The Economic Journal, **117** (*April*), 837–857. © The Author(s). Journal compilation © Royal Economic Society 2007. Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

PERSISTENCE OF OCCUPATIONAL SEGREGATION: THE ROLE OF THE INTERGENERATIONAL TRANSMISSION OF PREFERENCES*

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This article provides an explanation of the evolution and persistence of the women's segregation in jobs with less on-the-job training opportunities 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 are endogenously and simultaneously determined in the long run. The results show though the gender gap in training will diminish, it will also persist over time. This is because both types of women's preferences coexist at the steady state due to the socialisation effort of parents to preserve their own cultural values.

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 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 separation rates are four times as prevalent among women as among men.[2]

Nevertheless, times have changed. 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 recent years (Olsen and Sexton, 1996).

* The author thanks Gonzalo Olcina, Rosario Sanchez, Empar Pons and Alison Smith and three anonymous referees for their helpful comments. Earlier versions of this paper were presented at the XXV Spanish Symposium of Economic Analysis, the IV Spanish Congress of Labour Economics and the 17th Annual Congress of the European Economic Association. I thank participants, in particular Alberto Bisin and Andrew Postlewaite, for helpful comments and suggestions. Thanks also to the European University Institute (Florence) for their hospitality during the last stages of this project. Financial support of the Spanish Ministry of Education and Science under grant SEC2005-08054-ECON is gratefully acknowledged. A first version of this article has circulated as a WP of the *Instituto Valenciano de Investigaciones Económicas* (Valencian Institute of Economic Research).

[1] Other studies that have found that firm training significantly affects 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 one-quarter of the greater propensity of men to receive company training is explained by the different investment horizons of women.

Curiously, several papers have addressed the question of the *existence* of segregation of women in jobs with less training opportunities (Kuhn 1993; Barron *et al.*, 1993, for example). However, it has not been analysed theoretically how this type of occupational segregation will evolve and whether it will persist in the light of the recent changes in 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.

Women withdraw from the labour market due to demographic factors – e.g., children, marriage, divorce, migration (Gronau, 1988) – whereas men hardly even interrupt their career for personal or household considerations (Viscusi, 1980; Sicherman, 1996). This different behaviour might reflect the values or preferences acquired by children during socialisation process. For example, altruistic parents who know that their female children will face discrimination may endeavour to shape the preferences of their children so that they will be comfortable in traditional roles (Altonji and Blank, 1999).

The contribution of this article is to address this issue analysing 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 socialisation process.[3] Likewise, the socialisation 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.

In the model presented, two types of preferences are considered among women's population: *job-priority* and *family-priority* preferences. Women with family-priority preferences prefer to leave the labour market when they are confronted with the double responsibility of work and family. Conversely, women with job-priority preferences do not leave the labour market. Children acquire preferences from their parents (vertical transmission) and/or from some members of the parents' 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;[4] that is, they do not know for sure whether she will leave the labour market. Firms 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 leaving the labour market, they will sort women into jobs that require less on-the-job training. As suggested by Becker (1985), the lower women's attachment to the labour force can be

[3] See Hakim (2000, 2002) for a study of how lifestyle preferences are a major determinant of women's differentiated labour market careers. A survey of the theories of occupational segregation can be found in Anker (1997).

[4] There is no empirical support for the existence in the labour maker of a signal of worker labour market attachment, as far as I know. Precisely, workers' gender is primary considered as this signal, Barron *et al.* (1993), for example. Although it may be accepted that some visible characteristics could signal or help firms to predict the quit probability, the empirical evidence shows that these signals or the estimated quit probabilities do not help to explain the observed gender differences in firm training (Weiss, 1988; Royalty, 1996).

reflected not only in time but also in effort in market work. There are studies 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 model that analyses the role of transmission of preferences and where women could be segregated into jobs where workers' effort is easily monitored can be found in Escriche *et al.* (2004).

We find that some gender wage gap will persist but 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. Consequently, women will be persistently segregated to jobs with fewer training opportunities.

Coate and Loury (1993) analyse the question of the *persistence* of statistical discrimination but from a different perspective. 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.[5] However, in the model presented in this article, we analyse 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.

The added value of the model presented in this article compared with a more standard static model with statistical discrimination is that the introduction of the dynamics in women's preferences over time allows us to explain the decline of statistical discrimination without any exogenous shock or without any policy intervention. In a static model of statistical discrimination, unless some exogenous changes or shocks take place, the economy will remain in a given equilibrium. Conversely, in our model there is a feedback effect among changes in women's preferences distribution, parents self-fulfilling expectations and firms' training policy that leads to a decline of the gender wage gap.

The article is organised as follows. Section 1 contains some basic features of the model: the types of preferences, the optimal firms' policy, the utility functions and the socialisation process. Section 2 describes parents' education effort. Section 3 computes the steady state of the distribution of preferences among the women's population and some comparative static results. Finally, a discussion of the model under different assumptions and a discussion of the results are presented in Sections 4 and 5.

1. The Model

We consider an overlapping generations model. Population is a continuum and each individual lives for two periods and is productive only in the second period. In the first

[5] Moro (2003), in a model of statistical discrimination with multiple equilibria, does not obtain that the decline on black–white wage inequality is due to affirmative actions or other exogenous shocks. Mulligan (2004) discusses the reasons of the observed reduction of the gender gap and the increase wage inequality within-gender on the last decades.

period, as a child, the individual is educated in some preferences and, at the beginning of the second period, as an adult, he becomes active in the labour market and is hired by a firm. Each individual has one child, hence the population is constant. A new generation replaces the old one in the labour market.

1.1. *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 of capturing 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.

