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Multiple equilibria, fiscal policy, and human capital accumulation

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Abstract

This paper shows that in a three-sector model of endogenous growth with physical and human capital accumulation, taxation policy can generate indeterminacy under plausible parameterizations. The key for this result is that the accumulation of human capital is a non-market activity in which individuals combine their non-working time with intermediate goods that are provided by the market. This assumption is consistent with the microfoundations of human capital accumulation found by the literature on life-cycle earnings.

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1. Introduction

In recent years, there has been an extensive literature that examines the existence of indeterminate equilibria in dynamic general equilibrium models.¹ The motivation of this search is that indeterminacy is able to account for endogenous business fluctuations and for some empirically observed growth episodes that cannot be reconciled with more traditional literature.² The possibility of a continuum of equilibria is the consequence

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¹ See Benhabib and Farmer (1999) for a complete survey of this literature.

² See Benhabib and Galí (1995) for an overview of the empirical predictions of growth models with multiple equilibria.

of some market imperfections. Usually, the imperfections are assumed to come from external effects in production or monopolistic competition. Furthermore, it has been showed that indeterminacy appears under empirically realistic assumptions.

The intent of this paper is to show that multiple equilibria can also arise straightforwardly without abandoning the hypotheses of perfect competition and absence of externalities. We argue that the market imperfections generated by the taxation policy can generate indeterminacy in a three-sector endogenous growth model with physical and human capital accumulation. As a crucial ingredient for our result, we depart from the traditional endogenous growth model with human capital accumulation by making deeper the microfoundations of the process of human capital accumulation. We specify the accumulation of human capital as a non-market activity that uses effective labor and goods (and services) acquired in the market (intermediate goods, henceforth) as inputs. Therefore, the investment in human capital has a direct component given by the purchases of intermediate goods and an indirect component given by the opportunity cost of the time spent in accumulating human capital. While the former component is perfect substitute of physical capital investment and consumption, the later component is no perfect substitute of those alternative allocations of income. Both components are empirically relevant. For instance, [Perli and Sakellaris \(1998\)](#) estimate the total educational expenditures and the foregone labor income of students in US at 8% and 3.6% of GNP, respectively.

Traditionally, the endogenous growth models with human capital accumulation have often alternatively considered only one of these two components of human capital investment. Some models assume that human capital accumulation is a pure non-market activity (see, e.g., [Lucas, 1988](#)). Other models instead consider that human capital accumulation is a pure market activity where individuals increase their human capital by directly acquiring the intermediate goods without any other manipulation (see, e.g., [Rebelo and Stokey, 1995](#)). By contrast, [Jones et al. \(1993\)](#) also specified a process of human capital accumulation like ours. However, they postulate a two-sector model in which human capital accumulation requires market consumption goods and effective labor. We instead consider a third sector whereby intermediate goods are first produced with a specific technology that uses physical capital and effective labor as inputs. These intermediate goods are then used exclusively, together with effective labor, for the accumulation of human capital. As was pointed out by [Schultz \(1961\)](#), there are a bundle of market goods and services that enhance labor efficiency with cost of time, and however they do not directly satisfy any preferences underlying consumption.³ Since these goods and services are not perfect substitutes of consumable goods, it seems reasonable to assume here different technologies for the production of both types of goods. Hence, we will adopt the two-stage process of human capital accumulation proposed by [Ghez and Becker \(1975\)](#) and [Heckman \(1976\)](#) in their life-cycle models of earnings.

³ Textbooks, medicines or educational services from schools, colleges and universities are, among others, examples of these non-consumable goods. In reality, this process of human capital accumulation also uses a vector of consumable goods. However, we omit this possibility to clarify, without losing of generality, the exposition and contribution of the paper.

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