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The Subsidy to Human Capital Accumulation in an Endogenous Growth Model: A Comparative Dynamics Analysis*

This paper analyzes both the growth and the dynamic effects of the subsidy to human capital investment in a two-sector endogenous growth model. We show that the subsidy is growth-increasing, and it determines the dynamic behavior of the physical and human capital variables. Moreover, the economy reacts instantaneously to unanticipated changes in the subsidy rate. We prove that the jolt caused by the marginal introduction of the subsidy depends on whether the inverse of the elasticity of intertemporal substitution in consumption is larger than the elasticity of marginal productivity of labor with respect to physical capital.

1. Introduction

This paper analyzes the effects that a subsidy to human capital investment has on the development patterns of an economy represented by a two-sector model of endogenous growth with physical and human capital accumulation. In this model, labor in efficiency units can be reproduced in an unbounded fashion through the accumulation of human capital. In the spirit of Rebelo and Stokey (1995) there is a market sector supplying human capital competitively. Individuals buy this human capital so as to increase the efficiency of their labor.

The growth models with endogenous accumulation of human and physical capital are the subjects of an important branch of the recent literature on growth theory. In this type of model, the growth rate of income per capita is endogenously determined by the interaction among the technologies that allow for the accumulation of physical and human capital, the preferences of individuals and government policy variables. Thus, fiscal policy can have not only level effects, but also growth effects. Several theoretical studies in this literature have examined the mechanism by which alternative

fiscal policies affect growth (see, e.g., Lucas 1990; King and Rebelo 1990; Rebelo 1991; Rebelo and Stokey 1995; Milesi-Ferretti and Roubini 1998). There is, however, one aspect of this literature that deserves further consideration. While these studies have basically reduced their analysis to the effects on the balanced-growth path equilibrium, they have not sufficiently focused on the effects on the transitional dynamics of this type of model. Besides the growth effects, fiscal policy can also determine the equilibrium path along which the economy converges to the balanced-growth path equilibrium. Hence, it seems reasonable to investigate how different fiscal policies affect the equilibrium dynamics of this class of models.

Accordingly, Bond, Wang and Yip (1996) analyze the effects that factor taxes have on the stability properties of the model. Ortigueira (1998) characterizes the transitional dynamics of a model where human capital accumulation is a non-market activity in the presence of labor and capital income taxes. Nevertheless, these studies still do not analyze how changes in the fiscal policy parameters affect the dynamic behavior of the model. Mino (1996) makes the latter analysis for capital income taxation. However, since he cannot precisely compute the transitional dynamics of his model, his results on the dynamic effects are based on conjectures about these dynamics. Finally, Devereux and Love (1995) numerically study the dynamic effects of government spending shocks in a two-sector endogenous growth model with an endogenous labor supply.

The central concern of this paper is to characterize the equilibrium dynamics analytically in the presence of a constant subsidy to human capital investment as well as the dynamic effects of permanent shocks in the subsidy rate. We extend Hall's (1971) comparative dynamics analysis from the neoclassical growth model. More precisely, we explicitly calculate the competitive equilibrium path followed by the economy in the presence of a constant subsidy. After doing so, we analyze the effect that an unanticipated and permanent change in the subsidy rate has on the previous equilibrium path. We perform a positive analysis without normative conclusions. In our model, the laissez faire equilibrium is Pareto optimal since there are neither externalities nor other assumptions that may violate the first welfare theorem. There are other studies that investigate the welfare implications of subsidy policy in calibrated versions of models with externalities (see, e.g., Höfert 1996). They base their numerical analysis on the comparison, in terms of utility, between the entire path of consumption in the laissez faire economy and in the subsidized economy.

The presence of a subsidy to human capital investment does not alter the stability property of the model, although it does alter the behavior of physical and human capital along the transition path. In the absence of fiscal