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Resumen

Las conductas de las mujeres relacionadas con el mercado laboral cambiaron sustancialmente en las últimas décadas, acompañadas por modificaciones en los roles de género. Estos cambios sin embargo, no fueron idénticos para todas las mujeres, existiendo algunos grupos cuyo ingreso al mercado laboral fue más temprano y sus trayectorias más parecidas a las masculinas.

Este trabajo se propone caracterizar la evolución de la oferta laboral femenina para Uruguay en el largo plazo y analizar la existencia de comportamientos heterogéneos en su interior, para los distintos perfiles salariales. Para ello se estiman las elasticidades intertemporal y no compensada de la oferta laboral femenina, tanto en el margen intensivo como extensivo según grupos educativos y generaciones.

Los resultados obtenidos muestran que independientemente del nivel educativo de los grupos de mujeres, la participación de las cohortes más jóvenes en el mercado de trabajo ha aumentado. Las estimaciones confirman que la elasticidad intertemporal es positiva y mayor a la no compensada, tanto en el margen intensivo como extensivo: las mujeres ajustan, a lo largo de su ciclo de vida, su comportamiento laboral de acuerdo a su salario. Esto se cumple en particular para las mujeres menos educadas, lo cual representa evidencia contraria a que su comportamiento sigue la lógica del "trabajador añadido". Se confirma un efecto sustitución positivo, con magnitudes distintas según el nivel educativo y el margen de decisión considerado. En particular, la oferta de trabajo de las mujeres con educación terciaria es más sensible al salario en el margen extensivo que en el intensivo. Finalmente, se encuentra evidencia favorable a cambios intergeneracionales en la utilidad marginal de la riqueza.

Palabras clave: oferta laboral femenina, elasticidad intertemporal, elasticidad no compensada
Clasificación JEL: J16, J22

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Abstract

Women behaviors regarding the labor market have changed substantially in recent decades, accompanied by changes in gender roles. These changes, however, were not identical for all women with some groups entering sooner and showing trajectories more similar to those of men.

This paper aims to characterize the evolution of female labor supply in Uruguay in the long run and analyze the existence of heterogeneous behaviors for different wage profiles. In order to do so, we estimate women intertemporal and uncompensated labor supply elasticities, both at the intensive and extensive margins and by educational groups and generations.

The results show that regardless of the educational level of women's groups, the participation of younger cohorts in the labor market has increased. The estimates confirm that the intertemporal elasticity is positive and greater than the uncompensated both intensive and extensive margins: women adjust their work behavior according to their salary in the lifecycle. This is particularly true for less-educated women, representing evidence contrary to the logic of the "added worker". Positive substitution effect is confirmed, with different magnitudes according to educational level. In particular, the labor supply of women with tertiary education is more sensitive to wages at the extensive than the intensive margin. Finally, intergenerational changes in marginal utility of wealth are found.

JEL: J16, J22
Key Words: female labor supply, intertemporal elasticity, uncompensated elasticity

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1. Introduction

Women's decisions about remunerated work have become a central issue in labor economics studies because female insertion into the labor market has changed enormously. These changes are among the greatest social transformations in the western economies in recent decades (Claudia Goldin 2006; Francine Blau and Lawrence Kahn 2005). In this paper we estimate the uncompensated and inter-temporal wage elasticities of women in Uruguay using pseudo-panels, with the aim of identifying heterogeneous behaviors in the female population both at the extensive (participation) and the intensive (monthly working hours) margins.

In much of the existing literature on female labor participation, women's wages are assigned a crucial role in explaining why they allocate more time to paid work. It is assumed that the women's labor supply is highly elastic and that an increase in their participation can be explained by a rise in wages in the market (a strong substitution effect). However, in the empirical literature there is no consensus about how elastic the female labor offer is, and consequently no agreement about how important wage levels are in explaining the recent changes in women's labor market behavior.

Marina Bassi (2007) argues that studies that estimate the elasticity of the female labor supply in the developed countries run into problems when it comes to isolating the effect of wages because the rising trend in the female supply coincides with long periods of rising wages. This makes it difficult to distinguish the extent to which women's greater participation is a response to rising wages and how much it is due to other changes (that are cultural or stem from other factors) in the behavior of the female supply. To overcome this problem, the above mentioned author estimates elasticities in the female supply with data from Argentina, and suggests that the fact that that country has had marked economic cycles which have impacted strongly on wages makes it an ideal scenario to estimate wage elasticity at the extensive margin. Marisa Bassi (2007) uses specifications comparable to those of John Pencavel (1998) and finds that female labor supply elasticities are much lower than those found in the developed countries, where the relation between supply and wages is being overestimated. This findings show how important it is to generate greater understanding about the degree to which the women's labor supply is elastic.

In this respect, Uruguay would be an excellent context to measure the relation between paid work and women's wages because, like in Argentina, real wages have fluctuated considerably as a result of various macroeconomic shocks. In addition, Uruguay has several economic, demographic and socio-cultural features that make it possible to compare the analysis of its labor market and estimates of elasticities with those of the developed countries.

Our estimations in this paper are based on pseudo-panels constructed from a long compatible series of cross-section surveys. We adopt a dynamic approach and assume that supply decisions are inter-temporally connected and hence can only be understood in the context of a worker's life cycle. This enables us to consider decisions about the time devoted to paid work and the connection to the evolution of wages throughout a worker's whole life. Following John Pencavel (2002), we estimate the inter-temporal and uncompensated elasticities of the female labor supply in order to quantify the magnitudes of the substitution and income effects.

A review of the literature on the female supply suggests various hypotheses about the magnitude of inter-temporal and uncompensated elasticities. Because women devote less time to the labor market, the standard economic model predicts that the substitution effect should

dominate in the female labor supply (positive inter-temporal and uncompensated elasticities). However, the elasticity of the female labor supply is associated not only with their wage profiles but also with financial restrictions in their households (Marke Dessing 2002). Women are very often responsible for unpaid work in the home and this has an influence on their decisions about how much time to devote to paid work. For this reason they are conventionally defined as a "secondary labor force". It is possible that those who receive lower wages would at the same time have less incentive to allocate time to the labor market when economic circumstances improve (the added worker effect). If this hypothesis is true, women's supply decisions would not respond to their life cycle behavior (inter-temporal elasticities could be low or perhaps not even positive). What is more, women who gain access to higher wages could turn to market services or hire paid helpers to assist with their care functions in the home. This factor might be the basis of less sensitivity to wage changes, and lead to positive but low inter-temporal elasticities and null uncompensated elasticities.

It follows that the substitution and income effects might operate with different intensities, which suggests that the female population has heterogeneous labor behavior. This aspect has been explored very little in the literature, and again a study of the case of Uruguay has some advantages. It offers a promising opportunity to identify heterogeneous behaviors in the female labor supply because decisions at the intensive as well as at the extensive margin could be considered. Both aspects would contribute to female labor supply literature and open the way to a better understanding of the evolution of women's supply decisions in recent decades.

Our results provide evidence that inter-temporal elasticities are positive both at the intensive and the extensive margins; women adjust their labor behavior to their life cycle wages. This holds for women with tertiary education as well as for those with lower educational levels, which constitutes evidence against the hypothesis of added worker effect among less-educated women. We confirm that there is a positive substitution effect, but we find differences in women's supply behaviors by educational levels at the intensive and extensive margins. Women with tertiary education are more sensitive to wages on the extensive margin than on the intensive margin. Moreover, we find that the higher rates of participation in the labor market of younger generations are explained, in particular for women with intermediate education levels. There is also evidence of intergenerational changes in the marginal utility of wealth, which may indicate longer term cultural changes.

This paper is a contribution to improved understanding of the labor behavior of different groups of women. This is important in a wide range of economic and social policy contexts connected to social security, the income tax system, the education system, the distribution of income in the family, and fertility. Our results suggest that the rising trend in women's participation rates (which is led by less-educated women) will not be reversed in the near future, but are ambiguous as regards working hours.

Furthermore, we find differences in the magnitudes of the elasticities between generations and educational groups, which is indirect evidence about Goldin's (2006) hypothesis. She suggests that women are undergoing an intergenerational change in their "horizon" and "identity" as workers, and there are probably changes in men's expectations about women's labor behavior as well. Female work behavior that breaks the logic of the "added worker" could be favorable evidence about this. However, the differences in elasticities among different groups of women show that these trends are not reflected equally for all women.

This paper is organized as follows. In section 1 we describe the background to our study, in Section 2 we develop the conceptual framework, and Section 3 describes our information source. In Section 4 we carry out the descriptive analysis which underlies our selection of the

groups of women, and we estimate their inter-temporal and uncompensated elasticities in Section 5. Lastly, in Section 6 we draw our conclusions.

2. Background

Women's decisions about remunerated work have become a central issue in labor economics literature because their relation to the labor market has changed enormously. This is one of the most important social transformations in recent decades in the western economies (Goldin 2006; Blau and Kahn 2005). The empirical literature at the international and regional level focuses on the relation between wages and female labor market supply.[1] However, there are relatively few studies that analyze women's decisions at both the extensive and intensive margins, and consider uncompensated and inter-temporal substitution elasticities.

