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Optimal income taxation with endogenous participation and search unemployment ☆

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ABSTRACT

We characterize optimal redistributive taxation when individuals are heterogeneous in their skills and their values of non-market activities. Search-matching frictions on the labor markets create unemployment. Wages, labor demand and participation are endogenous. Average tax rates are increasing at the optimum. This shifts wages below their *laissez faire* value and distorts labor demand upwards. The marginal tax rate is positive at the top of the skill distribution even when the latter is bounded. These results are analytically shown under a Maximin objective when the elasticity of participation is decreasing in the skill level and are numerically confirmed under a more general objective. Under the Maximin, above approximately $20,000 per year, our model recommends higher marginal tax rates than a comparable competitive setting.

1. Introduction

In the literature on optimal redistributive taxation, the labor supply responses along the intensive (Mirrlees, 1971) or extensive (Diamond, 1980; Saez, 2002) margins are the only sources of deadweight losses. However, in this literature, non-employment, if any, is synonymous with non-participation. According to Mirrlees (1999), a "desire is to have a model in which unemployment (in our words, "non-employment") can arise and persist for reasons other than a preference for leisure." Along this view, it is important to recognize that some people remain jobless despite they do search for a job at the market wage. To account for the presence of (such involuntary) unemployment which is an important source of inequality, one should depart from the assumption of Walrasian labor markets. We provide an optimal tax formula in a search-matching framework where wages, employment, (involuntary) unemployment and (voluntary) non participation are affected by taxation on labor incomes.

Our economy is made of a continuum of skill-specific labor markets. On each of them, we introduce matching frictions *à la* Diamond (1982) and Mortensen and Pissarides (1999) to generate unemployment. Taxes are distortive because the government can only condition them on endogenous wages. As in most labor market models, we assume that the equilibrium gross wage maximizes an objective that is increasing in the after-tax (net) wage and decreasing in the pre-tax (gross) wage. This is because the former increases employees' welfare, whereas the latter decreases employers' profit.

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When taxation becomes more progressive,[3] a higher pre-tax wage becomes less attractive to workers, so a lower pre-tax wage is substituted for a lower after-tax wage.[4] This wage moderation effect of tax progressivity stimulates labor demand and reduces the unemployment rate on each skill-specific labor market. We call this response the "*wage-cum-labor demand*" margin. To focus on redistribution, we abstract from standard inefficiencies arising from search frictions by imposing a wage-setting mechanism that maximizes total resources in the absence of taxes (i.e. in the *laissez faire*). To account for the extensive margin, we assume that whatever their skill level, individuals differ in their value of remaining out of the labor force.[5] A higher level of taxes reduces the returns to participation, thereby inducing some individuals to give up search.

We derive an optimal tax formula in terms of behavioral elasticities by considering a tax perturbation approach in the spirit of Piketty (1997) and Saez (2001). Intuitively, given the redistributive objective and the participation response, the optimum typically requires a progressive income tax schedule. This generates a downward distortion along the wage–cum–labor demand margin. On the one hand, the latter distortion reduces resources available for redistribution. On the other hand, the rise in the employment probability enables to share more equally incomes among employed and unemployed workers of the same skill level. Simulations confirm our intuition that optimal taxation is progressive. Average tax rates are increasing along the wage distribution. Marginal tax rates are positive at the top of the income distribution, even when the skill distribution is bounded. Marginal tax rates can be negative at the bottom and transfers to low-skilled workers can be larger than transfers to the non-employed, i.e. an EITC can be desirable.

We obtain analytical results under a Maximin (Rawlsian) social objective. Optimal marginal tax rates are positive everywhere and optimal average tax rates are increasing when the elasticity of participation decreases along the distribution of skills. The reason is that a progressive income tax schedule is then optimal as it increases the level of tax at skill levels where participation decisions are the less responsive to the tax pressure. The optimal tax schedule thus reduces wages and increases labor demand to ease redistribution. Finally, we compare optimal marginal taxation in our model and in competitive settings with labor supply responses. Under a Maximin objective, compared to a competitive model with identical intensive and extensive responses, our model generates higher optimal marginal tax rates for annual earnings above approximately $20,000. Intuitively, in the two settings, a rise in the marginal tax rates implies equity gains and gross wage reductions. However, in our model, the latter effect increases the labor demand, thereby the number of tax payers.