1.2 *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 the adult women's population normalised to 1. After leaving a firm, workers do not go back to the labour market.[6] Thus, the withdrawal probability of women p_t, given μ, increases with 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, of a woman leaving the labour market.

[6] Alternatively, it can also be assumed that if a worker leaves the firm at the end of the first period and goes back to the labour market, she will only be hired in low-paid jobs without training possibilities, because, for example, firms find that there is no time to recover any training investment. This latter assumption will not change the results since there is a wage loss of leaving the labour market.

Because the labour market is competitive, firms in this model will design jobs to maximise the expected lifetime incomes of the workers that will occupy them. 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 maximises the expected lifetime productivity of a worker:

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

where $\delta \in (0, 1)$ is the discount factor of the firms. When hiring a man, firms decide considering $p_t = 0$. Thus, there will be two types of jobs offered by firms in equilibrium, one for men and another for women with different training opportunities. The optimal training to perform a job is characterised by the following first-order condition:

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

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 of an $f-$ woman withdrawing from the labour market, μ, (*ii*) the higher the fraction of job-priority women, the higher the on-the-job training provided by firms for women will be.

Finally, we assume that wages equal the productivity in each period, that is, $w_1 = f(\hat{C}_t) - \hat{C}_t$ and $w_2 = f(\hat{C}_t)$, where w_1 and w_2 denote the wages in the training period and the post-training period respectively.

1.3. *The 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,

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

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).

1.4. *The Cultural Transmission of Preferences*

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

Let P_t^{iz} denote the probability that a girl from a mother with preferences i is socialised to preferences z. The socialisation mechanism just introduced is then characterised by the following transition probabilities, for all $i, z \in \{j, f\}$:

$$P_t^{jj} = \tau^j + (1 - \tau^j)q_t, \tag{3}$$

$$P_t^{jf} = (1 - \tau^j)(1 - q_t), \tag{4}$$

$$P_t^{ff} = \tau^f + (1 - \tau^f)(1 - q_t), \tag{5}$$

$$P_t^{fj} = (1 - \tau^f)q_t. \tag{6}$$

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

$$q_{t+1} = q_t + q_t(1 - q_t)(\tau^j - \tau^f), \tag{7}$$

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

2. The Socialisation Effort Choice

Parents are altruistic and care about their children. The utility a child will obtain depends on her preferences. For this reason, parents try to transmit the more valuable preferences through socialisation in accordance with their own expectations about firms' policy.[8]

Parents can affect their children's probability of direct socialisation through some education effort. With a probability equal to the socialisation effort, denoted by τ^i, a parent with preferences i will be successful. But education effort involves some direct and indirect costs: it is time-consuming, it conditions the parents choice of neighbourhood 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 $c(\tau^i) = (\tau^i)^2/2k$. Thus, we have parents trying to

[7] Since men are assumed to have job priority preferences, the parents' type is determined by the mother type because what differentiate families, concerning cultural values, is the mother's preferences. Transmission of attitudes is a joint decision.

[8] Parents can also decide about their children's human capital investment, taking into account differences in their innate characteristics, which will lead to different returns in the labour market. This formal educational investment is independent of socialisation effort. For example, parents can make a high human capital investment and increase the child's productivity, but they cannot absolutely determine her future labour market commitment, since this also depends on oblique socialisation.

maximise their children's welfare net of the socialisation cost. Parents of type i choose the education effort $\tau^i \in \{0, 1\}$ that solves:

$$\max_{\tau^i}[P_t^{ii}(\tau^i, q_t)V^{ii}(C_{t+1}^e) + P_t^{iz}(\tau^i, q_t)V^{iz}(C_{t+1}^e)] - (\tau^i)^2/2k, \tag{8}$$

where P_t^{iz} are the transition probabilities and $V^{iz}(C_{t+1}^e)$ is the utility a parent 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 (the parents') preferences. This implies that in order to asses $V^{iz}(C_{t+1}^e)$, a parent of type i uses his own utility functions.[9] Hence, parents 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.

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

$$V^{jj}(C_{t+1}^e) = w_1(C_{t+1}^e) + \delta w_2(C_{t+1}^e) \tag{9}$$

$$V^{jf}(C_{t+1}^e) = w_1(C_{t+1}^e) + \delta(1-\mu)w_2(C_{t+1}^e) \tag{10}$$

$$V^{ff}(C_{t+1}^e) = w_1(C_{t+1}^e) + \delta[(1-\mu)w_2(C_{t+1}^e) + \mu F] \tag{11}$$

$$V^{fj}(C_{t+1}^e) = w_1(C_{t+1}^e) + \delta w_2(C_{t+1}^e). \tag{12}$$

Note that the expected utility for a child socialised as family-priority type is different when evaluated by an f–parent or a j–parent; that is, $V^{ff}(C_{t+1}^e)$ and $V^{jf}(C_{t+1}^e)$ are different because an f–parent includes the psychological payoff F from leaving the labour market and a j–parent does not. Hence, $V^{ff}(C_{t+1}^e) > V^{jf}(C_{t+1}^e)$. Hereafter, we denote the relative gains the parents perceive for socialising their children with their own values by $\Delta V^j(C_{t+1}^e) = V^{jj}(C_{t+1}^e) - V^{jf}(C_{t+1}^e)$ for j–mothers and $\Delta V^f(C_{t+1}^e) = V^{ff}(C_{t+1}^e) - V^{fj}(C_{t+1}^e)$ for f– mothers. Specifically, these relative gains are

$$\Delta V^j(C_{t+1}^e) = \delta\mu w_2(C_{t+1}^e), \tag{13}$$

$$\Delta V^f(C_{t+1}^e) = \delta\mu[F - w_2(C_{t+1}^e)]. \tag{14}$$

Now we turn to the maximisation problem of parents. The first-order condition is:

$$\frac{\partial P_t^{ii}(\cdot)}{\partial \tau^i} V^{ii}(C_{t+1}^e) + \frac{\partial P_t^{iz}(\cdot)}{\partial \tau^i} V^{ij}(C_{t+1}^e) = \frac{\tau^i}{k},$$

and by derivative of (3) to (6) and by substitution, it follows that: $k[\Delta V^j(C_{t+1}^e)](1-q_t) = \hat{\tau}^j$ and $k[\Delta V^f(C_{t+1}^e)]q_t = \hat{\tau}^f$, where $\hat{\tau}_t^j = \hat{\tau}^j(q_t, C_{t+1}^e)$ and

[9] 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).

