A discusión

PERSISTENCE OF THE GENDER WAGE GAP: THE ROLE OF THE INTERGENERATIONAL TRANSMISSION OF PREFERENCES*

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ABSTRACT

This paper provides an explanation of the evolution and persistence of the gender wage gap due to differences in training within the framework of an overlapping generations model with intergenerational transmission of preferences. "Job-priority" and "family-priority" preferences are considered. Firms' policy and the distribution of women's preferences influence each other and are endogenously and simultaneously determined in the long run. The results show though the gender gap in training will diminish, it will also will persist over time. This is because both types of women's preferences coexist at the steady state due to the socialization effort of parents to preserve their own cultural values.

Key words: gender wage gap, firm training, women preferences, cultural transmission.

JEL classification: J31, H31, J71

1 Introduction

The wage differential between men and women has been persistent over time. Although a decline in the wage gap has been observed since the 1970s, a significant gender gap still exists. Altonji and Blank (1999) find that women received 29% lower hourly wages than men in 1995, whereas the difference was 46% in 1979.

Gender differences in on-the-job training are often considered as an important source of this male/female wage gap. Gronau (1988) estimates that the gender gap is about 30% and that two thirds of this gap can be explained by gender differences in firm training, so that if this factor was eliminated the wage gap would be reduced to 10%.[1] Likewise, the lower firm training of women is often related to their weaker labour force attachment. When some on-the-job training is necessary to perform a job, it is costly for the firms to lose workers. Then employers who view women as being more likely to leave the firm will sort women into jobs with fewer training opportunities. Gronau (1988) finds that on average, women report that their jobs require only 9 months of training, compared with 20 months for men and that labour force separations rates are four times as prevalent among women as among men.[2]

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[1] Other studies that have found that firm training significantly affect the gender wage gap are Lynch (1992), Barron et al. (1993), Hill (1995), Macpherson and Hirsch (1995), and Olsen and Sexton (1996).

[2] More examples can be found in Duncan and Hoffman (1979), Royalty (1996), Altonji and Spletzer (1991), Viscusi (1980), among others. Royalty (1996) points out that about

Nevertheless, times have changed. Women are becoming more attached to the labour force. Later cohorts of women show lower separation rates (Light and Ureta, 1992), and accordingly, gender differences in the acquisition of on-the-job training have narrowed substantially in later years (Olsen and Sexton, 1996).

Curiously, several papers have addressed the question of the *existence* of segregation of women in jobs with less training opportunities.[3] However, it has not been theoretically analyzed how this type of occupational segregation will evolve and whether it will persist at the light of the recent changes in the women's labour force attachment. Both, *evolution* and *persistence* of occupational segregation will depend on whether the commitment of women to the labour force continues to increase. Costa (2000) points out that although substantial progress has been made, the commitment of men and all women is not yet comparable.

In order to start with this analysis, it seems interesting to know why

one-quarter of the greater propensity of men to receive company training is explained by the different investment horizons of women.

[3] See Kuhn (1993) or Barron et al. (1993), for example, for theoretical models in which workers with weaker attachment to the labour market are segregated to jobs that offer less training. There are also models that link the lower attachment of women to the labour force with other low-paying characteristics. For instance, Goldin (1986) finds women more likely to occupy jobs with a piece rate system of payment and Bulow and Summer (1986) find women less likely to be offered efficiency wage jobs. A survey of the theories of occupational segregation can be found in Anker (1997).

women withdraw from the labour market more often than men. Gronau (1988) found that women leave the labour market due to demographic factors (e.g., children, marriage, divorce, migration). He states: "In the absence of this factor, labour force separation rate would have been about the same for both sexes" (Gronau, 1988, p.292). Viscusi (1980) and Sicherman (1996) also found similar results; men hardly even interrupt their career for personal or household considerations. It seems to be a kind of "social norm" that children internalise during the socialization process. This point leads us, in turn, to focus on this socialization process. Parents play a crucial role in the socialization of children; they try to shape the preferences of their children taking into account the type of labour market that they children will face.

The contribution of this paper is to address this issue. This paper analyses the evolution and persistence of occupational segregation of women into jobs with less training opportunities, considering that the labour force attachment reflects the attitudes and preferences acquired during the socialization process.[4] Likewise, the socialization process, in which parents play a crucial role, will depend on expectations about firms' policy. With this aim in mind, a simple overlapping generations model with statistical discrimination in job assignment, rational expectations and intergenerational transmission of preferences is proposed.

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[4] See Hakim (2000, 2002) for a study of how lifestyle preferences are a major determinant of women's differentiated labour market careers.

In the model presented, two types of preferences are considered among women's population: *job-priority* and *family-priority* preferences. The roles and attitudes concerning house and market work that are transmitted among generations will be denoted by preferences. Women with family-priority preferences get a higher utility from time devoted to family activities so that when they are confronted with the double responsibility of work and family, they prefer to leave the labour market. Conversely, women with job-priority preferences do not leave the labour market. To keep the model simple, men are assumed to have job-priority preferences as a way to capture social norms. Children acquire preferences from their parents (vertical transmission) and/or from some members of the parent's generation (oblique transmission). Specifically, we draw from the model of cultural transmission by Bisin and Verdier (1998, 2000 a/b, 2001).

Firms in this model choose the on-the job training provided for each job that they offer. The problem is that firms cannot distinguish between a job-priority woman and a family-priority woman; they decide using the probability of labour force withdrawal of women on average and statistical discrimination arises (Aigner and Cain, 1977; Cain, 1986). Hence, if employers view women on average as being more susceptible to leave the labour market, they will sort women into jobs that require less on-the-job training.[5]

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[5] As suggested by Becker (1985), the lower women's attachment to the labour force can be reflected not only in time but also in effort in market work. For a similar model where firms statistically discriminate and women could be segregated to jobs where workers effort

We find that some gender wage gap will persist but that a decline in the male/female wage differential should be expected. The reason is that there exists a unique stable steady state of the distribution of preferences involving both types of women.[6]

This result is consistent with the one obtained by Coate and Loury (1993). Their model analyzes the question of the persistence of statistical discrimination but from a different perspective. Particularly, they examine whether affirmative action policies will eliminate negative stereotypes that lead some groups to be discriminated against. The persistence of statistical discrimination could be explained, under some circumstances, by the ineffectiveness of such policies to break down the logic that leads minority groups to make choices that confirm employers' negative beliefs (stereotypes) in equilibrium. However, in the model presented in this paper, we analyze the possibility that statistical discrimination could disappear without any policy intervention, as a result of changes in attitudes over generations. We examine whether this mechanism could per se lead to the disappearance of statistical discrimination.

is easily monitored see Escriche et al. (2000).

