vol PT or u-searching PT, 2 if FT or inv PT or u-searching FT .

Table 9: Women Multinomial Logit under Definition 2

	2000		2008	
	PT	FT	PT	FT
Intercept	-5.536^*	-1.875^*	-5.368^*	-1.540^*
	(1.370)	(0.312)	(0.743)	(0.267)
Age	0.098^*	0.145^*	0.141^*	0.137^*
	(0.045)	(0.013)	(0.027)	(0.011)
Age2	-0.002^*	-0.002^*	-0.002^*	-0.002^*
	(0.0005)	(0.0001)	(0.0003)	(0.0001)
Edu2	0.286^*	0.221^*	0.331^*	0.316^*
	(0.117)	(0.033)	(0.084)	(0.035)
Edu3	0.512^*	0.900^*	0.430^*	0.936^*
	(0.135)	(0.037)	(0.091)	(0.038)
Edu4	0.850^*	2.054^*	0.921^*	2.028^*
	(0.178)	(0.049)	(0.113)	(0.048)
Married	-0.022	-0.524^*	-0.298^*	-0.555^*
	(0.351)	(0.117)	(0.114)	(0.055)
Em.par	0.137	0.121^*	0.399^*	0.422^*
	(0.200)	(0.045)	(0.102)	(0.040)
Un.par	0.311	0.401^*	0.858^*	0.875^*
	(0.290)	(0.073)	(0.169)	(0.078)
Child1	-0.291^*	-0.746^*	-0.394^*	-0.767^*
	(0.140)	(0.045)	(0.093)	(0.042)
Child2	-0.136	-0.446^*	-0.043	-0.345^*
	(0.124)	(0.042)	(0.078)	(0.037)
Child3	0.058	-0.280^*	-0.078	-0.107^*
	(0.109)	(0.032)	(0.078)	(0.035)
Child4	0.117	-0.099^*	-0.058	-0.061^*
	(0.112)	(0.032)	(0.084)	(0.036)
Child5	-0.219	-0.202^*	-0.040	-0.030
	(0.143)	(0.037)	(0.103)	(0.043)
Em.other	0.211	0.037	0.112	0.002
	(0.149)	(0.035)	(0.101)	(0.042)
Adult65	-0.929^*	0.041	-0.340^*	-0.133^*
	(0.301)	(0.050)	(0.156)	(0.057)
Obs.Total		33568	33448	
Log likel.		-21624	-23114	
Ps.R^2		0.1552	0.1553	

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively; s.e. in parenthesis.

The dependent var is 0 if NW, 1 if vol PT or u- searching PT, 2 if FT or u-searching FT or inv PT.

Table 10: Men Ordered and Multinomial Logit models 2008 under Definition 2

	ordered model	multinomial model	
		PT	FT
Interc.		-6.716^{*} (2.997)	-0.925^{**} (0.495)
Age	0.161^{*} (0.011)	0.198 (0.142)	0.258^{*} (0.023)
Age2	-0.002^{*} (0.0001)	-0.003^{**} (0.0015)	-0.004^{*} (0.0002)
Edu2	0.151^{*} (0.028)	0.307 (0.471)	0.233^{*} (0.051)
Edu3	0.157^{*} (0.029)	0.832^{*} (0.397)	0.214^{*} (0.053)
Edu4	0.411^{*} (0.036)	2.031^{*} (0.416)	0.745^{*} (0.071)
Married	0.149^{*} (0.044)	0.254 (0523)	0.274^{*} (0.089)
Em.par.	0.251^{*} (0.023)	0.396 (0.279)	0.518^{*} (0.044)
Un.par.	0.121^{*} (0.047)	-1.243 (0.215)	0.221 (0.090)
Child1	0.167^{*} (0.045)	0.210 (0.490)	0.456^{*} (0.107)
Child2	0.048 (0.038)	-0.133 (0.403)	0.163^{**} (0.085)
Child3	0.096^{*} (0.032)	-0.075 (0.374)	0.233^{*} (0.067)
Child4	0.098^{*} (0.031)	-0.409 (0.472)	0.194^{*} (0.060)
Child5	0.084^{*} (0.033)	-0.679 (0.490)	0.092 (0.059)
Em.other	0.089^{*} (0.033)	0.243 (0.553)	0.197^{*} (0.060)
Adult65	0.038 (0.044)	0.071 (0.586)	0.037 (0.079)
LIMIT_1	1.066^{*}		
LIMIT_2	1.081^{*}		
Obs.Total	31258		31258
Log likel.	-9100		-9114
Ps.R^2	0.255		0.254

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively; s.e. in parenthesis. The dependent var in the ordered (multinomial) model is defined as in Table 8 (Table 9).

that do not want a FT employment and compute the involuntary PT employment as the residual (Definition 2). Notice that Definition 1 is the less ambiguous of all since it includes in the voluntary PT category only those workers that do not want a FT job and in the involuntary category only those that have not found a FT employment. The problem with this definition is that we loose a lot of observations and the heterogeneity of PT employment. Table 8 describes the female results of the ordered model for each definition in Table 7.[9]. To gain some intuition on these results Table 9 reports a multinomial estimation of the labor categories implied by Definition 2. In this case higher education has a larger and positive impact on the probability of FT employment, being married and having children aged below 12 decrease, respectively, the probability of any type of employment (stronger effect on FT employment), and having children aged 12 or more decreases the probability of FT employment but it is not significant for PT employment. Moreover, the presence of adults older than 65 decreases the probability of any type of employment but it has a bigger impact on PT employment.

Table 10 reports the male results of both the ordered and the multinomial estimations under Definition 2. Comparing the results of the ordered model with those of women (Definition 2 in Table 8) we find opposite signs and larger absolute values for women in the married and children's coefficients (although not all significative). Moreover, education coefficients are larger for women than for men. Comparing the multinomial estimations across genders shows that education has a positive effect on any type of employment, but it is more important in the case of women; moreover, higher education has a stronger effect on FT employment than on PT employment in the case of women, whereas this effect is the opposite in the case of men. Finally, family variables like being married or having children are more important for FT than for PT and have opposite signs across genders; in the case of men these variables have a positive effect on FT employment and are not significative for PT, while in the case of women the presence of children aged 5 or more becomes not significant for PT employment.

