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Redistribution and insurance with simple tax instruments☆

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ABSTRACT

We analyze optimal taxation of labor and capital income in a life cycle framework with idiosyncratic income risk and ex-ante heterogeneity. Tax instruments are simple in that they can only condition on current income. We provide a decomposition of labor income tax formulas into a *redistribution* and an *insurance* component. The latter is independent of the social welfare function and determined by the degree of income risk and risk aversion. The optimal linear capital tax is non-zero and trades off redistribution and insurance against savings distortions. Our quantitative results reveal that the insurance component contributes significantly to optimal labor income tax rates and provides a lower bound on optimal taxes. Optimal capital taxes are significant.

1. Introduction

This paper characterizes Pareto optimal labor and capital income taxation in a life cycle framework. Individuals face idiosyncratic labor income risk but are already heterogeneous when they enter the labor market, consistent with a large empirical literature.[1] Our key innovation is to focus on simple, history-independent tax instruments: nonlinear taxes on *current* labor income and linear taxes on *current* capital income taxes. This approach contrasts with and complements the recent New Dynamic Public Finance (NDPF) literature that considers history-dependent tax instruments.

In particular, our approach allows us to address a set of policy relevant questions theoretically and quantitatively: What are the most important factors shaping optimal tax schedules? What are the roles of income risk and ex-ante heterogeneity for optimal tax rates? Do labor and capital taxes interact and how does that influence their optimal design?

Our model has a simple life cycle structure. Agents enter the labor market with heterogeneous productivity levels. They live and work for T periods. An agent's productivity is stochastic and evolves as a Markov process. Each period, *after* the shock is realized, an agent makes a labor-leisure and consumption-savings decision. The return on savings is deterministic. Thus, in period t, there is uncertainty about productivity in period $t+1$ but not about the level of assets in period $t+1$.

We first derive a novel formula for optimal marginal labor income tax rates. We show how a version of the mechanical effect that is well-known from static Mirrlees models (Diamond, 1998; Saez, 2001) can be cleanly decomposed into an insurance and a redistribution component. Intuitively, taxes serve a social insurance role which depends on the degree of risk aversion and wage risk in the economy. The redistribution component reflects how much redistribution of resources between individuals who are ex-ante different is valued.

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[1] See Meghir and Pistaferri (2011) and Jappelli and Pistaferri (2010) for recent surveys of the empirical literature.

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Concretely in the life cycle context, young individuals already start out with very different income levels. The redistribution component is then mostly pinned down by differences in welfare weights on different income levels at young age. We calibrate the model based on recent estimates of income risk parameters, which are allowed to condition on age, providing a realistic life cycle structure for the evolution of income risk (Karahan and Ozkan, 2013). We also provide a social insurance lower bound on taxes. The experiment we consider shuts down the redistributive benefits of labor taxes by adjusting the welfare weights in such a way that labor taxes would be zero in a static setting. Any positive level of taxes for these Pareto weights purely captures the insurance motive. In our benchmark calibration, we find that tax rates are strictly positive, starting at about 31%, then fall before they slightly increase again and converge to a level of around 20%.

Next, we derive a novel formula for the optimal linear capital tax rate. The optimal capital tax follows a very simple and intuitive equity-efficiency relationship: the gains from redistributing wealth are traded off against the negative incentive effects on the savings margin. In contrast to the famous Atkinson-Stiglitz result (Atkinson and Stiglitz, 1976), in a dynamic model with risk optimal capital taxes are, in general, non-zero. In our model savings taxes are not redundant as individuals are heterogeneous with respect to both labor income and capital income over their life cycle. It is, hence, beneficial for the government to employ two instruments with two-dimensional heterogeneity. This logic is related to the inheritance tax model by Piketty and Saez (2013). In our simulations, the government strongly relies on capital income taxation and the optimal tax rate is around 19% – even though the only savings motive in the model is the precautionary one.

In addition to those quantitative baseline results, we conduct several experiments to investigate how the social welfare function and idiosyncratic risk influence optimal policies. We also study the welfare losses from simplicity by comparing our policies to the dynamic mechanism design solution (NDPF) and optimal age-dependent taxes, which can be considered as an intermediate case.