There is large body of evidence showing the labour market sorts women into jobs with low-paying characteristics (see Macpherson and Hirsch, 1995, for example).

[6] The persistence of gender differences in labour market outcomes have always concerned economists, but it has been difficult to explain it theoretically. Becker's models based on a "taste for discrimination" explain the existence of the gender gap but predict the elimination of discrimination by competition (Becker, 1957).

The paper is organized as follows. Section 2 contains some basic features of the model: the types of preferences, the optimal firms' policy, the utility functions and the socialization process. Section 3 describes parents' education effort. Section 4 computes the steady state of the distribution of preferences among the women's population and some comparative static results. Finally, the discussion of the results and directions for future research are summarized in Section 5.

2   The model

We consider an overlapping generations model. The women's population is a continuum and each individual lives for two periods and is productive only in the second period. In the first period, as a child, the individual is educated in some preferences and, at the beginning of the second period, as an adult, she becomes active in the labour market and is hired by a firm. Each woman has one female offspring, hence the size of the women's population is constant. A new generation replaces the old one in the labour market.

2.1 Preferences.

There are two types of preferences (j and f) among the population. Individuals receive demands for non-market use of their time (home labour, children and care of the elderly, etc.) and they decide whether to leave

the labour market or not according to their preferences. In this model, family-priority individuals (those with f-type preferences) withdraw from the labour market. By contrast, job-priority individuals (those with j-type preferences) never leave the labour market. We assume that men, as a way to capture social norms, have job-priority preferences. Women could have j-preferences or f-preferences. Let q_t denote the fraction of job-priority women at time t among the population of women.

2.2 Firms: the on-the-job training problem.

In this model each individual, at the beginning of the second period of his life, is hired by a firm. The period of tenure with this firm is divided into a training period and a post-training period. We adopt a simplified version of Kuhn's model (1993).

Workers' productivity depends on the job they occupy. Specifically, a worker's productivity in the post-training period depends on the job he is matched with, and post-training output in any job is a function of the amount of training required to learn it C. Let $f(C)$ be this function with $f' > 0$, $f'' < 0$ and $f'(0) = \infty$. Productivity in the training period is given for simplicity by $f(C) - C$. The training is firm specific and financed by the firm.

Women receive demands for non-market use of their time with an exogenous probability $\mu \in (0, 1)$ at the beginning of the post-training period. This probability depends on exogenous factors such as child care facilities,

household aids, male participation in home labour and so on. As only family-priority women leave the labour market when such a demand arises, women's labour force withdrawal probability is given by

$$p_t = (1 - q_t)\,\mu,$$

where q_t is the fraction of j-women at time t, with adult women's population normalized to 1. Thus, the withdrawal probability of women p_t, given μ, is increasing in the proportion of women with family preferences, $(1 - q_t)$. It is assumed that firms know this probability p_t, that is, they know the probability, on average, that a woman leaves the labour market.

Because the labour market is competitive, firms in this model will design jobs to maximize the expected lifetime incomes of the workers that will occupy them.

Firms' problem for women-workers. Since firms cannot distinguish between the two types of women, they offer every women the same type of job. Formally, the problem for firms is to decide the on-the-job training that maximizes the expected lifetime productivity of a worker:

$$\max_C \; [f(C) - C] + \delta(1 - p_t)f(C) \tag{1}$$

subject to a zero-profit constraint, where $\delta \in (0, 1)$ is the discount factor of the firms. The optimal training to perform a job is characterized by the following first-order condition:

$$f'(C) = \frac{1}{1 + \delta(1 - p_t)}. \tag{2}$$

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Let $\hat{C}_t = \hat{C}(q_t; \delta, \mu)$ denote the solution to the firm problem (1). It is straightforward to check that (i) the lower the probability to withdraw from the labour market μ and (ii) the higher the fraction of job-priority women, the higher the on-the-job training provided by firms for women will be.

To focus on essentials, we assume that wages are identical in the training and post-training period and equal to the average lifetime output of a worker. Let $\bar{f}(\hat{C}_t)$ denote this expected average lifetime value of output:

$$\bar{f}(\hat{C}_t) = \frac{1}{2}[f(\hat{C}_t) - \hat{C}_t] + \frac{1}{2}\delta(1 - p_t)f(\hat{C}_t). \qquad (3)$$

Thus, a worker's wage is higher than his current productivity during the training period and lower during the post-training period, $[f(\hat{C}_t) - \hat{C}_t] < \bar{f}(\hat{C}_t) < f(\hat{C}_t)$. Hereafter, we will denote the wages for women in the training period and the post-training period -to facilitate posterior analysis- by w_1 and w_2, respectively; hence, $w_1 = w_2 = \bar{f}(\hat{C}_t)$.

It is interesting to mention that, in equilibrium, the higher the probability of exit from the labour force, the lower the women's wage. To see this, we calculate the derivative of expression (3) :

$$\frac{\partial \bar{f}(\hat{C}_t)}{\partial p_t} = \frac{\partial \hat{C}_t}{\partial p_t} \Big[[1 + \delta(1 - p_t)] f'(\hat{C}_t) - 1 \Big] - \delta f(\hat{C}_t), \qquad (4)$$

which is negative, since $f'(\hat{C}_t) - \frac{1}{1+\delta(1-p_t)} = 0$ because of the first order condition (2).