4.2 Employment properties

In this section we restrict the sample to salaried individuals and add a set of employment related variables as controls. These variables include four categories for the type of activity and occupation defined from the EPA socioeconomic classification: primary sector, blue-collar, white-collar/professional and service sector (base category); the type of contract variable takes the value 1 if the employment contract is permanent and 0 if it is temporary; the private sector variable takes the value 1 if the individual is employed in the private sector and 0 if employed in the public sector; finally, the variable 'want to work more hours' takes the value

[9] The results for 2000 (not shown) are similar.

1 if the individual wants to work more hours and 0 otherwise.[10]

First we estimate different specifications of a binary choice model where the dependent variable takes the value 1 if the individual works FT and the value 0 if she or he works PT, using the EPA classification. The estimation results are reported in Tables 11 and 12 for women and men, respectively. A summary of the main gender asymmetries found is reported in Table 13. Second we estimate a multinomial model where we distinguish between voluntary and involuntary PT employment using the alternative definitions discussed above. Due to sample limitations, in this case the focus is on the female population of 2008.[11] The estimation results using the combination of the reasons and hours criteria of Definition 3 are reported in Tables 14 and 15.

In all cases the inclusion of the market variables improves considerably the explanatory power of the model and, at the same time, implies similar values and significance levels for most individual and family coefficients. One remarkable exception is the 'being married' coefficient, which increases considerably its absolute value in the market models in the case of women, but not in the case of men. That is, the marital status tends to be more (less) relevant for women (men) in the market framework.

In the market framework of the binomial estimations we consider two models (model 2 and model 3), the difference is the inclusion of the variable 'want to work more hours' in model 3, which tries to capture the presence of involuntary employment. The negative sign and significance of this coefficient in Tables 11 and 12 reflect that the involuntary employment situation is positively related to PT employment. Some of the most sensitive coefficients to the inclusion of the 'want to work more hours' variable are those of 'being married' and the contract type. Again, the marital status becomes more relevant for women than for men. On the other hand, the decrease of the contract type coefficient (all market variables coefficients decrease) suggests that the desire of working more hours is mainly associated to temporary contracts regardless of gender.

Some of the gender asymmetries that showed up in the multinomial estimations of the non-market model in the previous section (inactive + active population) also arise in the market model (employed population). Being married and having children decrease the probability of FT employment for a woman, whereas for men being married increases the probability of FT and having children is in general not significant. In the case of men, education only matters at the highest level and, in contrast to the case of women, it has a negative influence on the probability of FT employment. A related feature is that working as a professional increases the probability of having a PT employment for a man, but not for a woman (it increases the probability of

[10] We have also included four firm size categories in an extended model and find that these variables are very significant, being more likely to have PT with small firms than with large firms. These results are available only for the year 2000 and can be obtained from the authors upon request.

[11] The few observations for men with a PT job do not allow to split the sample into voluntary and involuntary PT workers.

Table 11: Salaried Women Binary Logit, EPA definitions for PT and FT situations

	2000			2008		
	(1)	(2)	(3)	(1)	(2)	(3)
Interc.	−1.233**	1.510*	2.964*	1.405*	3.081*	3.814*
	(0.067)	(0.753)	(0.762)	(0.447)	(0.461)	(0.498)
Age	0.094*	0.018	0.016	−0.016	−0.039*	−0.031
	(0.028)	(0.030)	(0.033)	(0.018)	(0.019)	(0.021)
Age2	−0.001*	−0.0004	−0.0005	0.0002	0.0002	0.00001
	(0.0003)	(0.0004)	(0.0004)	(0.0002)	(0.0002)	(0.003)
Edu2	0.457*	0.389*	0.453*	0.370*	0.305*	0.288*
	(0.076)	(0.082)	(0.088)	(0.063)	(0.068)	(0.073)
Edu3	1.200*	1.107*	1.114*	0.939*	0.778*	0.733*
	(0.082)	(0.092)	(0.099)	(0.065)	(0.070)	(0.075)
Edu4	1.731*	1.255*	1.298*	1.692*	1.122*	1.042*
	(0.091)	(0.133)	(0.149)	(0.072)	(0.091)	(0.097)
Married	0.050	−0.057	−0.106	−0.150*	−0.257*	−0.455*
	(0.171)	(0.185)	(0.202)	(0.066)	(0.068)	(0.075)
Em.par.	0.111	0.003	−0.067	0.115	0.046	−0.016
	(0.117)	(0.127)	(0.139)	(0.077)	(0.082)	(0.087)
Un.par.	−0.085	−0.232*	−0.200	0.138	0.199	0.403*
	(0.176)	(0.192)	(0.214)	(0.124)	(0.131)	(0.141)
Child1	−0.229*	−0.347*	−0.483*	−0.769*	−0.844*	−0.967*
	(0.092)	(0.097)	(0.105)	(0.055)	(0.058)	(0.062)
Child2	−0.406*	−0.459*	−0.564*	−0.416*	−0.484*	−0.525*
	(0.083)	(0.090)	(0.096)	(0.051)	(0.054)	(0.057)
Child3	−0.361*	−0.455*	−0.494*	−0.125*	−0.153*	−0.127*
	(0.067)	(0.072)	(0.078)	(0.052)	(0.055)	(0.059)
Child4	−0.204*	−0.150*	−0.158*	−0.056	−0.059	0.032
	(0.069)	(0.074)	(0.081)	(0.058)	(0.062)	(0.068)
Child5	−0.171*	−0.120	−0.078	0.078	0.076	0.079
	(0.085)	(0.090)	(0.098)	(0.073)	(0.078)	(0.084)
Em.other	−0.230*	−0.092	−0.114	−0.119**	−0.064	−0.032
	(0.084)	(0.091)	(0.098)	(0.070)	(0.075)	(0.081)
Adult65	0.317*	0.206	0.150	0.085	0.059	0.106
	(0.139)	(0.146)	(0.152)	(0.111)	(0.119)	(0.128)
Primary		2.509*	2.478*		2.814*	2.794*
		(0.244)	(0.576)		(0.220)	(0.222)
Blue col.		1.995*	1.876*		1.566*	1.498*
		(0.122)	(0.129)		(0.089)	(0.092)
Profess.		0.055	−0.055		0.207*	0.169*
		(0.118)	(0.131)		(0.074)	(0.080)
Contract		1.134*	0.931*		0.920*	0.661*
		(0.066)	(0.072)		(0.049)	(0.053)
Private		−1.569*	−1.503*		−1.619*	−1.563*
		(0.090)	(0.095)		(0.068)	(0.073)
+hours			−3.975*			−2.477*
			(0.184)			(0.071)
Obs.	9751	9751	9751	14576	14576	14576
R^2	0.080	0.188	0.290	0.068	0.154	0.239

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively; s.e. in parenthesis.
The intercept (not reported) is always significative. The dependent var is 1 if FT, 0 if PT.

