



Human Capital and Optimal Income Taxes in a Life-cycle Model with Heterogeneous Agents



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Abstract

We study a life-cycle model with heterogeneous agents of discrete skill types. Agents' human capital changes over time through non-verifiable education expenses without skill shocks. Main findings are as follows. First, even though our model has no insurance motive, the capital wedge is unambiguously positive. Next, different from a positive and constant labor wedge in the literature, the labor wedge is unambiguously negative in first period and may be negative in other periods before the terminal period of the life cycle. Instead of resorting to subsidies on education, the capital and labor wedge can serve as mechanisms to foster human capital investment, which is new in the literature.

Introduction

The existing dynamic Mirrlees literature used models with exogenous skills to analyze optima income taxation. Bovenberg and Jacobs (2005) and Stantcheva (2017) expanded the dynamic Mirrlees literature that took into account educational and human capital decisions. Bovenberg and Jacobs (2005) studied optimal income taxation in a static model with both verifiable and non-verifiable expenses for education investment. In addition to finding optimal income taxes for redistribution policies, they uncovered optimal subsidies on the education expense that the government can verify, which serves to alleviate tax-induced distortions on learning. Stantcheva (2017) extended Bovenberg and Jacobs (2005) to a life-cycle model and considered only verifiable education expenses. Besides analyzing optimal capital and labor taxation, she explored optimal education subsidies that involved less than full deductibility of education expenses on the tax base. These papers are valuable in that they developed the existing Mirrlees literature to one with educational decisions and proposed optimal subsidies to education expenses in order to ease tax-induced distortions to learning.

However, education expenses may be non-verifiable. Private expenses for consumption may be pretended as private expenses for education purposes and are not distinguishable from the viewpoint of the government. When the government cannot observe investment in human capital, subsidies to education expenses are not feasible. With non-verifiable education expenses, subsidies to education expenses are infeasible. Then, how would non-verifiable education expenses affect the optimal tax policy on capital and labor income? This is an important question, but the existing literature does not offer answers. This paper attempts to fill the gap by extending Bovenberg and Jacobs (2005) and Stantcheva (2017) to the environment with only non-verifiable education expenses. Our paper contributes to the dynamic Mirrlees literature in that, under non-verifiable education expenses, capital and labor income taxation serves as devices to enhance skill formation, a new mechanism that is different from education subsidies proposed by Bovenberg and Jacobs (2005) and Stantcheva (2017).

Model

A continuum of agents live for T years, during which they work, consume, and invest in physical and human capital. Two types of agents, the high-skilled (H) and the low-skilled (L), accounting for the fraction π^H and $\pi^L=1-\pi^H$, respectively. To simplify the model, we assume that both types of agents have identical human capital levels (and thus identical skills) when born, but the high-skill type has initial advantages in learning. Education expenses for human capital investment are private information.

Under asymmetric information, the government (the social planner) solves the second-best program: it chooses constrained optimal allocations to maximize the utilitarian social welfare subject to resource constraints and incentive compatibility constraints.

Two novel results concerning distortions/wedges emerge. First, the capital wedge is positive on those who report as low skills. Second, the labor wedge on those who report as low skills is unambiguously negative in the first period and may be still negative in other periods before the final period, albeit positive in the terminal period. First result adds value to the existing literature in that the result is not based on insurance purposes, as our model has no skill shocks. Second result is different from the existing literature wherein the labor wedge is positive and constant over time.

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Intuition

These wedges arise, because human capital investment is endogenous and not verifiable by the benevolent government. These wedges serve as devices to foster human capital investment.

First, with unobservable education expenses, if high-skill agents report as low-skill agents, the benefit is not only from reducing education expenses for more consumption, but also from reducing working for more leisure. Thus, even without skill shocks, the intertemporal marginal rate of substitution in consumption is distorted by the informational friction concerning human capital investment. A positive capital wedge on those who report as low skills is optimal, because the policy discourages high-skill agents from misreporting as low skills and from reducing unobservable education expenses.

Next, the labor wedge on those who report as low skills is negative in early lifecycle, as the policy attracts low-skill agents to work more in their early lifecycle. The policy deters high-skill agents from misreporting as low skills, because should they have misreported as low skills, they would have had to work even more.

Calibration

Agents have 3-periods of live, each period being 15 years. Use the Cobb-Douglas technology of human capital taken from Ben-Porath (1967).

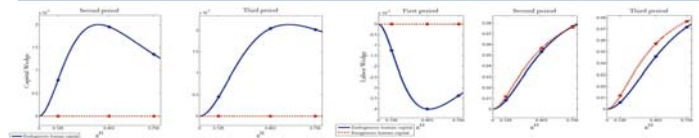


Figure 1. Capital wedges for the low type under different initial advantages of human capital.

Figure 2. Labor wedges for the type under different initial advantages of human capital.

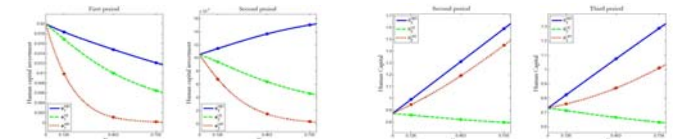


Figure 3. Human capital investment for different strategies.

Figure 4. Human capital level for different strategies.

Welfare gain of 2nd best over baseline

Economies	$\epsilon_1^H=0.126$	$\epsilon_1^H=0.463$	$\epsilon_1^H=0.756$
Baseline	0%	0%	0%
Our model	0.871%	1.076%	1.427%
HCI observable	0.897%	1.121%	1.472%
HCI and type observable	0.916%	1.32%	1.76%

Conclusions

Recently, Bovenberg and Jacobs (2005) and Stantcheva (2017) expanded the Mirrlees literature to models with human capital decisions and uncovered optimal subsidies to verifiable education expenses to alleviate tax-induced distortions on learning. With non-verifiable education expenses, subsidies to education expenses are infeasible. This paper studies how non-verifiable education expenses affect the optimal tax policy on capital and labor income.

Two novel results are obtained. First, the capital wedge is positive on those who report as low skills. Second, the labor wedge on those who report as low skills is unambiguously negative in the first period and may be still negative in other periods before the final period, albeit positive in the terminal period.

Positive capital wedges on low skills are optimal, because the policy discourages high-skill agents from mimicking low-skill agents so as not to reduce unobservable education expenses too much. Negative labor wedges on low skills are optimal in early periods of agents' lifecycle. The policy is a mechanism to attract low-skill agents to work more, which deters high-skill agents from misreporting as low skills, because should they have misreported as low skills, they would have had to work even more.

References

- Bovenberg, A.L., and B. Jacobs (2005) Redistribution and education subsidies are Siamese twins. *Journal of Public Economics* 89, 2005-2035.
- Stantcheva, S. (2017) Optimal taxation and human capital policies over the life cycle, forthcoming, *Journal of Political Economy*.