Firms' problem for men-workers. The problem when firms face a male

applicant is

$$\max_{C^M} [f(C^M) - C^M] + \delta f(C^M),$$

where C^M is the training on the job for men. The solution of this problem comes from the first order condition $f'(C) = \frac{1}{1+\delta}$ and will be denoted by $\hat{C}^M = \hat{C}(\delta)$. As in the case of women, we assume that the wage is the same in both periods and equals the annualised lifetime output of a man, that is, $w_1^M = w_2^M = \bar{f}(\hat{C}^M)$, with $\bar{f}(\hat{C}^M) = \frac{1}{2}[f(\hat{C}^M) - \hat{C}^M] + \frac{1}{2}\delta(1 - p_t)f(\hat{C}^M)$. Notice that men's wages will be higher than women's wages whenever there exists some probability that women leave the labour market.

2.3 The women's utility functions.

The utility depends on the lifetime incomes and also, for family priority women, on the non-monetary payoff, F, of family time. The utility function for f women and j women are, respectively,

$$U^f = w_1 + \delta\left[(1 - \mu)w_2 + \mu F\right],$$

$$U^j = w_1 + \delta w_2,$$

where δ is the discount factor (for simplicity, the same as the firm). It is assumed that the non-monetary payoff F exceeds the wage w_2 (specifically, $F > w_2(\hat{C}_t)$, $\forall \hat{C}_t$) so that it is rational for family-priority women to leave the firm in the post-training period if family responsibilities demand such action (which occurs with probability μ).

2.4 The cultural transmission of preferences.

Socialization determines the distribution of preferences among women. We will draw from the model of cultural transmission of preferences developed by Bisin and Verdier (1998, 2000 a/b, 2001). Children acquire preferences through observation, imitation and learning of cultural models prevalent in their social and cultural environment. In particular, children are first exposed to their families, and then to the population at large. So, we assume both vertical transmission, with children learning from their parents, and oblique transmission, with children learning from other adults. The paper by Antecol (2000), concerning cross-country differences in the gender gap in labour force participation rates, suggests some evidence of vertical and oblique transmission of tastes regarding family structure and women's roles in market versus domestic work (see Antecol, 2000; abstract).

The socialization of an individual works as follows.[7] The mother (type j or f) educates her child with an education effort $\tau^i \in (0,1)$, $i = \{j, f\}$. With probability equal to the education effort, τ^i, education will be successful and she transmit her preferences. With probability $(1 - \tau^i)$ the girl does not adopt her mother's preferences and she picks the preferences from another adult women chosen randomly from the population.

Let P_t^{iz} denote the probability that a girl from a mother with preferences i is socialized to preferences z. The socialization mechanism just introduced

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[7]Since all men have job-priority preferences, the following socialization process is only relevant for women.

is then characterized by the following transition probabilities, for all $i, z \in \{j, f\}$:

$$P_t^{jj} = \tau^j + (1 - \tau^j)q_t, \qquad (5)$$

$$P_t^{jf} = (1 - \tau^j)(1 - q_t), \qquad (6)$$

$$P_t^{ff} = \tau^f + (1 - \tau^f)(1 - q_t), \qquad (7)$$

$$P_t^{fj} = (1 - \tau^f)q_t, \qquad (8)$$

For instance, P_t^{jj} is the probability that a daughter of a job-priority mother is socialized to job-priority preferences. In particular, with probability τ^j, she adopts her mother preferences and with probability $(1 - \tau^j)$ she adopts these preferences from other j women with whom she is randomly matched.

Given the transition probabilities P_t^{iz}, the fraction of adult women with job-priority preferences at period $t + 1$ is given by

$$q_{t+1} = q_t + q_t(1 - q_t) \left[\tau^j - \tau^f \right], \qquad (9)$$

which is the equation on differences that shows the dynamic of the distribution of preferences among the women's population.

3 The education effort choice.

Parents are altruistic and care about their children. The utility a girl will obtain depends on her preferences. For this reason, mothers try to transmit

the more valuable preferences through education in accordance with their own expectations about firms' policy.

Mothers can affect their girls' probability of direct socialization through some education effort. With probability equal to the education effort, denoted by τ^i, a mother with preferences i will be successful. But education effort involves some direct and indirect costs: it is time-consuming, it conditions the choice of neighborhood and school in order to affect the social-cultural environment where their children grow up and so on. Let $c(\tau^i)$ denote the cost of the education effort τ^i, $i \in \{j, f\}$ and assume that $c(0) = 0, c' > 0$ and $c'' > 0$; specifically, we work without loss of generality, with the functional form $c(\tau^i) = \frac{(\tau^i)^2}{2k}$. Thus, we have mothers trying to maximize their children welfare net of the socialization cost. A mother of type i choose the education effort $\tau^i \in \{0, 1\}$ that solves:

$$\max_{\tau^i} \left[P_t^{ii}(\tau^i, q_t) V^{ii}(C_{t+1}^e) + P_t^{iz}(\tau^i, q_t) V^{iz}(C_{t+1}^e) \right] - \frac{(\tau^i)^2}{2k}, \qquad (10)$$

where P_t^{iz} are the transition probabilities and $V^{iz}(C_{t+1}^e)$ is the utility a mother with preferences i attributes to her child with preferences z if the child matches a job with an expected amount of training C_{t+1}^e (in period $t+1$, as an adult).

As in Bisin and Verdier (1998), it is assumed that parents perceive the welfare of their children only through the filter of their (parents') preferences. This implies that in order to asses $V^{iz}(C_{t+1}^e)$, a mother of type i uses his own

utility functions.[8] Hence, mothers obtain higher utility if their children share their preferences. Formally, it implies that $V^{jj}(\cdot) \geq V^{jf}(\cdot)$ and $V^{ff}(\cdot) \geq V^{fj}(\cdot)$ as will be confirmed by the analysis that follows.

