On gender gaps and self-fulfilling expectations: Theory, policies and some empirical evidence*

Sara de la Rica*, Juan J. Dolado** & Cecilia García-Peñalosa***

(*) Universidad del País Vasco, FEDEA & IZA
(**) Universidad Carlos III & CEPR & IZA
(***) CNRS and GREQAM.

April 14, 2008

ABSTRACT

This paper considers a model of self-fulfilling expectations, without moral hazard problems related to unobservable effort, which give rise to a multiple equilibrium of gender gaps in wages and participation rates. If cultural norms lead firms to believe that women do more household work than equally productive men, our model predicts that this initial situation will increase the wage gap in favour of men which, in turn, will exacerbate lower female participation. Hence, both effects lead to a gendered equilibrium with low participation and large gaps, even though an ungendered equilibrium is feasible. We examine the effects of a family-aid subsidy paid to working women. We find that this policy cannot move the economy away from the gendered equilibrium. However, this type of subsidy paid to both working men and women can remove the gendered equilibrium. Empirical analysis based on a time use survey for Spain is provided to test some of the main predictions of the model.

JEL Classification: J16 and J71.

Keywords: gender wage gap, participation, multiple equilibria.

* Corresponding author: Juan J. Dolado (dolado@eco.uc3m.es). We are grateful to Andrea Bassanini, Patrick Francois, John Knowles, Nezih Guner and seminar participants at the University of Leicester for useful comments. The first two authors gratefully acknowledge financial support from the Spanish Ministry of Education (SEC2006-10827; SEC2004-04101) and the EC (MRTN-CT-2003-50496), whereas the third author acknowledges support from Institut d’Economie Publique (IDEP).
1. Introduction

There is a growing literature that studies the joint determination of gender differentials in earnings and in the household division of labour.\(^1\) Most of these studies depart from Becker’s (1991) observation that a small initial comparative advantage of women in household production (e.g., in bearing and nurturing children) can lead to full specialization if, due to learning-by-doing and to household work increasing the marginal disutility of market work, the comparative advantage can grow over time. However, as some of these papers point out (see, e.g., Albanesi and Olivetti, 2007), huge improvements in medical and household technologies (plus less need of physical strength in most jobs) have rendered this comparative advantage unimportant and yet gender differences in the division of labour persist (see Bassanini and Saint Martin, 2008).

To tackle this puzzle, several explanations have been proposed. They rely upon incentive problems in the labour market leading to self-fulfilling expectations even when comparative advantages are absent. The idea is that the expectation by firms that women spend more time than men undertaking home tasks leads to earnings differentials in favour of men. Hence, since the expected opportunity cost is lower for women, they devote more time to household work, validating firms’ beliefs in this way. For example, Albanesi and Olivetti (2006) propose a model to generate this feature where firms are subject to incentive compatible constraints stemming from unobservability of both effort (a \textit{moral hazard} problem) and home hours which, as in Becker (1991), affect the marginal utility of effort (an \textit{adverse selection} problem). Lommerud and Vagstad (2007) follow Lazear and Rosen’s (1990) model of job ladders in assuming that there are two types of jobs: fast track and slow track jobs. Workers are placed in the fast track ones if the firm pays a fixed investment. Since effort is not observable, firms will only place workers in the fast track jobs if their expected output is large enough to recoup the investment cost. Since effort is not observable, firms will only place workers in the fast track jobs if their expected output is large enough to recoup the investment cost. If women have been traditionally the ones exerting primary major responsibility at home and wages are non-contractible, in equilibrium they will predominantly follow a “mommy track”. They analyze the stability properties of symmetric and asymmetric equilibria and characterize the situations where anti-discrimination policies (e.g., affirmative action) are effective.

---

depending on the initial equilibrium and the (permanent or transitory) nature of these policies.

Our paper falls into this stream of the literature and makes two contributions. First, we propose a model which yields self-fulfilling prophecies without using a moral hazard problem originated by the difficulty of perfectly monitoring effort or by the substitutability of effort at home and in the market, as the previous papers do. While both motivations are plausible, they are also somewhat restrictive. For example, wage gaps should be negligible for routine tasks by low-skilled employees for whom effort and output should be easily observable but, nevertheless, we still observe substantial gaps in those categories (see, e.g., de la Rica el al. 2008). Likewise, one could also think that household work, akin to running a “small firm”, increases the productivity of work in the market, instead of reducing it.

Instead, in our model, statistical discrimination plays a key role. However, rather than stemming from imperfect information on workers’ abilities, it arises from different expectations about the distributions of disutility shocks (unexpected need of irregular hours at work or events that require parental leave, etc.) affecting equally productive men and women once they have been trained for a job. If future wages are predetermined with respect to these shocks, then the job quit rate differs across genders, inducing differences in labour market participation to depend on expected wage gaps, an issue that is not tackled by models hinging on the moral hazard problem. Thus, in this fashion we are able to generate predictions about the relation between gender participation and wage gaps broadly in line with the available evidence (see below).

Further, the structure of our model is much simpler than in the above-mentioned papers since we do not need to analyse the design of incentive-compatible contracts in order to generate similar predictions. Secondly, in contrast to most existing work (see, e.g., the discussion in Lommenrud and Vagstad, 2007), our framework implies that, when multiple equilibria exist, welfare may be higher in the symmetric than in the asymmetric one. The reason why efficiency tends to be greater with discrimination is that it promotes some form or other of “specialization” in the labour market, an effect that is also present in our model. However, we also allow for a direct disutility of housework, which is minimized –i.e. efficiency maximized- when there is no discrimination. Under some scenarios, the second effect will dominate, implying that welfare is higher in the

---

2 See Altonji and Black (1999) and Donohue (2005) for recent surveys on “statistical discrimination”. 
absence of discrimination.

In our framework, under some assumptions about the distribution of shocks and the degree of diminishing returns to training, there are two equilibria: (i) an ungendered one, where there are no participation and wage gaps and the division of household work is fully egalitarian, and (ii) a gendered equilibrium with both gaps being favourable to men so that women specialize in household tasks. We examine the effect of alternative policies in an economy that is initially in a gendered equilibrium despite the fact that men do not enjoy any comparative advantage in productivity or bargaining. We find that family aid subsidies targeted at women not only do not move the economy to the ungendered equilibrium but also make the equilibrium allocation of housework and the distribution of wages more unequal. In contrast, when family aid is received by both men and women, the gendered equilibrium may disappear.

A first look at cross-country evidence provides some preliminary support to our empirical predictions. Figure 1 shows the relationship between the gender employment rate gap (horizontal axis) and the raw hourly wage gap (vertical axis) for workers aged 15-64 with an educational attainment of upper secondary education or less in several OECD countries. The data correspond to 2001, the latest year for which comparable data on a large number of OECD countries is available (see Bassanini and Saint Martin, 2008). The choice of lower-educated workers is due to the fact that higher educated women are less prone to quit their job when faced with a household shock because of the larger investment in human capital that they have undertaken and the affordability of formal household/child-care arrangements (see Altonji and Blank, 1999, and de la Rica et al., 2008). As can be inspected, there is a slight positive correlation (0.22) between both variables, which remains positive (0.16) once the two clear outliers represented by Korea and Italy are excluded. That is, even without controlling for observable characteristics, higher labour market participation gaps are associated with higher wage gaps, as our model predicts. Regarding training by gender, Arulampanam et al. (2004) report evidence for Europe finding that although, on average, women are no less likely

---

3 Similar graphs for the overall population of workers aged between 15 and 54, working at least 15 hours per week, can be found in Bassanini and Saint Martin (2008). The correlation is -0.13.

4 The low wage gender gap in Italy has been analyzed by Olivetti and Petrongolo (2006) where it is claimed that in countries with low female participation, women with relatively low return to paid job would choose to stay out of the market, thus narrowing the wage gap. However, why the gap is much lower in Italy than in other low female participation, like Greece or Spain, somewhat remains a puzzle. The high wage gap in Korea is probably due to the prevalence of low-paid jobs in dynamic eastern asian economies.
than men to train, there are significant differences in favour of men in the Southmediterranean countries (see also the detailed discussion in de la Rica et al., 2008 for the Spanish case). Finally, Figure 2 shows the relation between the participation gaps and the proportion of GDP devoted to family aid expenditure. The correlation is clearly negative implying that more generous family policies give rise to lower participation gaps and, in view of Figure 1, lower wage gaps. As is well known, Northern European countries are the ones with low gaps and high family expenditure shares whereas the South-mediterranean ones are the ones with higher gaps and lower expenditure.

