Gender based taxation.*

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Abstract

Women elasticity of the labor supply is substantially higher than that of men. The theory of optimal taxation implies that tax rates on income should be lower for women than for men. We analyze this argument in detail and show that given existing estimates of elasticities the optimal tax rates on men and women could be quite different. We also discuss how gender based taxation would interact with other policies having to do with possible gender discrimination in the labor market, with equity and with the social costs and benefits of increasing women participation in market activities.

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1 Introduction

One of the basic principles of optimal taxation is that the government should tax less the goods which have a supply more elastic to tax rates. Women labor supply is more elastic than that of men to after tax wages. Therefore optimal taxation theory implies that tax rates on labor income should be lower for women than for men. This argument is reinforced by considerations regarding the observed distribution of male and female earnings.

If one believes that the real world is pretty close to a complete market, no externalities, fully maximizing agents, no discrimination, no consideration of equity, that children's utility is well taken care off in family decisions and role model issues are unimportant then there is nothing to add to this argument: it is optimal to have gender based tax rates. If, instead, one believes that the world is far from the "clean" no externality no missing market case, discrimination exists and equity matters then one may ask the question of how a gender based taxation would interact with policies geared toward addressing all of the above, namely what would be the additional effect of gender based taxation in addition to reducing the welfare costs of income taxes.[1] In the second part of the paper (to be skipped by those who believe in perfect and complete markets) we argue that gender based taxation goes in the same direction as policies geared toward correcting alleged market failures and possibly does so more efficiently, i.e. with less distortions. This reinforces the optimal taxation argument.

The idea of gender based taxation is not totally new, neither in practice nor in theory. For instance whether or not the income of the second earner is added to that of the first earner for income taxation is not gender neutral. In fact adding up the two incomes with a progressive taxation goes exactly in the opposite direction of optimal taxation: the second earner's income (typically the woman) is taxed at a higher rate. Children subsidies and tax credit

[1] Obviously if one holds the first view all of those policies should be abolished.

are also not gender neutral.[2] Recently Sweden has introduced some explicitly gender based incentive systems: men have longer paid paternity leaves than women' maternity leaves.[3] The goal (right or wrong) is to influence the division of labor within the family but also equity since the career of the member of the family who takes leaves may be negatively affected. Gender based affirmative action programs are meant to eliminate gender discrimination in the labor market and they encourage participation of women in the labor force and their promotion to higher ranks. Many countries subsidize child care facilities with public money. As we discuss below these polices may be less efficient than gender based taxation in achieving their stated goals.

As for theory, the idea that taxes should depend on non-modifiable characteristics of subjects that are related to their earning capacity goes back at least to Akerlof (1978). Kremer (2003) discusses the possibility of age based taxation and also mentions the possibility of gender based taxation, although it does not fully explore the implications of it.

Two are the possible arguments against gender based taxation. One is that "women work too much" and taxing them corrects this inefficiency. For this to make sense it must be the case that women (and families) do not optimize correctly or do not intenalize some externality, regarding, possibly, children care and education. However many existing policies seem to be geared towards increasing women's participation in the labor force, as discussed above, even though in principle they could be wrong.[4] A second argument is that a prolonged and extensive use of gender based taxation may imply long run adjustments in family organization, investment in education of women, participation and attachment to the labor force that may lead in the long to an evolution of labor supply elasticities.[5] The legislator would

[2]A recent symposium of the Levy Economics Institute (2006) reviews and discusses various indirect ways in which tax systems are not gender neutral

[3]See Friebel et al. (2005).

[4]The Lisbon agenda a widely accepted set of goals for EU members countries includes explicitly an increase in women participation in the labor force as an objective,

[5]Recent evidence from the United States, in Blau and Khan (2004) and Goldin (2006)

have to be aware of these potential changes and adjust tax rates accordingly. We return to both these issues below.

The paper is organized as follows. In the nest Section we discuss the basic public finance argument that suggests a gender based taxation using a Ramsey/Mirelees approach. We also provide some numerical calculations suggesting that optimal tax rates might differ considerably in Italy, Norway and the USA, given the existing estimates of labor supply elasticities and earning distribution hazards. In Section 3 we examine various extensions and discuss additional aspects of gender based taxation beyond optimal taxation theory. The last Section concludes.

2 Optimal taxation theory of gender based taxation

In this section we show how a simple model of optimal taxation implies that tax rates should differ by gender and in particular female rates should be lower. In what follows we assume that in a married couple the family income of the two workers is not added for income taxation, as it is the case in many countries. Note that cumulating the income of the two earners in a family with progressive taxation lowers the labor supply of the second earner, typically the woman, and would work in the opposite direction of what optimal taxation theory suggests.[6]

2.1 The simplest case: uncorrelated labor supply decisions

Let's start from the simplest case in which labor markets for females and males are independent and all workers are equally productive irrespective

is consitent with this idea.

[6]The European Union has recently passed a directive suggesting to all countries a rule against cumulation of married couple income for taxation.

of gender.[7] Consider the market for females (denoted by subscript f; the analysis is identical for males denoted by subscript m). We assume that all workers are paid their marginal productivity w. For sake of exposition and without loss of generality, labor supply L_f is specified as a constant elasticity function of the after-tax wage:

$$L_f = s[(1-t)w]^{\sigma_f} \tag{1}$$

where t is the tax rate, $\sigma_f < 1$ is the elasticity and s is a scale factor.