Then, taking into account the utility functions, we can establish the expected utilities $V^{iz}(C^e_{t+1})$:

$$V^{jj}(C^e_{t+1}) = w_1\left[C^e_{t+1}\right] + \delta w_2\left[C^e_{t+1}\right] \tag{11}$$

$$V^{jf}(C^e_{t+1}) = w_1\left[C^e_{t+1}\right] + \delta(1-\mu)w_2\left[C^e_{t+1}\right] \tag{12}$$

$$V^{ff}(C^e_{t+1}) = w_1\left[C^e_{t+1}\right] + \delta\left[(1-\mu)w_2\left[C^e_{t+1}\right] + \mu F\right] \tag{13}$$

$$V^{fj}(C^e_{t+1}) = w_1\left[C^e_{t+1}\right] + \delta w_2\left[C^e_{t+1}\right] \tag{14}$$

Note that the expected utility for a girl socialized as family-priority type is different when evaluated by an f mother or a j mother; that is, $V^{ff}(C^e_{t+1})$ and $V^{jf}(C^e_{t+1})$ are different because an f mother includes the psychological payoff F from leaving the labour market and a j mother does not. Hence, $V^{ff}(C^e_{t+1}) > V^{jf}(C^e_{t+1})$. Hereafter, we denote the relative gains the mothers perceive for socializing their girls with their own values by $\Delta V^j\left[C^e_{t+1}\right] = V^{jj}(C^e_{t+1}) - V^{jf}(C^e_{t+1})$ for j-mothers and $\Delta V^f\left[C^e_{t+1}\right] = V^{ff}(C^e_{t+1}) - V^{fj}(C^e_{t+1})$ for f-mothers. Specifically, these relative gains are

$$\Delta V^j\left[C^e_{t+1}\right] = \delta\mu w_2(C^e_{t+1}), \tag{15}$$

$$\Delta V^f\left[C^e_{t+1}\right] = \delta\mu\left[F - w_2(C^e_{t+1})\right]. \tag{16}$$

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[8]Their own preferences are the best proxy they have for evaluating their child's welfare; this particular form of myopia is called *imperfect empathy* by Bisin and Verdier(1998).

Now we turn to the maximization problem. The first-order condition is:

$$\frac{d\,P_t^{ii}\,(\cdot)}{d\,\tau^i}V^{ii}\,{}^{|}C_{t+1}^e\,{}^{\mathbb{C}} + \frac{d\,P_t^{iz}\,(\cdot)}{d\,\tau^i}V^{iz}\,{}^{|}C_{t+1}^e\,{}^{\mathbb{C}} = \frac{\tau^i}{k},$$

and by derivative of (5) to (8) and by substitution, it follows that:

$$k\,{}^{\pounds}\Delta V^j\,{}^{|}C_{t+1}^e\,{}^{\mathbb{C}\alpha}\,(1-q_t) = \hat{\tau}^j$$

$$k\,{}^{h}\Delta V^f\,{}^{|}C_{t+1}^e\,{}^{\mathbb{C}|}\,q_t = \hat{\tau}^f,$$

where $\hat{\tau}_t^j = \hat{\tau}^j(q_t, C_{t+1}^e)$ and $\hat{\tau}_t^f = \hat{\tau}^f(q_t, C_{t+1}^e)$ denote the optimal educational efforts for both types of mothers. In order to guarantee interior solutions $\hat{\tau}_t^i \in (0,1)$, we assume that $\frac{1}{k} > \max {}^{\pounds}\Delta V^i\,{}^{|}C_{t+1}^e\,{}^{\mathbb{C}\alpha}$. Substituting (15) and (16), the optimal education efforts can be rewritten as:

$$k\delta\mu\,{}^{\pounds}w_2(C_{t+1}^e)\,{}^{\alpha}\,(1-q_t) = \hat{\tau}_t^j, \tag{17}$$

$$k\delta\mu\,{}^{\pounds}F - w_2(C_{t+1}^e)\,{}^{\alpha}\,q_t = \hat{\tau}_t^f. \tag{18}$$

It appears that the effort of mothers to transmit a particular preference depends on (i) the dominant preferences within the women's population (characterized by q_t) and (ii) the expectations about firms' training policy (which is characterized by C_{t+1}^e).

Derivation of the optimal education efforts, (17) and (18), with respect to q_t yields:

$$\frac{\partial\,\hat{\tau}_t^j}{\partial\,q_t} = -k\delta\mu\,{}^{\pounds}w_2(C_{t+1}^e)\,{}^{\alpha} < 0, \tag{19}$$

$$\frac{\partial\,\hat{\tau}_t^f}{\partial\,q_t} = k\delta\mu\,{}^{\pounds}F - w_2(C_{t+1}^e)\,{}^{\alpha} > 0. \tag{20}$$

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Therefore, the socialization effort of job-priority mothers decreases with the current fraction of j women in the population, as expression (19) shows. The reason is that the larger the fraction q_t, the better children are socialized to the j preferences by the social environment; in other words, oblique transmission acts as a substitute for vertical transmission.[9] By contrast, the socialization effort of family-priority mothers, $\hat{\tau}_t^f$, increases with q_t. The larger the fraction q_t, the more family-priority mothers must increase their socialization effort to offset the pressure of environment if they want to have their child share their same preferences. Notice that this result holds the expected on-the-job training constant and (as it has been shown in the previous section), employer training increases with the fraction of job-priority women (i.e., $\hat{C}_{t+1} = \hat{C}(q_{t+1}; \delta, \mu)$. It is assumed that each parent takes as given q_{t+1}, that is, the expected fraction of j women in the population since she considers the influence of her own socialization effort on the evolution of q_t negligible.

The other factor that determines the education effort of mothers is their expectations about the firms training policy.

Lemma 1 *The socialization effort of job-priority mothers, $\hat{\tau}^j(q_t, C_{t+1}^e)$, increases with the expected on-the-job training C_{t+1}^e; by contrast, the socialization effort of family-priority mothers, $\hat{\tau}^f(q_t, C_{t+1}^e)$, is decreasing with C_{t+1}^e,*

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[9]Bisin and Verdier (2000b) refer to this feature of educational effort as the "cultural substitution property".

that is:

$$\frac{\partial \ \hat{\tau}_t^j}{\partial \ C_{t+1}^e} \ = \ k\delta\mu(1 - q_t)\frac{\partial w_2 \left(C_{t+1}^e \right)}{\partial C_{t+1}^e} > 0 \qquad (21)$$

$$\frac{\partial \ \hat{\tau}_t^f}{\partial \ C_{t+1}^e} \ = \ -k\delta\mu q_t\frac{\partial w_2 \left(C_{t+1}^e \right)}{\partial C_{t+1}^e} < 0. \qquad (22)$$

Proof. This result is obtained by derivation of (17) and (18) with respect to C_{t+1}^e. ∎

The way mothers' socialization efforts change with respect to their expectations about the training requirements, differs according to type. The greater the on-the-job training, the higher the expected lifetime wages irrespective of the children's preferences. Thus, the opportunity cost of withdrawing from the labour market increases and, consequently, it is more advantageous to be a j woman than an f woman. This is the reason why the education effort of j mothers increases and the effort of f mothers decreases.