$\hat{\tau}_t^f = \hat{\tau}^f(q_t, C_{t+1}^e)$ denote the optimal educational efforts for both types of parents. In order to guarantee interior solutions $\hat{\tau}_t^i \in (0, 1)$, we assume that $1/k > \max[\Delta V^i(C_{t+1}^e)]$. Substituting (2) and (2), the optimal education efforts can be rewritten as:

$$k\delta\mu[w_2(C_{t+1}^e)](1 - q_t) = \hat{\tau}_t^j, \tag{15}$$

$$k\delta\mu[F - w_2(C_{t+1}^e)]q_t = \hat{\tau}_t^f. \tag{16}$$

It appears that the effort of parents to transmit a particular preference depends on

(*i*) the dominant preferences within the women's population (characterised by q_t) and
(*ii*) the expectations about firms' training policy (which is characterised by C_{t+1}^e).

Derivation of the optimal education efforts, (15) and (16), with respect to q_t yields:

$$\frac{\partial \hat{\tau}_t^j}{\partial q_t} = -k\,[w_2(C_{t+1}^e)] < 0, \tag{17}$$

$$\frac{\partial \hat{\tau}_t^f}{\partial q_t} = k\delta\mu\,[F - w_2(C_{t+1}^e)] > 0. \tag{18}$$

Therefore, the socialisation effort of job-priority parents decreases with the current fraction of $j-$ women in the population, as expression (17) shows. The reason is that the larger the fraction q_t, the better children are socialised to the preferences by the social environment; in other words, oblique transmission acts as a substitute for vertical transmission.[10] By contrast, the socialisation effort of family-priority parents, $\hat{\tau}_t^f$, increases with q_t. The larger the fraction q_t, the more family-priority parents must increase their socialisation effort to offset the pressure of the environment if they want their child to share their same preferences. Notice that this result holds the expected on-the-job training constant and (as 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 q_{t+1} as given, that is, the expected fraction of $j-$ women in the population since she considers the influence of her own socialisation effort on the evolution of q_t negligible.

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

LEMMA 1 *The socialisation effort of job-priority parents, $\hat{\tau}^j(q_t, C_{t+1}^e)$, increases with the expected on-the-job training C_{t+1}^e; by contrast, the socialisation effort of family-priority parents, $\hat{\tau}^f(q_t, C_{t+1}^e)$, decreases with C_{t+1}^e, that is:*

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

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

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

Proof. This result is obtained by derivation of (15) and (16) with respect to C_{t+1}^e.

The way parents' socialisation 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* parents increases and the effort of *f*–parents decreases.

Preferences among the women's population evolve over time, according to (7). In the next Section, the pattern of the distribution of preferences in the long run is analysed under the assumption of rational expectations.

3. 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 (15) and (16), into expression (7):

$$q_{t+1} = q_t + q_t(1-q_t)[\hat{\tau}^j(q_t, C_{t+1}^e) - \hat{\tau}^f(q_t, C_{t+1}^e)].$$

We assume that agents have rational expectations which implies $C_{t+1}^e = \hat{C}_{t+1}$, and considering, as we have shown in Section 1, that the optimal on-the-job training is $\hat{C}_{t+1} = \hat{C}(q_{t+1}; \delta, \mu)$, the above expression can be rewritten as follows:

$$q_{t+1} = q_t + q_t(1-q_t)[\hat{\tau}^j(q_t, q_{t+1}) - \hat{\tau}^f(q_t, q_{t+1})]. \tag{21}$$

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 $\hat{\tau}_s^j = \hat{\tau}_s^f$. Equalising the l.h.s of (13) and (14), we get

$$k\delta\mu\,[w_2(C_s)](1-q_s) = k\delta\mu\,[F - w_2(C_s)]q_s, \tag{22}$$

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

Proposition 2. *Assume the training requirements determined by firms is given by* $\hat{C}_t = \hat{C}(q_t; \delta, \mu)$ *and individuals have rational expectations,* $C_{t+1}^e = \hat{C}_{t+1}$. *The only stable steady state of the distribution of preferences among the women's population is* $\hat{q}_s \in (0, 1)$ *which solves:*

$$q_s = \frac{w_2[\hat{C}(q_s; \delta, \mu)]}{F}\,. \tag{23}$$

Proof. See Appendix.

This Proposition establishes that, in the long run, there is 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. Figure 1 illustrates the result of Proposition 1 (considering $F < 2w_2(\cdot)$). Note that there are two different areas:

(i) $\forall q_t < \hat{q}_s$ we have that $\hat{\tau}_t^j > \hat{\tau}_t^f$ and
(ii) $\forall q_t > \hat{q}_s$ 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 parents 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 (17) and (18)). As a consequence of this first effect, job-priority preferences tend to expand among young generations (see (21) considering $\hat{\tau}_t^j > \hat{\tau}_t^f$). However, there is a second factor which must be considered. Both type of parents expect better training opportunities for their daughter, which implies a higher opportunity cost of leaving the labour market. Thus *j*–parents have an additional incentive to intensify their education effort while the incentive of *f*–parents to transmit family preferences decreases (Lemma 1). In this context, the second effect reinforces the first one, and the fraction of job-priority women increases over generations (graphically, this change is represented by a movement along the bold curve). Simultaneously, the spread of job preferences leads to firms finding women increasingly more profitable to train. Therefore, they will offer better jobs to women. This behaviour of firms, in turn, confirms family expectations and reinforces the process.