It is well known that in this setting, starting from a situation of no labour taxation, the imposition of a tax on labor reduces employment and causes a social welfare loss corresponding to the standard triangle the expression for which is given by:

$$C_f = w(L_n - L_f) - \int_{L_f}^{L_n} \left(\frac{1}{s}L\right)^{\frac{1}{\sigma_f}} dL \tag{2}$$

where L_n is the equilibrium employment with no taxation (normalized for simplicity to be equal for males and females). Taking the derivative of C_f with respect to t, shows that the social loss increases in the tax rate.

$$\frac{dC_f}{dt} = -wt\frac{dL_f}{dt} = s\sigma_f w^{\sigma_f+1}(1-t)^{\sigma_f-1}t > 0 \tag{3}$$

Not surprisingly the distortions caused by labor taxation become more severe the higher is the elasticity of labour supply to wages in the initial equilibrium without taxes.[8] As a result, if the supply of females is more elastic than the supply of males, the same labour tax t_0 imposed on both genders generates more severe distortions in the market for females than in the market for males. Specifically, if $\sigma_f > \sigma_m$, and the same tax rate t_0 is imposed on both genders:[9]

[7] See Ramsey (1927) and Atkinson and Stiglitz (1980).

[8] Formally, $w(1-t) > 1$ is a sufficient condition for, $\frac{dC_f}{dtd\sigma_f} = \frac{1}{1-t}sw[w(1-t)]^{\sigma_f}\{1 + \log[(1-t)w]\} > 0$.

[9] Proofs are immediate from inspection of equations 1 and 3.

- the employment level decreases more for females than for males:

$$L_{f0} < L_{m0} < L_n. \tag{4}$$

- the social welfare loss is larger for females than for males:

$$C_{f0} > C_{m0} > 0. \tag{5}$$

Let $T_0 = t_0(wL_{f0} + wL_{m0})$ be the revenue raised by the government when the same tax rate t_0 is imposed in both markets. The government can reduce distortions while raising the same revenue, by imposing different tax rates t_f and t_m for female and males in order to minimize

$$C = C_f + C_m \qquad \text{s.t.} \qquad t_f wL_f + t_m wL_m \geq T_0 \tag{6}$$

The solution of this optimization problem indicates that the optimal tax rates are

$$t_f = \frac{\theta}{\sigma_f + \theta} < t_0 < \frac{\theta}{\sigma_m + \theta} = t_m \tag{7}$$

where $\theta = \frac{\lambda}{1+\lambda}$ and λ is the Lagrange multiplier on the government's constraint. In other words, starting from a single tax rate on labor, the government can minimize the aggregate social loss without losing revenues by imposing a lower tax rate on females and a higher tax rate on males.

From the viewpoint of this paper the choice of the optimal tax rates t_f and t_m has also important labor market consequences because it implies that:

$$\begin{aligned} L_f &> L_{f0} \\ L_m &< L_{m0} \end{aligned} \tag{8}$$

but

$$L = L_f + L_m > L_{f0} + L_{m0} = L_0 \tag{9}$$

Thus, moving from a single tax rate to the optimal gender based tax rates increases female employment more than it decreases male employment, so that total employment grows.[10]

[10]To see this, let $T_f = t_f wL_f$ and $T_m = t_m wL_m$. If the government constraint is

2.2 Cross elasticities

Labor supply decisions are typically joint within a family and therefore one has to consider cross elasticities of husbands and wives. Obviously for the case of singles cross elasticities are zero and the discussion of the previous section holds directly. However the labor elasticity of single women is lower than that of married women, an issues which we discuss below.

Consider a more general specification according to which the labor supply of gender j depends on the after tax wages of both genders, as in $L_j = L_j((1-\bar{t}_j)w_j, (1-\bar{t}_i)w_i)$ with own-elasticity σ_j, cross-elasticity γ_{ji} and tax rates $\bar{t}_i$ and $\bar{t}_j$.[11] Following the same steps of the analysis of Section 2.1, in the presence of non-zero cross-elasticities the first order conditions of the government problem imply that:

$$\begin{aligned} \bar{t}_f &= \frac{\bar{\theta} - t_m \frac{L_m}{L_f}\gamma_{mf}}{\sigma_f + \bar{\theta}} \\ \bar{t}_m &= \frac{\bar{\theta} - t_f \frac{L_f}{L_m}\gamma_{fm}}{\sigma_m + \bar{\theta}}. \end{aligned} \tag{10}$$

where $\bar{\theta} = \frac{\bar{\lambda}}{1+\bar{\lambda}}$ and $\bar{\lambda}$ is the Lagrange multiplier on the government's constraint in the presence of cross elasticities. Note how these expressions incorporate the optimal tax rates of the previous section as a special case if the cross elasticities are zero. Under reasonable assumptions the cross elasticities

satisfied and tax revenues remain unchanged:

$$dT_0 = 0 = \frac{dT_f}{dt_f}dt_f + \frac{dT_m}{dt_m}dt_m$$

which, if $\sigma_f > \sigma_m$, implies that

$$\left|\frac{dt_f}{dt_m}\right| > 1$$

and

$$|dL_f| = \left|\frac{dL_f}{dt_f}dt_f\right| > \left|\frac{dL_m}{dt_m}dt_m\right| = |dL_m|.$$

