



Sustained output growth under uncertainty: A simple model with human capital[☆]

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Abstract

In a model where agents use their labour/education choice to adjust their consumption profile over time, I show that the impact of uncertainty on growth depends, critically, on agents' attitudes towards risk, reflected by the coefficient of relative risk aversion. In this respect, the well known result from the literature on 'saving under uncertainty' can be extended into a broader context, whereby the intertemporal profile of consumption is determined via human capital accumulation rather than saving and physical capital investment.

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1. Introduction

During the late 1960s and early 1970s, a variety of theoretical analyses began exploring the impact of aggregate uncertainty on saving decisions (e.g., [Levhari and Srinivasan, 1969](#); [Sandmo, 1970](#); [Mirman, 1971](#); [Rothschild and Stiglitz, 1971](#)). Under different

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settings, all these analyses seemed to reach a consensus on the importance of attitudes towards risk on determining the reaction of saving rates to higher degrees of future uncertainty. Specifically, the main conclusion derived from the aforementioned analyses is that, in response to higher degrees of uncertainty, saving rates increase (decrease) if the coefficient of relative risk aversion is above (below) unity. When the coefficient of relative risk aversion is equal to one (i.e., the case of logarithmic utility) saving is unresponsive to aggregate uncertainty.

More recently, the work of Romer (1986) revived an important idea (originally proposed by Frankel, 1962) within a context of a production economy with intertemporal consumer maximisation. He showed that if the investment activity that adds to the aggregate stock of capital can generate and spread additional knowledge, and if the relative importance of knowledge on productivity is sufficiently high, then the economy can reach an equilibrium with ever increasing levels of output (or, equivalently, a *sustainable* and *endogenously determined* growth rate of output). The upshot from Romer's analysis was that the factors normally impinging on saving rates (and, therefore, aggregate investment) can improve our understanding of the differences in growth rates and, to some extent, potential standards of living across economies.

Of course, it was not long before theorists made the apparent connection and understood that, as long as uncertainty is an important consideration behind saving motives and behaviour, higher degrees of uncertainty may have significant long-term implications in terms of output growth trends. In particular, the theoretical analyses by Smith (1996), de Hek (1999) and Jones et al. (2005) addressed the issue of the interaction between uncertainty and long-run output growth within the context of dynamic, general equilibrium models with endogenous mechanisms for productivity improvements and stochastic elements arising from the presence of technology (or productivity) shocks. Their results verify the importance of the coefficient of relative risk aversion as this was described within the various analytical frameworks of the literature on optimal savings under uncertainty – a literature to which I alluded earlier.¹

The models constructed by Smith (1996), de Hek (1999) and Jones et al. (2005), despite being different in terms of their overall structure, share one common future: all types of capital accumulate through savings – that is, agents decide to sacrifice their current consumption and devote a certain fraction of their produced output with the purpose building up some capital stock that will facilitate future production and consumption. Nevertheless, pecuniary elements need not be the only ones to serve in the accumulation of capital. As the work of Uzawa (1965), Razin (1972) and Lucas (1988) suggested, another important aspect in the formation of capital (especially human capital), the accumulation of knowledge and, therefore, the driving force behind long-run growth involves the various human resources, like time or effort, that individuals devote with the purpose of improving their future productive capacity.

Naturally, in such scenarios the nature of the trade-offs between current and/or future benefits are slightly different from the standard consumption–saving choice. For example, we devote more time towards human capital accumulation in order to improve our future consumption possibilities, rather than working in order to achieve more current consump-

¹ In the same paper, de Hek (1999) analyses a second model with human capital. However, he restricts his attention to logarithmic utility.

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