



# Heterogeneous labor skills, the median voter and labor taxes<sup>☆</sup>



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## ABSTRACT

This paper analyzes the median voter's most preferred sequences of labor taxes in the standard neoclassical growth model. We consider an infinite horizon economy in which agents are heterogeneous with respect to both initial wealth and labor skills. We start by providing a set of sufficient conditions for the existence of a Condorcet winner. We then characterize the most preferred tax sequence by the median agent. First, we show that marginal labor taxes depend directly on the absolute value of the distance between the median and the mean value of the skills' distribution. Second, we find that in contrast to the intuition stemming from standard representative agent economies, labor taxes are more volatile and counter-cyclical taxation (e.g., increasing taxes in recession) might be optimal depending on the correlation between inequality and TFP. To assess the quantitative relevance of these findings, we calibrate the model economy to six countries and find that counter-cyclical labor taxation is optimal for all but the US.

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## 1. Introduction

One of the most commonly accepted prescriptions for fiscal policy over the business cycle is that labor taxes should exhibit little variance and their cyclical behavior should smooth deadweight burdens across time and states. However, such conclusions typically arise from representative agent economies, and thus, distributional aspects are absent.<sup>1</sup>

Any rational agent would prefer to receive the benefits of a particular fiscal policy and transfer the cost burden to others. This could be done in an intratemporal fashion by taxing groups with lower social weights more, or intertemporally by shifting the taxes to periods or states in which less favored groups would contribute relatively more. As Bassetto (1999) and Niepelt (2004) have shown, depending on the weights in the social welfare function, the intertemporal tax shifting and tax smoothing motives can be aligned or can act in opposite directions. Thus, any observed cyclical behavior could be optimal given some social weights.

To provide a more precise answer on optimal cyclical behavior of labor taxes, we study a social welfare function that uniquely pins down the social weights by encompassing the key principle of any democratic institution: one man, one vote.

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<sup>1</sup> See Chari et al. (1994) and Chari and Kehoe (1999).

We abstract from imperfections such as lack of commitment and market incompleteness. For this reason, we call the policy arising from this problem the optimal policy.

If output is positively correlated with government surplus or negatively correlated with revenue (or taxes) we call a fiscal policy pro-cyclical. Thus, a counter-cyclical tax schedule, which is the focus of this paper, is a pro-cyclical fiscal policy.

To be concrete, we study the standard neoclassical growth model with leisure choice, aggregate uncertainty, complete markets and heterogeneous agents. We assume that fiscal policies are chosen by majority rule. Agents vote once and for all at the beginning of time on sequences of capital and labor taxes. Building on [Bassetto and Benhabib \(2006\)](#) (henceforth B&B), we derive a median voter theorem and use the theorem to describe properties of equilibrium tax sequences. The theorem provides a precise statement of the role of redistribution considerations in determining policy.

In Proposition 1, we provide a set of sufficient conditions for the existence of a Condorcet Winner. We show that if heterogeneity is one dimensional, either in skills or initial endowments, and agents have balanced growth preferences, then the median agents most preferred fiscal policy is the Condorcet winner. If instead the heterogeneity is in both dimensions, Proposition 1 holds if we also assume that the distribution of initial holdings of capital is an affine function of labor skills.

Next we characterize the Condorcet winner. In Proposition 2 we show that marginal labor income taxes depend directly on the absolute value of the distance between the median and the mean value of the labor skills distribution. The results are extended to an environment in which skills evolve stochastically over time while the ranking among agents remains unchanged. In contrast to the representative agent's environment, the correlation between labor taxes and employment (and output) is ambiguous over the business cycle.

The intuition behind this result is similar to the tax shifting effect in [Bassetto \(1999\)](#) and [Niepelt \(2004\)](#). More inequality reflects the fact that the median voter has become relatively less efficient than the average agent, and therefore, her relative contribution to revenue is smaller than in periods with less inequality. Thus, by increasing labor taxes in periods with high inequality and decreasing taxes in periods with low inequality, the median voter shifts the burden of taxation toward relatively more efficient agents.

