



# On the optimal provision of social insurance: Progressive taxation versus education subsidies in general equilibrium



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## ABSTRACT

In this paper we compute the optimal tax and education policy transition in an economy where progressive taxes provide social insurance against idiosyncratic wage risk, but distort the education decision of households. Optimally chosen tertiary education subsidies mitigate these distortions. We highlight the quantitative importance of general equilibrium feedback effects from policies to relative wages of skilled and unskilled workers: subsidizing higher education increases the share of workers with a college degree thereby reducing the college wage premium which has important redistributive benefits. We also argue that a full characterization of the transition path is crucial for policy evaluation. We find that optimal education policies are always characterized by generous tuition subsidies, but the optimal degree of income tax progressivity depends crucially on whether transitional costs of policies are explicitly taken into account and how strongly the college premium responds to policy changes in general equilibrium.

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## 1. Introduction

In the presence of uninsurable idiosyncratic earnings risk, progressive taxation provides valuable social insurance among ex ante identical households. In addition it might enhance equity among ex ante heterogeneous households, which is beneficial if the social welfare function used to aggregate lifetime utilities values such equity. However, if high-earnings households face higher average tax rates than low-earnings households, this might discourage the incentives of these households to become earnings-rich through making conscious human capital accumulation decisions. The resulting skill distribution in the economy worsens, and aggregate economic activity might be depressed through this channel, which compounds the potentially adverse impact of progressive taxes on production through the classic labor supply channel.

In this paper we compute the optimal tax and education policy transition, within a simple parametric class, in an economy where progressive taxes provide social insurance against idiosyncratic wage risk, but distort the education decision of households. Optimally chosen tertiary education subsidies mitigate these distortions, making both policies potentially *complementary*. We model two different channels through which academic talent is transmitted across generations (persistence of

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innate ability vs. the impact of parental education) and permit different forms of labor to be imperfect substitutes, thereby generating general equilibrium feedback effects from policies to relative wages of skilled and unskilled workers.

We show that subsidizing higher education has important redistributive benefits, by shrinking the college wage premium in general equilibrium. This [Stiglitz \(1982\)](#) effect of fiscal policy on relative factor prices may make progressive taxes and education subsidies potential *policy substitutes* for providing social insurance.<sup>1</sup> We also argue that a full characterization of the transition path is crucial for policy evaluation. In our quantitative analysis we find that optimal education policies are always characterized by generous tuition subsidies. The optimal degree of income tax progressivity however crucially depends on whether transitional costs of policies are explicitly taken into account and how strongly the college wage premium responds to policy changes in general equilibrium.

Our benchmark economy models skilled and unskilled labor as imperfect substitutes in the production of final output, following the empirical literature since [Katz and Murphy \(1992\)](#) or [Borjas \(2003\)](#), with a substitution elasticity of 1.4. When maximizing utilitarian social welfare valuing transitional generations in this economy, we document in [Section 6.2.1](#) that the optimal policy is characterized by a massive education subsidy of  $\theta = 150\%$  of the college tuition cost<sup>2</sup> and a tax system that is characterized by only moderate tax progressivity. We model a simple parametric tax system with a tax deduction of  $d$  times average income (such that  $d$  is one measure of tax progressivity) and a constant marginal tax rate of  $\tau_l$  for incomes exceeding this threshold. The optimal tax deduction  $d$  amounts to only about  $d = 6\%$  of average income and the constant marginal tax rate stands at approximately  $\tau_l = 22\%$ . This intertemporally optimal tax reform generates welfare gains equivalent to more than 3% of permanent consumption, relative to the status quo policy, which is calibrated to broadly approximate current U.S. policy ( $\theta = 39\%$ ,  $\tau_l = 28\%$ ,  $d = 27\%$ ).