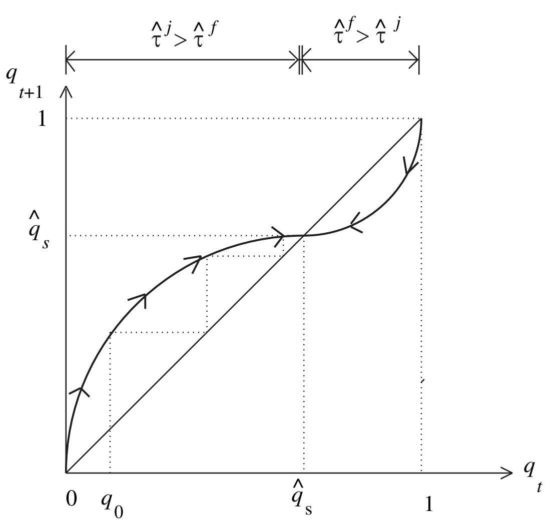

Fig. 1. *Convergence to the Steady State of the Women's Distribution of Preferences,* $\hat{q}_s$.

Nevertheless, society does not reach a state where all women are *j*–type because this expansion of *j*–preferences continues only to the extent that the effort $\hat{\tau}_t^j$ exceeds the effort $\hat{\tau}_t^f$. But notice that the parents' effort also evolves with the preferences prevalent in society (since oblique transmission substitutes vertical transmission). Accordingly, the effort of family priority parents $\hat{\tau}_t^f$ increases with the expansion of *j* preferences (see (18)) and, by contrast, the effort of *j*–parents, $\hat{\tau}_t^j$, decreases (see (17)). Thus these efforts are equal before a homogeneous society ($q_s = 1$) is achieved.

Viscusi (1980) founds that whereas females in manufacturing industries quit 80% more often than did men in 1958, the discrepancy had dropped to 16% by 1968. The evolution of preferences just described may provide part of an explanation for the decrease in the labour market exit rates of women (formally, p_t) based on the increase in women who prefer market to home work, q_t. To the extent that the preferences are private information, it is not easy to monitor the evolution of this variable q_t; but the increase in labour market participation of women in most Occidental economies may be interpreted as an increase in q_t.

3.1 *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 in the long run.

Implicit differentiation of (21), where $w_2[\hat{C}(q_s; \delta, \mu)] = f[\hat{C}(q_s; \delta\mu)]$, yields $d\hat{q}_s/d\mu <$ 0 and $d\hat{q}_s/dF < 0$. Hence, (i) a lower probability to exit the labour market μ of *f*–women, and (*ii*) a lower non-monetary payoff of family care and housework F will lead to a higher fraction of job-priority women in the long run.

The F parameter captures the value that *f*–women confer to household activities. The recent changes in trends of rates of divorce and nonmarriage, might lead to think that the value of the parameter F is lower because the economic support of women has diminished and so has become more uncertain (Edlund and Pande, 2002; Johnson and Skinner, 1986; Akerlof *et al.*, 1996). Therefore, to the extent that these changes affect the value that family-priority women at large confer to household time, it could be considered that such exogeneous shocks can affect women's labour market conditions at the steady state. Specifically, they will lead to an increase in the women's labour force participation rate and wages at the steady state.

4. Relaxing Some Assumptions of the Model

This Section shows that the model holds if we relax some assumptions established in Section 2, which gives a more realistic view of the issue. Specifically, in this Section we address the possibility that

(*i*) parents invest in their children's human capital,
(*ii*) women work part-time, and
(*iii*) individuals differ in their innate characteristics, which allows us to discuss siblings' earnings.

4.1. *Human Capital Investment from Parents*

A clear change of the basic model presented is to consider that parents make an investment effort in their children's human capital as well as a socialisation effort to transmit their own preferences. In this context, it may be thought that *j*–parents make a higher effort in human capital investments than *f*–parents and this will lead to different labour market returns. But what determines labour market behaviour is the socialisation effort, and in this concern, parents cannot absolutely determine the future labour market attachment of the child, since this also depends on oblique socialisation. With some probability, children are not as their parents want them to be. There will be women with higher educational attainment, those from *j*–families, but among them there will be both job-oriented and family-oriented women.

Hence, firms will be forced to discriminate statistically among women since educational attainment does not perfectly signal the type of preferences the worker has. This extension would bring the model closer to reality but it will not change the main results since firms cannot distinguish *perfectly* between *f*–women and *j*–women on the basis of their educational level.

In this concern, we should observe empirically that although education may help firms to predict the quit probability (to the extent that more educated workers show lower withdrawal rates; Weiss, 1988), the estimated quit probability may not help to explain the gender differences in firm training. As far as I know, Royalty (1996) is the only study that presents some evidence in this matter.

4.2. *Women Working Part-Time*

This article divides women into being either individuals who stay or leave the labour market. However, a common choice is somewhere in between, like a part-time job. The possibility that women could work part-time can be incorporated into the model and an interesting result arises.

