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RAISING FEMALE EMPLOYMENT: REFLECTIONS AND POLICY TOOLS

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Abstract
While there is consensus on the need to raise the time spent in the market by European women, it is not clear how these goals should be achieved. Tax wedges, assistance in the job search process, and part-time jobs are policy instruments that are widely debated in policy circles. The paper presents a simple model of labor supply with market frictions and heterogenous home production where the effects of these policies can be coherently analyzed. We show that subsidies to labor market entry increase women's entrance in the labor market, but they also increase exits from the labor market, with ambiguous effect on employment. Subsidies to part-time do increase employment, but they have ambiguous effects on hours and market production. Finally, reductions in taxes on market activities that are highly substitutable with home production have unambiguous positive effects on market employment and production. (JEL: J0, J2)

1. Introduction

The low level of female employment in most South European countries has attracted a great deal of attention by national and European policymakers. There are indeed huge differences across Member States in the share of employed women in the working age population, which is currently around 40% in countries such as Spain, Italy, and Greece and around 70% in Nordic countries (see Pissarides et al. 2003). At the intensive margin, recently collected empirical evidence on use of time shows that the average North American and German women spend the same share of time in leisure activities (Freeman and Schettkat 2002). Yet, the allocation of time between market and home production varies greatly between the two countries, with North American women spending on average 5.3 more hours per day in market activities than German women. Further, most of this difference comes from differences in the extensive margin,

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with a large share of women in Germany devoted full time in home production (child care, preparing meals, cleaning, etc.).

A fervid debate is currently devoted to finding specific policies that may raise female employment rates. These policies should increase women's incentives to substitute household production with market production, so as to increase the equilibrium level of employment and the size of official GDP. While there is a large consensus on the need to raise the time spent in the market by European women, there is some confusion over how these goals should be achieved. Reducing the high tax wedge, developing part-time work and improving assistance in the job search process are often mentioned policies, but their different effects are rarely discussed in a unified way. This generates some confusion. For instance, a natural question about part-time is whether it should be strongly encouraged, or whether one should simply avoid making part-time jobs unattractive relative to full-time jobs.[1] However, this type of question is rarely explicitly formulated. We believe that part of the confusion over the role and the effect of these various policies is linked to the lack of a unified analytical model where the different set of policies can be coherently analyzed. The goal of this paper is to propose such a framework.

To contribute to the debate, two key features of the labor market must necessarily be considered. The first element is heterogeneity in individual's utility in nonmarket time (e.g., the ability to produce at home or the utility of leisure). The second element is the existence of imperfections in the labor market. In this paper we build on the recent work of Garibaldi and Wasmer (2001), who have developed a theory of labor supply for a frictional labor market. In particular, they showed that when labor market participation involves an irreversible entry cost and market production is indivisible, the entry and exit decisions differ, and the participation decision is described by a double margin. Since the different policies described previously affect the two margins differently, and sometimes have an opposite impact (e.g., raise the propensity to enter the labor market while at the same time raise the propensity to leave the labor market), we need to clarify the effects of female employment policies on employment rates, market production and welfare.

We consider the three policies discussed previously in details: Subsidies to labor market entry, taxation to market activity, and subsidies to part-time. With respect to subsidies to labor market entry (which can also be interpreted as subsidies to mobility), the paper shows that they lead to an increase in the number of women entering the labor market. Yet, the overall effect on total employment can be ambiguous, since subsidies tend to reduce participation

1. Typically part-time jobs are associated with less health insurance, less employment protection, and lower unemployment benefits.

hoarding and thus increase exits from the market.[2] Less ambiguous and more standard results derive from the effects of taxation on market activities, which have non-neutral effects on participation since household production can not be taxed. Our analysis shows that a reduction in taxes leads to both larger entry and lower exit with unambiguous positive effect on total employment. These results are consistent with the recent work of Davis and Henrekson (2003) and Prescott (2002). Finally, we discuss also the effects of part-time. Our theory shows that an increase in part-time should never be banned, and any form of implicit obstacle should be removed. Yet, our results show that a subsidy to part time has two opposite effects on market production. If it indeed induces women that are full time in home production to enter part-time in the labor market (crowding in effect), it can also induce some women who are working full-time in the market to swap to part-time (a crowding-out effect). The overall effect on market production is thus ambiguous and depends on how the mass of women is positioned around the initial equilibrium. Nevertheless, if the distribution of home productivity is single-peaked, the positive effect on employment dominates if and only if the marginal participant is to the left of the peak of the distribution, or in words, when the employment rate is low.