[11] See Blundell and MaCurdy (1999) for a survey of models of family labour supply that deliver a specification of this kind.

are negative, and this is confirmed, with one exception, by the (admittedly scant) empirical evidence that will be discussed below in Section 2.4. The evidence also suggests that the cross elasticity for males γ_{mf} is very low, which implies that the optimal tax rate for females should not change much when joint family decisions are considered, with respect to the case of the previous section. More generally, the consideration of negative cross elasticities reinforces our basic result. When the optimal gender based tax rates are imposed, women work more not only because they are taxed less but also because the after tax wage of men is lower with respect to the benchmark situation in which a single tax is imposed in both markets. Men would instead work less because of the symmetrically opposite reasons. To the extent that cross elasitcies are very small, as we discuss below, all the results concerning labor force participation derived in the prvious section generalize to the case of non-zero cross elastcities. Thus even in this more general case we find that gender based taxation would not only minimize fiscal distortions for equal revenues, but also increase female labor market participation.

2.3 Different productivities

This far we have assumed equal productivity of every woman and every men. Using the Mirrlees-Diamond theory of optimal income taxation[12], one can explore additional implications of gender based taxation with different productivity in a way related to what Kremer (2003) has done looking at age based taxation. Let the distribution of labor incomes of gender j be

$$w_j \sim G_j(w) \tag{11}$$

with $j = f, m$ and $w_j \in [\underline{w}, \overline{w}]$. At this stage the reason why the two distributions differ is irrelevant. It may be because of gender discrimination of various types, or because labour productivity is distributed differently among females and males, maybe because of anticipated statistical discrimination;

[12]See Mirrlees (1971), Diamond and Mirrlees (1971a,b) and Diamond(1998).

namely women, expecting to be discriminated, invest less in education, therefore making statistical discrimination a rational outcome.[13] To argue in favor of a gender based taxation the reason of the difference is irrelevant in the short run, although it may become relevant in the long run as we discuss below. Assume that the population is a continuum of mass one for each gender and that workers derive utility from consumption and leisure according to a function that has, for simplicity, a quasi-linear specification:[14]

$$U_j(C_j, L_j) = C_j + V_j(1 - L_j) \tag{12}$$

where $C_j = wL_j - T_j(wL_j)$ is after tax income and $T_j(wL_j)$ is the tax function that the governments seeks to optimize. To do so, the Government chooses the tax schedules $T_j(wL_j)$ in order to maximize the social welfare function

$$\Omega = \int_{\underline{w}}^{\overline{w}} \Omega_f(U_f(C_f(w), L_f(w)))dG_f(w) + \int_{\underline{w}}^{\overline{w}} \Omega_m(U_m(C_m(w), L_m(w)))dG_m(w) \tag{13}$$

subject to the resource constraint

$$T = \int_{\underline{w}}^{\overline{w}} T_f(wL_f(w))dG_f(w) + \int_{\underline{w}}^{\overline{w}} T_m(wL_m(w))dG_m(w) \geq E \tag{14}$$

where E is the expenditures requirement of the government. As shown in Diamond (1971), in this setting the optimal tax schedule for gender j satisfies:

$$\frac{T_j(w)}{1 - T_j(w)} = H_j(w)K_j(w)P_j(w) \tag{15}$$

where

$$H_j(w) = \frac{1 - G_j(w)}{g_j(w)} \tag{16}$$

$$K_j(w) = \frac{1}{w}\left(1 + \frac{1}{\sigma_j(w)}\right) \tag{17}$$

$$P_j(w) = \frac{\int_{\underline{w}}^{\overline{w}}(\lambda - \Omega_j(U_j(w)))dG_j(w)}{\lambda(1 - G_j(w))} \tag{18}$$

[13] See Becker (1957), Arrow (1973), Altonji and Blank (1999).

[14] We are ignoring here issues of complementarity of leisure taking between husbands and wives; see Alesina Glaeser and Sacerdote (2005) for some discussion of this.

The optimal tax for each gender depends on three terms. The two relevant ones from the viewpoint of this paper are $H_j(w)$ and $K_j(w)$. $P_j(w)$ measures the distributional impact of raising marginal taxes between subjects earning different wages within each gender, and is irrelevant from our viewpoint as long as distributional concerns are not different across genders. The term, $K_j(w)$ is a decreasing function of the elasticity of labor supply of gender j. This term captures in a more general setting the same basic effect described in Section 2.1. If the elasticity of labor supply is higher for females, as suggested by the evidence, the optimal tax rate should be lower for them.

The value added of this approach with respect to what we know already from the basic model of Section 2.1 stems from the term $H_j(w)$ which is equal to the inverse of the hazard of the income distribution of gender j (see equation 16). The evidence described below, in Section 2.4, suggests that the hazard for females is typically higher than the hazard for males at any income level. This happens because the distribution of females has more mass concentrated at low income levels. As a result, also for this reason and independently of the elasticity of labor supply, the tax rate on labor income should be lower for females and higher for males. The intuition of this result is simple. At any given income level w, the numerator of the hazard measures the fraction of subjects whose labor supply is distorted, at the margin, by the tax rate. The denominator of the hazard measures instead the fraction of subjects who earn more than w and for whom the labor supply decision is not distorted at the margin by the tax rate set for income w. Indeed for the subjects who earn more than w, the tax levied at w is essentially an infra-marginal lump sum that does not change with the marginal labor supply decision. Thus, the hazard rate of the earnings distribution at any given income level is proportional to the distortion induced by the tax rate per unit of revenues.