Assume that both types of women prefer to work part-time during the second period in the firm (post-training period) and that firms offer this possibility with an exogenous probability γ, $0 < \gamma < 1$, depending on circumstantial factors (product demand, the number of women in the firm requiring part-time work, seasonal factors, legal constraints,...).[11] The expected lifetime productivity of a worker will change and firms' maximisation problem (1) must be replaced by:

$$\max_{C}[f(C) - C] + \delta \begin{Bmatrix} (1-\mu)f(C) + q_t\mu[\gamma\theta f(C) + (1-\gamma)f(C)]+ \\ +(1-q_t)\mu\gamma\theta f(C) \end{Bmatrix}$$

or also, $\max_C\ [f(C) - C] + \delta[(1 - p_t)f(C) + \delta\mu\gamma(\theta - q_t)f(C)]$, where θ is the relative productivity between a part-time and a full time worker, $0 < \theta < 1$, and $f(C)$ denoted the job productivity linked to firm-training. Notice that if $\gamma = 0$, the basic model is obtained. In this context, a woman's expected productivity will be higher than in the basic model if $(\theta - q_t) > 0$. This occurs when the post-training productivity of all

[11] Another option is to consider that firms always offer the possibility of working part-time, that is, that any women can choose to work part-time if she wants. This assumption seems less close to labour market reality; part-time jobs are still rare in some countries and in some occupations.

women working part-time ($\theta f(C)$) is higher than the post-training productivity obtained from $j-$women working full time ($q_t f(C)$). The first order condition (2) is replaced by $f'(C) = 1/\{1 + \delta[(1 - p_t) + \mu\gamma(\theta - q_t)]\}$ and the optimal training will be a function of the probability of working part-time, γ, and θ: $\hat{C}_t = \hat{C}(q_t; \delta, \mu, \gamma, \theta)$. Therefore, the firm training will be higher if the productivity of a worker in a part-time job is high enough, specifically, if $(\theta - q_t) > 0$.

Moreover, the utility functions of both types of women will be replaced by:

$$U^f = w_1 + \delta\{(1-\mu)w_2 + \mu[\gamma(w_2^{PT} + H) + (1-\gamma)F]\},$$
$$U^j = w_1 + \{(1-\mu)w_2 + \mu[\gamma(w_2^{PT} + H) + (1-\gamma)w_2]\},$$

where $w_2^{PT} = \theta f(C_t)$ is the part-time wage and H is the non-market payoff for a woman who can work part-time and attend to her family responsibilities. These utility functions capture the fact that if both types of women are offered the possibility of working part-time, both types accept (it is assumed that $w_2^{PT} + H > w_2$), but if not, the f–women prefer to leave the labour market (since $F > w_2$, as in the basic model) whereas j–women do not, which is the difference between job-oriented and family-oriented women.

Taking into account these utility functions, and the corresponding expected utilities $V^{iz}(\cdot)$, the relative gains for parents (13) and (14) should be replaced by:

$$\Delta V^j(C^e_{t+1}) = \delta\mu(1-\gamma)w_2(C^e_{t+1})$$
$$\text{and } \Delta V^f(C^e_{t+1}) = \delta\mu(1-\gamma)[F - w_2(C^e_{t+1})],$$

which are quite similar to those in the basic model but, in this case, the probability $(1 - \gamma)$ appears. This implies that the parents' incentive to transmit their own preferences diminishes and, consequently, their optimal socialisation effort will also diminish for any q_t. Moreover, Lemma 1 still holds and Proposition 2 slightly changes. It is easy to check that the equivalent to expression (23) will be $q_s = w_2[\hat{C}(q_s; \delta, \mu, \gamma, \theta)]/F$. The post-training wage, w_2, will be higher than in the basic model when women can work part-time if the expected post-training productivity is high enough $(\theta - q_s^b) > 0$, where q_s^b is the fraction of j–women at the steady state in the basic model. In this case, at the steady state, there will be more job-priority women. As a consequence, the firm training in jobs offered to women will be higher. Conversely, if $(\theta - q_s^b) < 0$, the firm training in jobs offered to women will be lower and also post-training wages. Accordingly, in the long run, there will be less job-oriented women and the wage gap will be reduced at a lower level.

Summarising, this extension suggests that an additional reason for the lower wages and training requirements of women's jobs is that, as firms anticipate that women will demand working part-time during a period of their lives, they could find it optimal to finance less training. Therefore, the introduction of part-time jobs in a economy, which is in transition towards the steady-state, could reinforce the increase in training, wages and participation rates of women that occur among generations or, conversely, could mitigate these changes. The effect (reinforcement or mitigation) over these changes will depend crucially on such parameters as θ (namely, the relative productivity of part-time jobs; notice that θ could depend, for example, on worked hours in a part-time job in comparison with a full-time job). Thus, if the part-time jobs that are created are low-productive jobs, the improvement of women in the labour market will be lower and, in the long run, they could be worse off than without part-time. This could contribute to explain the different success of part-time in different countries (i.e., the Netherlands *versus* Spain, for example).

4.3. *Sibling's Earnings*

The model implies a high similarity between siblings in the choice of labour market participation since the investment decision of the parents for siblings is identical. Unless there is a large age difference between the female siblings, the investment decision of the parents for female siblings should be very similar. However, in reality, not all siblings make the same choice concerning market and non-market work. The model could be extended to include innate differences between siblings and then parents will take into account that some are better fit for job-oriented paths and others for family-oriented ones.

