Economic Modelling 28 (2011) 501–514

Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/ecmod

Productivity growth and the U.S. saving rate

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ARTICLE INFO

Article history:
Accepted 5 July 2010

JEL classification:
E2

Keywords:
Consumption–income ratio
Saving rate
Productivity growth
United States

ABSTRACT

Over the last half century, the saving rate in the United States exhibited significant variations. In this paper, I examine whether a general equilibrium model that allows for shifts in the growth rate of total factor productivity can account for these variations. The model generates significant medium-run variations in the U.S. saving rate, and establishes a link between episodes of productivity growth slowdowns or accelerations and the saving rate—two concepts that have often been treated in isolation. While a productivity-growth based explanation is able to account for broader trends in the rising consumption–income ratio from about 1980 to 2000, there are other episodes during which the model is less successful.

1. Introduction

Over the last quarter century, the growth rate of consumption in the U.S. has far outstripped the growth rate of its GDP, leading to what is coined as a “saving slump” (Lusardi, 2009). Fig. 1 shows personal consumption expenditures as a percentage of GDP since 1952. Both the actual and Hodrick–Prescott filtered series exhibit an upward trend, especially after the 1970s—although there has been a slight decrease in this ratio since 2005. A more familiar restatement of this trend is the declining *personal* saving rate in the United States.[1] The literature has so far considered several factors including large capital gains, an aging population and financial innovations (see below for a more detailed discussion). One of the possible and hitherto overlooked explanations of this decline in the saving rate is the consequences of changes in productivity growth (such as productivity slowdown during the 1970s and 1980s, and productivity resurgence in the second half of the 1990s). Yet, basic economic theory suggests that such changes in productivity growth affect both the rate of return to capital and households' permanent income, and as such will likely to have significant income and substitution effects on consumption–saving decisions. This paper explores the significance of these effects for understanding the variations in the U.S. saving rate.

Although it is unlikely that a single factor is responsible for the observed variations in the consumption–income ratio, there are at least two reasons to examine the strength of the productivity channel alone. First, it is largely complementary to the existing explanations, and thus may improve our overall understanding of the saving rate in the United States. Second, in a dynamic general equilibrium setting, current and anticipated growth of productivity on the one hand, and consumption–saving decisions on the other hand are related through a range of factors. These factors include interactions among anticipated growth rate of productivity in the medium and long run, the elasticity of intertemporal substitution and the real rate of return to capital both in the short and long run.

In particular, consider these relations in a Ramsey model (e.g., Barro and Sala-i Martin, 1995, Chp. 2). In the steady-state solution of this model, when the elasticity of intertemporal substitution is relatively high, a permanent increase in the growth rate of productivity leads to a higher steady-state saving rate. This across steady-state comparison has two components. First, a higher productivity growth leads to a higher rate of return to capital per effective worker at the new steady state. This corresponds to lower capital per effective worker, and thus to lower demand for saving. The strength of this response depends on the elasticity of *intertemporal substitution*. At the same time, there is a positive *income effect*, as higher productivity growth will allow for more saving and investment without sacrificing consumption. Of course, outside the steady state, there are similar income and substitution effects, and the response of the saving rate to a change in the growth rate of productivity depends

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[1] In the quantitative sections of this paper I focus on the ratio of personal consumption expenditures to income, both of which exclude gross housing value added as reported in the national income and product accounts (NIPA), and consider a closed economy. In an appendix available from the author, I discuss a range of alternative expressions of the consumption–income ratio that differ in terms of their treatment of the foreign and government sectors, and durable goods. In all these cases, I document a marked increase in the consumption-to-income ratio at least since the early 1980s. So, the differences across business, foreign, government, and personal savings are not driving the trend shown in Fig. 1. See also Parker (2000) for an extensive discussion.

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doi:10.1016/j.econmod.2010.07.003