Table 12: Salaried Men Binary Logit, EPA definitions for PT and FT situations

	(1)	(2)	(3)
Intercept	-1.023	-1.546	-0.878
	(1.0320)	(1.546)	(1.096)
Age	0.250^{*}	0.239^{*}	0.248^{*}
	(0.047)	(0.047)	(0.049)
Age^2	-0.003^{*}	-0.003^{*}	-0.003^{*}
	(0.0005)	(0.0006)	(0.0006)
Edu2	0.006	0.049	0.005
	(0.190)	(0.193)	(0.196)
Edu3	-0.200	-0.128	-0.064
	(0.188)	(0.202)	(0.204)
Edu4	-0.737^{*}	-0.419^{**}	-0.446^{**}
	(0.186)	(0.237)	(0.240)
Married	0.574^{*}	0.415^{*}	0.341^{*}
	(0.169)	(0.171)	(0.178)
Em.par.	-0.087	-0.054	-0.119
	(0.137)	(0.138)	(0.141)
Un.par.	-0.494^{*}	-0.436^{*}	-0.139
	(0.218)	(0.221)	(0.229)
Child1	-0.231	-0.229	-0.175
	(0.158)	(0.159)	(0.162)
Child2	-0.045	-0.050	-0.013
	(0.161)	(0.161)	(0.166)
Child3	0.006	0.005	0.103
	(0.162)	(0.162)	(0.165)
Child4	0.168	0.163	0.181
	(0.183)	(0.183)	(0.186)
Child5	0.512^{*}	0.446^{*}	0.399^{**}
	(0.223)	(0.222)	(0.223)
Em.other	-0.400^{**}	-0.366^{**}	-0.327
	(0.214)	(0.212)	(0.212)
Adult65	0.361	0.357	0.414
	(0.344)	(0.346)	(0.350)
Primary		0.584^{**}	0.650^{*}
		(0.326)	(0.331)
Blue col.		1.119^{*}	1.162^{*}
		(0.164)	(0.167)
Profess.		-0.162	-0.313^{**}
		(0.166)	(0.172)
Contract		1.281^{*}	0.956^{*}
		(0.138)	(0.144)
Private		-0.499^{*}	-0.529^{*}
		(0.163)	(0.166)
+hours			-2.352^{*}
			(0.138)
Observ.	19470	19470	19470
R^2	0.036	0.075	0.151

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively.

S.e. in parenthesis. The dependent var is 1 if FT, 0 if PT.

Table 13: Main Gender Asymmetries in the probability of FT employment, binary models

	Family	Personal	Market
Men	Married (+) Children (not)	High education (-) Rest education levels (not)	Professional (-)
Women	Married (-) Children (-)	$\uparrow$ Education $\Rightarrow\uparrow$ Coef All education levels (+)	Professional (+)

female FT employment). A summary of these important gender asymmetries is reported in Table 13, but they should be interpreted with caution since the number of male observations is very small.

Finally, comparing the results of the binary market model across 2000 and 2008 for the female population reveals that some family characteristics like being married and having small children have become more relevant, increasing the probability of PT employment against the FT employment. In contrast, the level of education has become less important. One possible interpretation is that advances in the regulation of PT employment have benefited the consolidation of PT as an alternative employment option for many women, but another possibility is the reemergence of attitudes towards traditional gender roles in recent cohorts, which can be an obstacle for greater gender equality in the labor market. This and the gender asymmetries discussed above suggest that the path of PT employment in Spain is consolidating in very different ways for men and women separately.

To conclude this section we analyze the determinants of involuntary PT employment among salaried women (living with a partner). The aim of this final stage is to confirm the importance of involuntary employment and to identify the profile of an involuntary PT worker. We have estimated several specifications of a multinomial model, using the alternative employment status definitions listed in Table 7. Table 14 reports the results for the best fit we found. In this case, the dependent variable takes the value 0 if the status is voluntary PT, the value 1 if the status is involuntary PT and the value 2 if it is FT employment. Model 1 refers to the estimation of the model with individual and family characteristics only and model 2 refers to the extended model including the market variables. Note that now the variable 'want to work more hours' is not in the list of explanatory variables, since whether the worker wants to work more hours or not is already included in the definitions of involuntary and voluntary PT situations.

As above, the inclusion of the market variables adds substantial explanatory power to the model and both the signs and significance levels of most variables in the market model are similar to those in the non-market setup. These results complement those of Table 11 in that they confirm the importance of accounting for