This is the reason why, in this framework, optimal tax rates should be inversely related to the hazard of the earnings distribution. If this hazard

is higher for females, as we show below in Section 2.4, a gender based tax rate designed to be inversely proportional to gender specific hazards would minimize distortions per unit of revenues raised by the government.

2.4 Some numerical calculations

While there may be disagreement on the level of labor supply elasticities, very few (if anybody) would argue that they are the same across genders. Alesina Glaeser and Sacerdote (2005) extend the survey of Blundell and MaCurdy (1999) on the empirical estimates of the labor supply both for the US and other countries. Methods of estimation vary greatly and result vary by countries. Most researchers would agree that a consensus estimate of the male labor elasticity is roughly zero or very small. There is more variability for females, but on average the estimated elasticity could be somewhere between 0.4 and 1.

Using existing estimates of elasticities, in this section we show that the optimal gender difference in tax rates may be quantitatively substantial in three countries with rather different configuration of female labor participation, namely: Italy, Norway and the USA. The two European countries are interesting to compare since they are at the extreme of the range of female labor participation rates and have more generally different family structures and attitudes towards gender issues.[15] The USA went through considerable changes in female labor supply behavior during the eighties and nineties, as recently documented by Blau and Kahn (2004), and Goldin (2006): female labor participation has increased and, even more importantly for our purposes the elasticity of female labor supply has decreased.

Let's begin by examining the case in which cross elasticities are zero as a benchmark. Considering equation (7) in Section 2.1 and observing that θ

[15]See Fernandez (2007) and Alesina and Giuliano (2007) on cross country differences in female labor participation as explained by cultural effects and family structures.

can at most be equal to 1[16], one can derive upper and lower bounds for the ratio of the optimal gender tax rates $\frac{t_f}{t_m}$:

$$\frac{\sigma_m}{\sigma_f} < \frac{t_f}{t_m} < \frac{\sigma_m + 1}{\sigma_f + 1} \tag{19}$$

The third line of Table 1 shows some simple calculations of the upper bound $\frac{\sigma_m+1}{\sigma_f+1}$ based on the elasticities reported in the first two lines. For Italy and Norway (respectively in 1993 and 1994) we use the estimates obtained in a series of papers by Aaberge et al.(1999,2002,2006) which provide a structural econometric framework that allows to estimate own- and cross-elasticitities taking into account non-convex budget sets, non-linear labour supply curves and institutional hours constraints. For the US (in the period 1999-2001) we rely on the estimates obtained by Blau and Kahn (2004) using March CPS data. The values of labor supply elasticities which are different for the three countries highlight the differences in the maximum ratio of female versus male optimal tax rates.

For Italy where the difference in elasticities is the highest the ratio is *at most* 68%, which implies a very large difference in optimal tax rates between women and men. For Norway, where the gender difference in labor elasticities is much lower than in Italy, the maximum ratio is much higher, but still implies that the optimal female tax rate must be at least 9 percent smaller than the male rate. As expected, the USA lay somewhere in between the two European countries, with an optimal female tax rate that cannot be larger than 79% of the male rate.

Making assumptions about the shadow price of the tax revenue constraint of the social welfare optimization problem (6), it is possible to derive, using equation 7, the optimal tax rates of males and females that would keep revenues constant. For example, assuming $\theta = .25$ (that is $\lambda = .3$), in order to minimize distortions while keeping government revenues at the current

[16]This is the limiting value of θ when the shadow price λ of the tax revenue constraint of the social welfare optimization problem (6) goes to infinity.

level, the tax rate of Italian females should be 27% while that for males should be as high as 68%. Note that the implied ratio is much lower then the maximum one described above. Assuming for Norway a value of θ equal to 0.5, to capture the idea that the shadow price of the revenue constraint is higher in this country because of the heavier tax pressure, the optimal gender tax rates are 49% for female and 56% for males. These estimates are higher and of course significantly closer one to the other given the greater similarity of labor supply elasticities across genders, but still markedly different. In the USA, where we have assumed $\theta = 0.25$ as in Italy, the optimal tax rate for males is similar to the Italian one given the almost identical elasticity estimates, while for females, whose elasticity is closer to Nordic European standards, the optimal tax rate is closer to the Norwegian one. In a general equilibrium simulation of a model of gender based taxation, building for example on the framework proposed by Aaberge et al. (1999, 2002, 2006), one could estimate the implicit value of θ for each country and obtain more precise estimates of the optimal gender based tax rates. This exercise is left for future research

Let us now turn to the bottom of the table where we consider non-zero cross elasticities, which are rarely estimated. The existing studies typically show that the labor supply of each gender decreases when the wage of the other gender increases, but the cross-elasticity is in absolute value larger for females than for males for whom it is typically estimated to be close to zero. In order to use equations (10) to compute the optimal gender tax rates in the presence of non-zero cross-elasticities, we need to calibrate also the labor force participation ratio between the two genders and for this purpose we use the OECD data as reported in Alesina, Glaeser and Sacerdote (2005).[17]

The bottom two lines of Table 1, suggests that the consideration of joint family supply decisions does not change in a significant way the results ob-

[17]To focus on the effect of considering non-zero cross elasticities, we performed these calculations keeping the value of the Lagrange multiplier unchanged so that $\theta = \bar{\theta}$.

tained above under the more restrictive assumption of zero cross elasticities: the optimal tax rates remain considerably different between genders in all countries.