Our framework also allows to investigate the interaction between labor and capital taxation, which is not possible in the static Mirrlees model. We examine optimal capital income taxes for a given labor income tax.[2] Strikingly, we find that for given labor income taxes, optimal capital tax rates differ substantially, depending on how labor income taxes are set. This depends on two mechanisms. First, lower labor income taxes lead to a more concentrated distribution of wealth which increases the redistributive power of capital income taxes. Second, the lower the degree of social insurance through labor income taxation, the stronger the desire to self insure in the form of precautionary savings and the lower the elasticity of savings with respect to capital income taxes.

Finally, our contribution is also of technical nature. We show that assuming preferences without income effects on labor supply is the key simplification to make the problem of choosing optimal history independent but fully nonlinear labor income taxes tractable.[3] If labor income taxes are only a function of current income y_t, the income that individuals optimally choose in a decentralized economy only depends on their current productivity θ_t and not on accumulated wealth. For the allocation, this implies that income is solely a function of θ_t and not of the history of shocks $\theta^t = (\theta_1, \theta_2, \ldots, \theta_t)$. This guarantees that the individuals can easily be ordered among the y_t dimension. A second advantage of this specification is that the Hessian matrix of the individual problem has a zero minor diagonal. This makes a first-order approach valid under a mild monotonicity condition on $y_t(\theta_t)$ as in the static Mirrlees model. As we show in the main body of the paper, these considerations make it possible to solve for optimal nonlinear labor and linear capital income taxes. We believe our approach is also attractive for other life cycle settings, where the focus should be on history independent but fully nonlinear labor taxes, for example, settings with retirement.

1.1. Related Literature

Our paper builds on the work by Diamond (1998), Piketty (1997), and Saez (2001). They were among the first to write down the optimal marginal tax rate formula as a function of elasticities and the skill distribution. Our analysis has the same goal in a dynamic framework and we show how the formula from Diamond (1998) is augmented in this context. The novel force we find here is that the interaction with savings taxes matters. This happens because the savings decision is endogenous with respect to labor taxes, which in turn affects the government's budget by the presence of savings taxes. Another difference is that in our dynamic setting, the so-called 'mechanical effect' captures two things: redistribution between ex-ante heterogeneous agents and social insurance against idiosyncratic wage risk.

Two related papers in the so-called *New Dynamic Public Finance* (NDPF) are Golosov et al. (2016) and Farhi and Werning (2013). They characterize the solution to the dynamic mechanism design problem when the planner's constraint on policy instruments only comes from the asymmetric information problem. Our approach is complementary: we restrict the instruments to only condition on current income. Arguably, this brings the policies closer to reality, as complex history-dependent taxation is required in the NDPF. Because of this restriction to not use all available information from the past but to tax only based on current income, the optimal marginal tax rate formulas we obtain are simpler to interpret.[4]

A recent related paper, that also studies optimal nonlinear labor income taxation in the presence of risk and uncertainty is Boadway and Sato (2015). Our approach differs in two respects: (i) their timing structure is different in that individuals choose their labor supply before wage risk is realized – we assume that individuals choose their labor supply after the realization of uncertainty. We share the view of Boadway and Sato (2015, p. 12) that "In reality, there are elements of both approaches present" and therefore consider our approach as complementary. We relate our formulas for optimal labor taxes to theirs. (ii) They study a static setting and therefore do not study the question of capital taxation.

Two recent papers also study simpler policies in dynamic stochastic environments. Weinzierl (2011) and Bastani et al. (2013) study age-independent and age-dependent income taxation to quantify the welfare gains from age-dependent taxation.[5] These papers work with a small discrete type space. Our innovation and contribution to this literature is that our first-order approach allows to study a continuous-type framework. We are, thus, able to optimize over a fully nonlinear labor income tax schedule that is well defined for each income level and the optimal tax results can be connected to the

[2] In an earlier version of this paper, we also studied the optimal labor income tax for a given level of the capital tax. The level of the capital tax did not matter a lot for optimal labor income taxes, see Findeisen and Sachs (2014).

[3] This also allows to look at welfare losses from simplicity as compared to the full mechanism-design optimum. We provide such an analysis in Section 4.7.

[4] Jacobs and Schindler (2012) show that in a two-period model with linear labor taxes, a similar role for the capital tax as in the NDPF-literature arises as capital taxes have the positive effect of boosting labor supply in the second period.

[5] Blomquist and Micheletto (2008) is an important earlier theoretical contribution in this literature, where it is shown that age-dependent taxes can Pareto improve on age-independent taxes and that capital should be taxed. Da Costa and Santos (2015) study optimal age-dependent taxation in an OLG economy and find that parts of the welfare gains from age-dependent taxes are lost in the transition due to the endogeneity of human capital.