Figure 1: Relationship between wage and employment gaps

Figure 2: Relationship between family aid expenditure and employment gaps

5 It includes cash transfers, services and tax breaks towards family; see www.oecd.org/els/social/family/database.
The rest of the paper is structured as follows. Section 2 lays out the model, first with homogeneous individuals and later allowing for gender differences. Section 3 discusses the properties of the different equilibria. Section 4 deals with welfare analysis. Section 5 studies the effects of different policies to eliminate the ungendered equilibrium. Section 6 provides some detailed empirical evidence on the main predictions of the model using individual data from a Spanish survey on time use. Finally, section 7 concludes.

2. Modelling gender gaps

2.1 The basic setup: A training model

To account for the presence of both gender participation and wage gaps, we use a simple model inspired by Acemoglu and Pischke (1998)’s analysis of the financing of training in frictional labour markets, adapted to our framework where there are no search frictions but exogenous disutility shocks are allowed to induce quits.6

The basic setup is as follows. Men and women live for two periods and are endowed with identical time and ability which are both normalized to 1. The population of both males and females is also normalized to 1. In period 1, firms are randomly matched with just one worker of either gender who is single. All individuals get an amount of training $\tau$ offered by the firm, which may differ across genders. Workers do not receive a wage during the first period. Finally, there is free entry of firms in this period, which bear a linear training cost, $c(\tau) = \tau$.

At the start of period 2, individuals of each gender form couples (exogenously) and decide on how to split the household chores on the basis of expected relative wages. Once this decision is taken, workers (who are ready to start producing after getting trained) are made a wage offer by the firm, $W$. After the wage has been announced, individuals suffer a disutility shock, $\omega$, which may force them to quit the job. The $\omega$ shock is an i.i.d. random variable with c.d.f. $F(\omega)$. The support of the distribution function may differ between men and women, and will depend on the way in which household chores are split. Individuals then decide whether to work or to quit. In the first case, production takes place and wages are paid. Output depends on the level of training received in period 1 with a production technology given by $a(\tau)$, where

---

6 See also de la Rica et al. (2008).
\[ a(\tau) = \beta \tau^{\alpha/2}, \quad 0 < \alpha < 1, \text{ so that } a'(\cdot) > 0 \text{ and } a''(\cdot) < 0. \]

Since workers’ productivity depends on the amount of training provided by firms, these will decide this amount in period 1 and the corresponding wage in period 2, taking as given the decision about the division of labour in couples, and hence the distribution of the shock for each gender. Conversely, couples bargain over the division of housework at the start of period 2 before the disutility shock is realized, taking as given the wages offered by firms to each gender. Hence, workers will always get trained in period 1 and will stay in the firm and produce in period 2 insofar \( W - \omega \geq 0. \)

Summing up, the timing of decisions can be graphically represented as follows:

\[
\begin{array}{cccccc}
\text{t=1} & \text{t=2} \\
\hline
\text{Training} & \text{Household decision} & \text{Wage offer} & \text{Disutility shock} & \text{Production} \\
\hline
\uparrow & \uparrow & \uparrow & \uparrow & \uparrow
\end{array}
\]

### 2.2 Homogenous workers

To solve for both wages and the amount of training, we proceed backwards in time. In order to simplify the derivation we will assume that the distribution of shocks is uniform, i.e., \( \omega \sim U[0, \varepsilon] \) with \( \varepsilon \leq 1 \), assuming that the shock can never exceed the unit of time each individual has in period 2. To understand the way in which wages and training are chosen by firms, we start with a situation in which all workers are identical. We refer to this case as the setup with homogenous workers. Later, gender differences will be considered.

Under the assumption that the wage in period 2 is announced by the firm before the shock \( \omega \) is realized, firms will choose \( W \) in order to maximize expected profit in that period, denoted by \( \Pi \), leading to the following optimization problem:

\[
\max_{W} \Pi = \max_{W} \int_{0}^{W} [a(\tau) - W] \frac{1}{\varepsilon} d\omega = \max_{W} \frac{a(W) - W^2}{\varepsilon}. \tag{1}
\]

Hence, the first-order condition (henceforth, f.o.c.) with respect to \( W \) implies that the wage paid in equilibrium, \( W^* \), satisfies:

\[
W^*(\tau) = \frac{a(\tau)}{2}, \tag{2}
\]

---

7 This is just the average of the worker’s productivity’ and the outside wage which is assumed to be zero. The weight \( \frac{1}{2} \) in the average is due to the choice of the uniform distribution in the illustration. Alternative distributions will give rise to a weighted average with unequal weights.
so that expected profits in period 2 are:

\[ \Pi(\tau) = [a(\tau) - a(\tau)/2] \frac{W^*}{\epsilon} = \frac{a(\tau)^2}{4\epsilon}, \]  

(3)

where the term \( W^*/\epsilon \) captures the probability that an individual does not quit, i.e., the probability that \( W - \omega \geq 0 \) and hence that the individual participates in the labour market.

Free-entry of firms implies that expected profits at the beginning of period 1 are driven down to zero. The zero-profit condition then pins down the optimal level of training in period 1, \( \tau^* \), that is:

\[ \Pi(\tau^*) - \tau^* = 0. \]  

(4)

Given the functional form of \( a(\tau) \), \( \tau^* \) is chosen to be:

\[ \tau^* = \left( \frac{\beta^2}{4\epsilon} \right)^{1/\alpha}. \]  

(5)

Next, replacing (5) in (2) yields the optimal wage:

\[ W^* = \frac{\beta}{2} \left( \frac{\beta^2}{4\epsilon} \right)^{1/\alpha^2}. \]  

(6)

These expressions imply that when the support of the shock is greater, i.e., \( \epsilon \) is larger, the worker gets less training and receives a lower wage. The intuition is that a greater expected shock implies a higher probability of quitting in period 2 and hence reduces the expected return to the firm which responds by reducing the amount of training. Note that our assumption that \( \alpha < 1 \) plays a crucial role. If \( \alpha \) were greater than 1 - that is, if there were weak diminishing returns in training - then the firm would respond to a higher probability of quitting by increasing the amount of training, using the resulting increase in the wage to offset the higher expected value of the shock. We assume that diminishing returns in training are sufficiently strong to prevent this counterintuitive result.

From equation (5) we can compute the probability that an individual works which, since the population equals unity, corresponds to the participation rate. This probability is given by \( P^* = \Pr (\omega \leq W^*) = W^*/\epsilon \), while the expected wage is \( P^* W^* = W^*/\epsilon \). Using (5), we have:
\[ P^* = \left( \frac{\beta}{2} \right)^{1-\alpha} \left( \frac{1}{\epsilon} \right)^{\frac{2-\alpha}{2(1-\alpha)}} , \]  
\[ P^* W^* = \left( \frac{\beta^2}{4\epsilon} \right)^{1-\alpha} , \]

which under the assumption that \( \alpha < 1 \) imply that a greater value of \( \epsilon \) results in a lower probability of employment/participation rate and a lower expected wage. We further assume:

**Assumption 1:** The following inequality holds: \( \left( \frac{\beta^2}{4\epsilon} \right)^{\frac{1}{1-\alpha}} \leq \epsilon \).

Assumption 1 ensures that \( P^* \leq 1 \). The assumption simply requires the productivity of training, \( \beta \), to be not too large since, otherwise, the resulting wage would be sufficiently high, relative to the shock, to lead to full participation. In what follows we will denote the parameter \( \left( \frac{\beta^2}{4\epsilon} \right)^{\frac{1}{1-\alpha}} \) by \( b_1 \), where, by Assumption 1 and \( \epsilon \leq 1 \), it holds that \( b_1 \leq 1 \). Furthermore, we can express the wage as \( W^* = \sqrt{\epsilon b_1} \), implying that \( W^* \leq 1 \).