Specifically, it could be assumed that children have a different innate ability (high, h, or low, l), with identical probability, which will make them more or less productive in the labour market. Let us consider that high ability individuals are more effective learning on the job and have a higher productivity after receiving firm training. The firms' maximisation problem (1) will be modified as follows: $\max_C [f(C) - C] + \delta(1 - p_t)[\lambda f(C) + (1 - \lambda)f(C)\bar{j}]$, where $\bar{j}$ is the expected ability of a worker $\bar{j} = 0.5h + 0.5l$ and $\lambda \in (0, 1)$ is the relative weight of post-training productivity independent of workers' ability, $f(C)$. Thereby, the term $\lambda f(C) + (1 - \lambda)f(C)\,\bar{j}$ gives the post-training productivity of a worker with an expected innate ability $\bar{j}$ which has received C firm training. The fraction $(1 - \lambda)$ is the fraction of productivity that depends on some complementarities between training and ability. The optimal training will be obtained from the first order condition: $f'(C) = 1/\{1 + \delta(1 - p_t)\,[\lambda + (1 - \lambda)\bar{j}]\}$. Let us assume that $\bar{j} = 1$ so that the expected productivity of an applicant is the same as was establish in Section 2; thereby, the optimal training will be the same but heterogeneity between applicants is considered. (This allows us to isolate the effects of introducing differences in innate characteristics from the effect of a change in the expected workers' post-training productivity that will appear otherwise.) Firm training is also worthwhile for low ability workers, that is, $\lambda f(C) > f(C) - C$. Wages in the second period will be different for low and high ability workers: $w_2^h = \lambda f(C) + (1 - \lambda)f(C)h$, $w_2^l = \lambda f(C) + (1 - \lambda)f(C)\,l$; from now on, superscripts h and l will refer to high and low ability individuals. The rest of the model also suffers minor changes. The probabilities, $P_t^{i,z}$, that a girl from a i-mother adopts z-preferences have to be modified to consider that this girl can have h or l ability with identical probability:

$$P_t^{jj} = \frac{1}{2}[\tau^{j,h} + (1 - \tau^{j,h})q_t] + \frac{1}{2}[\tau^{j,l} + (1 - \tau^{j,l})q_t],$$

$$P_t^{jf} = \frac{1}{2}[(1 - \tau^{j,h})(1 - q_t)] + \frac{1}{2}[(1 - \tau^{j,l})(1 - q_t)],$$

$$P_t^{ff} = \frac{1}{2}[\tau^{f,h} + (1 - \tau^{f,h})(1 - q_t)] + \frac{1}{2}[\tau^{f,l} + (1 - \tau^{f,l})(1 - q_t)],$$

$$P_t^{fj} = \frac{1}{2}(1 - \tau^{f,h})q_t + \frac{1}{2}(1 - \tau^{f,l})q_t,$$

where $\tau^{j,h}$ and $\tau^{j,l}$ ($\tau^{f,h}$ and $\tau^{f,l}$) denote the education effort of $j-$parents ($f-$parents) to transmit their preferences to a high or low-ability descendant, respectively. These four expressions replace (3) to (6) of Section 2. The fraction of adult women with $j-$preferences at period $t+1$ will be given by:

$$q_{t+1} = \frac{1}{2}\{q_t + q_t(1-q_t)[\tau^{j,h} + \tau^{j,l}]\} + \frac{1}{2}\{q_t + q_t(1-q_t)[\tau^{f,h} + \tau^{f,l}]\}.$$

The relative gains for socialisation should be adapted to the new context of differences in ability:

$$\Delta V^{j,h}(C^e_{t+1}) = \delta\mu w^h_2(C^e_{t+1}, h), \Delta V^{j,l}(C^e_{t+1}) = \delta\mu w^l_2(C^e_{t+1}, l,),$$
$$\Delta V^{f,h}(C^e_{t+1}) = \delta\mu[F - w^h_2(C^e_{t+1}, h)], V^{f,l}(C^e_{t+1}) = \delta\mu[F - w^l_2(C^e_{t+1}, l)],$$

which leads to the optimal education effort for high-ability and low-ability descendants:

$$\hat{\tau}^{j,h}_t = k\delta\mu[w^h_2(C^e_{t+1}, h)](1-q_t), \hat{\tau}^{j,l}_t = k\delta\mu[w^l_2(C^e_{t+1}, l)](1-q_t),$$
$$\hat{\tau}^{f,h}_t = k\delta\mu[F - w^h_2(C^e_{t+1}, h)]q_t, \hat{\tau}^{f,l}_t = k\delta\mu[F - w^l_2(C^e_{t+1}, l)]q_t,$$

which implies that $\hat{\tau}^{j,h}_t > \hat{\tau}^{j,l}_t$ and $\hat{\tau}^{f,h}_t < \hat{\tau}^{f,l}_t$. Thus, parents with $j-$preferences try to transmit their own traits with more effort to a child with a high innate ability that is valued in the labour market, h, than to a child more family-oriented, l. Coherently, parents with f–preferences transmit their own preferences with more intensity to low-ability descendants than to those more job-oriented, h. The dynamics of the women's distribution of preferences (21) should be replaced by:

$$q_{t+1} = q_t + q_t(1-q_t)\frac{1}{2}[(\tau^{j,h} + \tau^{j,l}) - (\tau^{f,h} + \tau^{f,l})].$$

The steady state of this extended model is calculated as in Section 4 and the interior steady state when innate characteristics are included is obtained from $(\tau^{j,h} + \tau^{j,l}) = (\tau^{f,h} + \tau^{f,l})$ which gives:

$$q_s = \frac{\frac{1}{2}w^h_2[\hat{C}(q_s;\delta,\mu), h] + \frac{1}{2}w^l_2[\hat{C}(q_s;\delta,\mu), l]}{F}, \text{ or } q_s = \frac{w_2[\hat{C}(q_s;\delta,\mu), \bar{j}]}{F}.$$

Hence, when different innate ability for family and labour market activities, h and l, are included in the model, the fraction of job-oriented women in the population is the same in the long run and so also is the gender wage gap.[12] The reason is that if j–parents have two children, each one with one type of ability, they will transmit their preference with more intensity to the able one and with less intensity to the less talented. These efforts offset each other and the probability that a child of this family have j–preferences is the same as in the basic model. (The opposite applies for f–parents.) Hence, to the extent that children can have high and low abilities with identical probability, the model will not change with respect to the women's preferences in the long run.

