Available online at www.sciencedirect.com
ScienceDirect
Journal of Economic Theory 144 (2009) 2293–2309
JOURNAL OF Economic Theory
www.elsevier.com/locate/jet

Business cycle fluctuations and the life cycle: How important is on-the-job skill accumulation?

Gary D. Hansen [a,*], Selahattin İmrohoroğlu [b]

[a] *UCLA, Department of Economics, 8283 Bunche Hall, Los Angeles, CA 90095-1477, United States*
[b] *USC, Marshall School of Business, Bridge Hall 308, Los Angeles, CA 90089-0804, United States*

Received 11 October 2007; final version received 11 August 2008; accepted 18 August 2008

Available online 3 December 2008

Abstract

We study the effects of on-the-job skill accumulation on average hours worked by age and the volatility of hours over the life cycle in a calibrated general equilibrium model. Two forms of skill accumulation are considered: learning by doing and on-the-job training. In our economy with learning by doing, individuals supply more labor early in the life cycle and less as they approach retirement than they do in an economy without this feature. The impact of this feature on the volatility of hours over the life cycle depends on the value of the intertemporal elasticity of labor supply. When individuals accumulate skills by on-the-job training, there are only weak effects on both the steady-state labor supply and its volatility over the life cycle.

JEL classification: E24; E32; J24

Keywords: Business cycles; On-the-job skill accumulation; Overlapping generations; Human capital

1. Introduction

Inspired by the research agenda proposed by Lucas [19], the equilibrium business cycle literature demonstrates that surprisingly simple model economies display fluctuations with quantitative properties like those of business cycles experienced by actual economies. Most of this literature, beginning with Kydland and Prescott [18], has studied versions of the infinite horizon

* Corresponding author.
E-mail address: ghansen@econ.ucla.edu (G.D. Hansen).

0022-0531/$ – see front matter
doi:10.1016/j.jet.2008.08.009

stochastic growth model calibrated to match secular growth facts. Ríos-Rull [22] showed that this basic claim extends to stochastic life cycle economies where individuals respond to aggregate shocks differently depending on age.[1]

This work, as well as work by Gomme, Rogerson, Rupert and Wright [9], has used these models to study time averages of hours worked by age and the volatility of hours worked by age due to business cycle shocks.[2] A striking finding from this literature is that age-specific human capital seems essential for this type of model to account for the statistical properties of hours worked by age found in U.S. data. In the existing literature these human capital differences are modeled by multiplying individual hours worked by exogenous efficiency weights calibrated to match relative hourly earnings by age.[3] These calibrated efficiency weights increase while young, peak at prime age, and decline towards the end of an individual's working life.

The goal of this paper is to evaluate the usefulness of this assumption by exploring how the quantitative-theoretical findings of this literature are changed when the efficiency weights are endogenous rather than exogenous. In actuality, differences in productivity by age are the result of human capital accumulation, much of it obtained on-the-job. While young workers may be less productive than prime age workers and therefore earn less per hour, they also take into account whatever return from experience they receive from working. That is, their effective wage may be much higher than their current wage given that they will be compensated with higher wages in the future. These returns from experience are ignored when exogenous efficiency weights are assumed. In addition, the efficiency weights themselves will vary in response to shocks, potentially affecting the business cycle behavior of other endogenous variables. We study two forms of on-the-job skill accumulation in the context of a stochastic life cycle growth model: learning by doing (LBD) and on-the-job training (OJT).[4] In the first case, human capital is perfectly complementary with providing productive labor services–human capital is accumulated simply as a result of working. This contrasts with the second case where no productive labor services are provided while spending time engaged in OJT.[5] We then compare the results obtained with on-the-job skill accumulation with those from an economy with exogenous age-specific wage parameters. All three economies are calibrated so that the steady state values for the age-specific wage parameters are identical.

We find that introducing OJT gives steady state and business cycle properties that are essentially identical to the case without skill accumulation. LBD, on the other hand, affects both sets of properties significantly. In particular, the impact of learning by doing is greater when labor

[1] Understanding why and how individuals respond to business cycle shocks as they grow older is arguably important for understanding how the properties of business cycles change as the population ages and for evaluating government policies that affect individuals differently depending on age or, immigration policies for example, that might change the age composition of the population. See Jaimovich and Siu [15] for evidence that demographic change has had a significant effect on business cycle volatility. Another related paper Kim, and Manovskii [16] which investigates the role of demographic change on the return to experience.

[2] These papers follow the real business cycle tradition of measuring business cycle volatility by computing the percent standard deviation of time series that have been detrended using the Hodrick–Prescott filter.

[3] For example, see Hansen [10].

[4] In modeling LBD, we employ the human capital production function used by Chang, Gomes, and Schorfheide [7] in their analysis of learning by doing in an infinite horizon business cycle model. We use a similar function to model OJT.

[5] Both forms of on-the-job skill accumulation have been extensively studied in the micro labor literature. Early papers on OJT include Ben-Porath [4], Becker [2], Blinder and Weiss [5], Heckman [12], Mincer [21], and Rosen [23]. Shaw [24] estimates a dynamic labor supply model with LBD. Imai and Keane [14] estimate a structural model of labor supply with LBD and find that this feature can reconcile the relatively high labor supply elasticity that is consistent with aggregate data with the low elasticity typically found in the micro literature.