Let's now consider the hazard rates of income distributions, which can be obtained from available earnings surveys for Italy, Norway and the USA. The bottom panels of Figure 1 display, for each country, a smoothed estimate of the distribution of total labour earnings of females and males.[18] In all countries the right tail of the distribution indicates that there are more males than females with high total labor earnings. The opposite is true in the left tail of the distribution, where females are over-represented with respect to males. Given these gender differences in the distribution of earnings it is not surprising that the hazard defined in equation (16) is higher for females in all countries. Table 2 reports the weighted averages of the hazards plotted in the top panels of Figure 1, with weights given by the frequency of observations in each interval of the categorical earning function. The average hazard of females is 7 percentage points higher in Italy and 5 percentage points higher in Norway and the USA.

These differences reinforce the conclusion, based on the analysis of elasticities, that the optimal tax rate of females should be lower than that of males. The consideration of hazards implies that, by shifting the tax burden from females to males, the government can reduce the amount of distortion caused by taxation per unit of revenues because at each given earnings level the fraction of females whose supply decision is distorted at the margin is

[18]The data come from the Survey of Household Income and Wealth (SHIW) for Italy, the Norwegian Linked Employer-Employee Data Set for Norway (see Moen, Sorensen and Salvanes, 2004) and the Current Population Survey (CPS) for the USA. Earnings for the USA are top-coded at 100,000 dollars. To obtain these estimates we have categorized total labor earnings in intervals of 2,000 euros (2,500 dollars for the US, which is how earnings are recorded in the CPS). The smothed distributions have been obtained using locally weighted regressions of the relative frequency in each interval on the categorical earning variable. For Italy we have only after tax earnings. But note that this reinforces our findings because progressive taxation compresses the after tax distribution of earnings more for males than for females.

higher than that of males, relative to the fraction of subjects of the same gender who earn more and are therefore not affected at their margin. How do these observed differences in earning distribution add quantitatively to the differences in tax rates calibrated above is a difficult question to answer. In order to do so we would need a more sophisticated simulation framework, a task left for future research.

2.5 Summing up

From standard theory of optimal taxation we easily derive the result that gender based income tax rates, with lower rates for women, are optimal. Given what we know about the elasticities of labor supplies and the hazard rates of the earnings distributions across genders, the difference between the optimal tax rates between men and women could be quite large even though long run responses of elasticities and hazards may lower the difference over time. If one believes that no other consideration in addition to optimal taxation arguments is relevant for the issue at end, than he (she) may stop reading here. What we are doing next is to explore the effects of lower tax rates on women on a variety of individual and family decisions and what their effects may be.

3 "Side" effects of gender based taxation

3.1 Women pre and after tax salaries

In any situation with a downward labor demand with gender based taxation pre tax women wage would go down and after tax wage would increase. Alesina and Perotti (1997) show that this would happen even in a model with monopolistic labor unions who maximize a welfare function that depends on unemployment and take home salary of union members. Higher (lower) income taxes would translate in unions' higher (lower) pre tax salary demand.

The authors show evidence in support of this effect in unionized countries and sectors.

From an employer point of view it would then become cheaper to hire women, therefore favoring women employment and their promotion to higher paid jobs especially with progressive taxation since at higher tax rates the effect of gender based taxation would be stronger. These effects are consistent with the stated goal of affirmative action policies geared toward correcting discrimination and inequities in the labor market against women. But gender based taxation would achieve affirmative action goals more efficiently through a price mechanism. An analogy with anti pollution policies is revealing: the efficient way to reduce pollution is to tax it not to impose quantitative restrictions that would be the correspondent of affirmative action policies in this context.

3.2 Women working, role models and children success

One of the effect of gender based taxation is that women would work more in the market and less at home and men would work a bit more at home and a bit less in the market (since their elasticity of labor supply is low).[19] The net effect would be to reduce total amount of home work versus market work. For example, regarding child care, the policy change would cause the total amount of time spent by parents with children to go down. Note, however, that this would not be necessarily bad for chidren. Given that men spend relatively little time with children, the marginal benefit of time spent at home by men may be higher than the marginal loss of an hour spent by a woman away from home.[20] More generally, in the absence of other pre-

[19]The empirical relevance of home production has been recently emphasized by several authors investigating the decline in market work in several European countries. In particular Burda, Hammermesh and Weil (2007) show, looking at time diary surveys, that women and men work a remarkably similar number of hours per week, but women work more at home and less in the market.

[20]This is one of the motivation of the Swedish policies described in the introduction (see Friebel et al., 2005) creating incentives for paternity leave versus maternity leave.

existing distortions, since gender based taxation reduces *tax* distortions the change in time allocation between home and work that would derive from its introduction has to be welfare improving.