**2.3 Allowing for different distributions of shocks**

Once the basic expressions for training and the wage have been derived for homogenous workers, we introduce gender differences by allowing for different distributions of disutility shocks for men and women. At this stage, we take this differential feature to be exogenous. Later, it will be endogenised in the decision process within the household. The key difference is that the c.d.f. for men, \( F_m(\omega) \), is assumed to be stochastically dominated by the c.d.f. for women, \( F_f(\omega) \), namely, \( F_m(\omega) \geq F_f(\omega) \) for \( \omega > 0 \). As before, we assume that the corresponding distributions are uniform, so that \( \omega_i \sim U[0, \epsilon_i] \) (\( i=m, f \)) with \( \epsilon_f \geq \epsilon_m \).

From (5) and (6), the optimal amount of training received by men and women and their corresponding wages are given by:

\[ \tau_i = \left( \frac{\beta^2}{4\epsilon_i} \right)^{\frac{1}{1-\alpha}}, \quad W_i = \frac{\beta}{2} (\tau_i)^{\frac{\alpha}{2}}, \quad i = f, m \]

Clearly, if \( \epsilon_m < \epsilon_f \), then \( \tau_f < \tau_m \) and \( W_f < W_m \). That is, since women have a higher quit probability than men, they receive less training and therefore get a lower wage.
We can also derive the corresponding participation rates in the labour market which are given by \( P_i = \Pr (\omega_i \leq W_i) \), yielding:

\[
P_m = \frac{W_m}{\varepsilon_m}, \quad P_f = \frac{W_f}{\varepsilon_f}.
\] (10)

Thus, it follows that \( P_f < P_m \). To ensure that participation rates are bounded above by unity, we modify Assumption 1 accordingly to:

Assumption 2: The following inequality holds: \( \left( \beta^2 / 4\varepsilon_i \right)^{-1/2} \leq \varepsilon_i \) for \( i = m, f \).

2.4 Gender gaps

From (10) and (11), it is straightforward to compute the gender gaps for labour market participation and wages, denoted by \( p \) and \( w \), respectively, which are defined as the ratio of the relevant variables for men and for women. That is, \( p = P_m / P_f \) and \( w = W_m / W_f \), yielding:

\[
p = \left( \frac{\varepsilon_f}{\varepsilon_m} \right)^{\frac{1}{2(1-\alpha)}}, \quad w = \left( \frac{\varepsilon_f}{\varepsilon_m} \right)^{\frac{\alpha}{2(1-\alpha)}}.
\] (11)

Since \( 0 < \alpha < 1 \), then the following proposition holds:

**Proposition 1:** Gender gaps depend on the difference in the distribution of the shock. Whenever \( \varepsilon_m < \varepsilon_f \), it is verified that \( p > 1 \) and \( w > 1 \). For \( \varepsilon_m = \varepsilon_f \), then \( p = w = 1 \).

The intuition for this result is again simple. The model is characterized by statistical discrimination. If \( \varepsilon_m < \varepsilon_f \), women will have a higher probability of quitting in period 2. Hence, they are offered lower training in the first period and a lower wage in the second period. Their lower wage is the result of lower training, while their lower participation is a combination of a direct effect due to the actual distribution of the shock and an indirect effect as statistical discrimination leads to a lower wage. Identical distributions of the shock, on the other hand, would imply no discrimination and hence the absence of participation and wage gaps.

3. Household division of labour and equilibria

3.1 Household division of labour

The next step is to endogenise the couple’s decision of how to split household chores at
the beginning of period 2. We assume that there is a household good to be produced by the members of the household, and that this good provides a fixed utility, $u$. The couple jointly decides how to split the responsibility for production of the household good by choosing the fraction $s \in [0,1]$ of the household chores allocated to the woman.

The production of the good has two disutility costs. Part of the cost is known ex ante, while another part is random and depends on the shock received by the household. To give an example, suppose that the household good consists of raising children. Children have to be collected from school and ferried to their after-school activities every day, imposing a (known) disutility cost to the member of the couple doing it. Then there are shocks, such as a child being sick and needing to stay home with a parent, which are uncertain. These shocks, however, have a cost only if the parent is working, and imply a reduction in the (monetary) utility derived from the job.

The certain disutility costs of producing the household good for the man and woman are assumed to be $(s^{-1} - 1)$ and $(1-s)^{-1} - 1$, respectively, which are increasing and convex. Thus, if $s = 1$, the man gets no disutility, and vice versa. There is a single shock affecting the household, $\omega$, whose distribution, as before, is $U[0,\varepsilon]$. A fraction $s$ of this shock is borne by the woman and a fraction $(1-s)$ by the man, implying $\varepsilon_f = s\varepsilon$ and $\varepsilon_m = (1-s)\varepsilon$. Further assumptions are that there is full income sharing within the household and that the partners maximize the sum of utilities with respect to $s$ taking their wages as given.

Expected household utility accruing to the household, net of the cost of the shock, is denoted by $V^{H}$ and is given by:

$$V^{H} = u + \left[ \int_0^{W_{f} / (1-s)} (W_{m} - (1-s)\omega) \frac{1}{\varepsilon} d\omega + \int_0^{W_{f} / s} (W_{f} - s\omega) \frac{1}{\varepsilon} d\omega \right] - \left[ \frac{1}{s} + \frac{1}{1-s} - 2 \right],$$

which can be expressed as:

$$V^{H} = u + \frac{1}{2\varepsilon} \left[ \frac{W_{m}^{2}}{(1-s)^{2}} + \frac{W_{f}^{2}}{s^{2}} \right] - \left[ \frac{1}{s} + \frac{1}{1-s} - 2 \right].$$

(12)

The household members jointly maximize household utility as in the collective decision making models of, e.g., Chiappori (1988, 1997). There are two elements that the

---

8 There is an extensive literature on home production and collective decision making. See Bergstrom (1997) for a review of models of the household.
household takes into account when choosing $s$. On the one hand, there are the convex costs of housework - captured by the last term in (12) - which have an equalizing effect as total disutility is minimized when housework is equally shared. On the other, there is a participation effect. To understand this effect, note that expected household income - the second term in (12)- is maximized when the member of the couple with the lower wage bears all the shock, the reason being that this ensures labour market participation of at least one of the household members. The choice of $s$ is then driven by this trade-off: specialization in market and household production by the two household members maximizes income, but full sharing of housework minimizes the disutility associated with producing the household good.

Maximizing (12) with respect to $s$ yields the f. o. c.:

\[
\frac{\partial V^H}{\partial s} = \frac{1}{2\varepsilon} \left[ \frac{W_m^2}{(1-s)^2} - \frac{W_f^2}{s^2} \right] + \left[ \frac{1}{s^2} - \frac{1}{(1-s)^2} \right] = 0, \tag{13}
\]

which implies that the equilibrium allocation of household work is given by $s^*$ where:

\[
\left( \frac{1-s^*}{s^*} \right)^2 = \frac{1 - \frac{W_m^2}{2\varepsilon}}{1 - \frac{W_f^2}{2\varepsilon}}. \tag{14}
\]

Under the assumption that participation rates are less than one, i.e. $P_i = \frac{W_i}{\varepsilon_i} \leq 1$ for $i = m, f$, the term $W_i^2/2\varepsilon$ is also less than one. Then $d s^*/d W_f < 0$ and $d s^*/d W_m > 0$, implying that a higher female (male) wage results in a reduction (increase) in the share of household work allocated to women. Moreover, when wages are equalised, i.e., $W_f = W_m$, then the allocation is even among genders, with $s^* = 1 - s^* = 0.5$. This is due to symmetry in the way in which we model the costs of housework, together with the fact that the convex cost function implies that the total disutility cost is minimized when chores are evenly split.