Pencavel (1998) analyzes United States female labor supply decisions in the period 1975-1994, and distinguishes married women from single women. He groups women into nine cohorts according to year of birth and employs five educational categories, and he estimates the relation between (weekly and annual) hours worked and wages. He finds that the younger cohorts have greater wage-supply elasticities, and concludes that elasticities are greater among younger women and married women.[2] Bassi (2007) argues that the high elasticity in developed countries could be explained by high collinearity between wages and female labor force participation series, and that consequently wage responses cannot be distinguished from real shifts in women's labor decisions. She suggests that Argentinean data would be more suitable for measuring the relation between work and female wages because they show significant fluctuations in response to macroeconomic shocks. As a result, wages show significant trendless variation, and this allows her to isolate the pure wage effect. Using cohorts over the period 1975-2002, she finds low wage elasticity in female labor decisions on the extensive margin. However, in her estimates she does not distinguish between uncompensated and inter-temporal elasticities.

Uruguay is also an ideal context to measure the relation between women's remunerated work and wages. In recent decades, this country has undergone several macroeconomic shocks and real income and wages fluctuated considerably (Luis Bértola and Fernando Lorenzo 2004).[3] Moreover, previous studies yielded outcomes for Argentina and Uruguay that were similar as regards labor offer behavior. Roberto González and Héctor Sala (2011) analyze inter-temporal elasticity in the Mercosur countries (1997-2009) and find negative elasticities for Argentina and Uruguay.[4] However, we should note that these authors do not analyze elasticities by gender.

An advantage that Uruguay has in this context is that its data can be compared with labor markets in the developed countries because some of its economic, demographic and socio-cultural characteristics are similar to those of the developed world.[5] In Uruguay the labor market is predominantly urban, a good majority (72%) of workers is in paid employment in the

[1] In other female labor supply studies, James Heckman and Thomas MaCurdy (1982) develop a model based on panel data to estimate the elasticity of inter-temporal substitution; Richard Blundell, Costas Meghir and Pedro Neves (1993) estimate inter-temporal elasticities for female supply, and compare women with children to those without children; Pencavel (1998) distinguishes between married and single women; Donald Robbins, Daniel Salinas and Araceli Manco (2009) find little inter-temporal elasticity – and even elasticity close to zero.

[2] The specifications used do not permit us to distinguish between inter-temporal and uncompensated elasticity (Pencavel 2002).

[3] GDP growth shows a pattern with Kuznets-like swings and extremely destructive downward phases. These crises were the result of a combination of changing trade conditions, devaluation and over-indebtedness. They occurred in the 1880s, the early 1910s, the late 1920s, the 1950s, the early 1980s and the late 1990s (Bértola and Lorenzo 2004).

[4] This outcome is linked to restrictions on access to credit, which does not allow workers to adjust their behavior to their life cycle.

[5] According to the World Bank, Uruguay ranks 59th in the world in terms of per capita GNP, and in Latin America it is second only to Chile. On 1 July 2013, Uruguay was promoted in the World Bank classification into the "High Income Country" group.

private and public sectors, and the level of formality among women as well as men is relatively high compared to the rest of the region.[6] In addition, Uruguay's long term reproduction patterns show a very early fall in the number of children per woman, which is unlike the situation in most Latin American countries (Adela Pellegrino 2010). However, this pattern is clearly different among the various educational levels and socioeconomic conditions of households.[7]

In Uruguay, the inequality rate is considerably lower than in other countries in the region[8] but there are still very pronounced gender asymmetries in the labor market. The increase in women's labor participation and improvements in their education have not been accompanied by a narrowing of the gender gaps on the main indicators. In 2010 the women's unemployment rate was 66.7% higher than the rate among men in that year. What is more, although the trend is for the wage gap to narrow, women's average labor remuneration per hour is still lower than men's. When this is broken down by educational level we find that female university graduates earn only 0.70 of what their male counterparts make (INE 2010).[9]

It is the gender gaps mentioned above that underlie studies to analyze women's and men's labor insertion decisions. Alma Espino, Martín Leites and Alina Machado (2009) examine the elasticity of the unpaid labor supply with respect to real wages and household income among married women in Uruguay (1991-2006), based on a cross-section data pool. In addition, Alma Espino, Fernando Isabella, Martín Leites and Alina Machado (2014) estimate the impact of wage levels on female and male labor supply decisions in Uruguay considering the extensive and intensive margins. They find gender differences in the magnitudes of inter-temporal elasticity and uncompensated elasticity, and this confirms a higher substitution effect for women. Furthermore, their findings suggest that the female labor supply behaves in a heterogeneous way.

Richard Blundell and Thomas MaCurdy (1999) emphasize that sometimes empirical analyses of the female labor supply are not precise about what model underlies their estimates and what elasticities are estimated. In this context, we feel there are too few studies aimed at estimating inter-temporal and uncompensated elasticities in the female population in our region. In this paper we present evidence that shows how important it is to make a conceptual distinction between the two types of elasticities and about the advantages of the methodology proposed by Thomas MaCurdy (1981). We identify the different effects that operate in decisions on the extensive and the intensive margins, we find there are significant differences in the magnitudes of the elasticities among different generational and educational groups, and we show that these translate into different work behaviors among women.

[6] In 2010 the percentages of men and women not registered in the social security system were very similar at 30.1% and 31.3% respectively (Instituto Nacional de Estadística (INE) 2010) the figures fell to 25.6% and 25.5% respectively in 2012.

[7] In Uruguay the mean number of children per woman is 2.45.

[8] In 2010 Uruguay's Gini rating was 0.42, which makes it the country with the lowest rating in Latin America (ECLAC 2010).

[9] These gaps are 0.76 among people who completed primary school and 0.79 among those who did not complete secondary school. In 2010 the gap was reversed only among people with a master's degree or a doctorate. In this category the figure was 1.02. (INE 2010).

3. Conceptual framework

When it comes to devoting time to paid work, two decisions are involved. First, there is the choice of whether or not to enter the labor market (a decision on the extensive margin), and second, once the decision to participate has been made, the individual chooses how many hours to devote to work (a decision on the intensive margin). It is supposed that the decision about allocating time to work is affected by changes in wage rates, so it can be explained with reference to the income effect and the substitution effect. The pure income effect assumes that when income rises, and if leisure is a normal good, the number of hours devoted to work will fall. The substitution effect incorporates the change in relative prices when there is a pay rise; leisure becomes more expensive and its consumption falls as more hours are devoted to work. The labor supply response to changes in wages at the intensive margin is ambiguous and depends on which effect dominates. It will be positive if the substitution effect dominates and negative if the income effect is dominant. In the decision at the extensive margin, the relation to wages is positive because in this case there is no income effect.

The relation between labor supply and wage rates is measured by using elasticities and – depending on the specification employed – it may incorporate the income effect, the substitution effect or both these effects (Richard Blundell and Thomas MaCurdy, 1999). It is proposed in the literature that elasticity is very low for the main household breadwinner and may even compensate for the two effects when the labor offer is inelastic. This situation is characteristic of men's behavior in the labor market. On the other hand, among workers who have a secondary role in household income because they participate less in the labor market or allocate little time to work, we would expect the substitution effect to dominate and hence their response would be positive. This is the logic that characterizes women's behavior.

As mentioned above, in this study we have adopted a dynamic approach and assumed that supply decisions are inter-temporally connected and therefore can only be understood in the context of the life cycle.[10] Therefore we consider the possibility that the consumption of physical goods can be substituted for leisure over time. Specifically, workers can alter their labor decisions over time when confronted with changes in their health status, family composition or real wage.

The income and substitution effects operate in a more complex way when we consider the whole life cycle and when there are restrictions on access to credit or people are uncertain (Shelly Lundberg 1985). For example, to the extent that women, as secondary workers, do unpaid work in the home, those who receive lower wages will have less incentive to allocate time to the labor market when their economic circumstances improve. In this situation, insertion into the labor market responds to the logic of additional workers in function of covering certain basic needs in the household (Dessing 2002). This could lead to a situation in which, when wages rise, women would reduce the number of hours they work, or even withdraw from the labor market. Thus a negative relation would be established between these women's labor market decisions and their wages (the income effect dominates because in this segment of the population leisure is a luxury good). These women's identity as workers and their time horizon are conditioned by the restrictions imposed on them by household responsibilities. On the other hand, women whose wages increase might have recourse to market services or hire paid workers (domestic service) to help them cope with these kinds of needs.

[10] Unless we assume that some people cannot see beyond the present time or there are "perfectly imperfect" capital markets, labor supply decisions are inter-temporally connected (MaCurdy 1981; Blundell and MaCurdy 1999).

Blundell and MaCurdy (1999) suggest that in order to determine how the income and substitution effects operate we need to use specifications that make it possible to identify which kind of elasticity is being estimated. In our study we estimate inter-temporal substitution elasticity or Frisch's elasticity (θ), which measures the response in terms of hours worked to "evolutionary" changes in wages over the whole life cycle, assuming that the marginal utility of wealth remains constant. Figure 1 shows the evolution of wages throughout the life cycle (evolutionary changes). If there are no financial restrictions we would expect the worker to allocate more time to remunerated work during the years when her wages are highest, which establishes a positive relation between wages earned and the amount of time devoted to work throughout the individual's life cycle (see the evolution of A in Figure 1.a and 1.b). In this case the income effect does not apply, and the inter-temporal substitution effect means that the correlation between changes in hours of work and changes in the wage should be positive. As a result $\theta > 0$.