This would not be the case if the taxation of women income were meant to correct for some other pre-existing distortion, so that reducing the tax rate on women would make them work "too much". For this to be the case, however, one of two condition must occur. One is that parents (and mothers in particular) must not take properly into account the welfare of children because small children do not have a voice in family decision about how much time the mother should spend at home. In other words children's "vote" is not counted properly in family decisions. The second possibility is that mothers do not take into account an externality. If by working more they reduce the "quality" of their children they may affect society above and beyond their private cost. Imagine, to be extreme but concrete, a son becoming a criminal but not stealing from their parents or a teen age pregnant daughter costing more to society than to parents in terms of welfare.

It is of course hard to measure how much parents love children. On the issue of whether the quality of children is reduced by working mothers we have evidence suggesting that children success is only mildly affected negatively by the participation of mothers in the labor force. On this point it is worth citing from the survey of there literature by Haveman and Wolfe (2005) who summarize the findings as follows: "Growing up in a family where the mother works appears to have a modest adverse effect on educational attainment....mothers' work choice do not appear to have any effect on the probability that a girl will have a out of wedlock birth in her teens or be a welfare recipient nor on educational achievements if the mother's work occurs in the child's teen years. In the last case the role model or additional income effect appears to dominate". A direct counterargument is that of a recurrent theme in the discussion about gender based affirmative action, namely the lack of role models for girls in the labor force when women participation

in market activities is low. With the possible exception of some religious groups, almost anybody would agree that a working mother is a positive role model. As noted above by Haveman and Wolfe (2005), the role model effect may be especially relevant for teenagers. The creation of role models may in fact compensate for the lower amount of child care provided by working mothers. It is fair to say, however, that there is much variance in the evidence on this highly politically charged issue and therefore we cannot quite be sure yet about the exact magnitudes of these effects.

Finally, note that in many country child care is publicly subsidized. A reduction on income taxes on women would increase demand for child care but would also allow women to purchase more child care at market prices. If public subsidies to child care are a way of increasing women participation to the labor force, reducing the income tax on women would go in the same direction and it could be a more efficient way of achieving efficiency in the child care market.

3.3 Divorce and fertility

More women working and working longer hours would increase their bargaining power within the family. In particular women in unhappy marriages could afford more easily a divorce if they had an established work and income outside the household. Divorce rates may go up, but the welfare implications of this effect are exceptionally difficult to measure.

The welfare of women stuck in bad marriages would certainly increase. Wolfers and Stevenson (2003) for instance estimate a significant reduction of family violence when divorce laws became more permissive in the US. The effect of divorce on the welfare of children is a hotly debate topic extremely politically charged. A very large literature suggest a negative impact of divorce on children (see the review by Haveman and Wolfe (1995)). Obviously a big problem in this literature is the non-exogeneity of parental divorce to

their children's outcome. A recent study by Sanz de Galdeano and Vuri (2006) that tries to tackle the exogeneity issue suggests that divorce " does not negatively affect teenagers' cognitive skills". It is fair to conclude that we do not really know for sure what are the effect of divorce on children, but the endogeneity of divorce goes in the direction of making divorce look worse in terms of children' attainments.[21]

One can think of two possible effects on fertility. One arises form higher women participation in the labor force and a higher incentive of investing in education for women. This effect is most likely to be negative.[22] The latter comes from the increase in divorce rates. A more likely divorce may reduce the incentives to have children, but a divorced woman from and unsuccessful match may remarry and have children why she would not have them in a non working family.[23] The welfare effect of a reduction (or of a less likely) increase in fertility depend on whether fertility is considered too high or too low. More precisely the question is whether individual decision about fertility are in any way "distorted" i.e. private decisions are not optimal for society.

3.4 Single and married women

The high elasticity of women's labor supply is mostly driven by married women. Single women (and by this we mean truly single, i.e. not living in a *de facto* marriage) have a lower elasticity of labor supply than married women.[24] Having different tax rates for married women and single women would make the system more complex and introduce incentives to marry; while gender cannot be changed (except at very high cost!) marital status can. Using the same tax rates for single women and married women in a

[21]Sanz de Galdeano and Vuri (2006) also include an excellent and up to date review of the literature on this question.

[22]See Goldin (2006) and the references cited therein.

[23]See Alesina and Giuliano (2006) for a recent discussion of the effects of divorce on fertilty.

[24]Aee Blundell and Mc Curdy (1999) and Aaberge et al. (2002, 2006).

sense favors single women since they are taxed at a lower rate than their labor elasticity would entail.

However, arguments about affirmative action and potential discrimination apply to single women as well and therefore, from this point of view, lower taxes for single women may be in sink with other social goals. Also single mothers are a good portion of single women and to the extent they are a category at risk of poverty (at least in the US), lowering taxes on them (including making them negative) may have other advantages and substitute for other welfare programs.

3.5 Lon run elasticities

One may ask the question about whether in the long run with gender based taxation the relative elasticities of the labor supply between men and women would remain as they are measured currently with gender neutral income tax rates. If the difference between the two were genetic they would, but it is hard to believe that they are: much of the difference has to do with who is considered the second earner of the family and issues concerning child care. Gender based taxation with differentiated tax rates is optimal only to the extent that women labor supply is more elastic then that of men. There may be a limit in how different tax rates can be before women become the first earner of the family with a lower elasticity in which case the gender based tax rate should be used in reverse. A similar reasoning applies to the consideration of gender differences in the hazards of the earnings distributions.