3.2 Multiple equilibria

Firms’ and households’ decisions are given by equations (9) and (14). In equilibrium expectations are fulfilled, hence the equilibrium is determined by the system of equations:

\[9\] The fact that $W_i^2/2\varepsilon \leq 1$ also ensures that the second-order condition for a maximum is satisfied.
\[ W_f = \sqrt{b_1 \epsilon \cdot s^{-\frac{\alpha}{1-\alpha}}}, \quad (E.1) \]
\[ W_m = \sqrt{b_1 \epsilon \cdot (1-s)^{-\frac{\alpha}{1-\alpha}}}, \quad (E.2) \]
\[ \left(1 - \frac{s^*}{s^*}\right) = \frac{1 - \frac{W_m^2}{2E}}{1 - \frac{W_f^2}{2E}}. \quad (E.3) \]

which jointly determines the division of housework across household members and their respective wages. To study the equilibrium configurations, we substitute for wages and express the f. o. c. (14) as:

\[ \left(1 - \frac{s^*}{s^*}\right) = 1 - \frac{b_2 (1 - s^*)^{-\frac{\alpha}{1-a}}}{1 - b_2 (s^*)^{-\frac{\alpha}{1-a}}}, \quad (15) \]

where \( b_2 \equiv b_1 / 2 \), and \( b_2 \leq 1 \).\(^{10}\)

We can examine the solutions of equation (15) by defining the functions:

\[ f(s) \equiv \left(1 - \frac{s}{s^*}\right)^2, \]
\[ g(s) \equiv \frac{1 - b_2 (1 - s)^{-\frac{\alpha}{1-a}}}{1 - b_2 s^{-\frac{\alpha}{1-a}}}, \]

so that the equilibrium allocation of housework is given by the intersection of these two functions of \( s \). Clearly, \( f(s) \) is decreasing and convex with a vertical asymptote at \( s = 0 \), with \( f(1) = 0 \) and \( f(0.5) = 1 \). As for \( g(s) \), it has two vertical asymptotes at \( s = b_2 \frac{1-a}{a} \), and \( s = 1 \); moreover, \( g(0) = 0 \), \( g(0.5) = 1 \), and \( g(1 - b_2 \frac{1-a}{a}) = 0 \). Lastly, it is increasing when \( s \in [0, b_2 \frac{1-a}{a}) \), decreasing when \( s \in (b_2 \frac{1-a}{a}, 1) \) and, under Assumption 2, it has an inflection point in the interval \( s \in (b_2 \frac{1-a}{a}, 1 - b_2 \frac{1-a}{a}) \).

Figure 3 depicts the intersections of \( f(s) \) and \( g(s) \). As it can be observed, there are three values of \( s \) that satisfy equation (15). In one of them, \( s_1^* = 0.5 \), while in the other two we have \( s_2^* \in (0.5, 1 - b_2 \frac{1-a}{a}) \) and \( s_3^* \in (0, b_2 \frac{1-a}{a}) \). Note that there cannot be corner solutions. They are ruled out because our assumption about the functional form

\(^{10}\) Given Assumption 1, it follows that \( b_2 \leq 0.5 \).
of the cost function implies that if one member of the couple does all household work, her marginal disutility is infinite, hence such a solution is never optimal.

Figure 3: Gendered and ungendered equilibria

![Graph showing gendered and ungendered equilibria]

Because we have assumed symmetry across genders in all aspects, we have two possible asymmetric equilibria, one in which women bear a greater share of housework (G), and another in which men do more than half of the household chores (G’). We focus on the more realistic case where women carry out a disproportionate share of household chores, and ignore the part of the domain of the $g(s)$ function defined by $[0, b_2^{-\frac{1-\alpha}{\alpha}})$. Hence, in the sequel, we restrict the analysis to two possible equilibria, one labelled the \textit{gendered} equilibrium (denoted by G), where $s^*_G > 0.5$, and another labelled the \textit{ungendered} equilibrium (denoted by U) where $s^*_U = 0.5$. Thus, by replacing $\varepsilon_f = s^* \varepsilon$ and $\varepsilon_m = (1 - s^*) \varepsilon$ in (11), the following result holds:

\textbf{Proposition 2:} Under Assumption 2, there are two equilibrium solutions for the female share of household work: (i) an ungendered solution with $s^*_U = 0.5$, $w^*_U = 1$ and $p^*_U = 1$ and (ii) a gendered solution with $s^*_G \in (0.5, 1 - b_2^{\frac{1-\alpha}{\alpha}})$, $w^*_G > 1$ and $p^*_G > 1$.

To illustrate the equilibria, consider the following numerical example. Using the values of the parameters: $\alpha = 0.5$, $\varepsilon = 1$ and $\beta = 2^{3/4}$, which satisfy Assumption 2, $s^*_G = 0.7236$ and $s^*_U = 0.5$ are the roots of equation (15). In the G-solution, the wage
and participation gap are $w_G^* = 1.62$ and $p_G^* = 4.22$. That is, male wages are 62 per cent higher for men than for women, which is a rather high value though roughly in line with those observed in countries with the largest wage gap; see Blau and Kahn (2000).

3.3 Comparative statics

Inspection of (15) and Figure 3 indicates that the system in (E.1)-(E.3) may have only one equilibrium. Consider a higher value of $\beta$, which increases $b_2$. As the range $s \in \left(b_2^{1-\alpha/\alpha}, 1 - b_2^{1-\alpha/\alpha}\right)$ gets narrower, the $g(s)$ function becomes steeper, moving the G-equilibrium to the left. That is, the G-equilibrium exhibits a less unequal division of housework and hence lower wage and participation gaps. Moreover, as Figure 4 shows, for sufficiently high values of $\beta$, there will be a unique U-equilibrium. Hence:

**Proposition 3:** Under Assumption 2,

(i) The higher the value of $\beta$, the less unequal the division of household labour is in the gendered equilibrium (i.e. the lower $s_G^*$ is) and hence the lower the wage and participation gaps are.

(ii) Economies with a sufficiently high value of $\beta$ will exhibit a unique, ungendered equilibrium.

**Figure 4:** The effect of productivity on equilibria

The intuition for Proposition 3 is the following. Recall that the household faces a trade-off between expected income and housework disutility: the former effect implies
full specialization is optimal \((s=1)\), while the latter tends to induce an equal allocation of housework across genders \((s=1/2)\). When wages are low, the household is less willing to forgo expected income in order to reduce the disutility cost. Hence, if firms offer equal wages there will be an even division of household chores, but if they offer different wages, housework will be unevenly allocated. When wages are high – i.e. \(\beta\) is large-, the household is more willing to forgo expected income in order to reduce the disutility cost, leading to a lower \(s^*_e\). If wages are sufficiently high, the disutility effect dominates, making the household division of work (almost) even when wages are different across genders.\(^{11}\) But if \(s\) is (close to) 0.5, then firms will pay the same wages to men and women. Hence a G-equilibrium cannot exist.

To the extent that a higher value of \(\beta\) corresponds to more productive economies, Proposition 3 implies that the gender gaps decrease in those economies. This result would explain the lower wage and participation gaps for the Nordic countries relative to the Southern countries reported in Figure 1, either because their gendered equilibrium is less unequal or because it does not exist.

### 4. Welfare analysis

In order to analyze the welfare implications of the equilibria discussed above, let us consider the problem faced by a social planner who chooses the allocation of housework taking into account its effect on wages. Since firms make zero expected profits, aggregate welfare is simply equal to the welfare of the representative household. Thus, substituting (9) into (12), the welfare function becomes:

\[
V^S(s) = u + \left[ b_2 (1-s) \frac{1}{1-s} + b_3 s \frac{1}{1-s} \right] - \left[ \frac{1}{s} + \frac{1}{1-s} - 2 \right].
\] (16)

We can examine which of the two equilibria results in a higher level of welfare by substituting the f. o. c. of the household (15) into this expression to get:

\[
V^S(s^*) = u - 2 - \frac{1 - b_2 s^* \frac{1}{1-s^*}}{(s^*)^2}.
\] (17)

Differentiating (17) yields:

\(^{11}\) To see this simply let \(b_2 \to \infty\) in equation (15), which makes the RHS of (15) equal to 1, implying \(s=0.5\).
which may be positive or negative, implying that it is ambiguous whether welfare is higher in the G- or in the U-equilibrium. The reason for this ambiguity is again the trade-off between maximizing market income, which occurs when there is full specialisation, and minimizing the disutility from household work, which requires equal sharing of housework.