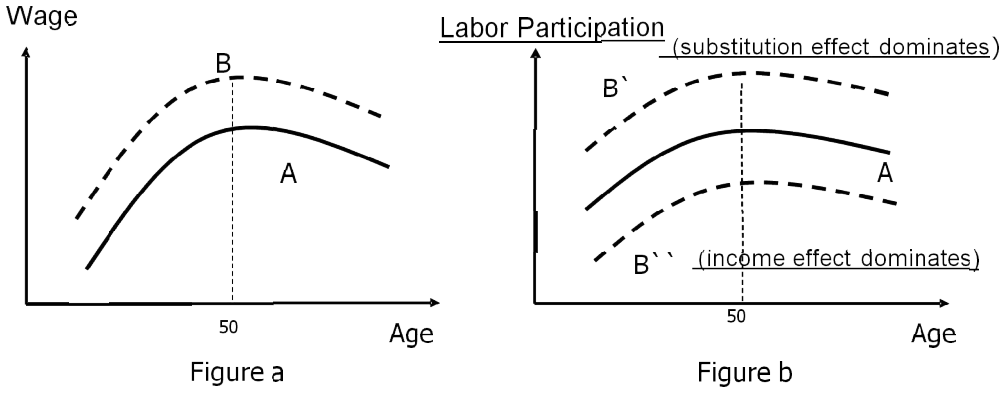
Following MaCurdy (1981) and Pencavel (2002), our estimations of this elasticity are based on:

$$(1)\ \ln(h_{k,s}(a)) = w_k + v_s + \sigma a + \theta \ln(w_{k,s}(a)) + \varepsilon_{k,s}(a)$$

where $h_{k,s}$ represents the hours worked by individuals in cohort k, with educational level *s* and age *a*, with their real wage (*w*).

It includes a vector of fixed cohort effects (w_k) and fixed educational effects (v_s) which capture the impact of the constant marginal utilities of wealth for each cohort and each educational level. Thus the specification allows marginal utility to vary among the cohorts in each educational group ($\lambda_{k,s}$), according to wage and wealth differences throughout the life cycle. Notice that $\lambda_{k,s}$ is fixed for each cohort with the same level of schooling. Equation 1 allows us to estimate the inter-temporal elasticity (θ). Equation 1 also enables us to estimate elasticities θ_J for the J different educational levels.

Figure 1. Labor market and life cycle



Note: A and B represent two hypothetical workers with different life cycle wage profiles. B' and B'' represent two alternative labor responses of agent B

Consideration of the life cycle enables us to analyze labor offer responses to changes in wage profiles. It can be seen in Figure 1a that B's expected income over her life cycle is greater than A's. For both profiles, θ is positive. However, it is not possible to determine which of the two workers will allocate more time to paid work. If the substitution effect dominates decision-making (Figure 1.b), as B has a greater opportunity cost for leisure the time she devotes to remunerated work will increase (B'). However, because B has greater total income in her life cycle, an income effect may dominate and the time she devotes to leisure may increase (B''). Uncompensated elasticity (δ) measures the response in terms of hours worked when there is an unexpected wage change at age a, and this is associated with a parametric change that affects behavior throughout the life cycle. It measures the effects of a wage profile change on labor supply, which means we must take into account the dependence of $\lambda_{k,s}$ on all wages.

MaCurdy (1981) and Pencavel (2002) propose a model to estimate uncompensated elasticity, where they derive the following equation:

$$(2)\ \ln\left[h_{k,s}(a)\right]=\sum_{i=0}^{2}\mu_{0i}a^{i}+\sum_{i=0}^{2}\mu_{1t}a^{i}K+\sum_{i=0}^{2}\mu_{2i}a^{i}S+\delta\ln\left[w_{k,s}(a)\right]+\beta y_{k.s}(a)+u_{k.s}(a)$$

Equation 2 considers how wages alter the marginal utility of wealth over the life cycle. It incorporates the following as explanatory variables: age, age squared, the age-cohort and age-schooling interactions, non-wage incomes (yk,s), and real wage. The coefficient associated with this last variable corresponds to uncompensated elasticity ($\delta=\theta+\eta_a$). We would expect that the marginal utility of wealth would decrease with real wages and wealth so each η_a coefficient should be negative. Because this equation incorporates the income effect, we arrive at $\delta\leq\theta$. Again, the elasticity δ_J can be estimated for the cohorts with a J educational level.

There is a variation of equation 2 that includes a quadratic form of the wage, and this serves to evaluate whether the elasticities are constant for female workers with different levels of wage income. In this case, it is supposed that inter-temporal and uncompensated elasticities are a linear function of the wage logarithm: $\theta=\theta_0+\theta_1\ln(w)$ and $\delta=\delta_0+\delta_1\ln(w)$, and a wage quadratic term is included.

To estimate elasticity at the "extensive" margin, the dependent variable hk,s is replaced by (pk,s) (Pencavel 1998), which represents the participation rate of cohort k with educational level s.

One limitation of this model is that it assumes a "unitary" conceptualization of household labor decisions. Compared to the bargaining approach, this type of model involves problems to do with understanding intra-household dynamics from a gender perspective (Bina Agarwal 1997) and has been shown to be inadequate to understand women's work options. First, it does not take into account that maternity makes for changes in life cycle decisions and possibilities, and second, it does not take into account the group of constraints that are discussed above. Nonetheless, when incorporating decisions throughout the life cycle, the intermissions in remunerated work participation that characterize the secondary worker's decisions can be added to the analysis. At the same time, the comparison between inter-temporal and uncompensated elasticities enables us to quantify the magnitudes of the substitution and income effects, and this is essential to an understanding of labor supply

decisions. The techniques applied enable us to carry out an exercise of measuring and interpreting women's labor supply decisions in recent decades, evaluating the differences among the female population and evaluating whether there is a pattern of convergence towards men's behavior due to changes in gender roles.

Our estimations in this paper are based on synthetic indicators that arise from the pseudo-panel information, which is built up on the basis of cross-section surveys.[11] The criteria for pseudo-panel construction enable us to analyze the presence of differences in the elasticities considering different generations and educational levels. Each cohort is defined as a group of individuals born in a set of consecutive years, and can be followed and sampled over time. In order to obtain synthetic cohorts that are more homogenous, we use variables such as gender and education that do not change over time.[12] If the same individual appears in two samples from different years, she will always be classified in the same cohort.

Pseudo-panel data represent an "average individual" so they do not enable us to consider heterogeneity within the cohorts, but they do allow us to make observations over time. Badi Baltagui (2005) argues that in pseudo-panel data analysis there is a tradeoff between the number of cohorts and their representativeness. Using a large number of cohorts will enable us to capture more heterogeneous behaviors but there will be fewer individuals per cohort, which means that the sample cohort average estimates of population cohort mean values will be less accurate (the synthetic cohorts lose representativeness). For this reason, if the number of cohorts is reduced the synthetic indicators will be more precise in summarizing individual information. But in this case, there is greater heterogeneity within the cohort and less variability in the information used in the pseudo-panels estimates.

Espino, Leites and Machado (2009) and Alma Espino and Alina Machado (2011) studied the impact of schooling on Uruguayan women's labor behavior and found that behavioral trends differ among groups with different educational levels. This provides a strong criterion for constructing homogeneous pseudo-panels. However, the parameters we estimate have to be interpreted as the elasticity of an average individual.

Problems could arise if the design of the sample was changed in different yearly surveys or if there were strong migratory movements (Francisca Antman and David McKenzie 2005). This could be a difficulty in the case of Uruguay, but there is no adequate solution.

Estimation procedures

Following (Pencavel 2002), we use weighted least squares (WLS); the weights are given by the number of observations in each of the cells. We estimate Standard errors by the White procedure and consider the possible presence of heteroscedasticity (Angus Deaton 1985; Pencavel 1998 and Pencavel 2002).

[11] There are three advantages to using pseudo-panels: they enable us to approach the inter-temporal distribution of hours worked more closely (which is not possible with cross-section information); they can minimize bias due to errors in variable measurement at the micro-data level because they use averages or similar statistics by cohort; and they allow us to incorporate macroeconomic variables (Heckman and MaCurdy 1982; Pencavel 2002). In addition, Deaton (1985) suggests that pseudo-panels do not suffer from the classic problem of panel data breakdown.

[12] Women over 25 are considered.

Wages are treated as endogenous as they can be correlated with the error term ($\varepsilon_{k,s}(a)$ and $u_{k.s}(a)$) in the main equation (because there are unobservable variables that explain hours worked and also incomes) or with the possibility of measurement errors.13 In order to address this aspect we use the instrumental variables approach. For the consistency of the instrumental variables estimator, this approach should have two properties. First the instruments must be uncorrelated with the error term (exogeneity assumption: they do not affect work behavior). It is well known that we cannot empirically test this property, and the use of the instrumental variable method has been extensively discussed in the literature because of the requirement that it should meet the erogeneity condition. Second, the instruments should be correlated with wages. To assess the quality of the instruments and the magnitude of the potential bias we follow John Bound, David Jaeger and Regina Baker (1995).14 They propose testing the joint significance of the instruments in the auxiliary equation of the two-stage method.

Under certain circumstances, the use of cohort mean values themselves serves as an instrumental variable procedure (James Heckman and Richard Robb1985). However, following Pencavel (1998 and 2002), Donnald Robbins, and Daniel Salinas and Araceli Manco (2009), two groups of variables are used as instrumental variables for wages.

