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On-the-job human capital accumulation in a real business cycle model: Implications for intertemporal substitution elasticity and labor hoarding

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Abstract

A substantial fraction of a worker's time at work goes to acquiring human capital. This paper explicitly considers on-the-job human capital accumulation from the perspective of time invested for acquiring skills and learning by doing in an RBC model and shows that the inability to account for human capital accumulation leads to a substantial bias in conventional estimates of intertemporal substitution elasticity.

Our main results are based on the standard intuition that the opportunity cost of time invested in acquiring human capital moves procyclically, so that on-the-job time invested in acquiring human capital is "countercyclical." Furthermore, the true wage rate becomes less procyclical, while production hours become more procyclical than total hours at work. The overall results can be viewed as providing a micro foundation for labor hoarding models without adjustment costs.

JEL classification: J22; J24; E24; E32

Keywords: Intertemporal substitution; Human capital investment; Business cycle; Labor hoarding

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1. Introduction

The intertemporal elasticity of substitution (IES) in labor supply has been a crucial topic in various fields of modern economics since Lucas and Rapping (1969) pioneered a representative agent model emphasizing intertemporal substitution of leisure. Over a typical business cycle, we observe that aggregate labor supply varies substantially, although its determinants, such as wages and interest rates, change relatively little. To explain this substantial fluctuation of labor as a response to mild variations in wages, equilibrium business cycle models require large intertemporal substitution in labor supply. However, extensive econometric studies based on micro panel data show that workers are less willing to substitute their labor supply intertemporally than typical business cycle calibration models imply (e.g., MaCurdy, 1981; Altonji, 1986, and Lee, 2001).[1] This micro-econometric evidence has often been cited as evidence against the intertemporal substitution hypothesis of market clearing business cycle theories.[2]

This paper attempts to show potential sources of bias in the estimation of the IES by taking explicit account of on-the-job human capital accumulation.[3] A new insight of this study is based on the following observation. In addition to production tasks, workers spend roughly 20% of total hours at work on acquiring job skills, according to the *SRC Time Use Data*.[4] However, conventional measures of wage rates assume all the hours spent at work are devoted to production and do not explicitly take into account on-the-job investment in human capital. As a result, observed hourly earnings from micro panel data that are constructed by dividing total earnings by total hours spent at work are consistently smaller than the true value of production hours. More important, when the share of production hours to total hours at work shows a cyclical pattern over business cycles, the inability to take into account on-the-job training hours will lead to a bias in the IES estimate because wage rates are being erroneously measured.

[1] For employed male workers, most micro estimates of IES are in the range of 0 to 0.5, while Lee (2001) shows that accounting for finite sample bias leads to a greater IES of about 0.5.

[2] Macro-econometric studies using aggregate time-series data generally show that a large variation in total hours worked takes the form of movements in and out of the labor force rather than adjustments in the average weekly hours worked. For this reason, macro-econometric studies often fail to support the intertemporal substitution hypothesis at the intensive margin (e.g., Mankiw et al., 1985). Even when these studies find the intertemporal substitution of average weekly hours statistically significant, the estimates are no larger than 0.3 (e.g., Alogoskoufis, 1987 and Cho et al., 1998). The consistency between micro- and macro-econometric evidence is not surprising, since micro panel studies usually analyze the individuals who were employed for the entire sample period, and thus, micro observations are the basis of macro time-series data, such as average weekly hours worked. This empirical finding makes the extensive margin of the optimal employment decision worth investigating (e.g., Hansen, 1985 and Chang and Kim, 2006a).

[3] There have been many attempts to account for why micro-econometric evidence is far below the macroeconomic convention. Rogerson and Rupert (1991) argue that a low estimate of the IES does not necessarily indicate a low desire to intertemporally substitute when the labor supply decision is at a corner solution. Domeiji and Floden (2002) suggest that the IES estimate will be biased downward if the econometrician ignores borrowing constraints. Shaw (1989) and Imai and Keane (2004) show in their life-cycle models that learning-by-doing can cause a downward bias in the IES estimate. In a standard life-cycle model with human capital investment, Lee (2004) provides estimates of the IES, ranging from 0.6 to 0.7.

[4] Social Research Center (SRC), "The SRC Time Use in Economic and Social Accounts: 1975–1976," the University of Michigan. Information about human capital investment hours is contained in the 1976 data. For detailed information on this database, see Juster et al. (1978).