Table 14: Salaried Women Multinomial Logit model 2008 under Definition 3

	(1)		(2)	
	Inv PT	FT	Inv PT	FT
Intercept	0.947	2.633*	1.088*	4.400*
	(0.795)	(0.567)	(0.813)	(0.584)
Age2	0.015	−0.015	0.025	−0.035*
	(0.032)	(0.024)	(0.033)	(0.024)
Age	0.0006	0.00002	−0.0006**	−0.00002
	(0.0004)	(0.0003)	(0.0004)	(0.0003)
Edu2	−0.129	0.314*	−0.131	0.253*
	(0.103)	(0.079)	(0.104)	(0.083)
Edu3	−0.359*	0.788*	−0.348*	0.640*
	(0.110)	(0.081)	(0.112)	(0.086)
Edu4	−0.395*	1.537*	−0.397*	0.971*
	(0.128)	(0.089)	(0.156)	(0.109)
Married	−0.595*	−0.436*	−0519*	−0.501*
	(0.117)	(0.090)	(0.118)	(0.092)
Em.par.	0.004	0.116	−0.053	0.068
	(0.133)	(0.096)	(0.133)	(0.099)
Un.par.	0.528*	0.404*	0.498*	0.433*
	(0.213)	(0.168)	(0.213)	(0.171)
Child1	−0.788*	−1.075*	−0.761*	−1.129*
	(0.099)	(0.070)	(0.100)	(0.072)
Child2	−0.363*	−0.552*	−0.383*	−0.621*
	(0.089)	(0.062)	(0.091)	(0.064)
Child3	0.043	−0.109**	0.007	−0.153
	(0.089)	(0.065)	(0.090)	(0.067)
Child4	0.241**	0.055	0.198*	0.031
	(0.098)	(0.075)	(0.099)	(0.078)
Child5	0.066	0.102	0.079	0.102
	(0.124)	(0.094)	(0.126)	(0.098)
Em.other	−0.013	−0.125	−0.025	−0.077
	(0.118)	(0.091)	(0.119)	(0.095)
Adult65	0.300	0.218	0.274	0.178
	(0.190)	(0.143)	(0.89)	(0.149)
Primary			−0.847*	2.416*
			(0.440)	(0.0282
Blue col.			−0.540*	1.359*
			(0.173)	(0.108)
Profess.			−0.013	0.213*
			(0.138)	(0.088)
Private			−0.123	−1.659*
			(0.125)	(0.086)
Contract			−0.904*	0.513*
			(0.076)	(0.061)
Obs.Total		12565		14576
Log likel.		−9823		−9052
Ps.R^2		0.069		0.1412

(*) and (**) stand for significance at the 5 and 10 percent levels, respectively; s. e. in parenthesis.

The dependent var is 0 if voluntary PT, 1 if involuntary PT, 2 if FT.

Table 15: Odds Ratios, Salaried Women Multinomial estimation under Definition 3

	(1)		(2)	
	Inv. PT	FT	Inv. PT	FT
Age	1.015	0.985	1.025	0.966
Age2	1.000	1.000	0.999	1.000
Edu2	0.878	1.369	0.877	1.288
Edu3	0.698	2.199	0.706	1.896
Edu4	0.674	4.651	0.672	2.641
Married	0.552	0.647	0.595	0.606
Em.par.	1.004	1.123	0.948	0.934
Un.par.	1.696	1.498	1.639	1.542
Child1	0.455	0.342	0.467	0.323
Child2	0.696	0.576	0.682	0.537
Child3	1.044	0.897	1.007	0.858
Child4	1.273	1.057	1.219	1.031
Child5T	1.068	1.107	1.082	1.107
Em.other	0.987	0.882	0.975	0.926
Adult65	1.350	1.244	1.315	1.195
Primary sec.			0.429	11.20
Blue collar			0.583	3.890
Professional			0.987	1.237
Private sec.			0.884	0.190
Contract type			0.405	1.670

involuntary employment in the study of PT situations and throw some light on the profile of a voluntary PT female worker. It is clear now that more education decreases the probability of involuntary employment and that ‘being married’ and having small children are very important determinants of voluntary PT employment. Furthermore, having grown up children or a temporary contract increases the probability of an involuntary PT situation. The quantitative implications for the relative employment probabilities are summarized in Table 15. These odds ratios reveal that the probability of involuntary PT employment is about 0.60 times the probability of voluntary PT if the woman is married, that is, the probability of involuntary relative to voluntary PT employment decreases by 40 percent if the woman is married. On the other hand, having children aged between 12 and 15 and having a fixed term contract increase the probability of involuntary PT relative to voluntary PT about 22 percent and 60 percent, respectively.

5 Conclusion

We have shown some important features of part-time employment in Spain and analyzed the extent of part-time employment as a voluntary option for employed and non-employed individuals. To illustrate the importance of traditional gender roles within the family, we have developed a two-adult household model inspired on Akerlof and Kranton (2000) and Basu (2004) where the individuals’ concerns about the traditional division of labor between market and home production are crucial for the stability properties of the household’s pattern of employment. Assuming that the man works full-time and that there is no part-time wage penalty, the theoretical model predicts that if the woman’s full-time employment is optimal, then part-time employment is always preferred to non-employment; but if the woman’s part-time employment is optimal, then full-time employment can be preferred to non-employment or not. In contrast, if a part-time wage penalty exists, the woman’s non-employment state can always be optimal.

In the empirical analysis we have focused on working age individuals living with a partner. First, we have shown that the model is sensitive to the chosen definition of voluntary part-time, and we use a definition based on the desire of working more hours combined with the reasons of having a part-time job. Second, we have explored the relative importance of individual, family and job related variables on the probabilities of involuntary and voluntary part-time employment. The empirical analysis has been developed in two stages. In the first stage we have omitted market variables and included the employed and non-employed individuals. The unemployed population was split between part-time and full-time workers according with their workweek searching options, and the part-time employees classified into part-time or full-time workers according with their voluntary (do not want a full-time job) or involuntary employment situation. The main empirical findings in this first stage have been: (i) education has a positive effect on part-time and full-time labor supplies, but it is more important for women than for men; (ii) in the case of women, the effect of higher education on the probability of full-time labor supply is more than twice the effect on part-time labor supply, whereas it is just the opposite in the case of men; (iii) in the case of women, family variables like being married or having children of any age have a negative effect on any type of labor supply, whereas these variables are not significant or have a positive effect on the full-time labor supply of men.

In the second stage, we have included some market variables as controls and restricted the analysis to employed individuals. The inclusion of the market variables improved considerably the explanatory power of the model and, at the same time, kept similar values and significance levels for most individual and family coefficients. Unfortunately the men's population size was too small in this case and we could not use the extended definitions for voluntary and involuntary part-time employment. We limitted the comparative gender analysis to binomial estimations using the official definitions but adding a new control variable related to the desire of working more hours. The inclusion of this explanatory variable suggested a positive association between temporary contracts and the presence of involuntary PT employment independently of gender. In contrast, being married and having children decreased the probability of full-time employment for a woman, but not for a man. For men, education only mattered at the highest level and, in contrast to the case of women, it favored part-time employment.