Preferences among the women's population evolve over time, according to (9). In the next section, the pattern of the distribution of preferences in the long run is analyzed.

4 The distribution of women's preferences and firms' training policy in the long run

The dynamics of the women's distribution of preferences is derived by substitution of the optimal education effort, $\hat{\tau}_t^j$ and $\hat{\tau}_t^f$ from (17) and (18), into

expression (9):

$$q_{t+1} = q_t + q_t(1 - q_t) \left[\hat{\tau}^j(q_t, C^e_{t+1}) - \hat{\tau}^f(q_t, C^e_{t+1}) \right].$$

We assume that agents have rational expectations which implies $C^e_{t+1} = \hat{C}_{t+1}$ and, as we have shown in Section 1, the optimal on-the-job training is a function of the fraction of j women in the population, that is, $\hat{C}_{t+1} = \hat{C}(q_{t+1}; \delta, \mu)$). Therefore, the above expression can be rewritten as follows:

$$q_{t+1} = q_t + q_t(1 - q_t) \left[\hat{\tau}^j(q_t, q_{t+1}) - \hat{\tau}^f(q_t, q_{t+1}) \right], \tag{23}$$

which is the equation in differences for q_t that characterizes the dynamics of the women's distribution of preferences.

This dynamic has three steady states: (i) $q_s = 0$, (ii) $q_s = 1$ and (iii) $q_s = \hat{q}_s \in (0, 1)$ where $\hat{\tau}^j_s = \hat{\tau}^f_s$. From equation (23), it is straightforward to check that when the socialization efforts of the two types are equal, the distribution of preferences is also stationary at a level denoted by $\hat{q}_s$; equalizing the l.h.s of (17) and (18), we get

$$k\delta\mu \left[w_2(C_s) \right] (1 - q_s) = k\delta\mu \left[F - w_2(C_s) \right] q_s, \tag{24}$$

and the steady state, $\hat{q}_s$, solves this equation.

Proposition 1 *Assume the training requirements determined by firms is given by $\hat{C}_t = \hat{C}(q_t; \delta, \mu)$ and women have rational expectations, $C^e_{t+1} = \hat{C}_{t+1}$. The only stable steady state of the distribution of preferences among*

women's population is $\hat{q}_s \in (0,1)$ which solves:

$$q_s = \frac{w_2 \quad \hat{C}(q_s; \delta, \mu)}{F} \tag{25}$$

Proof. See Appendix . ■

This Proposition establishes that, in the long run, there exists no distribution of preferences in which all women have job-priority preferences or family-priority preferences. Society achieves an interior steady state $\hat{q}_s \in (0,1)$ whatever the initial distribution of preferences; the heterogeneity of preferences is preserved in the long run. Notice that if $F < 2w_2(\cdot)$, at the steady state there will be a predominance of job priority preferences, that is, $\hat{q}_s \in \left[\frac{1}{2}, 1\right]$. (Similarly, if $F \geq 2w_2(\cdot)$, the steady state will be $\hat{q}_s \in (0, \frac{1}{2}]$.) By assumption, the value of family time F is higher than wage w_2, and from expression (25) it is obvious that the lower the value assigned to family time, the higher the proportion of j women at the steady state. Figure 1 illustrates the result of Proposition 1 (considering $F < 2w_2(\cdot)$). Note that there exist two different areas: (i) $\forall q_t < \hat{q}_s$ we have that $\hat{\tau}_t^j > \hat{\tau}_t^f$ and (ii) from $\forall q_t > \hat{q}_s$ we have that $\hat{\tau}_t^j < \hat{\tau}_t^f$. As we have shown above, these efforts are equal for $\hat{q}_s$.

Assume a traditional society (q_0 close to 0), where most women have family-priority preferences. As mothers try to transmit their own preferences and the j women are in a minority, the education effort of these type of women is high in order to offset the environment influence on their children. The opposite applies for the f women (see expressions (19) and (20)).
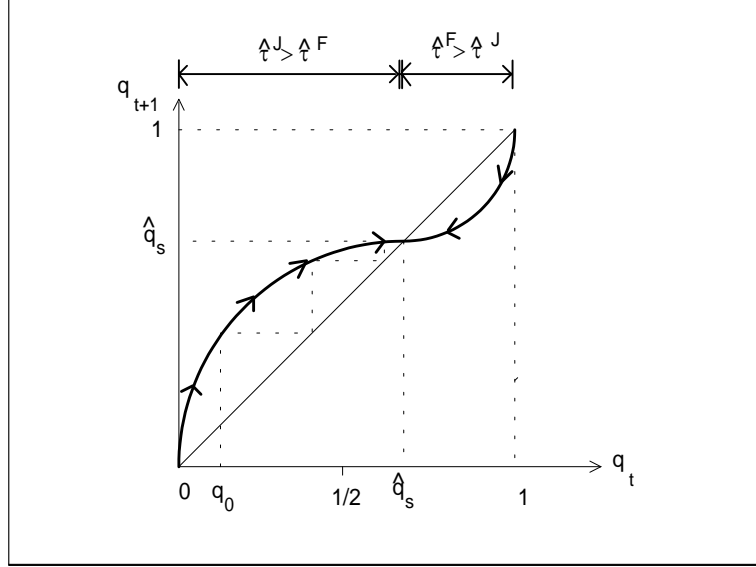
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Figure 1: Convergence to the steady state of the women distribution of preferences $\hat{q}_s$.