The crucial parameter determining which effect dominates is the level of productivity \( \beta \). Recall that \( b_2 \) is increasing in \( \beta \), while \( s_G^* \) decreases with the level of productivity. Hence, \( dV^S(s^*)/ds^* > 0 \) for sufficiently high values of \( \beta \), implying that welfare is higher in the G-equilibrium. To illustrate this result consider again our previous example, in which \( \alpha = 0.5 \), \( \epsilon = 1 \), \( \beta = 2^{3/4} \), where the two equilibria are \( s_G^* = 0.7236 \) and \( s_U^* = 0.5 \). If we further assume that \( u = 10 \), and substitute these values in equation (17) we obtain that the level of welfare in the G-equilibrium, \( V^S(s_G^*) = 3.2 \), is lower than that obtained for the U one, \( V^S(s_U^*) = 4.1 \).

This result contrasts with existing work where it has been generally found that specialization results in higher welfare. The difference lies in the fact that we have specifically modelled the disutility cost associated with housework. Moreover, our analysis has the implication that the nature of the efficient equilibrium may change. Suppose that the productivity parameter grows exogenously over time. Initially, when \( \beta \) is low, specialization delivers higher welfare. But as productivity grows, the opportunity cost of sharing housework falls and the U-equilibrium becomes the more efficient one.\(^{12}\)

### 5. Policies: Family aid and affirmative action

In this section we discuss whether there are some policies that could shift the economy from the G-equilibrium to the U one. Following an extensive literature on this issue, we focus on two of them: (i) subsidised family aid, and (ii) affirmative action.

#### 5.1 Subsidised family aid

Consider the introduction of government-funded family aid. To start with, suppose that

\[ \frac{dV^S(s^*)}{ds^*} = \frac{1}{s^{13}} \left[ 2 - \frac{2 - \alpha}{1 - \alpha} b_2(s^*) \right] \]

\(^{12}\) For analyses of how exogenous changes in productivity affect gender differences in the labour market, see Olivetti (2006) and Albanesi and Olivetti (2006).
only working women receive the subsidy, and that this subsidy is proportional to their wage in period 2, so that, if working, they will receive an income $W_f (1 + \kappa)$. Hence, women remain at work in period 2 if $W_f (1 + \kappa) - \omega \geq 0$. Men do not receive the subsidy and therefore work if $W_m - \omega \geq 0$. For the time being, we will ignore the financing of the subsidy to concentrate on the partial equilibrium effect. At the end of the section this issue will be dealt with.

Following the same reasoning as in section 2.2 about firms’ behaviour but with the upper limit of the integral for women in (1) changed from $W_f$ to $W_f (1 + \kappa)$, firms chose the following amount of training and wages:

$$\tau_f^{\kappa*} = \left(\frac{(1 + \kappa)\beta^2}{4\bar{\epsilon}_f}\right)^{\frac{1}{\alpha}}, \quad W_f^{\kappa*} = \frac{\beta}{2} \left(\tau_f^{\kappa*}\right)^{\alpha/2}, \quad (18)$$

where the superscript $\kappa$ denotes the case with subsidies. Male workers are offered the training level and wage derived in (9). Note that the total income of women in period 2, $Y_f^{\kappa*}$, is now given by:

$$Y_f^{\kappa*} = (1 + \kappa)W_f^{\kappa*} = \frac{\beta(1 + \kappa)}{2} \left(\tau_f^{\kappa*}\right)^{\alpha/2}. \quad (19)$$

Clearly, $\tau_f^{\kappa*} > \tau_f^*$ and $W_f^{\kappa*} > W_f^*$. For $\kappa < (\epsilon_f - \epsilon_m)/\epsilon_m$, i.e. if the subsidy is not too large, it is also the case that women receive less training and lower wages than men, that is, $\tau_f^{\kappa*} < \tau_m^*$ and $W_f^{\kappa*} < W_m^*$. Thus, not surprisingly, women fare better in the labour market when they are subsidised to stay in the job. They may even get higher wages than men in period 2 if the subsidy is sufficiently high. We will ignore this possibility. Likewise, from (18) and (19), a straightforward result would be that, abstracting from the household decision, the corresponding participation and wage gaps with family benefits, $p^\kappa$ and $w^\kappa$, are lower than without subsidies. This result, however, will not hold once we take into account the endogeneity of the division of housework.

Consider the household’s decision in this case. Each household chooses $s$ to maximize the expected net utility which is now given by:

---

13 In equilibrium, since $\epsilon_f = s\epsilon$ and $\epsilon_m = (1 - s)\epsilon$, this condition becomes $\kappa < 2s - 1$. 

---
The resulting f. o. c., once we have substituted for wages, yields the new equilibrium relationship:

\[
\begin{pmatrix}
1 - s^* \\
\alpha
\end{pmatrix}^2 = \frac{1-b_2(1-s^*)^{\frac{1-\alpha}{\alpha}}}{1-b_3 s^*^{\frac{1-\alpha}{\alpha}}},
\]

where \( b_3 = b_2(1+\kappa)^{\frac{2-\alpha}{\alpha}} > b_2 \). The LHS of equation (21) is identical to that in (15), while the RHS tilts upwards and takes a value greater than 1 when \( s=0.5 \). The new equilibrium is depicted in Figure 5 and can be summarised as follows:

**Proposition 4:** Under Assumption 2, a wage subsidy to female workers leads to a gendered equilibrium with \( s^* \in (0.5,1) \). The equilibrium division of household work implies a higher share for women, and hence a greater wage and participation gap, than in the absence of the subsidy.

A surprising feature of (21) is that, with the subsidy in place, the U-equilibrium with \( s=0.5 \) does no longer exists. In other words, a gender-based subsidy policy yields only a G-equilibrium. The intuition is that the asymmetry in income due to the subsidy prevents a symmetric equilibrium. Suppose households set \( s=0.5 \). Then women have a greater probability of staying in the job than men (the combination of the same shock...
plus the subsidy), implying that firms will offer women more training and a higher wage. But if female wages are higher than men’s, then $s=0.5$ cannot be a solution to the household’s problem. Hence, the U-equilibrium no longer exists. Moreover, from Figure 5 we can see that the new G-equilibrium lies to the right of the initial one, implying a higher equilibrium $s$. For example, in our previous example, we get $s^{s^*} = 0.7299 > s^*_G = 0.7236$. To understand this, recall the trade-off faced by the household between increasing expected income and reducing the disutility of housework. Because of the autonomous increase in the probability of participation of the female due to the subsidy, the household can now “afford” to raise the probability of participation of the male by reducing his share of housework. This result shares the spirit of the analysis of affirmative action policies in Coate and Loury (1993). Coate and Loury argue that an exogenous increase in the hiring probability faced by a minority would reduce the educational effort exerted by the minority and hence increase the educational gap. Similarly, in our framework the exogenous increase in the probability of participation of women reduces their commitment to the labour market.

Consider now the alternative policy of giving the same subsidy to each member of the household. Following the same reasoning as above, this would yield the equilibrium relationship:

$$\left(1 - s^{s^*}\right)^2 = \frac{1 - b_3(1 - s^{s^*})^{\frac{a}{1-a}}}{1 - b_3s^{s^*}^{\frac{a}{1-a}}}, \quad (22)$$

that will narrow again the range of values of $s$ for which the RHS of (22) is positive since $b_3 > b_2$. The first implication is that the subsidy moves the G-equilibrium to the left, reducing the value of $s^*_G$. Moreover, if the subsidy is high enough (i.e. if $b_3$ is large enough) equation (22) would have a unique U-equilibrium, as in Figure 4, with higher participation rates and wages of both genders than under laissez-faire, although the corresponding gaps remain the same as without subsidies. Once again this is the result of the trade-off between higher expected income due to specialization and lower disutility due to the sharing of housework. The subsidy effectively increases incomes and hence reduces the opportunity cost of sharing housework. If the increase in (expected) income is sufficiently high, the household will simply minimize the disutility associated with household work and choose equal sharing of domestic tasks. This reasoning somewhat echoes some of Saint-Paul (2007)’s arguments in favour of gender-
neutral taxation.