Instrumental Variable A (IVA)

In a first specification, imports and the real exchange rate are used as instrumental variables interacting with each other, and each of them interacting with a fourth-degree polynomial of age and years of education (IVA).15 These variables are candidates to be used as instruments because foreign trade variables are associated with elements that shift labor demand functions.16 Furthermore, standard supply models exclude these variables. The use of these instruments for the Uruguayan case is appealing because Uruguay is a small economy so exchange rates and international prices are fixed externally for the Uruguayan economy. Furthermore, Carlos Casacuberta and Marcel Valliant (2002) find a link between wages and the external trade variables of the different sectors.

Instrumental Variable B (IVB)

In a second specification, women's wages are instrumented through the wages of single men in a same educational-cohort cell. The basis for the selection of this instrument is that the two wages are correlated, but it is expected that the wages of single men will be exogenous to the decision of how many hours women work.

Other non-wage home incomes are also treated as endogenous in the specifications of uncompensated elasticity. In the case of IVA we use the same instruments. In the case of the IVB

13 In our case the measurements error bias would be reduced because there are relatively few individuals in each cohort.
14 Bound, Jaeger and Baker (1995) discuss the problems that the use of weak instruments could generate in contexts of finite samples. They point out that F statistical values below 10 would confirm the weakness of the instrument and the bias problems.
15 The possibility of using macroeconomic variables as instruments is one of the advantages of the pseudo-panels method.
16 Pencavel (1998 and 2002) justifies the use of external trade variables as an instrument by citing evidence found in previous studies in the USA that indicate a link between these variables and the structure and level of wages.

instruments, we introduce the non-wage income of single men for the non-wage income of women. Two variables are also added in this case: the interaction between education and imports, and the interaction between the real exchange rate and imports. In the auxiliary regression, the four instruments – the wage and the other incomes of single men and the two variables of external trade – are significant; both in the wage regression and in the other non-wage income regression (see Table A1).

Because only the hours worked of women who decide to participate are observed, another element to consider is sample selection bias due to self selection or incidental truncation. The resulting bias could be especially large when estimating the female labor supply if there are unobservable factors influencing their decisions about participation and about hours allocated once the women have joined the labor market (James Heckman 1979). The literature is not conclusive about the best way to treat this problem when pseudo-panels are used in the estimation, given that synthetic cohorts hide the differences in levels of participation throughout the years. The probability of participating would not be constant and therefore the estimations would have to correct this selection bias. To tackle this, Pencavel (1998) suggests including a selection term derived from the projected job ratios for each cohort.[17]

4. Information source

The information used in this paper comes from the Encuesta Continua de Hogares (ECH), Instituto Nacional de Estadística (INE) (the Uruguayan National Statistics Institute - Continuous Household Surveys) for the period 1986-2010. These surveys collect information about households and individuals regarding paid work and income. Their harmonization over the selected time period makes it possible to construct synthetic cohorts that are representative of urban Uruguay.

The study spans the cohorts born in the years 1932-1936 to the cohorts born in 1977-1981. The cohorts were constructed by assembling groups of individuals born in 5 consecutive years and considering 4 educational groups. To avoid the distortions caused by the time young workers set aside for education and by the retirement stage, we take the age bracket of 25 and 60 years old. Table A-2 shows the number of observations per cohort over time.

To estimate the parameters of interest for equations 1 and 2, the indicators alternatively used are average hours worked by people in the cohort as an indicator of labor supply (the intensive margin), and their levels of participation (the extensive margin). In the former, the micro-data we use correspond to everyone who received wage incomes, and in the latter, all the people in each cohort are considered. The ECH makes it possible to work with total weekly hours, that is to say the hours corresponding to all each person's jobs and the hours worked in their main occupation. Most of the people had only one job, which means that there are no significant differences between the two series. However, it is expected that the hours worked in any secondary job would be more difficult to measure. Therefore the estimations of the elasticities use hours and incomes of the main job as well as in the elasticities on the extensive margin. The construction criteria for the variables used in the estimations are summarized in Annex A-3.

[17] Heckman (1979) has suggested that this bias is an important problem of omitted variables and has proposed a treatment for it that cannot be applied in estimations based on pseudo-panels.

5. Descriptive analysis

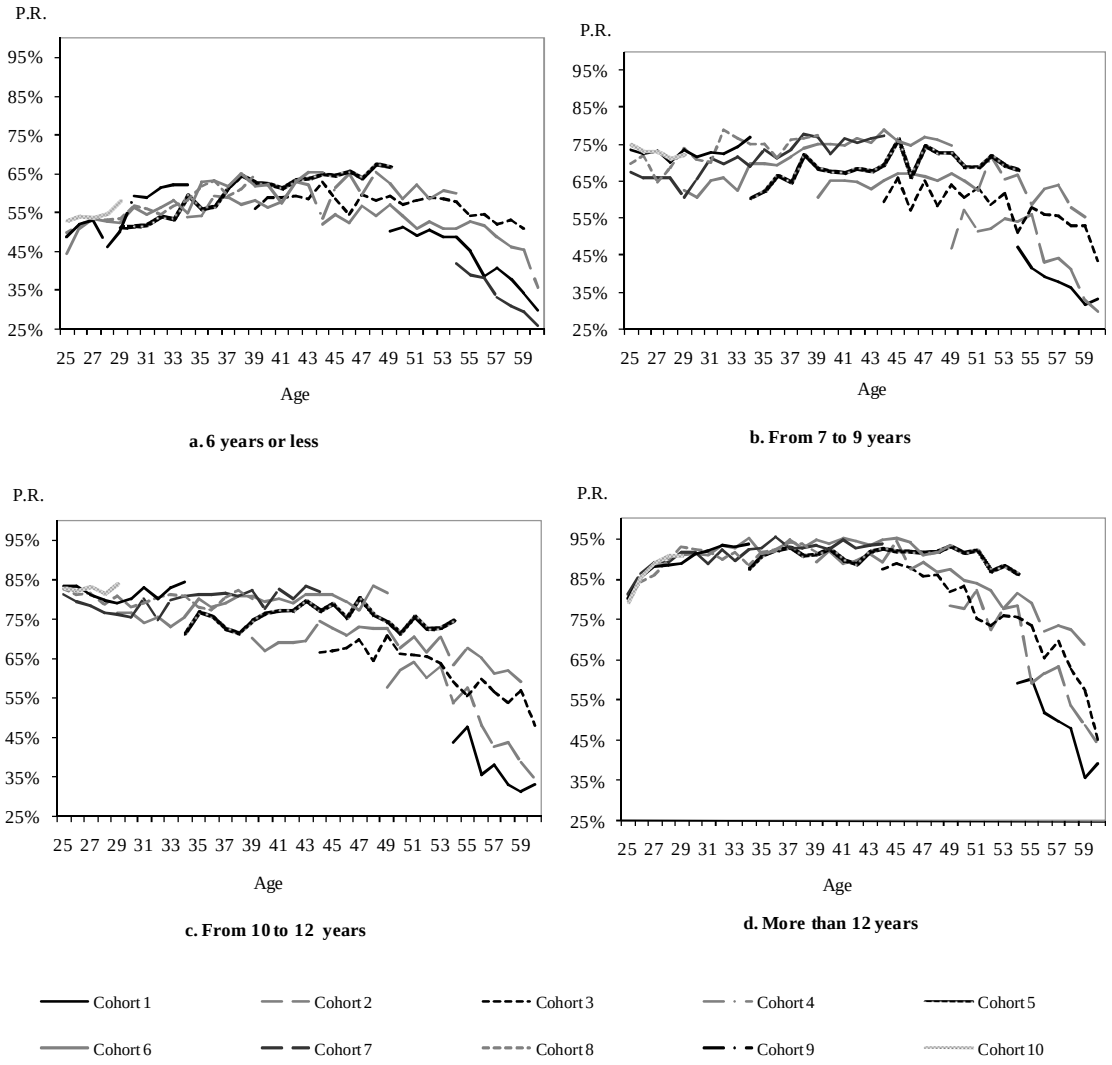
The number of women in the Uruguayan labor market has risen steadily since the mid 1980s; in 1986 the women's activity rate was 41.3% and by 2012 it had increased to 55.2%. In contrast, over the same period the men's activity rate remained relatively stable and in fact declined slightly, from 73.7% to 72.7%. This high level of women's participation is thought to be associated with their higher levels of education, the low birth rate and the rising trend in the divorce rate. As regards education, it should be noted that historically the gender gap in the population's average educational achievements has favored women. Consideration of the cohorts of people born in 1940 shows that Uruguay was the first country in Latin America to close the gap. It can be said that the improvement in the educational level of Uruguay's Economically Active Population (EAP) responds mainly to the rise among the female EAP. These characteristics are based on averages and they conceal heterogeneity among the different socioeconomic groups and age brackets, and inequalities among women that are expressed in their possibilities to access jobs and income.

In this section we analyze the intergenerational and life-cycle evolution of work participation, hours worked and wage income, and we distinguish among generations and educational levels.

In a context where the female participation rate has grown continuously since the mid 1980's, Figure 2 shows that the biggest increases have occurred among women with intermediate educational levels (Figures 2.b and 2.c). The evolution of female participation does not seem to respond to economic cycles or to the added work effect since this rise is a dominant long term trend.