The paper proceeds as follows. Section 2 derives the setup, the reservation strategies of workers and introduces a definition of welfare and expressions for aggregate home production, employment and hours. Section 3 investigates the role of subsidies to entry and taxes. Section 4 deals with part-time. Section 5 concludes.

2. Labor Supply on the Extensive Margins in an Imperfect Labor Market

2.1. Setup

In this section we extend the baseline model of labor supply with market frictions proposed by Garibaldi and Wasmer (2001). These extensions help us to discuss two policies that are widely debated in the discussion over female employment: the effects of marginal income taxes and policies aimed at facilitating entrance in the labor market. The role of part-time employment will be discussed in the next section.

We assume that a mass one of women enjoys utility from home production and market production. Women have a unit of time to be spent in market and

2. Participation hoarding is defined as the willingness to participate to the labor market even though the felicity derived from home production is larger than the wage, in order to save on future reentry costs in case of a change in either wages or home production. See Garibaldi and Wasmer (2001).

home production, two activities that we assume to be perfect substitutes. This is a strong assumption, but we maintain it throughout the paper for analytical simplicity, since it implies that women will specialize in the activity in which they are most productive. We assume that hours spent in market production are exogenously fixed and equal to one. In other words, market production is a full time activity, and our emphasis is on the extensive margin of labor supply. In market production people are paid a gross wage net of taxes, so that the take home pay for a full day in the market is $y = w(1 - t)$, where t is the tax rate. Utility from home production is heterogenous and stochastic and its value changes according to a Poisson at rate λ. A full day in home production yields a per period utility equal to x, where x is drawn from a continuous cumulative distribution $F(x)$ defined over the support $\Omega = [x_{\min}, x^{\max}]$. Further, home production cannot be taxed. The per period utility of women is

$$v^w = w(1 - t)$$

$$v^H = x$$

The key worker decision involves the time to be spent in market production. In absence of frictions in the market, the model is trivial and the participation decision is described by a single reservation value $x^* = w(1 - t)$, so that all individuals with home production below x^* participate full time in market activity. In reality, information on the location and the availability of jobs is not perfect, and the process of information gathering is akin to paying an irreversible entry cost equal to $\mathcal{C}$. Indeed, in our previous research we have shown that from the labor supply standpoint modelling the search process as a time consuming process is identical to assuming that entering the labor market involves an irreversible entry cost. In the current paper, we keep the irreversible cost assumption, and we assume that $\mathcal{C}$ is determined by both technological and policy dimensions. Job search assistance and training and mobility subsidies represent the policy dimension: Both aims at reducing the irreversible cost paid by market entrance.

2.2. Reservation Strategies

The existence of the irreversible cost $\mathcal{C}$ induces a distinction of the entry and exit decision. If we indicate with H the value function for being full-time in home production and with W the value function for being full-time in market production, the two margins are defined as

$$\text{Entry:} \quad H(x^\nu) = W(x^\nu) - \mathcal{C}$$

$$\text{Quit:} \quad H(x^q) = W(x^q),$$

where x^{ν} is the entry cut-off point and x^{q} is the exit cut-off point. To determine an expression for the two cut off points requires some algebra, since the intertemporal nature of the model does play a role. Formally, the value function of being in market activity reads

$$rW(x) = w(1-t) + \lambda\left[\int \max\{W(z), H(z)\}dF(z) - W(x)\right],$$

where r is the pure rate of time preferences. The equation has a standard asset value interpretation, and the integral in the right hand side simply says that conditional on a change in home productivity, the woman reoptimizes her position on the extensive margin. Similarly, the value of being full-time in home production reads

$$rH(x) = x + \lambda\left[\int \max\{W(z) - \mathscr{C}, H(z)\}dF(z) - H(x)\right].$$

Developing the algebra of the two margins, one obtains two equations for the two cutoff points whose expression read

$$\frac{x^{q} - x^{\nu}}{r+\lambda} = \mathscr{C} \qquad \text{(Entry)}$$

$$x^{q} = x^{*} + \frac{\lambda}{r+\lambda}\int_{x^{\nu}}^{x^{q}} F(z)\,dz. \qquad \text{(Quit)}$$

