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Income tax progressivity, physical capital, aggregate uncertainty and long-run growth in an OLG economy

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ABSTRACT

This paper analyzes the long-run growth-maximizing progressivity of income taxation in a standard two-period, overlapping generations model economy in which (i) there is aggregate uncertainty, (ii) attitudes towards risk and intertemporal substitution are considered apart, (iii) growth is driven by the accumulation of young individuals' savings in the form of physical capital in an *AK* economy, and (iv) young individuals' savings partly obey retirement motive and partly precautionary motive. The equilibrium growth rate is solved analytically, and conditions for the introduction of a progressive income tax in an economy with an existing proportional tax to reduce the equilibrium growth rate are obtained. The model is numerically illustrated after calibrating its parameters to mimic some basic features of the US economy to quantify the effects of progressivity changes. It is found that higher levels of progressivity lead to lower equilibrium growth rates. The effects on after-tax income inequality and in individual welfare, however, strongly depend on the specific assumptions made about labor supply by old individuals and the specific income tax design.

1. Introduction

The optimal degree of progressivity of income taxation has been a long debated issue among policy practitioners and academic researchers. Income tax progressivity helps to attain a more equal distribution of income, wealth and consumption. Additionally, in the presence of uninsurable uncertainty (whether because it is of aggregate nature or, being of idiosyncratic type, insurance markets are assumed away), progressive taxation provides some partial insurance and less volatile household consumption over time. The counterpart, however, is that progressive taxation introduces incentive distortions for labor supply, saving and investment decisions of private economic agents (see Conesa and Krueger, 2006).

Before reviewing some of the key academic works in the literature that have analyzed the progressivity of income taxation in some aspect, one might glance at the real world to see how progressive income taxation stands in developed economies. Assuming that progressivity is equivalent to increasing average tax rates, one way to go about this is to take a sample of OECD countries in 2010, and see how the average income tax increases with income. More precisely, and just as an approximation, suppose that for each country, we looked at (i) the annual gross wage earnings of adult, full-time manual and non-manual workers in the industry for a single person without dependents relative (as a percent proportion) to the economy-wide average gross wage earnings, and (ii) the *all-in* tax rate (calculated as the combined central and sub-central

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government income tax plus employee social security contribution) as a percentage of average gross wage earnings. We would end up with a graph like that in Fig. 1.[1]

In order to make the graph easier to understand, only a subset of OECD countries is shown (namely, US, Japan, Germany, France, UK and Italy), as adding more countries to the graph would just make it harder to read. The pattern is clear: taking into account only wage income, higher incomes face increasing average tax rates.

Turning now to academic articles, since the Mirrlees' (1971) paper on optimal income taxation in a static economy, economic literature has produced some major works on the optimal progressivity of the income tax.

Hubbard and Judd (1986), in an OLG economy with no growth, emphasize the role played by credit constraints. One of their findings is that "*recent analyses of progressive taxation focus on the disincentive effects* (...) *of high marginal tax rates. A move toward proportional taxation would indeed reduce these effects, but, in the presence of the borrowing constraints* (...), *would also reduce the consumption of constrained low-income individuals*. (...) *[T]he use of an exemption and a higher marginal tax rate can in some cases improve efficiency relative to a proportional tax* (...) *it may be that replacing capital taxes with a progressive tax on labor earnings could be efficiency-improving*".

Conesa and Krueger (2006) build an OLG economy with heterogeneous agents and exogenous growth in which (in addition to a consumption tax and a social security tax) an income tax is levied on *total* (i.e. capital *plus* labor) income, and where individuals face (i) uninsurable idiosyncratic labor productivity risk, and (ii) credit constraints. Assuming a utilitarian steady state social welfare criterion, they find that the optimal US income tax code is well approximated by (i) a flat tax rate of 17.2%, and (ii) a fixed deduction of about $9400: lower marginal tax rates for high-income people increase labor supply and savings incentives, whereas the desired amount of redistribution and insurance is accomplished by the fixed deduction. In consequence, optimal marginal (and average) tax rates would be considerably lower for households in the upper tail of the income distribution in comparison to observed tax rates.