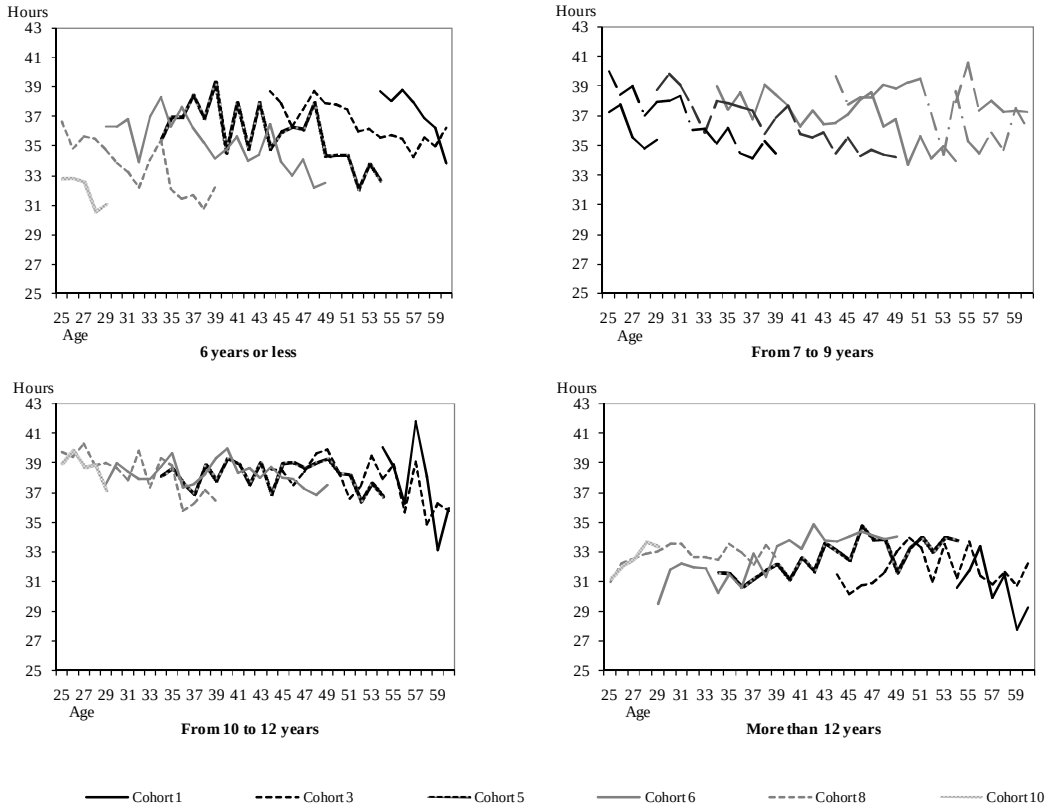
In all cases women's labor participation decreases after the age of 50, although the figures differ depending on years of schooling. The behavior of women with more years of schooling is more stable among generations and their profile by age bracket is more marked as regards labor behavior in the life cycle. The trend is for levels to increase until the age of 30 and to decrease after 50 years old (Figure 2.d). Women with 6 or less years of education have the lowest participation levels. There is a slightly rising trend but, as in all cases, this comes to an end at the age of 50 (Figure 2.a). The most stable participation rates throughout the life cycle can be found among women with intermediate educational levels. This is possibly liked to the fact that their insertion into the labor market occurs at younger ages.

Figure 2. Female participation rate per cohort according to age and years of schooling (%). Total for the whole country (towns with more than 5000 inhabitants).



The evolution of women's average hours worked shows inter-generational leaps among women with up to 10 years of schooling. In this group the trend is for younger cohorts to work fewer hours. Among women with 10 to 12 years of education the number of hours worked is relatively stable throughout the life cycle, and the same applies across generations. Lastly, those with more than 12 years of education may confirm the behavior predicted by the life cycle models (Figure 3.d) insofar as they join the labor market later, and when they do so at early ages they work fewer hours because they are engaged in their training process.

Figure 3. Average hours worked by women in their main activity by cohorts according to age and years of schooling. Total for the whole country (towns with more than 5000 inhabitants).



Note: For clarity, only the following cohorts are shown: 1,3,5,6,8,10

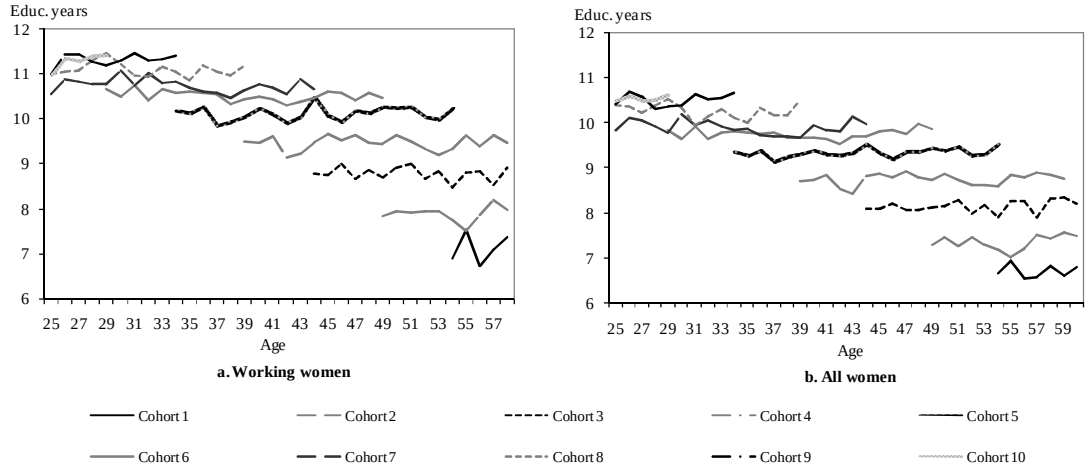
The behavior of the group with more years of schooling might be explained by the fact that more complete information about the evolution of their wages over their labor career is available, and because they are better able to coordinate their work activity with family life and use various strategies to provide care for children or other dependents and to carry out housekeeping tasks. In Uruguay, women with more years of education are the only group of workers whose average hours worked in a given age bracket increases as cohorts become younger, although over the period they work fewer hours (32 hours in the main activity). It must be taken into account that women with more education tend to be over-represented in sectors and occupations that involve fewer working hours. Their participation in the public sector and in health and education activities is relatively high. This more-educated group, even working fewer hours on average, has a higher participation rate and, as regard the labor market, their work behavior is more consistent with their life cycle stage.

In general, the younger generations of women have higher participation rates but, as mentioned above, there has been a slight decrease in the hours they work. Therefore, even though the trend in participation coincides with that in the USA (Pencavel 1998), the evolution of hours worked is different as that author found an increase among younger generations.

It should also be noted that the cohorts of women who work have more education than the rest of the women of the same generation (Figure 4). These differences are not found among men, who nearly all work (Espino et al 2014). Among the cohorts born between 1957 and 1981 -

mainly in the last three cohorts- we find that the educational gap among generations narrows, which may suggest the evolution of years of education completed is somewhat slowing down. This might indicate that the higher participation rates among the younger cohorts of women could be linked to other factors besides an increase in years of education.

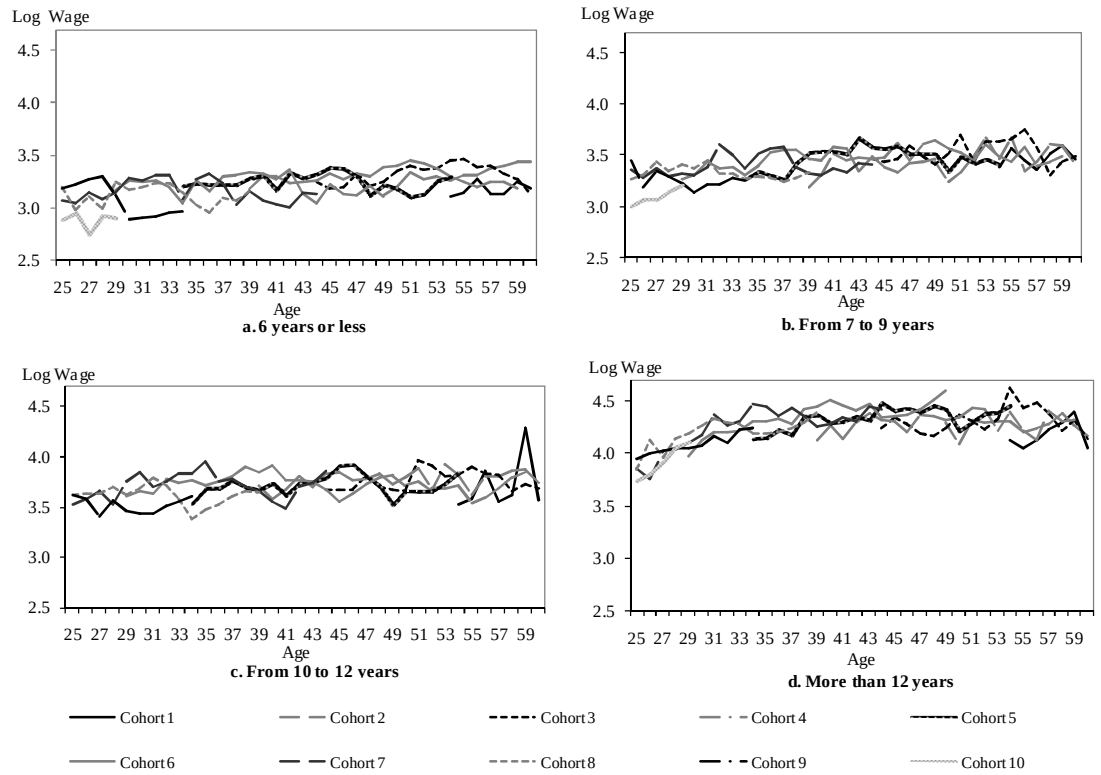
Figure 4. Average years of education per cohort among working women and among all women. Total for the whole country (towns with more than 5000 inhabitants).