This extension shows that female siblings can make different choices concerning labour market participation. Those with innate characteristics that better fit the labour

[12] The proof of Proposition 2, considering the changes of this extension, is similar to the one presented in Appendix A.

market will be more likely to have higher labour force participation rates. This fact can help to explain the lower correlation between sisters' earnings than between brothers' ones (since all male descendants are assumed to be job-oriented, as an approximation to reality). A woman can choose the family path and withdraw from the labour market and her sister can remain in her job.

It is commonly found that there is a correlation between siblings' earnings. In this regard, Solon (1999) points out that:

> The empirical literature on sibling correlation in earnings, mostly focused on brothers in the United States, suggests that somewhere around 40% of the variance in the permanent component of log earnings is generated by variation in the family and community background factors shared by siblings. This finding indicates that the role of family and community origins in accounting for earnings inequality is quite important and is larger than had been apparent from a superficial look at single-year earnings on siblings ... Nevertheless, just as large a share of long-run earnings variation is due to factors not common to siblings, and the question of what causes so much earnings inequality even within families is an important challenge for further research (p. 1775).

The cultural transmission of cultural traits may help to explain the observed correlation between siblings' earnings. On the one hand, the similarity between their labour force participation can account for part of the sisters' earnings correlation. They can make similar choices because it is more likely that sisters have the same type of preferences (than two women who are not sisters) about market and family activities. But, on the other hand, it is also true that there are also differences within the family: siblings are raised at different times and also treated differently depending on their innate characteristics. This different treatment of siblings may be reflected not only in their labour market attachment but also in their human capital, as suggested in Section 4.1. Both factors could account for differences in sibling earnings. Nevertheless, the research necessary for an investigation of these issues would take us beyond the scope of this article.

5. Discussion of the Results

This article provides an explanation for the continued existence of the occupational segregation of women in jobs with less training opportunities. The model captures the interrelationship between gender differences in labour market withdrawal rates, firms' hiring policy and intergenerational transmission of preferences. Parents realise 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 does the firms' training policy. Specifically, employers, that statistically discriminate among workers by gender, will observe how female exit rates change and, accordingly, they will adapt the jobs optimally designed for men and women. There is a phenomenon of reinforcement between these three factors, each effect feeds back onto the others.

The main result of the model is that the gender wage differential will persist. Women will be sorted into jobs that provide less training than the jobs offered to men. This result emerges because in the long run both types of women's preferences coexist. The model shows that assuming, for historical-cultural reasons, that the family-priority preferences were predominant in society, the gender wage gap will decline as consequence of parents' rational expectations. Parents in this type of society expect better training opportunities for their daughters, and they socialise them according to these expectations. As a consequence expectations are fulfilled, women's behaviour changes across generations and, obviously, firms' policy changes.

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

Secondly, the labour market participation of women will increase as a result of the spread of job-priority preferences. If fewer women withdraw from the labour market, the participation rate will increase. 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 US. Between 1950 and 1998 their participation rates rose from 22% to 62%, with the largest increase between 1950 and 1980. According to our model, Costa (2000) pointed out that 'change in women's labour force participation rates may be slow because it must await the movement of cohorts, with their different set of expectations and characteristics, through time ... Change in women's participation may also be slow because cohorts differ in their social norms regarding work and family.'

Thirdly, the differentials on participation rates between men and women will persist in the long run. The reason is that at the steady state there will always be a fraction of family-priority women who withdraw from the labour force due to family responsibilities. Preferences are private information and, consequently, we cannot observe their true evolution. But behavioural outcomes, which are the consequence of these preferences, become indirect measures of preferences. Thus the participation rate of women might be used as an indirect measure of their preferences. Notably then, as we have pointed out above, this rate has increased greatly in Western 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.

Appendix. Proof of Proposition 2

The proof is divided into three steps. First, 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 $\left.\frac{\mathrm{d}q_{t+1}}{\mathrm{d}q_t}\right|_{q_{t+1}=q_t=0} > 1$ and $\left.\frac{\mathrm{d}q_{t+1}}{\mathrm{d}q_t}\right|_{q_{t+1}=q_t=1} > 1$.

Implicit differentiation of (19) yields

$$\frac{\mathrm{d}q_{t+1}}{\mathrm{d}q_t} = \frac{1 + (1 - 2q_t)[\hat{\tau}^j(q_t, q_{t+1}) - \hat{\tau}^f(q_t, q_{t+1})] + q_t(1 - q_t)\dfrac{\partial \Delta\tau}{\partial q_t}}{1 - q_t(1 - q_t)\dfrac{\partial \Delta\tau}{\partial q_{t+1}}} \tag{24}$$

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

Evaluating (24) at the steady state $q_s = 0$ and $q_s = 1$, we obtain that:

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

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

It is easy to check that $[\hat{\tau}^j(0, 0) - \hat{\tau}^f(0, 0)] > 0$ and $[\hat{\tau}^j(1, 1) - \hat{\tau}^f(1, 1)] < 0$ (see expressions for optimal educational efforts (15) and (16)).