In a pretty much similar set-up, but allowing for *different* treatments for capital and labor incomes, Conesa et al. (2009) conclude that, for the US case, (i) the optimal capital income tax (flat) rate is 36%, while (ii) the optimal progressive labor income tax consists of a flat tax of 23% with a deduction of $7200 (relative to average household income of $42,000).[2] A critical assumption in obtaining this result is the existence of inter-cohort heterogeneity in terms of labor productivity. If no heterogeneity across individuals of the same age is introduced, the optimal labor income tax also becomes proportional. Thus, in a closely related paper and which incorporates *endogenous* human capital accumulation under alternative specifications, Peterman (2012) obtains the same result: assuming away individual heterogeneity, the optimal tax policies are always flat taxes.

Carroll and Young (2010) build an infinite horizon, perfect foresight model of heterogeneous agents for the US economy, and find that increases in the progressivity of the income tax schedule are associated with long-run distributions with (i) greater aggregate income, wealth, capital and labor, and (ii) lower income inequality and higher wealth inequality.

A common feature to all these references is that economic growth is either absent or made exogenous.[3] Switching to works which treat growth as endogenously generated, Caucutt et al. (2003) build up an OLG model with heterogeneous (skilled and unskilled) and liquidity constrained individuals in which growth is *human capital* investment driven. In their model, *reductions in the progressivity* of labor income tax (entrepreneurial profits – i.e. revenues minus labor costs – are taxed at a constant rate) can have by themselves *positive growth* effects. They conclude that (for the US case) "*the quantitative effects of eliminating progressivity can be economically significant*" as, depending on the precise mechanism of human capital accumulation considered, the annual per capita growth rate along the balanced-growth path would rise up to 0.52 percentage points. As they claim, "(i) *t is interesting that a less progressive tax system, which is rarely perceived as an egalitarian measure, gives rise to increased growth, decreased inequality, and greater mobility for the poor in the long run*".

Along similar lines, Benabou (2002) sets up a heterogeneous infinitely-lived agents model of *human capital* accumulation with (i) *missing*credit and (ii) *missing*insurance markets (so that there is no room for capital income and idiosyncratic risk is uninsurable). Focusing on the effects of progressive (labor) income taxes, it is found that (once again, for the US economy) long run growth would be maximized if the average (income-weighted) marginal tax rate were 34.8%, giving rise to a 0.5% increment in the long run growth rate (see Tang and King (2005) for a correction).

Li and Sarte (2004) build two perfect foresight, endogenous growth models and, focusing on the growth issue, find that "*the progressivity decrease implied [by the 1986 Tax Reform Act] helped raise US per capita GDP growth by* 0.12–0.34 *percentage points [depending on the particular model considered]*". More precisely, the authors modify Rebelo's (1991) original representative agent, infinite horizon, linear endogenous growth model to account for progressive taxes. Additionally, they also explore the possibility of productive government spending in a representative agent, infinite horizon growth model à la Barro (1990). In both cases, heterogeneity is introduced by assuming that individuals differ in their respective subjective discount factors.

[1] Source: OECD (2011), Taxing Wages 2010, OECD Publishing. http://dx.doi.org/10.1787/tax_wages-2010-en. See also file 1942506.xls in OECD Tax Database, on http://www.oecd.org/document/60/0,3746, en_2649_34533_1942460_1_1_1_1,00.html.

[2] Interestingly enough, the authors also find that borrowing constraints are *not* crucial for their optimal capital income tax results *whenever* labor income taxes are allowed to be progressive, and that *endogenous labor supply* is necessary for positive capital income tax rates.

[3] Although theory predicts sizable effects of tax policy in long-run growth rates, empirical evidence does not provide clear-cut conclusions. Differences in the results are mainly due to differences in the procedures followed to measure effective marginal tax rates, rather than average tax rates, and in the sample considered. Results range from those obtaining significant negative effects of personal income tax on growth rates (e.g. Padovano and Galli, 2001; Kneller et al., 1999), to concluding that the effects are not significant or modest at best (e.g. Angelopoulos et al., 2007; Lee and Gordon, 2005).