As a consequence of this first effect, job-priority preferences tend to expand among young generations (see (23) considering $\hat{\tau}_t^j > \hat{\tau}_t^f$). However, there exists a second factor which must be considered. The effort of mothers to socialize children in their own preferences is not independent of the potential benefits for inheriting these preferences. On this issue, families share identical points of view. The higher the expected wage, the higher the opportunity cost of leaving the labour market will be. Then j mothers have an additional incentive to intensify their education effort while the incentive to transmit family preferences for f mothers decreases (Lemma 1). In this context, the second effect reinforces the first one, and the fraction of

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job-priority women increases over generations (graphically, this change is represented by a movement along the bold curve).

To summarize, a traditional society evolves towards a society with more job-priority women. Nevertheless, society does not reach a state where all women are j because this expansion of j-preferences continue to the extent that the effort $\hat{\tau}_t^j$ exceeds the effort $\hat{\tau}_t^f$. But notice that the mothers effort evolves also with prevalent preferences in society (since oblique transmission substitutes vertical transmission). Accordingly, the effort of family priority mothers $\hat{\tau}_t^f$ increases with the expansion of j preferences (see (20)) and, by contrast, the effort of j mothers, $\hat{\tau}_t^j$, decreases (see (19)). Thus these efforts equal before a homogeneous society ($q_s = 1$) is achieved.

Two direct implications of the coexistence of preferences in the long run arise in this model.

Lemma 2 *Women's labour force withdrawal rate will not equal men's rate at the steady state and, accordingly, the job training received by women will never exceed men's.*

Logically, this result determines the evolution of wages.

Proposition 2 *If training levels in jobs are chosen optimally for men and women, and preferences are transferred among generations according to the socialization process described, the gender wage gap will persist in the long run.*

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The gender wage gap is the difference between $\bar{f}(\hat{C}_t)$ and $\bar{f}(\hat{C}^M)$. Since at the steady state women leave the labour market with higher probability than men, and wages are decreasing with this probability - see derivative (4)- the previous result arises.

Comparative statics

The determinants of the distribution of preferences within the women's population at the steady state $\hat{q}_s$ (μ, and F) affect the firm training in female jobs and, consequently, the gender wage gap in the long run.

First, a lower probability to exit the labour market μ of f women results in a higher fraction of job-priority women in the long run. Implicit differentiation of (25), where $w_2\left(\hat{C}(q_s;\delta,\mu)\right) = f\left(\hat{C}(q_s;\delta\mu)\right)$, yields:

$$\frac{d\hat{q}_s}{d\mu} = \frac{\frac{1}{F} f'\left[\hat{C}(\cdot)\right]\frac{\partial\hat{C}(\cdot)}{\partial\mu}}{1 - \frac{1}{F}\frac{\partial w_2\left(\hat{C}(q_s;\delta,\mu)\right)}{\partial\hat{q}_s}} < 0,$$

which is negative because: (i) the denominator is positive since condition (27) is verified at the steady state and (ii) the numerator is negative given that the first-order condition for optimal training (2) implies $\frac{\partial\hat{C}}{\partial\mu} < 0$.

Second, a lower non-monetary payoff of family care and housework F leads to a higher fraction of job-priority women in the long run:

$$\frac{d\hat{q}_s}{dF} = \frac{\frac{w_2\left(\hat{C}(\cdot)\right)}{F^2}}{1 - \frac{1}{F}\frac{\partial w_2\left(\hat{C}(q_s;\delta,\mu)\right)}{\partial\hat{q}_s}} < 0;$$

this expression is clearly negative arguing, as before, with respect to the denominator. The evolution and changes of this psychological payoff is beyond

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the scope of this paper. It seems probable that education at school and in the family could affect the "value" that a women places on family work, but this is a cultural norm that we consider should evolve without policy interferences since these could be controversial.

Summarizing, the gender gap will be lower the lower the exit probability μ of f women and the lower the payoff of non-market activities F will be.

Finally, our model may provide part of an explanation for the decrease in the labour market exit rates of women (formally, p_t) in the last decades.[10] Three factors can contribute to explain it. Firstly, an increase in the facilities to enabling mothers to combine market and family work (the parameter μ would diminish). Secondly, a decrease in the non-monetary payoff F for the non-market work. It is difficult to fully comprehend the evolution of this factor as it does not seem that women value child care any less now than in recent decades. Thirdly, an increase in women who prefer market to home work; labour market participation of women has increased in most Occidental economies. This fact could be a consequence of increases in q_t. To the extent that the preferences are private information, again, it is not easy to monitor the evolution of this variable.

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[10]Viscusi (1980) found that whereas females in manufacturing industries quit 80% more often than did men in 1958, the discrepancy has dropped to 16% by 1968.

5 Discussion of the results and future research.

This paper provides an explanation for the continued existence of the gender wage differential. The model presented has to be seen as a first step at integrating into a theoretical framework the interrelationship between gender differences in labour market withdrawal rates, firms' hiring policy and pre-market discrimination in the socialization process. Undoubtedly, girls and boys are not educated in the same way with respect to the relative value of market and non market work. This different treatment is reflected in women's labour market behavior. Nevertheless, society evolves. Parents realize that firms' policy can change and, consistent with this fact, try to transmit the most valuable preference (from their own point of view) to their children. As the distribution of preferences among the women's population changes, women's probability of leaving the labour market also changes and, in turn, so do the firms' policy. Specifically, employers, that statistically discriminate among workers by gender, will observe how female exit rates change and, accordingly, they will adapt the optimally designed jobs for men and women. There is a phenomenon of reinforcement between these three factors, each effect feeds back into the others.

The main result of the model is that the gender wage differential will persist, though a decrease is expected. Women will be sorted into jobs that provide less training than jobs offered to men. This result emerges because in the long run both types of women's preferences coexist.

The comparative static exercises show that the gender differential in on-the-job training and the relative proportion of both types of preference in the long run depend on a set of factors. This gender differential decreases (and the fraction of job-priority women increases) with the facilities to attend family responsibilities and increases with the utility that women derive from non-market activities. Consequently, the extension of policy measures favoring equal opportunities in the labour market (such as child allowances, a lengthening of the period of maternity and paternity leave, flexible work-time arrangements, the provision of crèches and, in general, those measures which help women combine work and child care/housework) will eventually reduce the differences in the labour market. Nevertheless, policy-makers should be concerned with non-labour market variables such as education, family policy, and a more equal sharing between the sexes of child care and household work.