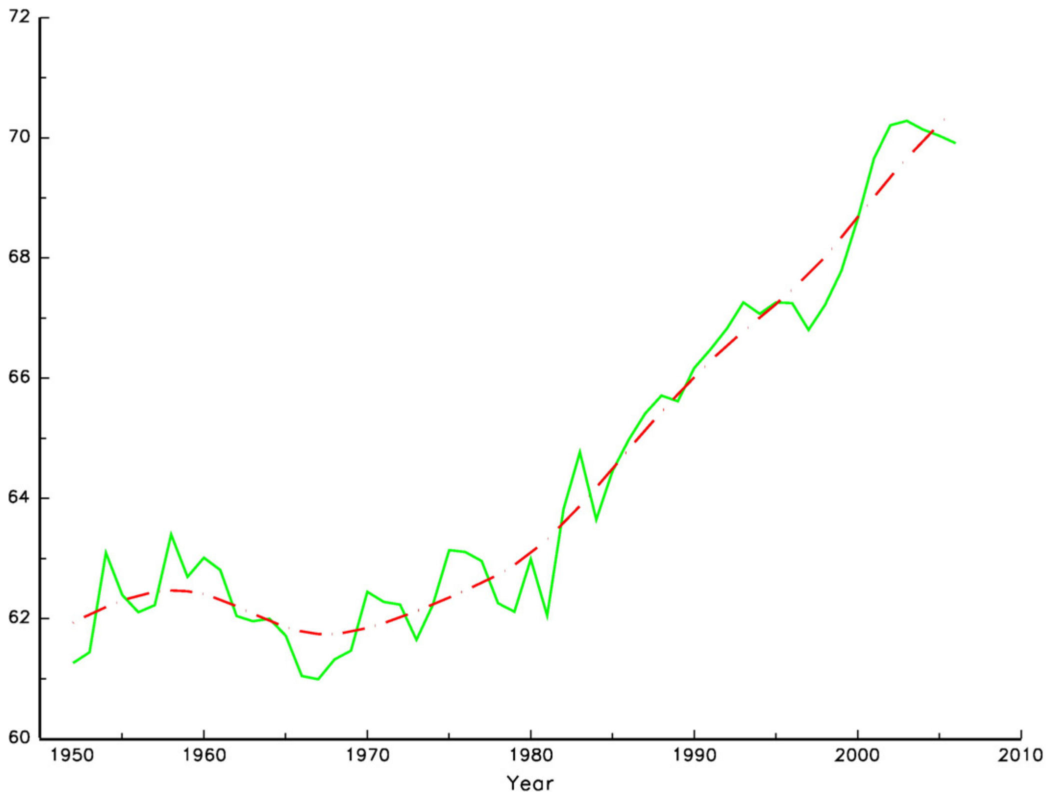

Fig. 1. Personal consumption expenditures as a percentage of GDP, United States, 1952–2006.Notes: The solid line is the actual data and the dashed line is the Hodrick–Prescott filtered data with the smoothing parameter set equal to 100.
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

on the initial conditions, as well as on the magnitude of the elasticity of intertemporal substitution relative to the new steady-state saving rate (Barro and Sala-i Martin, 1995, pp. 89–90). Moreover, when the long-run productivity growth varies over time, these factors have complex interactions. So, this paper investigates the combined effects of intertemporal substitution and income channels using a quantitative model, and examines the stand-alone contribution of a productivity-growth based explanation in accounting for the U.S. consumption–income ratio.[2]

To this end, I consider a dynamic general equilibrium model, use actual productivity growth data and examine whether the model-based consumption–income ratios are consistent with the observed data. I find that the model matches the important medium-term variations in the U.S. consumption–income ratio, especially from 1980 to 2000, and establishes a link between episodes of productivity slowdowns or accelerations and the saving rate—two concepts that have often been treated in isolation.[3] However, while a productivity-growth based explanation is able to account for broader trends in the rising consumption–income ratio from about 1980 to 2000, there are other episodes during which the model has much less success—for instance, the failure of the model to account for the high consumption–income ratio during the early 2000s.

In the model, changes in productivity growth are responsible both for income effects and intertemporal substitution effects, which have ramifications for the consumption–income ratio, and in this general equilibrium setting, it is not possible to isolate the independent contributions of these channels. However, I find that the rate of return to capital over the last 50 years has not been constant, and that the model closely tracks these changes. As such, these findings suggest that the intertemporal substitution channel—a core classical theme in macroeconomics—has been a potentially important contributor to the variations in the observed consumption–income ratio in the United States since 1952.

The quantitative approach followed here also distinguishes between actual and real-time forecasts of productivity growth, both of which enrich the empirical analysis in distinctive ways. In the Ramsey model, along a balanced-growth path, the time paths of consumption and income are typically determined by a *unique* long-run growth rate of the productivity factor, and both consumption and income grow at constant rates. Moreover, since the consumption–income ratio is bounded between zero and one, they must also grow at identical rates. Hence, in a deterministic neoclassical growth model, the steady-state consumption–income ratio is constant, and the model quickly converges to its long-run equilibrium.[4] This paper, on the other hand, accounts for the rising consumption–income ratio by appealing to shifts in the *actual* growth rate of total factor productivity. I also consider the distinction between *perceived* and actual long-run productivity growth. I compare the consumption–income ratios based on real-time forecasts of productivity growth

[2] The quantitative modeling approach pursued here is similar to those of Tobin (1967) and White (1978), who investigate whether life-cycle saving can account for the U.S. capital stock and saving rate. While the main target in these partial-equilibrium life-cycle models is the *net* saving rate, this paper focuses on the *gross* saving rate. Also, partial-equilibrium models often treat intertemporal substitution and productivity growth as separate (e.g., Deaton, 1992, Chp. 2), and do not relate changes in the productivity growth to intertemporal substitution.

[3] These shifts (or "waves") in the growth rate of total factor productivity of the nature were identified by Gordon (2004), among others. Specifically, according to the Bureau of Labor Statistics data, the business sector multifactor productivity growth rate was 2.77% during the period 1952–1973 (Golden Age), 0.82% between 1973 and 1995 (slowdown), and 2.09% between 1995 and 2006 (resurgence). See also Fig. A.1.

[4] In quantitative implementations, such a ratio is sometimes called a "calibration target." When the economy is approaching to its balanced-growth path, the consumption–income ratio need not be constant.