In the first equation, the entry margin shows that the surplus on the job (the left hand side in the equation) is equal to the entry cost. It also shows that when the entry cost is positive, $x^{q} > x^{\nu}$. The second equation, the quit margin, says in the case of positive $\mathscr{C}$, the quit cutoff points is above the frictionless cutoff point x^{*} by an extra term that reflects the fact that women hold on to market production as a way to save future entry costs if home production were to change. Note that the two equations can be described by two lines in a $[x^{q}, x^{\nu}]$ space. The entry margin is upward sloping and it is parallel to the 45° line. It is also easy to show that the quit margin is downward sloping as long as $\lambda > 0$, and is a horizontal line at x^{*} when $\lambda = 0$. The cutoff point equilibrium is given by the intersection of the two lines. We use this graphical representation in Figure 1 to analyse the effect of policies. Note that the two equations (Entry) and (Quit) imply that as friction disappears ($\mathscr{C} = 0$) the two cutoff points coincide with the net wage. In Garibaldi and Wasmer (2001), we showed that the cutoff points are such that

$$x^{q} \geq x^{*} \geq x^{\nu}$$

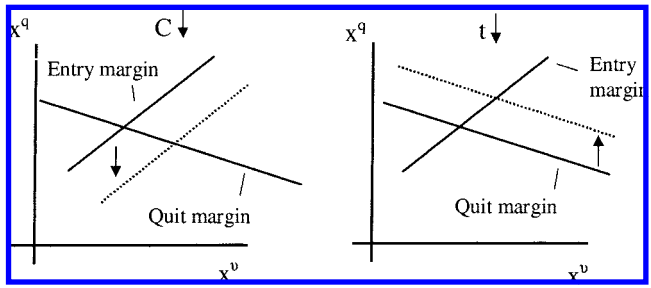

FIGURE 1. The effects of subsidizing entry (lowering $\mathcal{C}$, left panel) or reducing taxation of market activity (reducing t, right panel) on the entry and exit margins.

where $x^* = w(1 - t)$ is the frictionless participation margin, that is, the neoclassical reservation rule, and strict inequality holds whenever $\mathcal{C} > 0$.

2.3. Employment, Market Production, and Welfare

The model is then closed by the determination of the stock of employed and nonemployed people. Developing the algebra, the steady stock of employed people is

$$e = \frac{F(x^\nu)}{1 + F(x^\nu) - F(x^q)} \tag{1}$$

$$n = 1 - e = \frac{1 - F(x^q)}{1 + F(x^\nu) - F(x^q)} \tag{2}$$

where e is total employment and it increases with both margins while n is nonemployment and falls with both margins. To define aggregate home production H and *GDP*, we need to take into account the fact that not all workers between the two cutoff points are engaged in full-time production, since some of them are also employed. Denote by $\alpha < 1$ the fraction of nonemployed workers between x^ν and x^q. It is easy to show that $\alpha = n$.[3] Market GDP and aggregate home production H are thus defined as

$$H = \alpha \int_{x^\nu}^{x^q} x\,dF(x) + \int_{x^q}^{x^{\max}} x dF(x)$$

3. It is easy to verify that the number of employed workers below x^ν is $F(x^\nu)$ while the number of inactive workers above x^q is $1 - F(x^q)$. Between x^ν and x^q, one finds both employed and nonemployed workers. Unreported steady state conditions on stocks imply that

$$\alpha = \frac{n - (1 - F(x^q))}{n - (1 - F(x^q)) + e - F(x^\nu)} = n.$$

$$\text{GDP} = \int_{x^{\min}}^{x^{\nu}} y\,dF(x) + (1-\alpha)\int_{x^{\nu}}^{x^{q}} y\,dF(x) = ye\,.$$

The second equality in the GDP definition states that total production is simply proportional to employment since the choice of hours is inelastic. Note also that the net wage w is assumed to decrease by one to one when t increases so that the marginal product y is constant. Accordingly, taxes affect market GDP only through their effects on cutoff points.