The evolution of real wage incomes in the different cohorts differs among generations, and does not seem to conform to expected behavior in the life cycle (Figure 5). This contrasts with the series found by Pencavel (2002) in the USA in the period 1975-1994, in which real wages increase steadily with age and cohort. This different evolution could be linked to the cyclic behavior of the Uruguayan economy and in particular to the sizeable fall in real wage income that resulted from the economic and financial crisis at the beginning of the 21st century.

As regards wage evolution, the trends in the group with more than 12 years of education are similar to those found by Pencavel (1998) insofar as wage evolution conforms to the expected pattern during the life cycle – that is to say, wage income increases with age – and wages also increase as cohorts become younger.

Figure 5. Average hourly wage in women's main activity, per cohort for education years. Total for the whole country (towns with more than 5000 inhabitants).



To sum up, the evolution of women's educational levels per cohort and to a lesser extent of their wage incomes, are factors that play a part in explaining their increasing participation. Female participation does not seem to respond to the business cycle since the dominant long term trend is for the number of women who work to rise. This indicates that women's secondary worker role is decreasing over time. Moreover, given that the human capital accumulation gap narrows among more recent cohorts, it is possible that the trend for greater female participation responds not only to wage increases but also to other factors identified in the literature. It may respond, for example, to changes in preferences (towards more professional careers), to changes in society's attitudes to women working, to institutional changes, to easier job access as there is less discrimination and greater workplace flexibility, to technological changes that increase housework productivity, to the fall in the birth rate, to the rise in the divorce rate and other changes in family organization, to changes in men's attitudes to doing housework and caring for the children, to responses to economic cycles, and lastly to household strategies to maintain living standards.

The analysis above shows that there are marked differences between women with less than 12 years of education and those with 12 years or more. This finding justifies the criterion we employed in our specifications for the econometric analysis, and is consistent with the outcomes for Uruguay found by Espino, Leites and Machado (2009).

6. The elasticity of wage labor supply

We estimate inter-temporal elasticity and uncompensated elasticity by educational groups distinguishing between women with tertiary education and those without. Our selection of education ranges is based on the descriptive analysis above and on findings in the literature that show that women with tertiary education have their own distinct labor market behavior, which is relatively similar to the pattern among men (Espino, Leites and Machado 2009).

We analyze labor supply in terms of (i) hours worked (intensive margin) and (ii) participation (extensive margin). As we saw in the paragraph above, women's participation rates have grown very considerably and this is quite unlike the evolution of hours worked. The results of estimating inter-temporal and uncompensated elasticities at the intensive margin are shown below.

i. Elasticities at the intensive margin

For each education group, inter-temporal elasticity is greater or equal to uncompensated elasticity (Table 1 and Table 2). Our statistical tests show that women without tertiary education have greater inter-temporal and uncompensated elasticity compared to other women.

Table 1

Women's inter-temporal elasticities according to educational groups

Dependent Variable: Working hours (main occupation)	Without tertiary education		With tertiary education	
	IV - A	**IV - B**	**IV - A**	**IV - B**
log(w)	0.296***	0.292***	0.120***	0.024

Difference significance test among estimations for different educational groups	
Based on IVA	F(1,572)=28.98; Pvalue=0
Based on IVB	F(1,572)= 11.26; Pvalue=0

IVA: interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

IVB.Wage per hour and other income for single men

Table 2

Women's uncompensated elasticities according to educational groups

Dependent variable: Working hours (main occupation)	Without demographic controls				With demographic controls			
	Without tertiary education		With tertiary education		Without tertiary education		With tertiary education	
	VI - A	**VI - B**		**VI - B**	**VI - A**	**VI - B**	**VI - A**	**VI - B**
log(w)	0.296***	0.251***	0.103*	0.046	0.269***	0.228***	0.124**	0.051
log(other non-wage income)	-0.004	0.064***	-0.033	-0.029	0.009	0.073***	-0.023	-0.023
Other controls								
Presence of childen	n/a	n/a	n/a	n/a	-0.316***	-0.320***	-0.147***	-0.135**
Married or with domestic partner	n/a	n/a	n/a	n/a	0.177**	0.265***	0.087	0.066

Difference significance test among estimations for different educational groups		
Based on IVA	F(1,580)=10.91; Pvalue=0.001	F(1,576)=5.61; Pvalue=0.0182
Based on IVB	F(1,580)= 9.3; Pvalue=0.0024	F(1,576)= 6.34; Pvalue=0.0121

IVA: interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

IVB. Wage per hour and other income for single men. Interaction between education and imports. Interaction between real exchange rate and imports.

In the case of women without tertiary education, the estimated elasticity magnitude is consistent with what the mainstream literature expects for secondary workers. Both the inter-temporal and the uncompensated estimated elasticities confirm a strong substitution effect. These findings are evidence to reject the hypothesis that women's behavior is governed by the rationality of the added worker. This result is confirmed particularly among less-educated women. When we compare the two elasticities it can be seen that the income effect is very weak among both groups of women.

As regards uncompensated elasticity, in the group of women with more education this has a magnitude similar to that of men (between 0 and 0.186, based on Espino et al 2014).

These last results could be related to the hypothesis suggested by Goldin (2006) about changes in the "horizon" and "identity" of female workers. Inter-temporal elasticity shows that both groups of women optimize their labor decisions over the life cycle. Women's decisions at the intensive margin involve anticipating that their labor participation will have a wider and more stable horizon. Moreover, these women probably strengthen their "identity" as workers and appreciate their working careers, and – particularly in the group of more highly-educated women – their behavior is more similar to that of men. It was expected that better-educated women would allocate more time to labor market activities. The new issue is the labor insertion of less well-educated women, which is associated more with the behavior of younger generations. Even though the amount of time women with lower educational levels devote to paid work has increased, it seems that the role of "secondary worker" still prevails, because the substitution effect dominates uncompensated elasticities.

The coefficient for non-wage household income is not significant in most cases (Table 2), which indicates similar behavior to that of men (Espino, Leites and Machado 2009). Nonetheless, these results are not robust, which means we cannot draw convincing conclusions about this question. Pencavel (2002) argues that these estimates suffer from limitations when it comes to measuring effects not related to wage income, and discusses the sources of the problem. Moreover, the presence of children in the home has a significant effect, which is negative and of greater magnitude among women without tertiary education. This finding is associated with the constraints that an unpaid workload, child care and housekeeping tasks put on women when they consider participating in the labor market, since they are less able to resort to public services, to employ workers provided by the market or to remunerated domestic service. Lastly, among married women without tertiary education, the marriage (or having a partner) variable is positively associated with average hours worked, which is an unexpected result.

Following Chinhui Juhn, Kevin Murphy and Robert Topel (1991) and Pencavel (2002), we evaluate differences in elasticity magnitudes among different wage profiles in order to validate the estimations above, and a quadratic term is included in wages. The hypothesis that elasticities decrease with wage earnings cannot be rejected with this evidence. The and parameters are significantly negative in most cases. These results are consistent with the cited references, which indicates that the elasticities are lower for workers with higher qualifications, which is consistent with the findings presented in the paragraph above (Table 3).

Table 3

Women's inter-temporal and uncompensated elasticities assuming a non-linear relationship with income

Dependent variable: Working hours (main occupation)	Inter-temporal		Uncompensated	
	IV - A	IV - B	IV - A	IV - B
log(w)	0.727*	2.034***	1.060***	4.36***
log(w)*log(w)	-0.060	-0.231***	-0.137***	-0.55***
log(other non-wage income)	n/a	n/a	-0.159***	0.1535**

IVA: interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

VIB: Wage per hour and other income for single men. Interaction between education and imports. Interaction between real exchange rate and imports.

ii. Elasticities at the extensive margin

According to Pencavel (1998), in this case the labor participation levels of each cohort are used as the supply indicators, and the elasticities are estimated from equations 1 and 2. The sign of the inter-temporal elasticity of participation in the labor market is positive, which contrasts with findings at the intensive margin: women with higher levels of education have higher coefficients at the extensive margin (Table 4) although the difference is not statistically significant. Both groups of women adjust their labor participation to their life cycle wages. This constitutes additional evidence against the added worker effect among less-educated women. Moreover, women with tertiary education are more sensitive to wages at the extensive margin than at the intensive one. This is consistent with the fact that they incur higher opportunity costs for not participating in the labor market at their central ages, and that they access more flexible conditions of work, which allows them to adapt their conditions of work to make them compatible with maternity and household tasks, so once they enter the labor market they do not have to leave for reasons other than remuneration profiles. In addition, as they earn higher wages they can hire market services and thus have greater opportunities to be able to coordinate their home responsibilities with their work participation.

Table 4

Women's inter-termporal elasticities at the extensive margin, according to educational groups

Dependent Variable: Participation Rate	Without tertiary education		With tertiary education	
	IV-A	IV - B	IV - A	IV - B
log(w)	0.303***	0.309***	0.396***	0.330***
Difference significance test among estimations for different educational groups				
Based on IVA	F(1,572)=2.61; Pvalue=0.11			
Based on IVB	F(1,572)=0.04; Pvalue=0.84			

IVA: interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

IVB. Wage per hour and other income for single men.