Finally, we have estimated the profile of a part-time employed woman using our extended definition for voluntary and involuntary part-time employment. The results showed clearly the importance of education in reducing the probability of involuntary employment, as well as the importance of 'being married' and having small children. In contrast, having grown-up children and holding a temporary contract appeared as important factors increasing a woman's probability of being involuntary part-time employed relative to voluntary part-time employed, being these effects about 22 percent and 60 percent, respectively.

A Mathematical Appendix

A.1 The household's optimization problem

If $x^* = \left(c^*, k^*, l_m^*, l_f^*\right)$ is an optimal solution to the household's problem, then it must satisfy the budget constraint $g_1(x) = c + k - \sum w_i l_i \leq 0$, the time constraints $g_2(x) = l_m - 1 \leq 0$, $g_3(x) = l_f - 1 \leq 0$, and the non-negative constraints, $l_m \geq 0$, $l_f \geq 0$, $k \geq 0$, $c \geq 0$, and there must exist, respectively, multipliers $\lambda_1, \lambda_2, \lambda_3, \gamma_1, \gamma_2, \gamma_3, \gamma_4$ associated to these constraints such that the Kuhn-Tucker conditions are satisfied:

$$\frac{\partial U(x^*)}{\partial x_h} - \sum_{j=1}^{3} \lambda_j \frac{\partial g_j(x^*)}{\partial x_h} + \gamma_h = 0 \qquad h = c, k, l_m, l_f. \tag{11}$$

$$-\lambda_j g_j(x^*) = 0 \qquad j = 1, 2, 3. \tag{12}$$

$$\left(\frac{\partial U}{\partial x_h} - \sum_{j=1}^{3} \lambda_j \frac{\partial g_j(x^*)}{\partial x_h} \right) x_h^* = 0 \qquad h = c, k, l_m, l_f. \tag{13}$$

$$\lambda_j \geq 0, \gamma_h \geq 0 \qquad \forall j, \forall h. \tag{14}$$

Where $U(x)$ is given by (6). Moreover, since the household's utility function is strictly concave in c, k, and the non-market time $(2 - l_m - l_f)$, it follows that the solution to the Kuhn-Tucker conditions, $(x^*, \lambda^*, \gamma^*)$, solves the household's problem:

$$\kappa() \equiv \frac{(\delta A)^{\frac{1}{1-\theta}} (a + \sum_i w_i l_i^*) - Ab(2 - \sum_i l_i^*)}{A + (\delta A)^{\frac{1}{1-\theta}}}, \tag{15}$$

$$(1)\ If \quad \kappa() > 0,\ k^* = \kappa() : \tag{16}$$

$$c^* = \frac{A}{A + (\delta A)^{\frac{1}{1-\theta}}} \left\{ a + \sum l_i^* (w_i - b) + 2b \right\}, \tag{17}$$

$$z^* = \frac{A (\delta A)^{\frac{1}{1-\theta}}}{A + (\delta A)^{\frac{1}{1-\theta}}} \left\{ a + \sum l_i^* (w_i - b) + 2b \right\}\ if\ k^* > 0. \tag{18}$$

$$(2)\ If \quad \kappa() \leq 0,\ k^* = 0 :$$

$$c^* = a + \sum_i w_i l_i^*\ if\ k^* = 0,\ z^* = Ab(2 - \sum_i l_i^*).$$

Where (18) follows from (1) and (15). The utility function implies that $c^* > 0$, so $\gamma_4^* = 0$, $\lambda_1^* > 0$, and at least one l_i^* must be strictly positive. The utility function also implies that $z^* > 0$, so if $k^* = 0$, it must be true that at least one l_i^* must be strictly less than one. Suppose that $w_i > b$, $i = m, f$, so we restrict the solution to cases where participation can be positive for any individual. From (11) follows that $c^{*\theta-1} - \delta A z^{*\theta-1} = \gamma_3^* \geq 0$, so $\lambda_2^* = c^{*\theta-1} w_m - \delta A z^{*\theta-1} b + S_\mu > 0$, hence (12) implies $l_m^* = 1$, so (13) implies $\gamma_1^* = 0$. >From (15), if $Ab - (\delta A)^{\frac{1}{1-\theta}} w_m < 0$, $k^* > 0\ \forall l_f \geq 0$, so $\gamma_3^* = 0$. l_f^* follows from (11) and it is given in the text. Two cases if $Ab - (\delta A)^{\frac{1}{1-\theta}} w_m > 0$: (1) $k^* = 0$, $\gamma_3^* > 0$, if $l_f^* \leq (Ab - (\delta A)^{\frac{1}{1-\theta}} w_m)/(Ab + (\delta A)^{\frac{1}{1-\theta}}) < 1$, so it must be $l_f^* < 1$ and so $\lambda_3^* = 0$. If $w_f > \left(\delta (Ab)^\theta + S_\mu \right) w_m^{1-\theta}$, then $l_f^* > 0$ and so $\gamma_2^* = 0$, in this case l_f^* is given by the implicit solution to $-\left(w_m + w_f l_f^* \right)^{\theta-1} w_f + \delta (Ab)^\theta (1 - l_f)^{\theta-1} + S_\mu = 0$, but if $w_f \leq \left(\delta (Ab)^\theta + S_\mu \right) w_m^{1-\theta}$, $l_f^* = 0$. (2) $k^* > 0$ if $l_f^* > (Ab - (\delta A)^{\frac{1}{1-\theta}} w_m)/(Ab + (\delta A)^{\frac{1}{1-\theta}}) > 0$, so $0 < l_f^* \leq 1$, expression for l_f^* given in the text.