Finally, welfare is the sum of both home and market production net of entry costs, that is,

$$\mathcal{W} = n\int_{x^{\nu}}^{x^{q}} x\,dF(x) + \int_{x^{q}}^{x^{\max}} x\,dF(x) + y(1-n) - \lambda F(x^{\nu})n\mathcal{C}\,,$$

where the last part is simply the steady-state number of entrants to the labor markets multiplied by their entry cost.

3. Subsidies to Entry to the Labor Market and Reductions in Taxation

3.1. The Effects of Reducing the Irreversible Entry Cost

We now want to consider the effect of two possible policies for increasing employment. The first one is a subsidy to labor market entry, which can also be interpreted as a subsidy to mobility or a subsidy job search assistance. All interpretations are consistent with a reduction in the entry cost $\mathcal{C}$ at the individual level. Such a reduction in $\mathcal{C}$ will induce an increase in labor market entrance, as more women will have an incentive to supply market hours. But our simple model immediately shows that the story is more complicated, since a reduction in $\mathcal{C}$ not only raise the entry cutoff point, but it also reduce the quit cutoff point. The overall effect on employment is thus ambiguous. As displayed in the left part of Figure 1, a reduction in $\mathcal{C}$ induces a downward shift in the entry margin along the quit margin, with a reduction of both x^{q} and x^{ν}. What happens to employment is then ambiguous, and depends on the relative density of people that are sitting in the entry or in the quit margin. Note that the fall in the quit margin disappears if $\lambda = 0$ since in that case, the quit margin is horizontal. By extension, when λ is close to zero, the positive entry effect dominates over the negative quit effect. In terms of welfare, simply note that the lower $\mathcal{C}$, the closer the equilibrium is from the first best neoclassical labor supply model.

3.2. The Effects of Taxation

We now consider the second policy, namely the effect of reducing the tax rate *t*. As displayed in the right part of Figure 1, the increase in taxation is equivalent to a shift of the quit margin along the entry margin, leading to a reduction in both the entry and the quit cutoff points. The effect of a reduction in *t* is now independent of the fact that λ is positive or zero, and amounts to a an increase in both margins with positive effects on the entry and the quit margin. A reduction in tax shifts people out of home production into full-time market activity, increasing both employment and market production.

This is consistent with the literature on the effects of taxation on market activity carried out by Davis and Henrekson (2003). They find a high cross-country correlation between taxation and employment rates in high substitution industries such as household and personal services, eating, drinking, lodging, and retail trade. Inasmuch as women can engage at home in activities that are highly substitutable to market production, a high tax wedge clearly generates an incentive to move away from market production. As a result, a reduction in taxes on those activities has unambiguous effects on employment and market production.

4. Part-time Labor

Let us introduce part-time labor in our simple theory. We assume that workers can now work part-time in the labor market, and have the same productivity per hour *y* as in full-time activity, and thus the same gross hourly wage *w*. In this discussion, we don't need a full intertemporal structure and set λ to zero. We thus simply focus on flow utility, and denote by *W*, *P*, and *H* full-time market activity, part-time market activity and full-time home production. Denote by *t* the tax rate on full-time activity and $t_{1/2}$ the tax rate on part-time activity. A large value of $t_{1/2}$ can also feature differences in worker's valuation of part-time jobs, such as reduced social security. If working part-time requires half a unit of time, the indirect utility functions are thus $W(x) = y(1 - t)$; $P(x) = [x + y(1 - t_{1/2})]/2$ and $H(x) = x$.

It can be remarked that beyond taxes, here there is no specific preference for part-time since there is perfect substitutability between home production and market income. Later on in this section we shall relax this assumption. In the baseline model without taxes, there is a single cut-off point $x^* = y$ such that

$$W(x^*) = P(x^*) = H(x^*) ,$$

where women below x^* are in full-time activity and people above x^* are in full-time home production. If there is a mass point of individuals at $x = y$ then

this mass of workers is indifferent between the three states and a positive fraction of them may be in part-time.

Now, suppose that the government wishes to encourage part-time, by reducing taxes on part-time jobs and setting it to $t_{1/2} < t$. Let us denote by ε the relative increment in wages obtained by workers, with of course $\varepsilon = (t - t_{1/2})/(1 - t)$ is decreasing in $t_{1/2}$ and increasing in t. We assume that the reduction in taxes is financed through a lump-sum tax on all households. The main question we want to address is what happens to market hours and market production.