A number of studies are related to our work. In the optimal taxation literature that focuses on the intensive margin (Mirrlees, 1971), the optimal marginal tax rate at the top is nil if the skill distribution is bounded (Sadka, 1976; Seade, 1977). This implies that the average tax has to be decreasing in the upper part of this distribution (Hindriks et al., 2006; Boadway and Jacquet, 2008). Taking an unbounded (Pareto) distribution of skills, Diamond (1998) and Saez (2001) show that asymptotic marginal tax rates are positive. In our paper, the marginal tax rate is positive at the top even when the skill distribution is bounded. Simulations suggest that extending the skill distribution by a Pareto unbounded function has only modest quantitative effects on optimal marginal tax rates.

Both the intensive labor supply and the wage-cum-labor demand margins account for the empirical fact that gross earnings decrease with marginal tax rates (Saez et al., forthcoming). As to which of these two margins matters more remains an open empirical question. We believe that our wage-cum-labor demand margin might be crucial. Blundell and MaCurdy (1999) and Meghir and Phillips (2008) conclude that the elasticity of the intensive labor supply margin is likely very small. Manning (1993) finds a significantly negative effect of tax progressivity on the UK unemployment rate (see also Sørensen, 1997 and Røed and Strøm, 2002), which is consistent with the presence of a wage–cum–labor demand response to tax progressivity. The wage–cum–labor demand margin is also a plausible explanation for the result obtained by Blomquist and Selin (2010) according to which the hourly wage rate elasticity is similar to the taxable labor income elasticity with respect to the marginal tax rates for males in Sweden.

There is growing evidence that participation decisions matter a lot (Meghir and Phillips, 2008). Diamond (1980), Saez (2002) and Choné and Laroque (2005, 2011) have thus studied optimal income taxation when individuals' decisions are limited to a binary choice between working or not, wages are exogenous and there is no unemployment. This "pure extensive" literature focuses on the rationale for an EITC and is silent on the shapes of optimal average and marginal tax rates. On the contrary, our paper provides results on the whole income tax profile. It can be shown in the pure extensive setting that average tax rates are increasing if the social objective is Maximin and the participation elasticity is decreasing along the skill distribution. We retrieve this analytical result in a more general model that does account for two important facts: the existence of gross incomes responses to marginal tax rates and the presence of involuntary unemployment, which is an important source of income inequality.

Saez (2002) has proposed a model of optimal taxation with both extensive and intensive labor supply margins. While he does not provide analytical results for the mixed case, his simulations show that the EITC is optimal when responses along the extensive margin are more important than responses along the intensive one and the social objective is not Maximin. We emphasize the role of the monotonicity of the elasticities of participation. Furthermore, his simulations consider only few points in the bottom half of the income distribution, while ours offer a much broader picture along the whole wage distribution.

Some papers have made a distinction between unemployment and non-participation. Boadway et al. (2003) study redistribution when unemployment is endogenous and generated by matching frictions or efficiency wages. The government's information set is different from ours because they assume that it observes productivities and can distinguish among the various types of non-employed. Boone and Bovenberg (2004) depart from the standard model of nonlinear income taxation à la Mirrlees (1971) by adding a job-search margin that is the single determinant of the unemployment risk. As in our model, the government cannot verify job search. However, in their model, the cost of participation is homogeneous in the population and the unemployment risk does not depend on wages nor on taxation. In Boone and Bovenberg (2006), the framework is similar but since the government observes employed workers' skill, taxation is skill-specific. Strand (2002) studies the desirability of tax progressivity in a matching model with wage bargaining but restricts the government's instrument to an income tax that is linear above a threshold.

Hungerbühler et al. (2006), henceforth HLPV, propose an optimal income tax model with unobservable workers' skills and wage-cum-labor demand responses in a matching framework. HLPV assumes that all individuals face the same cost of participation whatever their skill level. Consequently, every agent above (below) an endogenous threshold of skill participates (does not participate). Instead here, this cost varies both

[3] In this paper, a tax schedule is progressive when employment tax rates are increasing along the wage distribution. The employment tax rate divides the sum of the tax liability and the assistant benefit by the gross wage level. This corresponds to what Immervoll et al. (2007) among others call *participation* tax rate. In the presence of unemployment, it is more appropriate to use the term *employment* tax rate.

[4] As overviewed by Bovenberg (2006), this property holds in the monopoly union model (Hersoug, 1984), in the right-to manage union model (Lockwood and Manning, 1993), in the matching model (Pissarides, 1998), in the efficiency wage model (Pisauro, 1991) and also in the textbook competitive labor supply framework. In the latter, a higher (annual) pre-tax wage is obtained thanks to more effort in employment (the so-called intensive margin of the labor supply). For simplicity, we ignore labor supply responses along the intensive margin.

[5] Because of this additional unobserved heterogeneity, the government has to solve an adverse selection problem with "random participation" *à la* Rochet and Stole (2002).