Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
Economic Modelling 23 (2006) 308–315
Economic Modelling
www.elsevier.com/locate/econbase

Monetary policy determines the long-run Phillips curve: An OLG model of production with cash-in-advance constraints

Ayse M. Erdogan [a], Ismail Saglam [b,*]

[a] Department of Economics, University of Minnesota, Minneapolis, MN 55455, USA
[b] Department of Economics, Bogazici University, Bebek 34342, Istanbul, Turkey

Accepted 8 November 2005

Abstract

This paper studies a cash-in-advance model with overlapping generations of producers and workers. Producers own decreasing returns to scale technologies, and both producers and workers face liquidity constraints in the labor and good markets. We characterize monetary competitive equilibrium and show that the way monetary policy is conducted determines the long-run Phillips curve.

JEL classification: D51; D52; D91; E52

Keywords: Cash-in-advance; Overlapping generations; Phillips curve

1. Introduction

Cash-in-advance constraints have extensively been studied in infinite-horizon models with production. Some examples are Cooley and Hansen (1989), Fuerst (1992), Carlstrom and Fuerst (1995), Christiano et al. (1997, 1998), and Basci and Saglam (1999, 2003a,b). These studies all establish an operational Phillips curve between inflation and employment that is downward-sloping, or equivalently the presence of a working capital premium as the gap between real wage and productivity. This gap can be completely eliminated, as proposed by numerous studies, by a deflationary policy (Friedman rule) that equates the real rate of return on money to the time preference of the representative agent.

* Corresponding author. Tel.: +90 212 3597643; fax: +90 212 2872453.
E-mail address: saglamis@boun.edu.tr (I. Saglam).

0264-9993/$ - see front matter
doi:10.1016/j.econmod.2005.11.001

The purpose of this paper is to demonstrate in a cash-in-advance model with production that monetary policy may determine the sign of the slope of the long-run Phillips curve. We obtain this unconventional result in an economy with overlapping generations of producers and workers who live for two periods and who face liquidity constraints in the labor and good markets. After characterizing the monetary competitive equilibrium, we show that an increase in the growth rate of money supply, through a rise in old producers' share in money transfers, decreases the equilibrium real wage rate and employment. Thus, we obtain between anticipated inflation and employment the conventional downward-sloping Phillips curve commonly derived in the cash-in-advance literature. At the opposite extreme, an increase in the growth rate of money supply, through a rise in young producers' share in money transfers, leads to an increase in the equilibrium real wage rate and employment. We thus recover the upward-sloping Phillips curve, almost fifty years after its first appearance.

The paper is organised as follows. Section 2 is devoted to the presentation of the model. In Section 3, we define and characterize the monetary competitive equilibrium. We explore the relationship between monetary policy and Phillips curves in Section 4. Finally, Section 5 concludes.

2. The model

There are overlapping generations of two types of agents, 'workers' and 'producers', indexed by $i=w,p$. At the beginning of period $t\in Z=\{-\infty,\ldots,-1,0,1,\ldots,\infty\}$ appears generation t that lives for two periods. The subscript $\{1,t\}$ stands for a 'young' member of generation t and $\{2,t\}$ for an 'old' member of generation $t-1$, who meet in period t. There is no population growth, so in each period there are equal numbers of young and old agents of each type that we denote by n^i for $i=w,p$.

There are two commodities in each period: a factor of production, labor, and a nonstorable consumption good produced with labor. Workers have equal amounts of labor endowments in both periods, denoted by $\bar{l}_1^w=\bar{l}_2^w=\bar{l}^w>0$. Producers do not have labor endowments; but each of them owns a decreasing returns to scale (DRTS) technology $f^p(\cdot)$ that converts labor into good. Just before the end of his life, each old producer of generation t leaves his technology as bequest to a distinct member of generation $t+2$ so that each producer is born with a technology available for two periods.

Workers value leisure in units of the consumption good through the function $v^w(\cdot)$. The representative worker and producer of generation t have the lifetime utilities $U^w(c_{1,t}^w+v^w(e_{1,t}^w))+\beta^w U^w(c_{2,t+1}^w+v^w(e_{2,t+1}^w))$ and $U^p(c_{1,t}^p)+\beta^p U^p(c_{2,t+1}^p)$, respectively. Here, β^i denotes the time preference and $c_{1,t}^i$ and $c_{2,t+1}^i$ denote two-period consumption of each type-i agent, whereas $e_{1,t}^w$ and $e_{2,t+1}^w$ denote the two-period leisure of each worker. We assume that $U^i(\cdot)$, $v^w(\cdot)$ and $f^p(\cdot)$ are twice continuously differentiable, increasing, strictly concave, and satisfy Inada conditions.

The economy operates with fiat (outside) money. Let m_t denote the aggregate money stock at the end of period t that evolves according to $m_{t+1}=(1+\alpha)m_t$, where $\alpha>-1$. Government changes the money stock through lump-sum transfers/taxes at the beginning of each period. While no worker receives money transfer during his lifetime, each of the young and old producers living in period t receive $x_{1,t}^p=\alpha_1 m_{t-1}/n^p$ and $x_{2,t}^p=\alpha_2 m_{t-1}/n^p$ units of money transfer, respectively. We assume $\alpha_1+\alpha_2=\alpha$, and allow the taxation of old producers as long as $\alpha_2>-1$. But, we must have $\alpha_1>0$ inevitably, since young producers need cash for their wage expenses in the factor market.