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Voting over selfishly optimal nonlinear income tax schedules with a minimum-utility constraint

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ABSTRACT

Pairwise majority voting over alternative nonlinear income tax schedules is considered when there is a continuum of individuals who differ in their labor productivities, which is private information, but share the same quasilinear-in-consumption preferences for labor and consumption. Voting is restricted to those schedules that are selfishly optimal for some individual. The analysis extends that of Brett and Weymark (2016) by adding a minimum-utility constraint to their incentive-compatibility and government budget constraints. It also extends the analysis of Röell (2012) and Bohn and Stuart (2013) by providing a complete characterization of the selfishly optimal tax schedules. It is shown that individuals have single-peaked preferences over the set of selfishly optimal tax schedules, and so the schedule proposed by the median skill type is a Condorcet winner.

1. Introduction

We consider pairwise majority voting over alternative nonlinear income tax schedules when, as in Mirrlees (1971), there is a continuum of individuals who differ in their labor productivities, which is private information, but share the same preferences for labor and consumption. A tax schedule is a Condorcet winner if a majority of voters weakly prefers it to any of the other tax schedules being considered. Given the potential complexity of a nonlinear income tax schedule, a Condorcet winner only exists if some restrictions are placed on the set of permissible tax schedules. Here, we follow the lead of Röell (2012), Bohn and Stuart (2013), and our previous work, Brett and Weymark (2016), by restricting attention to selfishly optimal nonlinear income tax schedules. That is, voting is restricted to those nonlinear tax schedules that some individual would choose from among the feasible tax schedules if that person were a dictator.[1] What these schedules are depends on the feasibility constraints that are considered. In our companion article, the only constraints on a tax schedule are that it be incentive compatible and respect the government's budget constraint; the latter constraint is equivalent to the economy's material balance constraint. In this article, we further constrain the selfishly optimal schedules by requiring that they guarantee some minimum utility level to all individuals. This requirement prevents the adoption of tax schedules that extract excessive rents from the very poorest members of society.

Labor productivity is a unidimensional measure of an individual's skill. A selfishly optimal tax schedule depends on the skill level of the individual who proposes it. The set of tax schedules that are voted on consists of all of the schedules that are selfishly optimal for some skill type. Consequently, it is possible to index the set of admissible tax policies by the skill level. In effect, this index is a single dimension on which the policies can be ordered.

When preferences are quasilinear in consumption and there is a finite number of skill levels, Röell (2012) has shown that preferences over the selfishly optimal tax schedules are single-peaked provided that the minimum-utility constraint does not

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[1] Meltzer and Richard (1981) consider majority voting over selfishly optimal *linear* income tax schedules. Snyder and Kramer (1988) investigate majority voting over selfishly optimal nonlinear income tax schedules when individuals allocate a fixed amount of labor between the taxable and underground sectors. De Donder and Hindricks (2003) use simulations to investigate the existence of a Condorcet winner among the set of selfishly optimal quadratic income tax schedules. There is also an extensive literature that investigates the existence of a Condorcet winner when tax schedules that are not selfishly optimal are permitted. See, for example, Gans and Smart (1996) and Roberts (1977).

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bind. Thus, the median voter theorem of Black (1948) applies, and so the median skill-type's most preferred tax schedule is a Condorcet winner. Röell (2012) only provides a partial characterization of the selfishly optimal tax schedules. In Brett and Weymark (2016), we provide a complete characterization of these schedules when there is a continuum of skill levels and the minimum-utility constraint is not imposed. Using this characterization, we are able to determine the utility that each type of individual obtains from the selfishly optimal schedule proposed by any other type and thereby identify how each skill type ranks the permissible tax schedules. This allows us to provide a simple demonstration of Röell's result that these preferences are single-peaked in the proposers' skill levels, from which her median voter theorem follows.

Here, we extend our earlier results by providing a complete characterization for the continuum model of the selfishly optimal income tax schedules that satisfy the minimum-utility constraint in addition to the incentive-compatibility and government budget constraints when, as in our earlier article, preferences are quasilinear in consumption. Moreover, we show that individual preferences are single-peaked over these selfishly optimal tax schedules, and so the median skill-type's preferred schedule is a Condorcet winner. For a continuum of skill types, Bohn and Stuart (2013) also investigate majority voting over selfishly optimal tax schedules with the same constraints as are used here, but without our restriction that preferences are quasilinear. They show the existence of a Condorcet winner in their model without appealing to single-peakedness or Black's median voter theorem. As in Röell (2012) and Bohn and Stuart (2013) only provide a partial characterization of the selfishly optimal tax schedules. The complete characterization of these schedules plays an important role in establishing our median voter theorem.