Second step. In order to prove the existence and uniqueness of the steady state which solves (23), $q_s = w_2[\hat{C}(q_s; \delta, \mu)]/F$, we define the functions $g(q_s) = q_s$ and $h(q_s) = w_2[\hat{C}(q_s; \delta, \mu)]/F$. 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:

$$h'(q_s) = \frac{1}{F} \times \frac{\partial w_2[\hat{C}(q_s; \delta, \mu)]}{\partial \hat{q}_s} = \frac{1}{F}\frac{-\delta\mu}{\{1 + \delta[1 - \mu(1 - \hat{q}_s)]\}^2}\frac{f'[\hat{C}(q_s)]}{f''[\hat{C}(q_s)]} > 0$$

and

$$h''(q_s) = \frac{-\mu\delta}{F}\left\{-\frac{2\delta\mu}{[1 + \delta(1 - p_t)]^2}\frac{f'(C)}{f''(C)} + \frac{1}{[1 + \delta(1 - p_t)]^2}\frac{\partial}{\partial \hat{q}_s}\left[\frac{f'(C)}{f''(C)}\right]\right\} < 0.$$

A sufficient condition for the concavity of $h(q_s)$ is that the productivity function, $f[C(\cdot)]$ is convex enough; in particular, if $\frac{\partial}{\partial q_s}[\frac{f(C)}{f''(C)}] > 0$, it follows that $h''(q_s) < 0$. On the other hand, $h(0) > 0$ and $h(1) < 1$ by the assumption that $F > w_2(\cdot)\ \forall q_s$.

Summarising, $g(q_s)$ is increasing and lineal, $h(q_s)$ is increasing and concave with $h(0) > 0$ and $h(1) < 1$. Hence there exits a unique interior solution $\hat{q}_s \in (0, 1)$ that verifies (23).

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:

$$\frac{1}{F} \times \left.\frac{\partial w_2[\hat{C}(q_s; \delta, \mu)]}{\partial q_s}\right|_{q_s=\hat{q}_s} < 1\,. \tag{25}$$

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

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

Now, we evaluate the derivative (24) at $q_t = q_{t+1} = \hat{q}_s$ where $\hat{\tau} = \hat{\tau}^j = \hat{\tau}^f$ and we obtain:

$$\left.\frac{\mathrm{d}q_{t+1}}{\mathrm{d}q_t}\right|_{q_{t+1}=q_t=\hat{q}_s} = \frac{1 + \hat{q}_s(1-\hat{q}_s)\partial\Delta\tau/\partial q_t|_{q_t=\hat{q}_s}}{1 - \hat{q}_s(1-\hat{q}_s)\partial\Delta\tau/\partial q_{t+1}|_{q_{t+1}=\hat{q}_s}}. \tag{26}$$

The derivatives $\partial\Delta\tau/\partial q_t$ and $\partial\Delta\tau/\partial q_{t+1}$ are obtained from expressions (17) to (20):

$$\frac{\partial\Delta\tau}{\partial q_t} = \frac{\partial\hat{\tau}^j}{\partial q_t} - \frac{\partial\hat{\tau}^f}{\partial q_t} = -k\delta\mu F < 0 \tag{27}$$

$$\frac{\partial\Delta\tau}{\partial q_{t+1}} = \frac{\partial\hat{\tau}^j}{\partial q_{t+1}} - \frac{\partial\hat{\tau}^f}{\partial q_{t+1}} = k\delta\mu\frac{\partial w_2[\hat{C}(q_{t+1};\delta,\mu)]}{\partial q_{t+1}}, \tag{28}$$

where (17) and (18) have been substituted in (27), and (19) and (20) in (28). By substitution of (27) and (28) into (26), it follows that

$$\left.\frac{\mathrm{d}q_{t+1}}{\mathrm{d}q_t}\right|_{q_{t+1}=q_t=\hat{q}_s} = \frac{1-\hat{q}_s(1-\hat{q}_s)k\delta\mu F}{1-\hat{q}_s(1-\hat{q}_s)k\delta\mu\left.\dfrac{\partial w_2[\hat{C}(q_{t+1};\delta,\mu)]}{\partial q_{t+1}}\right|_{q_{t+1}=\hat{q}_s}}. \tag{29}$$

After some calculations with expression (29) we obtain that $\left.\dfrac{\mathrm{d}q_{t+1}}{\mathrm{d}q_t}\right|_{q_{t+1}=q_t=\hat{q}_s} < 1$ if $\dfrac{1}{F} \times \left.\dfrac{\partial w_2[\hat{C}(q_s;\delta,\mu)]}{\partial q_s}\right|_{q_s=\hat{q}_s} < 1$. We have shown that this condition holds at the steady state $\hat{q}_s$ (see (25)), therefore we obtain that $\mathrm{d}q_{t+1}/\mathrm{d}q_t|_{\hat{q}_s} < 1$. (Notice also that the steady state $\hat{q}_s$ is locally stable if $|\mathrm{d}q_{t+1}/\mathrm{d}q_t|_{q_{t+1}=q_t=\hat{q}_s} < 1$.)

Finally, the expression (24) can be rewritten, substituting derivatives (27) and (28) as follows:

$$\frac{\mathrm{d}q_{t+1}}{\mathrm{d}q_t} = \frac{1+(1-2q_t)k\delta\mu\{w_2[\hat{C}(q_{t+1})] - Fq_t\} - q_t(1-q_t)k\delta\mu F}{1-q_t(1-q_t)k\delta\mu\dfrac{\partial w_2[\hat{C}(q_{t+1})]}{\partial q_{t+1}}}.$$

Clearly $\hat{q}_s$ does not depend on k, and neither do $\partial\, w_2[\hat{C}(q_{t+1})]/\partial q_{t+1}$. Therefore, considering k small enough, both the numerator and denominator of (29) will be positive. Then $dq_{t+1}/dq_t > 0$ for all q_t. (The dynamic (21) has neither an interior maximum nor a minimum in (0, 1).) Given that $dq_{t+1}/dq_t|_{q_s=0} > 1$, $dq_{t+1}/dq_t|_{q_s=1} > 1$ and $dq_{t+1}/dq_t|_{q_{t+1}=q_t=\hat{q}_s} < 1$, this is a sufficient condition for global stability.

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Submitted: 10 June 2003
Accepted: 9 March 2006

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