A.2 Propositions and proofs

A.2.1 Proof of Proposition 1

Using (17) and (18), the household's welfare can be written as a function of the individuals' market time:

$$If\ k^* > 0,$$
$$V(l_m, l_f) = \frac{\left(1+\delta(\delta A)^{\frac{\theta}{1-\theta}}\right)^{1-\theta}}{\theta}\left(a + \sum l_i (w_i - b) + 2b\right)^{\theta} + (l_m - l_f) S_\mu.$$
$$If\ k^* = 0,$$
$$V(l_m, l_f) = \frac{\left(a+\sum l_i w_i\right)^{\theta}}{\theta} + \delta \frac{\left(Ab\left(2-\sum l_i\right)\right)^{\theta}}{\theta} + (l_m - l_f) S_\mu.$$

>From (11) and (12) , $l_m^* = 1$. (1) $k^* > 0$, given $l_m = l_m^*$, implies that $V(1, l_f)$ is strictly decreasing in l_f if $w_f \leq b$, so $l_f^* = 0$. If $w_f > b$, $V(1, l_f)$ is strictly concave and has a unique critical point $0 < l_f^* \leq 1$; if $l_f^* \in (0,1)$, $V(1, l_f)$ is increasing in the interval $\left(0, l_f^*\right)$ and decreasing in $\left(l_f^*, 1\right)$; if $l_f^* = 1$, $V(1, l_f)$ is strictly increasing in l_f for $l_f \in (0,1)$. It follows that (i) if FT is optimal, $l_f^* = 1$, $V(1, l_f) > V(1, 0)\ \forall l_f \in (0,1)$, so $PT \succ NW$. (ii) If PT is optimal, $l_f^* \in (0,1)$, $V(1,1) \geq V(1,0)$ or $V(1,1) < V(1,0)$, so $FT \succeq NW$ or $NW \succ FT$. (2) $k^* = 0$, from the household's problem we know that if $l_f^* > 0$, it must be true that $l_f^* < 1$. So if PT is optimal, $V(1,1) \geq V(1,0)$ or $V(1,1) < V(1,0)$ depending on w_f.

A.2.2 The power weighting factor

Suppose that $w_m \geq w_f > b$. Given wages and technology parameters, the power-weighting factor is a function of l_f alone, $\mu(l_f)$, with $\mu(0) = \overline{\mu}$, $\mu(1) = \underline{\mu}$, $\left[\underline{\mu}, \overline{\mu}\right] \subseteq [0,1]$ and $\mu\prime < 0$, $\mu\prime\prime < 0\ \forall l_f \in (0,1)$. Moreover, $\mu\prime\prime(l_f)/\mu\prime(l_f)$ is decreasing in l_f, with $\mu\prime\prime(l_f)/\mu\prime(l_f) \to \infty$ as $l_f \to 0$ and $\mu\prime\prime(l_f)/\mu\prime(l_f) \to \eta > 0$ as $l_f, \to 1$.

The relationship between the woman's labor supply and the weighting factor It follows from the solution to the optimization problem provided in the text that l_f^s is independent of μ if $s_m = s_f$, otherwise they define a non-increasing relationship between l_f^s and μ if $s_m > s_f$ or a non-decreasing relationship if $s_m < s_f$:

$$s_m > s_f: \quad \ell(\mu) = \begin{cases} 0 & if \quad \mu \geq n \\ l \in (0,1) & if \quad m < \mu < n \\ 1 & if \quad \mu \leq m \end{cases} \tag{19}$$

$$s_m < s_f: \quad \ell(\mu) = \begin{cases} 0 & if \quad \mu \leq n \\ l \in (0,1) & if \quad n < \mu < m \\ 1 & if \quad \mu \geq m \end{cases} \tag{20}$$

Where $n = (Y_0 - s_f)/(s_m - s_f)$, $m = (Y_1 - s_f)/(s_m - s_f)$, $Y_0 > Y_1$, and l is the solution provided in the text; if $s_m > s_f$, $\ell\prime(\mu) < 0$ and $\ell\prime\prime(\mu) > 0$ for $m < \mu < n$; if $s_m < s_f$, $\ell\prime(\mu) > 0$ and $\ell\prime\prime(\mu) > 0$ for $n < \mu < m$.

Definition 1 *For given wages and technology parameters such that $l_m^* = 1$, a household's equilibrium $\left(l_f^*, \mu^*\right)$ is a stationary solution to the iterative process $l_{t-1} = \ell\left(\mu_{t-1}\right)$, $\mu_t = \mu(l_{t-1})$, $t = 1, 2, .., $ for given $\mu_0 \in \left[\underline{\mu}, \overline{\mu}\right]$. That is, $l_f^* = \ell(\mu^*)$ and $\mu^* = \mu\left(l_f^*\right)$ ..*

Let F define the law of motion for the power weighting factor:

$$\mu_t = \mu\left(\ell\left(\mu_{t-1}\right)\right) = F\left(\mu_{t-1}\right),\ given\ \mu_0 \in \left[\underline{\mu}, \overline{\mu}\right]$$

That is, a fixed point of F is a household equilibrium. In case $s_m > s_f$, (19) implies that $F(\mu) = \overline{\mu}$ if $\mu \geq n$, $F(\mu) \in (\underline{\mu}, \overline{\mu})$ if $\mu \in (m,n)$ and $F(\mu) = \underline{\mu}$ if $\mu \leq m$, with $F\prime(\mu) > 0$ and $F\prime\prime(\mu) > 0$ iff $(s_m - s_f)\left((1-\theta)^{-1} + 1\right) / ((s_m - s_f)\mu + s_f) < \mu\prime\prime(l(\mu)) / \mu\prime(l(\mu))$ over (m,n). In case $s_m < s_f$, (20) implies that $F(\mu) = \overline{\mu}$ if $\mu \leq n$, $F(\mu) \in (\underline{\mu}, \overline{\mu})$ if $\mu \in (n,m)$ and $F(\mu) = \underline{\mu}$ if $\mu \geq m$, with $F\prime(\mu) < 0$ and $F\prime\prime(\mu) < 0$ over (n,m).