In order to explain the intuition behind this result it is instructive to proceed in three steps. Consider first an economy in which fiscal policy has no effect on the college wage premium (because skilled and unskilled labor are *perfect substitutes*) and transitional dynamics are ignored.<sup>3</sup> In the appendix to this paper we construct and analyze a simple version of this model<sup>4</sup> with fixed (but education-specific) labor productivity and show analytically that the lack of explicit private insurance against idiosyncratic wage and thus income risk justifies the provision of public insurance via progressive taxation, even though such a policy discourages college attendance. We also demonstrate how education subsidies can partially offset this distortion and thus complement the progressive tax policy. When we turn this simple model into a full quantitative life cycle equilibrium economy to analyze optimal steady state policy quantitatively in [Section 6.2.2](#), we indeed find that both policies complement each other in the steady state, in that *both* the public education subsidy  $\theta$  and the relative tax deduction  $d$  increase from their status quo levels of ( $\theta = 38.8\%$ ,  $d = 27.1\%$ ) to ( $\theta = 170\%$ ,  $d = 31\%$ ). That is, ignoring general equilibrium relative wage effects and transitional dynamics, the optimal tax system is *more progressive* than the status quo U.S. system.

In addition to improved social insurance, the substantial welfare gain (in the order of 2.6% of lifetime consumption) stem from the fact that per capita output (and thus consumption) increases in the long run despite average hours worked falling. This is feasible since an education boom (the share of college educated individuals increases by 50% in the long run) improves the skill distribution in the economy. However, building up the skill distribution takes time (as new college students constitute only a small part of the overall workforce), and thus in a second step towards explaining our benchmark results from [Section 6.2.1](#), we conduct an optimal policy transition analysis. In [Section 6.2.3](#) we show that implementing the *steady state optimal* policy along the transition drives the economy into a severe recession induced by the decline in labor supply and capital accumulation on account of the higher marginal tax rates required to pay for the more generous education subsidy and higher tax deduction. Therefore taking the transitional costs into account the *steady state optimal* policy actually entails significant *welfare losses* relative to the status quo, in the order of 2.8% of lifetime consumption. In contrast, the optimal policy reform, taking the transition path explicitly into account, still calls for substantially higher education subsidies than the current status quo, but now calls for *less progressive* taxes (both relative to the steady state optimum of  $d = 30\%$  as well as the status quo of  $d = 27.1\%$ ) in order to avoid the short-run recession induced by higher marginal tax rates. The optimal tax deduction falls to  $d = 10\%$  of average income and optimal marginal taxes decrease from a status quo of 27.5% to 23%. The finding that an explicit consideration of transitional dynamics in the analysis of education finance reform in models with endogenous human capital accumulation is potentially very important for optimal tax design is the first main quantitative conclusion of this paper.

Relative to the benchmark economy, the economies considered in steps 1 and 2 of the analysis abstract from changes in the college wage premium induced by the policy reform and the economic transition it triggers. When we relax this assumption and characterize optimal policy under our preferred benchmark substitution elasticity between skilled and unskilled labor of 1.4 (that is, return to the results from [Section 6.2.1](#)) our main optimal policy conclusions from step 2 (large education subsidy, modest tax progressivity when the transition path is taken into account, substantial welfare gains in the order of 3% of lifetime consumption) remain intact: the optimal education subsidy rate is 150%, the optimal tax deduction now only 6% of average income and marginal

<sup>1</sup> [Heathcote et al. \(2014\)](#) also evaluates the quantitative importance of general equilibrium effects of fiscal policy on relative factor prices in their analysis of an analytically tractable dynamic incomplete markets economy. Similarly, [Rothschild and Scheuer \(2013\)](#) stresses the Stiglitz effect in their study of optimal redistributive fiscal policy in a Roy model where households self-select into different sectors, rather than different skill (education) levels, as in this work.

<sup>2</sup> This implies that, effectively, the government not only provides free tertiary education, but also covers part of the living expenses of those going to college.

<sup>3</sup> We first analyzed this case in our previous work, [Krueger and Ludwig \(2013\)](#).

<sup>4</sup> This version of the model in turn builds on the work by [Bovenberg and Jacobs \(2005\)](#), but is tailored to mimic our quantitative life cycle model as closely as possible to provide intuition for our quantitative results.

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