As regards uncompensated elasticity, the magnitude of the coefficient for women with tertiary education is lower than for the other group, and in most specifications not significantly different from zero. However, for women without tertiary education, uncompensated elasticity is still positive, which indicates that the substitution effect predominates. The statistical tests we performed lead us to reject the notion that uncompensated elasticities are the same among educational groups for both groups of instruments (Table 5).

Table 5

Women's uncompensated elasticities at the extensive margin according to educational groups

Dependent variable: Participation rate	Without demographic controls				With demographic controls			
	Without tertiary education		With tertiary education		Without tertiary education		With tertiary education	
	IV - A	IV - B	IV - A	IV - B	IV - A	IV - B	IV - A	IV - B
log(w)	0.236***	0.216***	0.038	-0.004	0.214***	0.198***	0.076*	0.016
log(other non-wage income)	0.071***	0.091***	-0.037	-0.017	0.079***	0.095***	-0.006	-0.018
Other controls								
Presence of children	n/a	n/a	n/a	n/a	-0.264***	-0.272***	-0.039	-0.026
Married or with domestic partner	n/a	n/a	n/a	n/a	0.087	0.109	0.244***	0.213**
Difference significance test among estimations for different educational groups								
Based on	F(1,580)=17.76; Pvalue=0.000				F(1,576)=9.95; Pvalue=0.0017			
Based on	F(1,580)= 20.36; Pvalue=0.000				F(1,576)= 13.38; Pvalue=0.0003			

IVA: interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

IVB: Wage per hour and other income for single men. Interaction between education and imports. Interaction between real exchange rate and imports.

The findings above are the same when the specifications include the demographic variables. The presence of children under 6 years old in the home has a negative impact on the probability that women with no tertiary education will participate in the labor market, whereas this impact is nonexistent for the other group. This is consistent with the idea expressed above that better-educated women have advantages when it comes to coordinating household work with paid work.

iii. Changes in responses according to different age ranges

The coefficients obtained for the age range analysis cannot be interpreted as elasticities but constitute an approach to responses to wage variations by age ranges. Cohort controls that consider that part of these variations could be associated with inter-generational changes are included.

Differences in the decisions are found at the intensive and extensive margins (Table 6). In the former, the wage coefficients are significant, positive, and have a steady evolution which decreases as the age range progresses. This is verified for both instruments and it indicates that sensitivity to wage decreases when women go beyond their reproductive age. The result of the same exercise for the decision at the extensive margin shows an evolution consistent with the inverted U shape.

Table 6

Correlation between wage income and labor market hours allocated at intensive and extensive margins, according to age range (with cohort controls)

Age range	IV - A	IV - B	IV - A	IV - B
25-29	0.054***	0.056***	0.055***	0.063***
30-34	0.042***	0.045***	0.059***	0.067***
35-39	0.033***	0.035***	0.064***	0.071***
40-44	0.030***	0.031***	0.064***	0.070***
45-49	0.025***	0.027***	0.063***	0.068***
50-55	0.015***	0.017***	0.050***	0.054***

IVA: interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

IVB. Wage per hour and other income for single men

This result is associated with the fact that decisions to participate in the labor market at extreme ages are more influenced by factors other than wages. For instance, in the younger group, non participation can be related to human capital investment and maternity, while in the older group it can be related to retirement and the difficulties of getting a job at an advanced age. In middle age, the relation between wages and hours is stronger, which, with higher wages, increases the opportunity cost of not participating.

iv. Inter-generational changes

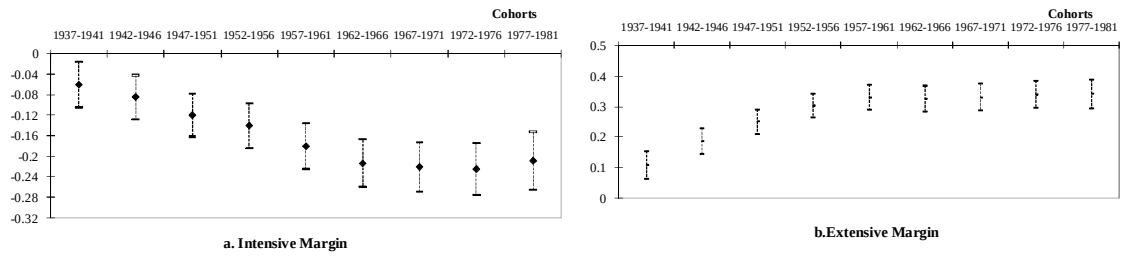
When inter-temporal elasticity is estimated for all women, the specifications demand the incorporation of a fixed effect on different generations' levels, which is ( ) . Even though the estimations of this parameter may suffer from some consistency problems, these are attenuated when the cohorts are observed over a long period of time and are composed of a high number of observations.

The estimates of "cohort effects" show there is a discrete change among generations in the working hours average and in levels of participation. As shown in Figure 6, a decreasing trend in the average of hours worked is found for the younger cohorts. The application of regular statistical tests enable us to affirm that the cohort effect is significantly lower in the 1972-1976 and 1977-1981 cohorts than in the 1942-1946 and 1947-1951 cohorts.

A direct interpretation of these parameters comes from the specifications used, which represent a logarithmic transformation of the marginal utility of initial wealth. This decreasing trend could be associated with the fact that the wage profile of the younger women throughout their life cycle is relatively high compared to their older peers. This result is in line with the model predictions, which assert that the marginal utility of wealth decreases with respect to wage profile (MaCurdy 1981).

On the other hand, younger generations' participation has a rising trend that ceases at the generations born between 1957 and 1961. This trend could be associated with a higher opportunity cost of not participating in the labor market, and is also in line with Goldin's (2006) hypothesis.

Figure 6. Cohort effect at the intensive and extensive margins (point estimates and intervals of confidence).



The fixed effects are also analyzed for women with and without tertiary education in order to ascertain whether the cohort effect operates differently depending on education (Figure 7). The observed drop in the cohort effect is more pronounced for less-educated women, who have greater inter-generational differences. Among the better-educated women, the generational differences are not significant, which is consistent with the fact that they were the first group to enter the labor market. Apart from the better-educated women, the group that has always joined

the labor market at the youngest age is women from the poorest households, therefore the drop in the cohort effect for women without tertiary education could respond to the recent entry of those with intermediate educational levels (see Figure 2). These women are under less financial pressure than the poorest group and when they obtain paid work they carry on doing their household tasks and consequently work fewer hours at their jobs.

Figure 7. Cohort effect at the intensive margin according to educational group

Note: The estimates of cohort effects are based on the results in Table 1 using IVA.

Lastly, to examine the possibility of inter-generational changes in decisions at the extensive margin, we analyze the fixed effects for the various educational levels. In this case, the pattern is not homogeneous, which is a result we expected. The trend for participation to increase from one generation to the next applies only to women without tertiary education, which is in line with the hypothesis outlined in the paragraph above.

Figure 8. Cohorts effect at the extensive margin according to educational groups. Note: the estimates of cohort effects are based on the results in Table 4 using IVA.

To sum up, while previously women with more education had high participation rates, the current higher activity rates of the younger generations in the labor market is explained by women with intermediate education levels. The different behaviors at the intensive and extensive margins might be associated with the increased participation of women who are married or have a partner, who work fewer hours because they continue to discharge their responsibilities in the home.

7. Conclusions

In this paper we measure the relation between labor and wages and assess the impact of wage movements on female labor force participation, which has undergone a marked increase in the context of significant variations in real wages due to macroeconomic shocks. Our results confirm the idea that female participation does not seem to respond to the business cycle because the dominant long term trend is for participation to increase. Our findings also suggest that women's labor behaviors vary depending on years of schooling and are also affected by cultural, social and demographic changes.

We find evidence that inter-temporal elasticities are high and positive at the intensive and extensive margins, which indicates that women adjust their labor behavior to their life cycle wages. These results coincide with the findings of previous research in developed countries, and they differ from the findings in other developing countries as regards the elasticities found. Furthermore, we confirm the existence of different behaviors within the female labor supply.

Our descriptive analysis shows that levels of women's participation in the Uruguayan labor supply have risen in the last three decades. This increase responds to fixed behavior associated with inter-generational changes. In all female educational groups the more recent cohorts have higher participation levels, although recently this trend has intensified among women without tertiary education. The labor behavior of women with more years of schooling is more stable among generations. At the same time their labor market participation is relatively similar to men's, and this behavior is consistent with the life cycle model predictions. The positive association between participation in the labor market and education is confirmed.

Better-educated women have always entered the labor market at a younger age, but today the transition to greater labor participation is also the prevailing trend among younger-generation women with lower educational levels.

