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Risky human capital and deferred capital income taxation ☆

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Abstract

We study the structure of optimal wedges and capital taxes in a dynamic Mirrlees economy with endogenous distribution of skills. Human capital is a private, stochastic state variable that drives the skill process of each individual. Building on the findings of the labor literature, we construct a tractable life-cycle model of human capital evolution with risky investment and stochastic depreciation. In this setting, we demonstrate the optimality of (a) a human capital premium, i.e., an excess return on human capital relative to physical capital, (b) a large intertemporal wedge early in the life-cycle, and (c) a non-zero intratemporal wedge even at the top of the skill distribution at all dates except the last date in the life-cycle. The main implication for the structure of optimal linear capital taxes is the necessity of deferred taxation of physical capital. The average marginal tax rate on physical capital held in every period is zero in present value. However, expected capital tax payments do not equal zero in every period. Necessarily, agents face negative expected capital tax payments early in the life-cycle and positive expected capital tax payments late in the life-cycle.

JEL classification: D82; E62; H21; J24

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☆ The views expressed here are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Richmond or the Federal Reserve System.

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1. Introduction

We study a dynamic Mirrlees economy in which agents' lifetime skill profiles depend on a stochastic, endogenous, privately observed state variable which represents individual human capital. In this economy, we characterize the optimal allocation of human capital, labor, physical capital and consumption, and construct a tax system that implements this allocation in equilibrium.

Our model of human capital evolution is consistent with three main facts from the large empirical literature on human capital.

First, numerous studies summarized in Carneiro and Heckman [6] document that most of human capital investment occurs early in the life-cycle. We incorporate this fact in our model by assuming that human capital investment can be undertaken only at the first date in the agent's life-cycle. The lifetime skill profile of each agent in the economy is an increasing function of the initial human capital investment.[1]

Second, it has been well documented in empirical studies that the returns on human capital investments are risky.[2] We capture this fact in our model by assuming that initial human capital investment is subject to an idiosyncratic productivity shock, and the level of accumulated human capital is subject to idiosyncratic depreciation shocks throughout the agent's life-cycle. For tractability, we assume an absorbing structure of the idiosyncratic shocks to human capital.[3] Once human capital of an agent is hit by an adverse shock, the skill profile of this agent diverts to a deterministic, exogenous, low skill profile. This assumption makes our economy a generalization of the absorbing shock economy studied in Diamond and Mirrlees [11] and Golosov and Tsyvinski [17].

Third, the literature on human capital has long recognized the difficulty in distinguishing human capital investment from ordinary consumption expenditure.[4] As well, this difficulty has been recognized in the ongoing policy debate on how to design the tax system in order to foster human capital accumulation.[5] At the core of this measurement problem lies the fact that, in reality, there

[1] We study optimal individual human capital investment in a life-cycle model with a finite time horizon. The assumption of finite time horizon is natural, given that the returns to individual human capital investment are finitely lived and the labor literature on intergenerational persistence of human capital does not find that parents' human capital investment enhances human capital of the children beyond the indirect income effect (cf. Restuccia and Urrutia [33]).

[2] See Palacios-Huerta [30] who documents that the variation in the stochastic properties of different human capital returns is substantial, especially when comparing human capital and liquid assets. This fact is also supported by the empirical studies showing that much of the variation in individual or household earnings in US panel data is not explained by individual variables such as age, sex, education, or by aggregate variables (see, e.g., Meghir and Pistaferri [29], and Storesletten et al. [37]).

[3] In our model, human capital is a private, persistent, hidden state variable with continuous support. To our knowledge, models with such state variables are not, as of yet, tractable outside of some special cases. See Section 1.1 for a discussion of the technical contribution of our paper.

[4] As early as in 1961, T.W. Schultz in Presidential Address to the AEA raised this question: "How can we estimate the magnitude of human capital investment? (...) Most relevant activities clearly are (...) partly consumption and partly investment, which is why the task of identifying each component is so formidable." See Schultz [35,36] and Shaffer [34] for an extensive discussion. Also, see Heckman [20,21], Trostel [38], Davies, Zeng and Zhang [10], Carneiro and Heckman [6].

[5] A 2005 memorandum to the President's Advisory Panel on Federal Tax Reform on tax treatment of investment in human capital prepared by the Treasury Department's Office of Tax Analysis says, "In practice, it can be very difficult to distinguish between human capital investment and education consumption." See the reference United States Department of Treasury, Office of Tax Analysis [13] for a full discussion.