We have shown that for an initial traditional society, the fraction of family-priority women will decrease over time. Thus three results emerge directly from the model presented. First, gender differences in levels of on-the-job training and in the wage gap will diminish. Empirical studies support this result; Olsen and Sexton (1996) found that training differences lessened between the 1970s and the 1980s. In 1976, men acquired 118 percent more current training on average that women; by 1985, that training differential had fallen to 90 percent. O'Neill and Polacheck (1993) show that recent

decline in the gender gap reflects improved training for women and this could be due to a decrease in employer discrimination, or an increase in women's education efforts and/or work attachment.

Second, the labour market participation of women will increase as a result of the spread of job-priority preferences. Costa's (2000, p.23) findings, for example, confirm this result. Since 1950 there has been an unprecedented increase in the participation of married women in paid labour in the United States. Between 1950 and 1998 their participation rates rose from 22% to 62%, with the largest increase between 1950 and 1980.

Third, the differentials on participation rates between men and women will persist, since at the steady state there will always exist a fraction of family-priority women. Preferences are private information and, consequently, we cannot observe their true evolution. But behavioral outcomes, which are the consequence of these preferences, become indirect measures of preferences. Notably then, as we have pointed out above, this rate has increased greatly in Occidental countries but it has not equalled that of men (60% compared to 90%, approximately). In this sense, Costa (2000, p.25) pointed out that "the relatively small size of married women's wages and income elasticities of labour market participation suggest that those women who are out of the labour force may very well have a very strong taste for remaining at home. Unless these tastes change the labour force participation rates of married women may not increase much above their current rate

of 62 percent". This observed apparent top of women's participation rates is consistent with the prediction of this model in that in the long run both types of preferences will coexist.

An interesting question for future research concerns the analysis of whether the educational level women bring to the labour market could be a signal of labour market withdrawal. Concerning this extension, Sicherman (1996) points out that schooling has a negative effect on departures for most of the non-market related reasons. Royalty (1996) finds that the positive effect of education on training is due to differences in turnover by education level.

On the other hand, formal education can be considered by job-priority mothers as a socialization instrument if we assume that schooling promotes this preferences (Bowles and Gintis, 1998, suggest that schooling promotes a particular type of preferences that firms specially appreciate -"incentive enhancing preferences"-). Thus the model can be extended considering family and school-college to be substitutes in the socialization process for job-priority mothers.

A   Proof of Proposition 2

The proof is divided into three steps. Firstly, it is proved that the steady states $q_s = 0$ and $q_s = 1$ are unstable. Secondly, we establish the existence and uniqueness of the interior steady state $\hat{q}_s$. Finally, we prove the stability $\hat{q}_s$.

First step. The steady states $q_s = 0$ and $q_s = 1$ are locally unstable if

$$\frac{dq_{t+1}}{dq_t}\bigg|_{q_{t+1}=q_t=0} > 1 \text{ and } \frac{dq_{t+1}}{dq_t}\bigg|_{q_{t+1}=q_t=1} > 1.$$

Implicit differentiation of (23) yields

$$\frac{dq_{t+1}}{dq_t} = \frac{1 + (1 - 2q_t)\left[\hat{\tau}^j(q_t, q_{t+1}) - \hat{\tau}^f(q_t, q_{t+1})\right] + q_t(1 - q_t)\frac{\partial\Delta\tau}{\partial q_t}}{1 - q_t(1 - q_t)\frac{\partial\Delta\tau}{\partial q_{t+1}}} \quad (26)$$

where $\frac{\partial\Delta\tau}{\partial q_t} = \frac{\partial}{\partial q_t}\left[\hat{\tau}^j(q_t, q_{t+1}) - \hat{\tau}^f(q_t, q_{t+1})\right]$ and $\frac{\partial\Delta\tau}{\partial q_{t+1}} = \frac{\partial}{\partial q_{t+1}}\left[\hat{\tau}^j(q_t, q_{t+1}) - \hat{\tau}^f(q_t, q_{t+1})\right]$.

Evaluating (26) at the steady state $q_s = 0$ and $q_s = 1$, we obtain that:

$$\frac{dq_{t+1}}{dq_t}\bigg|_{q_{t+1}=q_t=0} = 1 + \left[\hat{\tau}^j(0,0) - \hat{\tau}^f(0,0)\right] > 1$$

$$\frac{dq_{t+1}}{dq_t}\bigg|_{q_{t+1}=q_t=1} = 1 - \left[\hat{\tau}^j(1,1) - \hat{\tau}^f(1,1)\right] > 1.$$

It is easy to check that $\left[\hat{\tau}^j(0,0) - \hat{\tau}^f(0,0)\right] > 0$ and $\left[\hat{\tau}^j(1,1) - \hat{\tau}^f(1,1)\right] < 0$ (see expressions for optimal educational efforts (17) and (18)).

Second step. In order to prove the existence and uniqueness of the steady state which solves the equation (25), $q_s = \frac{w_2(\hat{C}(q_s;\delta,\mu))}{F}$, we define the functions $g(q_s) = q_s$ and $h(q_s) = \frac{w_2(\hat{C}(q_s;\delta,\mu))}{F}$. The function $g(q_s)$ is increasing and linear: $g'(q_s) = 1$. The function $h(q_s)$ is increasing and concave. Derivatives $h'(q_s)$ and $h''(q_s)$ require some calculations:

$$h'(q_s) = \frac{1}{F} \times \frac{\partial w_2\left(\hat{C}(q_s;\delta,\mu)\right)}{\partial p_t}\frac{\partial p_t}{\partial q_s} = \frac{\delta\mu}{F}f'\left(\hat{C}(q_s;\delta,\mu)\right) > 0$$

where expression (4) has been used, and

$$h''(q_s) = \frac{\delta\mu}{F}f'(C)\frac{\partial}{\partial \hat{q}_s}\hat{C}(q_s;\delta,\mu) > 0,$$

because $\frac{\partial}{\partial \hat{q}_s}\hat{C}(q_s;\delta,\mu) = -\frac{\mu}{(1+\delta(1-p_t))}\frac{1}{f''(C)} > 0$.