In general the inter-temporal elasticity of each educational level is positive and higher or equal to uncompensated elasticity, and women without tertiary education always have greater uncompensated elasticities than the other group. At the intensive margin less-educated women also have greater inter-temporal elasticities, but at the extensive margin women with tertiary education have equal or greater inter-temporal elasticities than their less-educated counterparts. These results confirm that all the groups of women optimize their allocation of time to remunerated work throughout their life cycle, and tend to participate more at the ages when they can earn higher wages. These results also highlight an important difference among educational groups. Women with less education tend to react strongly to unexpected changes in wages – which is a feature of a secondary labor force – whereas women with tertiary education show no reaction to abrupt wage changes, which can be interpreted as a clear sign that they have strong worker identity. In addition, women with tertiary education have a stronger optimization pattern in their life cycle, albeit through participation rates rather than through hours of work. This could be related to the fact that they postpone entry into the labor market in order to accumulate human capital, which means they insert into it at ages associated with higher wages (it is shown that the wage profile of these groups coincides with what life cycles theories predict). But this behavior might also suggest that when they have to devote time to unpaid care responsibilities and domestic tasks in the home they adjust the length of their working day rather than leaving the labor market. This highlights once again that women in this group have strong worker identity and are perhaps aware of the cost to their careers that periods of inactivity cause. In this respect, their behavior has become more similar to that of men.

From a theoretical point of view, given the salary profile of women with less education and the lower opportunity cost of their not working, it is expected that their behavior could be explained by added worker rationality. However, the relatively high inter-temporal elasticity and positive uncompensated elasticity found in this study provides evidence against this hypothesis.

These findings could be interpreted in the light of Goldin's (2006) hypothesis: when women make decisions about labor market insertion they anticipate that their participation will be more stable and have a wider horizon. Moreover, they probably strengthen their "identity" as workers and appreciate their working career more.

Lastly, we find evidence that there are inter-generational changes in the marginal utility of wealth. The wages earned by younger generations throughout their life cycle are relatively higher than the wages their peers in the previous generations received and this might mean that wealth has lower marginal utility, which is in line with the model predictions. This indicates that women in younger generations have a better wage profile. There is a supplementary hypothesis here, namely that preferences have changed and these younger generation women place more value on their labor careers.

To sum up, we can affirm that the younger female generations participate more in the market but once they insert into it their average working week is shorter. The different behaviors at the intensive margin could be associated with the entry of women who are married or have a partner. These are the women whose participation in paid work has increased the most, but at the same time they continue to discharge their responsibilities in the home.

The trend for female work participation to rise is expected to continue. The implications of this trend at the intensive margin are ambiguous and depend on how far women – especially those with less education – are able to coordinate paid work with their household and family responsibilities.

A very important aspect here is the design of public policies to facilitate women's entry into the labor market and cater to their different wage profiles and home care demands. This has practical consequences not only as regards the provision of services but also in terms of promoting co-responsibility between women and men. As mentioned above, the possibility of women coordinating paid work with unpaid work in the home depends very much on the incomes of people and of households. The trend for women's labor participation to increase does not indicate that all women want to work in the market, but all women should be as free as men are to choose what kind of work they do and how much of their time they devote to it.

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Annex

Table A-1

Indicators of the quality of the instrumental variables (All women)

Endogenous variable	Test	Inter-temporal elasticities specification		Uncompensated elasticities specification	
		VI A (*)	VI B (*)	VI A (**)	VI B (**)
log (wage)	*F (Additional insturments)*	F(9, 571) =44.16	F(1,580) = 68.76	F(10, 576)=17.54	F(4, 583) = 65.16
	F (First stage)	F(22,571) =756.11	F(11,580) = 63.38	F(19, 576) = 321.42	F(12,583)= 573.62
log (other non-wage income)	*F (Additional insturments)*	n/a	n/a	F(10,576)=20.93	F(4, 583) = 30.85
	F (First stage)	n/a	n/a	F(19,576)= 357.74	F(12,583)= 530.16

VIA (*): interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

VIB (*). Wage per hour for single men

VIA (**): interaction among imports and age, age squared, age cubed, and age to the fourth power. Interaction among real exchange rate and age, age squared, age cubed, and age to the fourth power. Interaction between education and imports. Interaction between education and real exchange rate. Interaction between real exchange rate and imports

VIB (**).Wage per hour for single men and other non-wage income for single men. Interaction between education and imports. Interaction between real echange rates and imports

Table A-2

Number of observations by cohort and age

Cohort	1	2	3	4	5	6	7	8	9	10
Born between:	1932-1936	1937-1941	1942-1946	1947-1951	1952-1956	1957-1961	1962-1966	1967-1971	1972-1976	1977-1981
Age										
25	-	-	-	-	-	-	2.060	1.966	2.003	2.745
26	-	-	-	-	-	-	1.967	1.829	1.969	3.256
27	-	-	-	-	-	-	1.894	1.857	1.936	3.622
28	-	-	-	-	-	-	1.858	1.836	1.882	4.210
29	-	-	-	-	-	2.072	1.859	1.759	1.704	4.422
30	-	-	-	-	-	2.411	2.110	2.052	2.775	-
31	-	-	-	-	-	1.939	1.743	1.695	3.010	-
32	-	-	-	-	-	2.151	1.969	1.845	3.661	-
33	-	-	-	-	-	1.954	1.933	1.711	4.063	-
34	-	-	-	-	2.029	2.018	1.891	1.653	4.373	-
35	-	-	-	-	2.136	2.064	1.954	2.477	-	-
36	-	-	-	-	2.064	2.082	1.962	2.990	-	-
37	-	-	-	-	1.969	2.008	1.852	3.518	-	-
38	-	-	-	-	2.039	2.042	1.854	3.963	-	-
39	-	-	-	1.917	1.925	1.963	1.759	4.146	-	-
40	-	-	-	2.256	2.247	2.173	2.886	-	-	-
41	-	-	-	1.692	1.865	1.921	2.836	-	-	-
42	-	-	-	2.088	2.235	2.263	3.903	-	-	-
43	-	-	-	1.891	1.959	1.930	4.180	-	-	-
44	-	-	1.768	1.717	1.735	1.817	4.296	-	-	-
45	-	-	1.960	1.835	2.001	2.798	-	-	-	-
46	-	-	1.814	1.803	1.745	3.109	-	-	-	-
47	-	-	1.744	1.781	1.724	3.565	-	-	-	-
48	-	-	1.818	1.915	1.858	4.078	-	-	-	-
49	-	1.705	1.687	1.683	1.667	4.132	-	-	-	-
50	-	2.109	2.080	2.046	2.937	-	-	-	-	-
51	-	1.580	1.578	1.481	2.658	-	-	-	-	-
52	-	1.779	1.843	1.878	3.675	-	-	-	-	-
53	-	1.742	1.761	1.649	3.799	-	-	-	-	-
54	1.896	1.680	1.638	1.740	3.972	-	-	-	-	-
55	1.880	1.716	1.613	2.252	-	-	-	-	-	-
56	1.838	1.849	1.594	2.728	-	-	-	-	-	-
57	1.671	1.499	1.507	2.830	-	-	-	-	-	-
58	1.811	1.729	1.602	3.356	-	-	-	-	-	-
59	1.714	1.507	1.477	3.473	-	-	-	-	-	-
60	2.192	1.879	2.489		-	-	-	-	-	-

Table A.3. Definition of variables used

All the variables used are derived from cross-section surveys that are carried out annually, and in order to obtain the variables to be used in the context of pseudo-panels the average value is taken. Each cohort or cell is constructed from the intersection of three variables (sex, educational level and birth generation) and is observed at different ages.	
Hours of work in main employment:	(Dependent variable) The data are from a question in the Continuous Household Survey. Until the year 2000 there was a question about the number of hours worked in the previous week in the respondent's main employment. In 2001 this was changed to the number of hours usually worked in the main occupation (defined by the survey). Responses that report more than 90 hours per week are excluded. Logarithms are applied to this figure.
Labor income per hour in main employment:	This is based on the information gathered in the Continuous Household Survey about total income from main occupation. This is expressed in real terms at December 2006 prices and a process for outliers is applied whereby responses that differ from the mean by more than 3 standard deviations are excluded. This value is divided by the number of hours worked per month in the activity the respondent declares to be the main one. The final value is obtained by converting the weekly values obtained in the Continuous Household Survey into monthly values. After applying logarithms, averages are taken for individuals who belong to the same cohort or cell.
Other non labor income:	This is constructed from the household income from all sources variable from the Continuous Household Survey, which is converted into real values to obtain the variable. The total of household income is the sum of all the members of the household's work income in real terms, with outliers removed using the procedure explained above. This value is then divided by the number of members in the household to obtain a per capita value, and is expressed in logarithms.
Variables used to correct for bias:	
Effective employment rate:	This is calculated simply as the number of individuals in employment in the cohort / cell divided by the total number of individuals in it.
Projected employment rate:	This is the predicted employment rate for each cell based on age, age squared, schooling and instrumented income.
Demographic variables:	
Presence of minors:	This variable is constructed by identifying the households of the individuals studied in which there are children under the age of 6 who are in any way related. When the cells are constructed, the value obtained is the percentage of households in the observed cohort / cell that have this characteristic.
Married or with a partner:	This is the percentage of women in each cohort / cell who state they are either married or in a consensual union with a partner.
Instruments	
Imports:	This is the value of total imports into the country in each calendar year in constant values, obtained from the Balance of Payments data published by the Central Bank of Uruguay. After the value for a cell is obtained, the average for the 5 calendar years covered by each cell is derived, and then weighted by the number of observations made in each year.
Real exchange rate:	This variable is an index of the real exchange rate for 9 countries that are important in Uruguay's foreign trade, and is constructed by the Central Bank of Uruguay. Each value also corresponds to the average for each calendar year, and thus the cell values consist of a combination of the values for 5 different calendar years.
Single people's income:	Single males and females who are not the head of household's children were identified. This sub-group was used to construct the work income and other income variable.

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