We next turn to the financing of the subsidy. It is clear from (21) that a subsidy for women financed by taxing men will lead to an asymmetry in the RHS of (22) eliminating therefore the U-equilibrium. Thus, the only possibility is that firms finance it. Therefore, we suppose that firms pay a contribution $t_i$ for each employed worker. Moreover, we assume that the government balances the budget, implying that $t_i = \kappa W_i$. In this case, denoted by the superscript $F$, firms set the wage in period 2 to maximize:

$$\max_{W_i} \int_0^{W_i(1+\kappa)} \left[a(\tau_i) - W_i - t_i\right] \frac{1}{\varepsilon_i} d\omega = \max_{W_i} \left[a(\tau_i) - W_i - t_i\right] W_i(1 + \kappa),$$

which yields:

$$W_i F^*(\tau_i) = \frac{a(\tau_i)}{2 + \kappa}. \quad (24)$$

The zero-profit condition, together with $t_i = \kappa W_i$, implies that the level of training is given by:

$$\tau^F = \left[\frac{\beta^2}{\varepsilon} \frac{1 + \kappa}{(2 + \kappa)^2} \right]^{-1}. \quad (25)$$

Equations (24) and (25) imply lower wages and training than without subsidies, as a result of the labour tax paid by firms. Participation is given by $P_i F = (1 + \kappa) W_i F^* / \varepsilon_i$, and may be higher or lower than under laissez-faire due to the opposite effects of the subsidy that tends to increase it and the lower wage that tends to reduce it.

As regards the household decision on $s$, a similar argument as before yields the following f.o.c.:

$$\left(1 - s F^*\right)^2 = \frac{1 - b_4 (1 - s F^*)^{1-a}}{1 - b_4 s F^*^{1-a}}, \quad (26)$$

where $b_4 \equiv b_2 \left[(1 + \kappa)^a / (1 + \kappa / 2)^2\right]^{1-a}$. For values of $\alpha$ large enough, it holds that $b_4 > b_2$, leading again to a unique U-equilibrium. Thus, the following result holds:

**Proposition 5**: Under Assumption 2 and if $\alpha$ is large enough, an equal wage subsidy to male and female workers leads to an ungendered equilibrium with $s F^* = 0.5$. 

21
To understand the intuition for this result recall the two effects affecting participation: a direct one that tends to increase participation, and an indirect one operating through the reduction of training induced by the tax paid by firms, which tends to reduced participation. Note from equation (25) that a high value of $\alpha$ implies a low elasticity of training with respect to the subsidy. This means that the direct effect dominates, leading to higher participation and higher expected income for any given division of housework. As in section 3.3, a higher income implies that couples can afford to reduce the disutility cost of housework and they do so by choosing an equal split.

5.2. Affirmative action
A possible policy is to impose affirmative action that prevents firms from engaging in statistical discrimination. In our setup discrimination appears because firms offer different amounts of training to men and women. Consider then a policy that requires that firms post the amount of training they will provide before they are matched with a candidate. Recalling that all individuals work in the first period and that the population is equally split across genders, the expected profit of a firm is given by:

$$\Pi(\tau) = \frac{1}{2} \left( \frac{a(\tau)^2}{4\varepsilon_f} + \frac{a(\tau)^2}{4\varepsilon_m} \right).$$  \hfill (3')

The zero-profit condition $\Pi(\tau^a) - \tau^a = 0$ then pins down the optimal level of training in period 1 under affirmative action, $\tau^a$, that is:

$$\tau^a = \left[ \frac{\beta^2 \left( \frac{1}{8} \left( \frac{1}{\varepsilon_f} + \frac{1}{\varepsilon_m} \right) \right)^{\frac{1}{1-a}}}{\varepsilon_f + \varepsilon_m} \right].$$  \hfill (5')

Since men and women receive the same amount of training, equation (2) implies that they also receive the same wage.

Turning to the couple’s division of household work, from the f. o. c. (E.3), equal wages imply equal sharing of domestic tasks. Hence, the only possible equilibrium is $s = 0.5$. Note that this implies that it is optimal for the firm to offer the same amount of training to both genders. In other words, since the reason why the U- equilibrium appears is a coordination problem, affirmative action will coordinate firms and households on the U- equilibrium in which firms would choose not to discriminate across genders even if they could.
That affirmative action policies reduce gender gaps is not surprising. A recurrent question in the literature is whether or not such policy needs to be permanent or whether a one-shot policy can permanently reduce gender gaps; see Coate and Loury (1993). The fact that in our setup multiplicity is due to a coordination problem implies that a one-period policy will change the equilibrium permanently. Imposing equal amounts of training for men and women changes the household decision problem and results in equal sharing of household tasks. Once firms observe $s=0.5$ and couples are paid equal wages, there is no reason for either of them to expect a different outcome even if the affirmative action policy were removed. Hence, the economy will remain in the U-equilibrium.

5.3. Asymmetric economies

Our framework makes the strong assumption of complete symmetry between men and women, and it is this assumption that allows for the existence of U-equilibria. In this section we examine how the results are modified when we suppose that there is an (exogenous) asymmetry associated to gender.

There are many ways of allowing for asymmetries, ranging from differences in comparative advantage in home/market production to the structure of intra-household bargaining. We focus on the latter aspect and assume that men have higher bargaining power in the household decision-making process, measured by $\eta$, so that household utility can be expressed as:

$$\nu^{II} = u + \frac{1}{2e} \left[ \frac{(1+\eta)W_m^2(1-s) + (1-\eta)W_f^2}{s} \right] - \left[ \frac{1+\eta - 1-s}{s} - 2 \right],$$

with $\eta \in (0,1)$. The resulting f. o. c. together with the expressions for wages in (9) imply that equilibrium is given by:

$$\left( \frac{1-s^*}{s^*} \right)^2 = \frac{1-\xi (1-s^*)^{\frac{\alpha}{1-\alpha}}}{\xi - b_2(s^*)^{\frac{\alpha}{1-\alpha}}},$$

where we denote the relative bargaining power $(1+\eta)/(1-\eta)$ by $\xi > 1$. The left-hand side of this expression is just like in the symmetric case, while the right-hand side, i.e. the $g(s)$ function, shifts upwards as compared to equation (15). As a result, when $s=0.5$, $g(s)$ takes a value greater than 1, implying that an U-equilibrium cannot exist. Because the household gives greater weight to the disutility of the man, even when
wages are the same across genders, women do more than half of the housework. But as women are bearing a greater fraction of the shock, firms will pay lower wages to them. Hence only a G-equilibrium exists.

Under this asymmetric case, a wage subsidy targeted to women can work. In effect, denoting the relative bargaining power \((1 + \eta)/(1 - \eta)\) as \(\xi > 1\), and paying a subsidy equal to \(\kappa W_f\) to participating women, equations (21) and (27) yield the following f. o. c.:

\[
\frac{(1 - s^\kappa \eta^*)^2}{s^\kappa \eta^*} = \frac{1 - \xi b_2 (1 - s^\kappa \eta^*)^{\alpha}}{\xi - b_2 (s^\kappa \eta^*)^{1 - \alpha}}^{1 - \alpha}
\]

where the superscript \((\kappa, \eta)\) denotes the case with asymmetric power and subsidies, and \(b_2 = b_2 (1 + \kappa)^{2 - \alpha}\). Thus, one could choose \(\kappa\) so as to equate make the right-hand-side of (28) equal to 1 when \(s=0.5\), yielding:

\[
(1 + \kappa) = \left(\xi + \frac{\xi - 1}{\alpha} \frac{b_2}{2^{1 - \alpha}}\right)^{2 - \alpha}\]

implying that the f. o. c. (28) becomes now:

\[
\frac{(1 - s^\kappa \eta^*)^2}{s^\kappa \eta^*} = \frac{1 - \xi b_2 (1 - s^\kappa \eta^*)^{\alpha}}{1 - \xi b_2 (s^\kappa \eta^*)^{1 - \alpha} + (\xi - 1) \left(1 - (2 s^\kappa \eta^*)^{1 - \alpha}\right)}^{1 - \alpha}.
\]

Comparison of (29) and (15), using the same reasoning as in (26), implies that the U-equilibrium becomes more likely. Whether it becomes a unique equilibrium or not hinges on the sizes of \(\xi\) and \(b_2\), which in turn depend upon \(\eta\) and \(\beta\) (for given values of \(\alpha\) and \(\varepsilon\)). This result somewhat mimics the argument by Alesina et al. (2007) in their proposal of different taxation for men and women. In their reasoning, the asymmetry across genders is that women have higher elasticity of labour supply than men and, therefore, in line with to the Ramsey principle of optimal taxation, the former should have lower taxes than the latter. In our setup, the asymmetry arises from different bargaining power in the distribution of household chores but the policy implication is the same. Notice, however, that our result in (29) also implies that, for given \(\eta\), this gender-based taxation scheme is bound to be more effective in achieving
an U-equilibrium in more productive economies, i.e., with higher $\beta$.