A selfishly optimal income tax schedule can be identified from a schedule that shows how the optimal before-tax income varies with the skill level. A proposer prefers to redistribute resources from other skill types toward himself. In effect, he uses a maxi-max social welfare function for types with lower skills and a maxi–min social welfare function for those with higher skills. In our companion article, we show that if a proposer simply allocates the maxi-max incomes to all lower types and the maxi–min incomes to all higher types, then the second-order incentive constraint would be violated. In order to satisfy this constraint, the selfishly optimal before-tax income schedules must instead consist of three regions. In the lower part of the skill distribution, an individual receives his maxi-max income, whereas in the upper part of the skill distribution, an individual receives his maxi–min income. For intermediate skill levels, including the skill level of the proposer, everybody receives the same before-tax income. This region provides a "bridge" between the maxi-max and maxi–min parts of the schedule. As in the utilitarian optimum (Mirrlees, 1971), everybody on the maxi–min part of the schedule faces a positive marginal tax rate except for the most highly skilled, whose marginal tax rate is zero. On the maxi-max part of the schedule, everybody faces a negative marginal tax rate (a marginal wage subsidy) except for the least skilled, whose marginal tax rate is zero.

We show that with the addition of the minimum-utility constraint, the before-tax income schedules that are selfishly optimal also have three regions. Because the resources that can be extracted from the lowest skilled are now more limited, the first region no longer tracks the maxi-max solution. Instead, the before-tax incomes of the lowest types lie strictly between the maxi–min and maxi-max incomes when the minimum-utility constraint binds. In effect, the minimum-utility constraint gives rise to a countervailing incentive to transfer resources toward the lowest type, which pushes a selfishly optimal tax schedule in the direction of the maxi–min schedule. As a consequence, it is now possible for marginal tax rates to be positive for some incomes in the first region. Because preferences are quasilinear in consumption, the introduction of the minimum-utility constraint does not affect the qualitative features of the other two regions of the before-tax income schedule. However, the introduction of this constraint can affect where the boundaries of the three regions are located.

In our companion article, we determine the before-tax incomes for each skill level in a selfishly optimal schedule point-wise, which facilitates our demonstration that individuals have single-peaked preferences over the set of selfishly optimal schedules. The minimum-utility constraint precludes us from characterizing these schedules point-wise, which adds to the complexity of the analysis. Nevertheless, in spite of this added complexity, we are able to show that individuals have single-peaked preferences over the selfishly optimal schedules and, hence, the schedule proposed by the median skill type is a Condorcet winner. If the minimum-utility constraint does not bind for the median type's schedule, then the resulting tax system is as described in Brett and Weymark (2016).

The remainder of this article is organized as follows. The next section describes the model economy. Section 3 contains a detailed analysis of the selfishly optimal schedules. The existence of a Condorcet winner is established in Section 4. Section 5 contains concluding remarks. The proofs of our results are given in the Appendix.

2. The model

There is a continuum of individuals that differ in skill w. The skill parameter w is an individual's type. It measures an individual's constant marginal productivity of labor. The cumulative distribution function $F(\cdot)$ for this parameter is continuous with support $[\underline{w}, \bar{w}]$, where $0 < \underline{w} < \bar{w}$. The density $f(w)$ is assumed to be positive for all w in the support of F. Labor markets are perfectly competitive, so an individual's before-tax income is given by

$$y = wl, \tag{1}$$

where $l \geq 0$ is the amount of labor supplied. Thus, w is this type's wage rate. Income can also be thought of as being labor in efficiency units. There is a single consumption good which serves as the numeraire in this economy. The amount consumed is $x \geq 0$.

All individuals have the same quasilinear-in-consumption preferences over labor and consumption represented by the utility function

$$\tilde{u}(l, x) = x - h(l) \tag{2}$$

on $\mathbb{R}^2_+$, where the function h is increasing, strictly convex, and three-times continuously differentiable on $\mathbb{R}_+$. Because the number of hours needed to achieve a given level of income is decreasing in the skill level, individuals with different skills differ in their preferences over income and consumption. In light of (1), these preferences can be represented by the parameterized utility function

$$u(y, x; w) = x - h\left(\frac{y}{w}\right). \tag{3}$$

The standard single-crossing property of preferences (Mirrlees, 1971) is satisfied with respect to income and consumption because the marginal rate of substitution at any bundle (y, x) is decreasing in w when $y > 0$.

Individuals face an anonymous tax schedule $T: \mathbb{R}_+ \to \mathbb{R}$ that specifies the tax $T(y)$ paid, which could be negative, by someone with income y. The choice of this schedule is determined by majority voting, as described below. The maximum consumption