If for a long time tax rates on women would remain much lower than men' in the limit the man may become the second earner in the family and therefore men and women elasticities may become the same or even higher for men. How fast that may happen and for what differences in gender based tax rates is likely do depend on how deeply role models about traditional

role for women and men are felt[25] but certainly the issue is relevant. In fact these long run considerations are an important area of future research on the question of whether cultural stereotypes, social norms and family structure change relatively slowly or quickly to changing economic incentives and the economic environment. This is a quite important issue but one which is above and beyond the basic point that we want to make in this paper and is therefore left for future research.

4 Discussion and Conclusions

Taxing labor income of women less than that of men satisfies criteria of optimal taxation, given the different elasticity of the labor supply of women and men and the gender differences in the hazards of the earnings distributions. In other words, one could obtain more tax revenue with the same average tax rates by reducing the rates on women of a certain amount and increasing that of men by less. Even considering cross elasticities between husbands and wives the differences between the tax rates of males and females could be quite large if, as it appears from the available empirical evidence, the elasticities of male and female labor supply are very different. Using estimates for the USA the female tax rate should be no greater than about 80% of that of males and possibly much less. Note that the current US tax code that implies adding husbands and wives' income for income tax purposes go in the opposite direction of optimality, since the income of the second earner (typically the wife) is taxed at a higher rate. Therefore not adding the salary of husbands and wives for income tax purposes would be a move in the right direction. For Italy and Norway, which are at the opposite extremes as far as gender differences in elasticities are concerned, the female tax rate should be at most 68% of the male rate in the first country and 91% in the second one. The consideration of earning distribution hazards reinforces this conclu-

[25] See Alesina and Giuliano (2007) and Fernandez (2007).

sion suggesting that, by shifting the tax burden from females to males, the government can reduce the amount of distortion caused by taxation per unit of revenues. Therefore taking into account the different hazard rates would make the optimal differences in tax rates even bigger than those discussed above and based only upon an elasticity argument.

In addition to satisfying criteria of optimal taxation, gender based taxation generates effects on women participation in the labor force that go in the same direction of other public policies. Gender based taxation achieves these goals taking advantage of incentives given by the price system of pre and after tax wages. It also has the benefit of simplicity in the sense that gender is easily observable and all that is required is the institution of two sets of income tax brackets for male and female tax payers. One could also think about changing the degree of proportionality on the tax rates of men and women but that would require more sophisticated simulations of the effects of this policy on labor supply decisions.

The focus of this paper was normative but it is worth concluding with a word about the political feasibility of gender based taxation. Let's consider who would benefit in monetary terms for a tax reform that lowers tax rates on women and raises taxes on men (by a lesser amount) keeping government spending constant. Needless to say by Coase theorem if interpersonal non discretionary transfers were available the losers could be compensated since the reform is welfare improving. Lets consider preferences without such transfers, ignoring expectations regarding changes in future marital status. Single women working after the tax change would favor it. Those who were working before gain (assuming that the tax cut is not completely absorbed by lower pre tax wages), those who chose to work after the tax cut are better off than before because the option of not working is still available but they do not choose it anymore. Single working men would oppose it. Non working singles after the tax change are indifferent. Married couple in which the woman does not work even after the tax change would oppose it. The

key group is married couples in which the wife works after the tax changes. Remember that the tax change reduces distortions. If every married couple were identical (thus ignoring issues of progressive taxation and different productivities etc.) than for every couple the policy is welfare improving since it is welfare improving in the aggregate. If people vote as a function of the couple's utility only, than the couple would favor the reform. If individuals give some weight to their own utility women would favor the reform more than men. Complication arise with progressive taxation and different productivities in different married couples. These are issues left for future research. Finally above and beyond monetary gain or losses, some individuals may favor gender based taxation for the affirmative action type results achieved by the policy, in the same way as currently not every men opposes gender based affirmative action policies..