6. Empirical evidence

6.1. Data and descriptive statistics

The data used for the empirical analysis is taken from the 2002-2003 Spanish Time Use Survey (STUS). This dataset is part of the Harmonized European Time Use Survey (HETUS) carried out by Eurostat. The initial sample consists of over 20,000 households and contains a wide range of information on the household (household composition, region, domestic service, housing characteristics, household income, etc) and on each of its members (demographic and labour market characteristics, including wages). But the main novelty of this database is the existence of individual information on daily activities through a personal diary, which all members of the household over ten years old must complete on a selected day. The diary records the activities undertaken by each respondent. For each 10 minutes interval (and during 24 hours), individuals must recode which is the primary and secondary activity that has been undertaken. Activities are coded according to a list provided by Eurostat (see Table A1 of the Appendix for details). Housework time is defined as the number of minutes reported in the diary that each individual devotes, as primary activity, to category 3 in Table A1, i.e., household and family, which includes cooking, cleaning, laundry, gardening and pets, maintenance and repairs, shopping, household management, childcare and other adults’ care. We recode this information for both members of the couple to then compute their shares and, in particular the ratio of the woman’s and the man’s shares.

Our sample is restricted to employed couples living in the same household, aged 25-64 years, with valid information on wages and female housework share. The resulting sample consists of 1,578 households with information on basic demographic and labour market characteristics of both the head and the spouse. Table 1 presents descriptive statistics (means and standard deviations) of wages, full-time/part-time status, age, education and female housework share by different demographic characteristics of the couple.  

---

14 Wages are measured on hourly basis. However, the original wage variable is net monthly wages and it is reported in intervals of 500 euros. There are seven wage intervals: 0-500, 500-1000, 100-1500, 1500-2000, 2000-2500, 2500-3000 and >3000. We have taken the average value of each interval as the point value for net monthly wages. We have converted net monthly wages in hourly wages by using weekly working hours, which are available.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>St. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly Wage Woman</td>
<td>7.30</td>
<td>4.11</td>
</tr>
<tr>
<td>Hourly Wage Man</td>
<td>8.60</td>
<td>4.18</td>
</tr>
<tr>
<td>Average Log Wage Gap (Man-Woman)</td>
<td>0.19</td>
<td>0.52</td>
</tr>
<tr>
<td><strong>Full-Time/Part-Time Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Full Time Woman</td>
<td>0.849</td>
<td>0.35</td>
</tr>
<tr>
<td>% Full Time Men</td>
<td>0.973</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Primary (or less) Education Woman</td>
<td>0.37</td>
<td>0.48</td>
</tr>
<tr>
<td>% Primary (or less) Education Man</td>
<td>0.40</td>
<td>0.49</td>
</tr>
<tr>
<td>% Secondary Educ. Woman</td>
<td>0.31</td>
<td>0.46</td>
</tr>
<tr>
<td>% Secondary Educ. Man</td>
<td>0.32</td>
<td>0.47</td>
</tr>
<tr>
<td>% University Educ. Woman</td>
<td>0.32</td>
<td>0.46</td>
</tr>
<tr>
<td>% University Educ. Man</td>
<td>0.26</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Age Woman</td>
<td>40.1</td>
<td>8.07</td>
</tr>
<tr>
<td>Average Age Man</td>
<td>42.33</td>
<td>8.32</td>
</tr>
<tr>
<td><strong>Female Housework Share</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.65</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>By Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>0.67</td>
<td>0.19</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.66</td>
<td>0.18</td>
</tr>
<tr>
<td>University</td>
<td>0.62</td>
<td>0.18</td>
</tr>
<tr>
<td><strong>By Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>0.64</td>
<td>0.21</td>
</tr>
<tr>
<td>31-40</td>
<td>0.64</td>
<td>0.17</td>
</tr>
<tr>
<td>41-50</td>
<td>0.66</td>
<td>0.18</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>0.68</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Other Household variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Receiving family aid income</td>
<td>0.03</td>
<td>0.18</td>
</tr>
<tr>
<td>Number of children</td>
<td>0.65</td>
<td>0.86</td>
</tr>
</tbody>
</table>


Salient features are: the male member of the household earns on average 18% more than his wife, 97% of male members work on full-time basis, and around 15% of women work as part-timers. Regarding education, it is interesting to observe that the percentage of college education is higher for the female member of the household (36% compared to 26%), so working wives are on average more educated than their spouses. In addition, they are on average two years younger. Finally, the burden of the housework share is vastly taken by the female member of the household: on average, female housework share is around 70%. Further, it is higher the lower the educational
level of the female is, but even for women with college studies, the female housework share reaches 65%. Regarding age, younger women seem to share the housework with their husbands more than older ones, although for all ages they do most of the housework tasks. Finally, only 3% of the households receive family aid.

### 6.2. Female share of household work and the gender wage gap

Proposition 2 above implies that, under the G-equilibrium, the female share of housework is larger than 0.5 and the wage gap favours men. In addition, the higher the gender wage gap, the higher the female housework share will be in equilibrium. Thus, from an empirical point of view, we should observe a positive correlation between the female share and the gender wage gap within couples. This is the first empirical implication to be tested with our dataset.

**Figure 6: Correlation between Gender Wage Gap and Female Housework Share**

![Graph showing correlation between gender wage gap and female housework share across countries.](image)

Notes: (X-axis) Female Housework Share is constructed as the relative (%) share of housework task that married working females exert relative to married working males (from HETUS). (Y-axis) Raw Gender wage gaps for workers with less than tertiary education – 2001.

We present two types of evidence to check whether Proposition 2 holds. The first one is just a descriptive correlation between aggregate gender wage gaps and aggregate female housework share across countries. The HETUS website allows users to get information on the average time spent by men and women in housework tasks for specific demographic groups and for several countries. In particular, we have selected married and working men and women with less than tertiary education and computed the female share of housework. In Figure 6 this share is plotted against the gender wage gap.
gap of workers 15-65 years of age with that educational attainment (as in Figure 1) for several OECD countries. As can be inspected, the correlation, excluding the Italian outlier (see discussion in footnote 4), is strongly positive and therefore consistent with Proposition 2.

Secondly, we make use of the micro-data in the STUS to compute the intra-household division of housework tasks. Specifically, we select households of working couples as our unit of analysis and look at the effect of the gender wage gap within the household on the female relative share of housework task \( s/(1-s) \). We estimate a linear relationship between the log of \( s/(1-s) \) and the (logged) wage gap within the couple (log hourly wage man - log hourly wage woman). Other controls are the education levels and full-time job status of both women and spouses, number of children and controls for regions. Initially, we also included the age of both women and spouse, although we finally decided to exclude them as they were not statistically significant. OLS results are presented in the first column of Table 2.\(^{15}\)

The results reveal that the response of the female relative housework share with respect to the (logged) wage gap is such that an increase of 1 percentage point in the gap raises the female share by 2 percentage points, and this magnitude is close to being statistically significant at 5% significance level.\(^{16}\) Other interesting results are the expected ones: female’s higher educational attainment and working full-time (relative to part-time) lead to a reduction of the female housework share, whereas a greater number of children increases it.

\(^{15}\) It may be argued that the wage gap is endogenous for the female housework share: Indeed, unobserved individual characteristics may be positively correlated with the wage gap, thus creating spurious correlation between this variable and the error term. We have tried to instrument the wage gap with second or third-order polynomials in the age gap and interactions between female education and the age gap, as in Mroz (1987), Fortin and Lacroix (1997) and Chiappori et al. (2002). However, the correlation between these variables and the logged wage gap is very weak, which prevents them from being used as suitable instruments. Unfortunately, STUS does not contain any other variables that can be used as adequate instruments for the gender wage gap.