Summarizing, $g(q_s)$ is increasing and lineal, $h(q_s)$ is increasing and convex with $h(0) > 0$ and $h(1) < 1$. Hence there exits a unique interior solution $\hat{q}_s \in (0,1)$ that verifies (25).

To simplify the proof of stability of $\hat{q}_s$ notice that at the steady state $\hat{q}_s$ the relation between $g'(q_s)$ and $h'(q_s)$ is $h'(\hat{q}_s) < g'(\hat{q}_s) = 1$ or, equivalently:

$$\frac{1}{F} \times \left. \frac{\partial^3 w_2 \; \hat{C}(q_s; \delta, \mu)}{\partial q_s} \right|_{q_s = \hat{q}_s} < 1 \tag{27}$$

Third step. Global stability of $\hat{q}_s$.

We first show that for all $q_0 \in (0,1)$ there is a perfect foresight path of distribution of preferences that converges to the steady state q_s.

Assume $q_t \geq \hat{q}_s$, and women expect $\hat{q}_s < q_{t+1}^e \leq q_t$ then, $\hat{\tau}^j(q_t, C_{t+1}^e) \leq \hat{\tau}^f(q_t, C_{t+1}^e)$. Therefore, $q_{t+1}^e = q_{t+1} \leq q_t$ and the expectation is self-confirmed.

Assume $q_t < \hat{q}_s$ and women expect $q_t < q_{t+1}^e < \hat{q}_s$, then $\hat{\tau}^j(q_t, C_{t+1}^e) > \hat{\tau}^f(q_t, C_{t+1}^e)$. Therefore, $q_{t+1}^e = q_{t+1} > q_t$ and the expectation is self-confirmed.

Now, we evaluate the derivative (26) at $q_t = q_{t+1} = \hat{q}_s$ where $\hat{\tau} = \hat{\tau}^j = \hat{\tau}^f$ and we obtain:

$$\left. \frac{dq_{t+1}}{dq_t} \right|_{q_{t+1}=q_t=\hat{q}_s} = \frac{1 + \hat{q}_s(1-\hat{q}_s) \left. \frac{\partial \Delta \tau}{\partial q_t} \right|_{q_t=\hat{q}_s}}{1 - \hat{q}_s(1-\hat{q}_s) \left. \frac{\partial \Delta \tau}{\partial q_{t+1}} \right|_{q_{t+1}=\hat{q}_s}}. \tag{28}$$

The derivatives $\frac{\partial \Delta \tau}{\partial q_t}$ and $\frac{\partial \Delta \tau}{\partial q_{t+1}}$ are obtained from expressions (19) to (22):

$$\frac{\partial \Delta \tau}{\partial q_t} = \frac{\partial \hat{\tau}^j}{\partial q_t} - \frac{\partial \hat{\tau}^f}{\partial q_t} = -k\delta\mu F < 0 \tag{29}$$

$$\frac{\partial \Delta \tau}{\partial q_{t+1}} = \frac{\partial \hat{\tau}^j}{\partial q_{t+1}} - \frac{\partial \hat{\tau}^f}{\partial q_{t+1}} = k\delta\mu \frac{\partial^3 w_2 \; \hat{C}(q_{t+1}; \delta, \mu)}{\partial q_{t+1}}, \tag{30}$$

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where expressions (19) and (20) have been substituted in (29), and (21) and (22) in (30). By substitution of (29) and (30) into (28), it follows that

$$\left.\frac{dq_{t+1}}{dq_t}\right|_{q_{t+1}=q_t=\hat{q}_s} = \frac{1 - \hat{q}_s\left(1 - \hat{q}_s\right)k\delta\mu F}{1 - \hat{q}_s\left(1 - \hat{q}_s\right)k\delta\mu \left.\frac{\partial\,w_2\left(\hat{C}(q_{t+1};\delta,\mu)\right)}{\partial q_{t+1}}\right|_{q_{t+1}=\hat{q}_s}}. \qquad (31)$$

After some calculations with expression (31) we have that $\left.\frac{dq_{t+1}}{dq_t}\right|_{q_{t+1}=q_t=\hat{q}_s} < 1$ if $\frac{1}{F} \times \left.\frac{\partial\,w_2\left(\hat{C}(q_s;\delta,\mu)\right)}{\partial q_s}\right|_{q_s=\hat{q}_s} < 1$. We have shown that this condition holds at the steady state $\hat{q}_s$ (see (27)), therefore we obtain that $\left.\frac{dq_{t+1}}{dq_t}\right|_{\hat{q}_s} < 1$. (Notice also that the steady state $\hat{q}_s$ is locally stable if $\left.\frac{dq_{t+1}}{dq_t}\right|_{q_{t+1}=q_t=\hat{q}_s} < 1$.)

Finally, the expression (26) can be rewritten, substituting derivatives (29) and (30) as follows:

$$\frac{dq_{t+1}}{dq_t} = \frac{1 + (1 - 2q_t)k\delta\mu\left[w_2(\hat{C}(q_{t+1})) - Fq_t\right] - q_t\left(1 - q_t\right)k\delta\mu F}{1 - q_t\left(1 - q_t\right)k\delta\mu\frac{\partial\,w_2\left(\hat{C}(q_{t+1})\right)}{\partial q_{t+1}}}.$$

Clearly $\hat{q}_s$ does not depend on k, and neither do $\frac{\partial\,w_2\left(\hat{C}(q_{t+1})\right)}{\partial q_{t+1}}$. Therefore, considering k small enough, both the numerator and denominator of (31) will be positive. Then $\frac{dq_{t+1}}{dq_t} > 0$ for all q_t. (The dynamic (23) does not have neither an interior maximum nor a minimum in $(0,1)$.) Given that $\left.\frac{dq_{t+1}}{dq_t}\right|_{q_s=0} > 1$, $\left.\frac{dq_{t+1}}{dq_t}\right|_{q_s=1} > 1$ and $\left.\frac{dq_{t+1}}{dq_t}\right|_{q_{t+1}=q_t=\hat{q}_s} < 1$, this is a sufficient condition for global stability.

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