Proposition 2 *Suppose that $w_m \geq w_f > b$ and $s_m > s_f$.*
(1) The household equilibrium is unique and stable if $n \leq \underline{\mu}$ or $m \geq \overline{\mu}$ or $m < \underline{\mu} < \overline{\mu} < n$. It is given by $(0, \overline{\mu})$ if $n \leq \underline{\mu}$, by $(1, \underline{\mu})$ if $m \geq \overline{\mu}$, or by $\left(l_f^*, \mu^*\right)$ if $m < \underline{\mu} < \overline{\mu} < n$, where $l_f^* \in (0,1)$ and $\mu^* \in (\underline{\mu}, \overline{\mu})$.
(2) If $\underline{\mu} \leq m < \overline{\mu} < n$, $(1, \underline{\mu})$ is a (locally) stable equilibrium, it can be unique or there can be additional interior equilibria, alternating from unstable to (locally) stable.
(3) If $\underline{\mu} \leq m < n \leq \overline{\mu}$, $(0, \overline{\mu})$ and $(1, \underline{\mu})$ are locally stable equilibria, there is also an interior solution which can be unique and unstable or there are multiple (odd number) interior solutions alternating from unstable to (locally) stable.
(4) If $m \leq \underline{\mu} < n \leq \overline{\mu}$, $(0, \overline{\mu})$ is a (locally) stable equilibrium, it can be unique or there can be an even number of interior solutions alternating from (locally) stable to unstable.

Proof: In this case F is non-decreasing and $m < n$. (1) If $m < n \leq \underline{\mu}$, $F(\mu) = \overline{\mu}\ \forall \mu \in [\underline{\mu}, \overline{\mu}]$, so there is a unique fixed point, $F(\overline{\mu}) = \overline{\mu}$. Moreover, $\mu_t = \overline{\mu}\ t \geq 1, \forall \mu_0 \in [\underline{\mu}, \overline{\mu}]$, it follows from (19) that the household equilibrium $(0, \overline{\mu})$ is unique and stable. If $\overline{\mu} < m < n$, $F(\mu) = \underline{\mu}\ \forall \mu \in [\underline{\mu}, \overline{\mu}]$, so there is a unique fixed point, $F(\underline{\mu}) = \underline{\mu}$. Moreover, $\mu_t = \underline{\mu}\ t \geq 1, \forall \mu_0 \in [\underline{\mu}, \overline{\mu}]$, it follows that the household equilibrium $(1, \underline{\mu})$ is unique and stable. If $m < \underline{\mu} < \overline{\mu} < n$, $F(\underline{\mu}) > \underline{\mu}$, $F(\overline{\mu}) < \overline{\mu}$, $F\prime > 0$ over (m,n), $F\prime\prime > 0$ over (ε, n) for arbitrarily small $\epsilon > 0$, and $F\prime\prime = 0$ at most at one point $\mu \in (m,n)$; so F must cut the 45^o line (from above) at a unique point $\mu^* \in (\underline{\mu}, \overline{\mu})$, $F\prime(\mu^*) < 1$. (2) If $\underline{\mu} \leq m < \overline{\mu} < n$, $F(\underline{\mu}) = \underline{\mu} = F(m) < m$, $F(\overline{\mu}) < \overline{\mu} = F(n)$. So if $F\prime\prime > 0$ over the whole (m,n), the unique and stable fixed point of F is $\underline{\mu}$ and the corresponding household equilibrium is $(1, \underline{\mu})$. But if $F\prime\prime < 0$ over (m, ε) for some arbitrarily small $\varepsilon > 0$, F can cut the 45^o line from below at some $\mu^1 \in (m, \overline{\mu})$ and must change concavity at just one point over (m,n) since $F\prime\prime > 0$ close to n. If such μ^1 exists, F must cross the 45^o line (now from above) at some $\mu^2 \in (\mu^1, \overline{\mu})$ since $F(\overline{\mu}) < \overline{\mu}$. Since $F\prime(\mu^1) > 1$ and $F\prime(\mu^2) < 1$ the corresponding household equilibria (l^1, μ^1) and (l^2, μ^2) are (locally) unstable and stable, respectively, being $0 < l^2 < l^1 < 1$. (3) If $\underline{\mu} \leq m < n \leq \overline{\mu}$, $F(\underline{\mu}) = \underline{\mu} = F(m) < m$, $F(n) = \overline{\mu} = F(\overline{\mu})$. Proceeding as in case (2) now there are two corner solutions $(1, \underline{\mu})$ and $(0, \overline{\mu})$, both (locally stable), and there must be some additional interior solution since F must cut the 45^o line from below at least once. If $F\prime\prime > 0$ over the whole (m,n), the interior solution is unique and unstable ($F\prime(\mu^1) > 1$), but if $F\prime\prime < 0$ over (m, ε) for some arbitrarily small $\varepsilon > 0$, there can be two more interior solutions, μ^3 and μ^2, one unstable ($F\prime(\mu^3) > 1$) and another (locally) stable ($F\prime(\mu^3) < 1$), with $\mu^3 < \mu^2 < \mu^1$. (4) If $m \leq \underline{\mu} < n \leq \overline{\mu}$, $F(\underline{\mu}) > \underline{\mu}$, $F(n) = F(\overline{\mu}) = \overline{\mu}$. So $\overline{\mu}$ is a fixed point of F and the corresponding household equilibrium $(0, \overline{\mu})$ will be unique and stable if $F\prime(\mu) > 1$ for all $\mu \in (\underline{\mu}, n)$. Otherwise, there can be one μ^1 unstable ($F\prime(\mu^1) = 1$)or two additional interior solutions, $\mu^2 < \mu^1$, μ^2 (locally) stable ($F\prime(\mu^2) < 1$) and μ^1 unstable ($F\prime(\mu^1) > 1$).

Proposition 3 *Suppose that $w_m \geq w_f > b$ and $s_m < s_f$.*
(1) The household equilibrium is unique and stable if $m \leq \underline{\mu}$ or $n \geq \overline{\mu}$ or $n < \overline{\mu} \leq m$. It is given by $(1, \underline{\mu})$ if

$m \leq \underline{\mu}$, or by $(0, \overline{\mu})$ if $n \geq \overline{\mu}$, or by $\left(l_f^*, \mu^*\right)$, $l_f^* \in (0,1)$, $\mu^* \in \left(\underline{\mu}, \overline{\mu}\right)$ if $\overline{\mu} < m$.
(2) There is a (locally) unstable interior household equilibrium and a (locally) stable cycle equilibrium if $\underline{\mu} < m < \overline{\mu}$ and $F\left(\underline{\mu}\right) > m$. The interior equilibrium is given by (l_f^*, μ^*), $\mu^* \in \left(\underline{\mu}, m\right)$, and the cycle equilibrium is given by $\left\{\left(l_f^c, \underline{\mu}\right), (1, \mu^c)\right\}$, $l_f^c \in \left(l_f^*, 1\right)$, $\mu^c = F\left(\underline{\mu}\right) < \overline{\mu}$ if $n < \underline{\mu}$, or it is given by $\left\{\left(0, \underline{\mu}\right), (1, \overline{\mu})\right\}$ if $n \geq \underline{\mu}$. But if $F\left(\underline{\mu}\right) < m$, (l_f^*, μ^*), $\mu^* \in \left(\underline{\mu}, m\right)$ is unique and stable.