\(^{16}\) The estimated coefficient (0.096) corresponds to \( \partial \log(s/(1-s))/\partial \log \omega \). Thus, \( \partial s/(1-s)0.096 = s(1-s)0.096 \). Using the average value of \( s \) in Table 1 (0.69) yields a response of 0.02 with a standard error of 0.0106 computed using the delta method.
Table 2. Estimates of the Impact of the Gender Wage Gap on the Relative Female Housework Share (s). Dependent Variable: log(s/(1-s))

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Wage Gap (men-women)</td>
<td>0.096*</td>
<td>0.086*</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Dummy of Rich Region</td>
<td>---</td>
<td>-0.087*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.05)</td>
</tr>
<tr>
<td>Secondary Educ. (woman)</td>
<td>0.028</td>
<td>0.028</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Secondary Educ. (spouse)</td>
<td>-0.09</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>University Educ (woman)</td>
<td>-0.12</td>
<td>-0.13*</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>University Educ. (spouse)</td>
<td>-0.14**</td>
<td>-0.14*</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Full-time job (woman)</td>
<td>-0.41***</td>
<td>-0.40***</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Full-Time job (spouse)</td>
<td>0.53***</td>
<td>0.53***</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>Number of children</td>
<td>0.14***</td>
<td>0.14***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
</tbody>
</table>

R-squared                     | 0.061         | 0.063         |
N. observations               | 1578          | 1578          |

Note: Robust standard errors. *, **, *** mean significantly different from zero at 10%, 5% and 1% levels, respectively. In column [1], 17 controls for CCAA are also included. Rich Regions are those with GDP per capita above the Spanish average: Balearic Islands, Cataluña, Madrid, Navarra and the Basque Country.

6.3. Female Share of Household work and Productivity

Given the evidence shown above, we can describe Spain as exhibiting, if anything, a G-equilibrium. Proposition 3 above suggests that the G-equilibrium in economies with high productivity levels will exhibit a lower female housework share than in economies where productivity levels are smaller, a prediction that can be tested with our data.

As before, we present two types of evidence. First, simple aggregate correlations for those countries participating in HETUS are offered. Next, more elaborate intra-household evidence from STUS is presented. Regarding the former, Figure 7 displays GDP per capita and the female share of household work across countries. The correlation is strongly negative, and therefore consistent with Proposition 3.
In order to measure the partial correlation between productivity and the within household female share, we can make use of the fact that we have information on the Spanish regions (Comunidades Autónomas or CC.AA) in which the household lives. Given that there are significant differences in productivity levels among regions, we can address to what extent more productive regions exhibit a lower female housework share, as Proposition 3 asserts. Regional productivity levels are measured in terms of regional GDP per capita (in 2002) and we compute the average female housework share by region from our sample of couples. Five regions exhibit GDP per capita clearly above the national average in 2002: Balearic Islands, Cataluña, Madrid, Navarra and the Basque Country. We denote these as “rich regions”. At the aggregate level, Figure 8 depicts the correlation between regional labour productivity and the female share, which turns out to be negative as well. At the micro level, a dummy variable for rich regions is constructed and, from an OLS regression, we look at the impact of working a rich region on the female share of housework task. We also interacted this dummy variable with the logged wage gap but the coefficient turned out to be insignificant. Column 2 of Table 2 displays the results of this exercise. The impact of working in a rich region is significantly negative at the 10% level, which indicates the existence of a smaller female share in housework tasks in more productive regions, as Proposition 3 suggests.
6.4. Female share of housework and policies

The empirical predictions of the theoretical model regarding the effect of a subsidy are not clear-cut: in asymmetric households where men have more bargaining power than women, a subsidy targeted at working women can shift the G-equilibrium to the U one. However, in a symmetric household, the U-equilibrium can only be achieved through a subsidy targeted at both members of the household. Testing accurately this empirical prediction is not feasible with the data at hand. The micro-data on the STUS lacks information regarding a possible symmetric or asymmetric behaviour of members of the household. Furthermore, it is not possible to address whether the male, female or both receive a family-aid subsidy. In these circumstances, all we can present is some descriptive evidence on the correlation between the percentage of GDP spent on family aid expenditure and the female share of housework task across countries. Figure 9 displays such correlation. The relationship between the two variables is strongly negative: countries which devote a greater share of the GDP to family aid are those where the female share of housework is lower, and vice versa. This preliminary evidence may be interpreted in terms of our discussion in section 5.3 about asymmetric economies where a different bargaining power may exist. However, more research needs to be done in order to clarify the channels through which these subsidies affect household decisions.
7. Conclusions

We have proposed a simple model of self-fulfilling prophecies discrimination of women based on statistical discrimination of ex-ante identical partners in households. As opposed to other models in this literature, our model does not rely on the unobservability of effort, efficiency wages in some sectors or adverse selection problems. Instead, we propose a framework in which employers train equally productive men and women, but have different expectations about the distribution of disutility shocks (unexpected need of household work) each gender receives after they have been trained for a job. If future wages are predetermined with regard to these shocks, then the quit job rates will differ across genders, causing labour market participation to depend on expected wages and vice versa.

Our model gives rise to multiple equilibria -gendered and ungendered- leading to several policy implications which are harder to obtain in other models. First, in contrast to most of the literature, welfare in the symmetric equilibrium may be greater than in the asymmetric one. The reason for this is that having one member of the household specializing in home production has two opposing effects: on the one hand, it leads to greater expected household income, as is standard in existing work; on the other, the disutility of housework is minimized when this task is shared amongst household members. Which effect dominates crucially depends on the level of
productivity: the ungendered equilibrium results in higher welfare in highly productive economies, while the opposite holds in less productive ones. The immediate implication of this result is that the desirability of policy intervention may not be the same in all economies.

We have shown that a policy of family aid (e.g., wage subsidies) targeted to married women may not only fail to achieve a symmetric equilibrium but could also worsen the wage gap across genders. In contrast, neutral aid that is targeted to the whole family will be more efficient in leading to an ungendered equilibrium, and such policy works better in more productive economies.

Some preliminary evidence for Spain using a time-use survey seemingly confirms some of our predictions concerning the relationship between wages and the sharing of household tasks, as well as on the role of productivity. However, more empirical work is needed in order to test other ones, notably the effect of alternative policies whose effects we cannot identify with the dataset at hand. This remains in our future research agenda.
Data Appendix:

<table>
<thead>
<tr>
<th>Group of Activities</th>
<th>Activities included</th>
</tr>
</thead>
<tbody>
<tr>
<td>0. Personal Care</td>
<td>Sleep, eat, other personal care</td>
</tr>
<tr>
<td>1. Job</td>
<td>Main and second job, activities related to employment</td>
</tr>
<tr>
<td>2. Study</td>
<td>School and University, homework</td>
</tr>
<tr>
<td>3. Family and housework</td>
<td>Food preparation, dish washing, cleaning dwelling, other household upkeep, laundry, ironing, handicraft, gardening, tending domestic animals, caring for pets, walking the dog, construction and repairs, shopping and services, physical care, supervision of child, teaching, reading and talking with child, other domestic work</td>
</tr>
<tr>
<td>4. Voluntary work and meetings</td>
<td>Organisational work, informal help to other households, participatory activities</td>
</tr>
<tr>
<td>5. Social life and leisure</td>
<td>Visits and feasts, other social life, entertainment and culture, resting</td>
</tr>
<tr>
<td>6. Sports and outdoor activities</td>
<td>Walking and hiking, other sports or outdoor activities</td>
</tr>
<tr>
<td>7. Hobbies and computer games</td>
<td>Computer and video games, other computing, other hobbies and games</td>
</tr>
<tr>
<td>8. Lecture, radio and TV</td>
<td>Reading books, other reading, TV and video, radio and music, unspecified leisure</td>
</tr>
<tr>
<td>9. Travel related to work or others</td>
<td>Travel to/from work, study or shopping, other travel</td>
</tr>
</tbody>
</table>
References