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# Financing education using optimal redistributive taxation

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## Abstract

In this article, the joint use of an income tax and public provision of education as instruments to achieve the government's distributional objectives is considered. Individuals differ in innate labour productivity and in aptitude to acquire skills through education. Actual labour productivity depends on both innate skill and the amount of education received. Using a generalized version of the Mirrlees tax problem that incorporates these features, qualitative properties of an optimal tax schedule are investigated.

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## 1. Introduction

Typically, elementary and secondary education is provided free of charge, and the tuition for post-secondary education only covers a small fraction of the cost. As a consequence, government expenditures on education can be, and are, used to pursue redistributive goals. In this article, we consider the joint use of an income tax and public provision of education as instruments to achieve the government's distributional objectives. This is an issue that has already received considerable attention in the optimal non-linear income tax literature. What distinguishes our analysis from previous

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work is the use of two parameters to characterize individuals. Individuals differ in innate labour productivity  $w$  and in aptitude to acquire skills through education  $a$ . An individual's actual labour productivity depends on both his innate skill and the amount of education received. An individual with a higher aptitude for education needs to spend less time to achieve a given amount of education. In earlier studies, only the innate labour productivity parameter has been considered.

In order to focus on the redistributive aspects of education, we only consider the role that education has to play in augmenting human capital, as reflected in labour productivity. Publicly-provided education has other uses as well. For example, it can be used to expand educational opportunities to individuals who are constrained by capital market imperfections from borrowing against future earnings. See, for example, Barham et al. (1995). Public education may be used to help offset underinvestment in education as the result of the time inconsistency of individual choices, as in Boadway et al. (1996). If private investment in education is unobservable, a moral hazard problem arises if future earnings and, hence, tax liabilities depend on the amount of education attained. Publicly-provided education may be used to help alleviate this moral hazard problem. See, for example, Wilson (1999). Education may also serve as a signal of labour productivity without affecting productivity, as in Arrow (1973) and Spence (1974). We do not consider the possibility of having privately-provided education, and therefore do not address issues such as the relative desirability of public versus private education, a topic considered by Grout (1983) from an optimal tax perspective.

Our model extends the standard Mirrlees (1971) formulation of the optimal non-linear income tax problem by adding education as an additional instrument and by having a second source of information asymmetry. Individual preferences depend on consumption, market labour, and time spent being educated. Because there are no capital market imperfections, we do not need to temporally separate education and work, and so, following Hare and Ulph (1979), we use a one-period model. All individuals are required to complete a basic amount of education and may undertake further discretionary education to improve their skills. The amount of compulsory education is exogenously determined.<sup>1</sup> As noted above, an individual's labour productivity depends on his innate skill  $w$  and on the amount of education received, and the time required to attain a given educational standard depends on his aptitude for education  $a$ . Both the skill and educational-ability parameters are private information. There is a continuum of individuals, with the parameters  $w$  and  $a$  continuously distributed on a unit square. The government can only set taxes as a function of income. For simplicity, we assume that all education is provided free of charge. Given the tax schedule, individuals choose consumption, market labour, and time spent in education optimally. The production technology exhibits constant returns to scale. Our social planner (government) chooses the tax schedule to maximize a utilitarian social welfare function taking into account the

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<sup>1</sup> In a model in which individuals differ only in a single characteristic, Boadway and Marchand (1995) have investigated when some compulsory publicly-provided education is justified on redistributive grounds.

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