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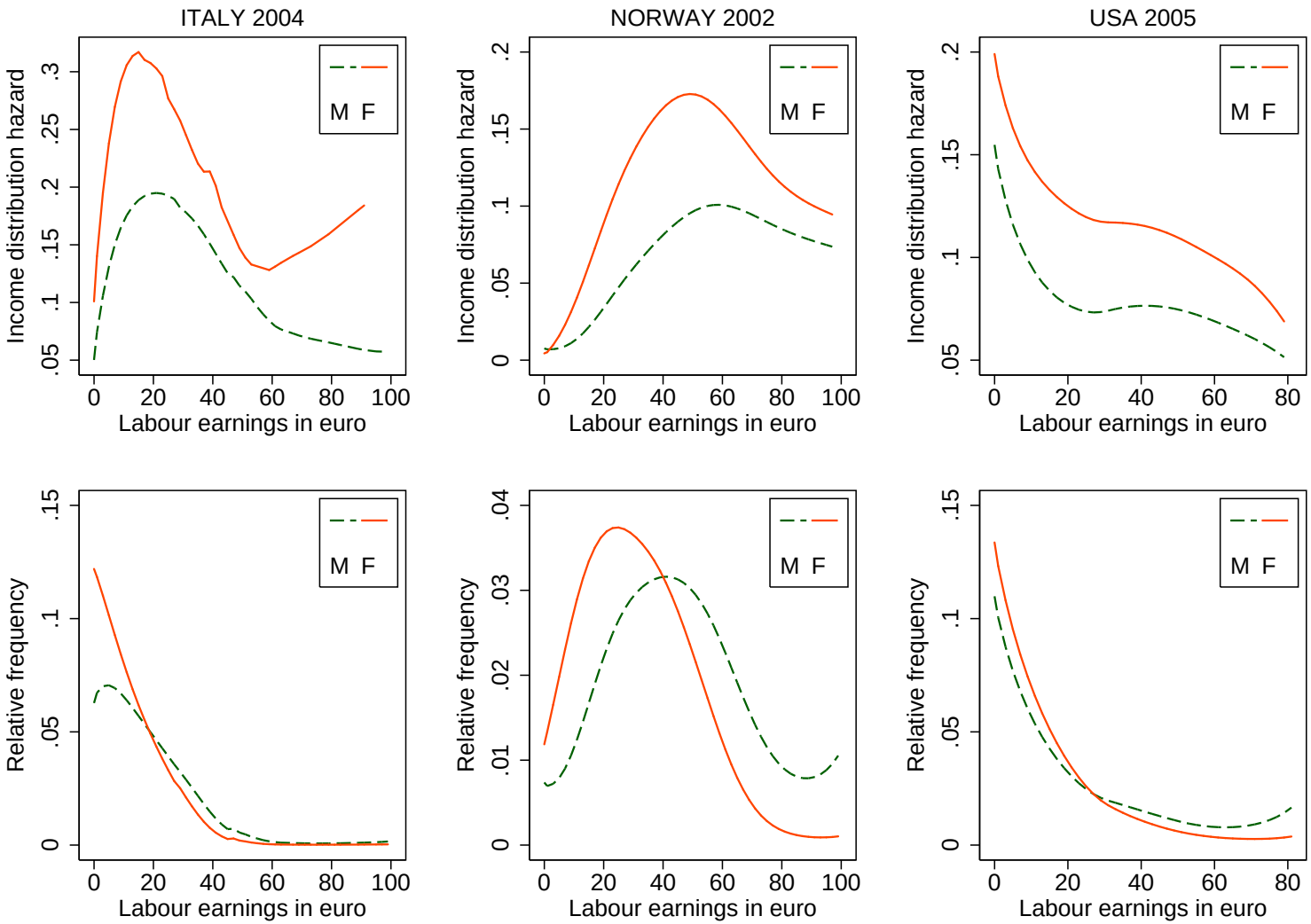
Table 1: Optimal gender based taxation in Italy, Norway and USA

		Italy	Norway	USA
Assuming zero cross elasticities:				
Female elasticity[a]	σ_f	0.66	0.52	0.40
Male elasticity[a]	σ_m	0.12	0.39	0.10
Maximum optimal gender tax ratio[b]	$max\left(\frac{t_f}{t_m}\right)$	0.67	0.91	0.79
Optimal revenues-constant tax rate for females[c]	t_f	0.27	0.49	0.38
Optimal revenues-constant tax rate for males[c]	t_m	0.68	0.56	0.71
Assuming non-zero cross-elasticities;				
Female cross-elasticity[a]	γ_{fm}	-0.49	-0.42	-0.19
Male cross-elasticity[a]	γ_{mf}	-0.12	-0.23	0.03
Gender labor force participation ratio[d]	$\frac{l_f}{l_m}$	0.64	0.92	0.84
Optimal revenues-constant tax rate for females[e]	$\bar{t}_f$	0.35	0.57	0.35
Optimal revenues-constant tax rate for males[e]	$\bar{t}_m$	0.77	0.70	0.91

Notes:
(a)The sources are: Aaberge et. al. (2002) for Italy in 1993; Aaberge et. al. (2006) for Norway in 1994; Blau and Kahn (2004) for the USA in 1999-2001.
(b) Computed assuming $\theta = 1$ as in equation 19.
(c) Computed as in equation 7, assuming $\theta = 0.25$ for Italy and the USA and $\theta = 0.5$ for Norway.
(d)The source is Alesina, Glaser and Sacerdote (2005).
(e) Computed as in equation 10, assuming $\bar{\theta} = 0.25$ for Italy and $\bar{\theta} = 0.5$ for Norway.

Figure 1: Hazard rates of the earnings distribution in Italy, Norway and USA



Note: The data come from the Survey of Household Income and Wealth (SHIW) for Italy, the Norwegian Linked Employer-Employee Data Set for Norway (see Moen, Sorensen and Salvanes, 2004) and the Current Population Survey (CPS) for the USA. Earnings for the USA are top-coded at 100,000 dollars. To obtain these estimates we have categorized total labor earnings in intervals of 2,000 euros (2,500 dollars for the US, which is how earnings are recorded in the CPS). The smothed distributions have been obtained using locally weighted regressions of the relative frequency in each interval on the categorical earning variable. For Italy, earnings are after tax, which, as we argue in footnote 18, reinforces the interpretation of our findings.

Table 2: Weighted averages of the hazard rates of the earnings distribution in Italy, Norway and USA

	Italy	Norway	USA
Females	.25	.12	.16
Males	.17	.07	.11

Note: The table reports, for each country and gender, the weighted average of the hazard rates plotted in the top panels of Figure 1, where the weights are given by the frequency of observations in each interval of the categorical earning variable of the corresponding country.