Intuitively a larger mass of workers take a part-time job and the relevant cutoff values of x are now

$$x^h = y(1 + \varepsilon) = y^+$$

$$x^w = y(1 - \varepsilon) = y^-$$

since utility is simply given by $W(x) = y$; $P(x) = (x + y(1 - \varepsilon))/2$; $H(x) = x$. People above x^h are full time in home production, people below x^w are full-time on the job and people in the interval $[x^w - x^h]$ are in part-time. The subsidy to part-time employment leads to an increase in total employment, since the number of employed women raise from $F(y)$ to $F(y^+) = F(y(1 + \varepsilon))$. This is an extensive margin result. Turning to production and thus indirectly to the total number of hours, we have

$$\text{GDP} = \int_0^{y^-} y dF(x) + \frac{1}{2} y \int_{y^-}^{y^+} dF(x) = \frac{y}{2}[F(y^-) + F(y^+)]$$

RESULT 1. *Market GDP is increased by a larger ε iff if F is locally convex around y, that is, iff $f'(y) > 0$. For small ε, the effect on market production in absolute value is proportional to ε and thus disappear as ε is zero.*

To see this, simply note that $\partial \text{GDP}/\partial \varepsilon = \varepsilon y^3 f'(y)$ after a Taylor expansion around $\varepsilon = 0$. To understand the ambiguous effect of this result, one has to realize that a subsidy to part time has two effects on market production. On the one hand, it induces women that are full time in home production to enter part-time in the labor market (crowding in effect). On the other hand it induces women who are working full-time in the market to swap to part-time (a crowding out effect). The overall effect on market production is thus ambiguous and depends on how the mass of women is positioned around the initial equilibrium. If in the initial equilibrium the mass of women who marginally prefers full time home production is larger (lower) than the mass of women who marginally prefers full-time home production (i.e., if the density is locally

increasing), the crowding in (out) effect dominates and market production increases (falls). If the two mass of women is identical, than there is no effect on market production. An alternative formulation of this statement is that, if the distribution of x is single-peaked, then subsiding part-time will increase hours and market production if the marginal worker is to the left of the peak, while it would reduce them if the marginal worker is to the right of the peak.

One can also check what happens to aggregate home production H, and after few similar steps of algebra one finds that

$$\frac{\partial H}{\partial \varepsilon} = -\frac{\partial GDP}{\partial \varepsilon} + y^2 \varepsilon f(y) = -\varepsilon y^2 [y f'(y) + f(y)]$$

The first line shows that part of the effect of a relative subsidy to part-time ε is a transfer from market production to home production, plus a deadweight loss represented by the mass of people at the extensive margin, that is, $y^2 \varepsilon f(y)$. The second line indicates that the sign of the effect on home production depends on the sign of the derivative of the function $yf(y)$ with respect to y.

There are two possible extensions to this simple model. The first one is to relax the assumption that there is no specific preference for part-time. This is equivalent to relaxing the perfect substitutability in x and y and have instead a flow utility $u((1 - e)x, ey)$ with $e \in \{0, ½, 1\}$ that refers to the hours spent in the market. We can show that in this analytical more complex model a subsidy to part-time would still generate a crowding in and a crowding out effect. The intuition of Result 1 would still carry along, so that the overall effect would still be affected by the slope of the density function f at the cut off points. A second extension would be to introduce worker's heterogeneity on market production rather than on home production. If we assume that market productivity y is dispersed in the population with a c.d.f. $\tilde{F}$ while x is common to individuals, the problem is formally identical to the one of this paper: We can simply solve it by replacing W by H and vice versa. The effects of the subsidy on part-time would still depend on the slope of the density $\tilde{f}$ at the initial equilibrium.

5. Conclusion

While in Europe there is large consensus on the need to raise the time spent in the market by European women, there is some confusion about the ways in which these goals should be achieved. This paper has presented a simple and original model of labor supply in an imperfect labor market. We showed that subsidies to labor market entry increase women's entrance in the labor market, but they also increase exits from the labor market, with ambiguous effect on employment. Furthermore, subsidies to part-time do increase employment, but they have ambiguous effects on hours and market production. Finally, we show

that reductions in taxes on market activities that are highly substitutable with home production have unambiguous positive effects on market employment and production.

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