The median voter still wants to smooth distortions over states and time. If periods of high average productivity (and a larger tax base) are more likely to happen in periods with more inequality, the two effects are aligned, and therefore, labor taxes and aggregate productivity are positively correlated; which implies that tax smoothing is optimal. Otherwise, the tax shifting and tax smoothing effects act in opposite directions and the sign of the correlation is ambiguous. Notice that a negative correlation between *TFP* and inequality is a necessary condition for a counter-cyclical tax schedule to be optimal. A sufficient condition is that the changes in inequality along the business cycle are large relative to the volatility of *TFP*.

To shed light on the scale of our findings we solve the model economy numerically. We use constructed series for aggregate productivity (*TFP*) and skills inequality for six countries: Argentina, Brazil, Chile, Canada, the UK and the US. The necessary condition for the optimality of pro-cyclical fiscal policy is present in the sample: inequality is negatively correlated with *TFP* in all six countries, that is, inequality increases in recessions and decreases in booms. Further, the standard deviation of inequality is between 2 and 3.5 times larger in the developing countries than in the developed countries. This suggests the possibility of both more volatile labor income taxes and pro-cyclical (or less counter-cyclical) fiscal policy in developing countries.

We find that for the poorer countries in the sample the optimal labor tax is twice as volatile as in the richer countries, while pro-cyclical labor taxes are optimal only for the US. The reason for this is that in Canada and the UK not only is the volatility of inequality low, but the volatility of *TFP* is also low. The incentives for tax smoothing and tax shifting are both low, but the latter dominates. The numerical simulations provide evidence that pro-cyclical fiscal policy, at least in terms of revenue, should be the norm rather than exception.

Our paper is related to the literatures on macro Median Voters and optimal policy with heterogeneous agents. As previously mentioned, we extend the B&B median voter result. B&B consider a more general class of Gorman aggregable preferences but do not consider leisure choice or uncertainty.<sup>2</sup> [Azzimonti et al. \(2008\)](#) analyze majority voting over marginal taxes without aggregate uncertainty or capital accumulation, and are therefore able to characterize the best sequence of labor taxes for each type with taxes in the first two periods. [Krusell and Ríos-Rull \(1999\)](#) study the steady state of a similar environment but with sequential voting, taxes on capital and labor income constrained to be equal, and where only future taxes can be changed. They solve a Markov stationary equilibrium numerically and find, as in this paper, that the level of income taxation depends on the skewness of the income distribution.<sup>3</sup>

Three papers about the cyclical behavior of fiscal policy are closely related to ours: [Bassetto \(1999\)](#), [Niepelt \(2004\)](#) and [Werning \(2007\)](#). To the best of our knowledge [Bassetto \(1999\)](#) is the first paper to note that tax smoothing may not be optimal in environments with heterogeneous agents. However, the effect arises from intertemporal interest rate manipulation instead of a tax shifting motive. [Niepelt \(2004\)](#) shows how the relatively richer West Germans shifted the cost of German unification to future generations in order to allow formerly poor East Germans to become as rich as West Germans, and therefore, increase their contribution.

<sup>2</sup> Important contributions on median voter results related to fiscal policy include [Meltzer and Richard \(1981\)](#) (the first paper in the macro literature), [Alesina and Rodrik \(1994\)](#) and [Persson and Tabellini \(1994\)](#).

<sup>3</sup> [Azzimonti et al. \(2006\)](#) provide an analytical characterization of time-consistent Markov-perfect equilibria in an environment similar to [Krusell and Ríos-Rull \(1999\)](#), but individual heterogeneity is restricted to initial wealth. [Corbae et al. \(2009\)](#) in an environment with uninsurable idiosyncratic risk show that the increase in inequality in the US economy since 1983 can account for at least 2/3 of the observed taxes.

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