Proof: $m > n$, F is non-increasing and concave. (1) If $m \leq \underline{\mu}$, $F(\mu) = \underline{\mu}$ $\forall \mu \in [m, \overline{\mu}]$, so there is a unique fixed point $F\left(\underline{\mu}\right) = \underline{\mu}$ and for any given $\mu_0 \in \left[\underline{\mu}, \overline{\mu}\right]$, $\mu_t = \underline{\mu}$ $t \geq 1$. If $n \geq \overline{\mu}$, $F(\mu) = \overline{\mu}$ $\forall \mu \in \left[\underline{\mu}, n\right]$, so there is a unique fixed point $F(\overline{\mu}) = \overline{\mu}$ and for any given $\mu_0 \in \left[\underline{\mu}, \overline{\mu}\right]$, $\mu_t = \overline{\mu}$ $t \geq 1$. If $n < \underline{\mu} < \overline{\mu} \leq m$, $F(n) = \overline{\mu}$, $F(m) = \underline{\mu}$, $F(\mu) \in \left(\underline{\mu}, \overline{\mu}\right)$ $\forall \mu \in \left[\underline{\mu}, \overline{\mu}\right]$ and for any given $\mu_0 \in \left[\underline{\mu}, \overline{\mu}\right]$, $\mu_t \in \left(\underline{\mu}, \overline{\mu}\right)$ $t \geq 1$, or if $\underline{\mu} < n < \overline{\mu} \leq m$, $F(\mu) = \overline{\mu}$ $\forall \mu \in \left[\underline{\mu}, n\right]$, $F(\mu) \in \left(\underline{\mu}, \overline{\mu}\right)$ $\forall \mu \in (n, m)$, $F(\mu) = \underline{\mu}$ $\forall \mu \in [m, \overline{\mu}]$, in either case there is a unique and interior fixed point. The result follows applying (20). (2) $F(n) = \overline{\mu}$, $F(\mu) = \underline{\mu}$ $\forall \mu \in [m, \overline{\mu}]$, so there is a unique interior fixed point, $F(\mu^*) = \mu^* < m$. If $n > \underline{\mu}$, $F(\mu) = \overline{\mu}$ $\forall \mu \in \left[\underline{\mu}, n\right]$; $\mu_1 = F(\mu_0) = \underline{\mu}$, $F(\mu_1) = \overline{\mu}$ for any $\mu_0 \in [m, \overline{\mu}]$; $\mu_1 = F(\mu_0) = \overline{\mu}$, $F(\mu_1) = \underline{\mu}$ for any $\mu_0 \in \left[\underline{\mu}, n\right]$; $\mu_t \in [m, \overline{\mu}]$ $t > 2$ for any $\mu_0 \neq \mu^*$, $\mu_0 \in (n, m)$. So $\left\{\underline{\mu}, \overline{\mu}\right\}$, $F\left(\underline{\mu}\right) = \overline{\mu}$, $F(\overline{\mu}) = \underline{\mu}$, is a (locally) stable limit cycle and μ^* is unstable. If $n < \underline{\mu}$ and $F\left(\underline{\mu}\right) > m$, $\mu_1 = F(\mu_0) = \underline{\mu}$, $\mu_2 = F(\mu_1) = \mu^c$, $\mu_3 = F(\mu^c) = \underline{\mu}$ for any $\mu_0 \in [m, \overline{\mu}]$, and $\mu_t > m$ for some $t > 2$ for any given $\mu_0 \neq \mu^*$, $\mu_0 \in \left(\underline{\mu}, m\right)$. So, in this case, the (locally) stable limit cycle is given by $\left\{\underline{\mu}, \mu^c\right\}$. But if $F\left(\underline{\mu}\right) < m$, $m > \mu_1 > \mu_3 > .. > \mu^*$ for any $\mu_0 \in \left(\underline{\mu}, \mu^*\right)$, or $\underline{\mu} < \mu_1 < \mu_3 < .. < \mu^*$ for any $\mu_0 \in (\mu^*, m)$, so μ^* is stable.

B Statistical Appendix

Main descriptive statistics of explanatory variables, EPA 2008.

variable	Women		Men	
	Mean	S.D	Mean	S.D
married	0.908	0.289	0.903	0.295
aged	43.21	10.61	44.54	10.16
aged2	1979.91	913.09	2086.77	896.71
edu1	0.265	0.441	0.237	0.426
edu2	0.292	0.456	0.307	0.461
edu3	0.260	0.438	0.289	0.454
edu4	0.184	0.387	0.166	0.371
child1	0.173	0.378	0.185	0.388
child2	0.184	0.387	0.196	0.397
child3	0.217	0.412	0.232	0.422
child4	0.165	0.374	0.175	0.380
child5	0.315	0.464	0.308	0.462
employment of partner	0.784	0.411	0.551	0.497
unemployment of partner	0.036	0.185	0.065	0.247
inactive partner	0.180	0.384	0.384	0.486
employment of other adults	0.251	0.433	0.245	0.430
adults older than 64	0.051	0.219	0.050	0.218
primary sector	0.040	0.196	0.0527	0.224
service sector	0.528	0.499	0.181	0.385
private sector	0.307	0.461	0.501	0.500
blue collar	0.074	0.263	0.369	0.483
professional	0.348	0.476	0.386	0.486
contract type	0.323	0.467	0.514	0.499
want to work more hours	0.050	0.217	0.051	0.22

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