



Growth and welfare effects of monetary policy with endogenous fertility



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ABSTRACT

This paper investigates the economic growth and social welfare implications of monetary policy in an endogenous growth model with endogenous fertility. We show that, in the money-in-the-utility-function framework, endogenous fertility governs the validity of money superneutrality, the transitional dynamics of an anticipated monetary policy, and the optimal monetary policy. Along a balanced growth path, monetary growth increases fertility and reduces the economic growth rate if consumption and real balances are complements or are independent. However, monetary expansion may decrease fertility and increase economic growth if consumption and real balances are substitutes. Generally speaking, the superneutrality of money does not hold in the presence of endogenous fertility. More importantly, with endogenous fertility, the Friedman (1969) rule is no longer a welfare-maximizing monetary policy. We also show that an anticipated inflation induces the transitional dynamics of fertility and the economic growth rate even though the intertemporal elasticity of substitution equals unity. This differs from the conventional notion in the existing literature.

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1. Introduction

Drastic transitions in the demographic structure of developed and developing countries over the past several decades have stimulated considerable interest in how population affects economies. Economists have paid much attention to the role of fertility in economic growth issues. The literature includes studies on the existence of multiple equilibria or balanced growth paths in economies (e.g., Becker et al., 1990; Palivos, 1995), on optimal population growth and optimal economic growth rates (e.g., Palivos and Yip, 1993), on the effects of fertility shocks (e.g., Wang et al., 1994), on income inequality and economic growth (e.g., De la Croix and Doepke, 2003), on the fertility externality and the optimal fiscal policy (e.g., Van Groezen and Meijdam, 2008), and on social status and economic growth (e.g., Tournemaine, 2008). Obviously, these studies mentioned above restrict their analysis to real-side issues. To the best of our knowledge, an exception is Yakita (2006) who examines the effect of an increase in life expectancy on the portfolio choices of individuals and, thereby, on economic growth and inflation in a monetary model of endogenous growth populated by overlapping generations. Our focus differs from his. To highlight the importance of the family decision regarding fertility in a monetary framework, this paper aims to explore the positive and normative implications of monetary policy in an endogenous growth model with endogenous fertility.

Analyzing the relationship between monetary policy and economic growth is a central issue in macroeconomics. Due to the excellent contributions of Romer (1986) and Lucas (1988), many economists focus on endogenous growth theory and are

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interested in determining whether or not monetary policy can influence long-term economic growth. Previous studies consider the importance of how money enters the economy to examine the effect of inflation on the balanced growth rate (e.g., Marquis and Reffett, 1991; Wang and Yip, 1992; Van der Ploeg and Alogoskoufis, 1994; Mino and Shibata, 1995; Chang and Lai, 2000; Chang, 2002; Jha et al., 2002). De Gregorio (1993), Zhang (1996), and Mino (1997) focus on the role of a real factor, such as the endogenous labor decision, which the real business cycle literature emphasizes. Chang et al. (2000) concentrate on the effects of pursuing a wealth-motivated status; and agents engage in the accumulation of wealth, lending impetus to the long-term growth rate. Recently, Itaya and Mino (2007) have demonstrated that preference structures and production technology are important factors in assessing the effects of monetary policy in a growth model characterized by increasing returns and endogenous labor choices.

Empirical studies also reveal an interest in fertility behaviors. They examine the factors affecting fertility, such as the wage, per capita output, taxation, and transfer programs (e.g., Willis, 1973; Hotz and Miller, 1988; Whittington et al., 1990; Zhang et al., 1994; Milligan, 2005; Björklund, 2006). Do any other factors, such as financial conditions, influence fertility decisions? This phenomenon may occur in some developing countries, such as Central Eastern European countries. By using Ukrainian data from 1996 to 2005, Maksymenko (2009) showed that there exists a relationship between financial wealth and fertility; financial conditions, such as money holdings, account for the changes in fertility in Eastern Europe. This finding implies that if fertility is linked to money holdings, the government can influence fertility via monetary policy.

To respond to this empirical finding, this paper will uncover the long-term effects of an increase in the money growth rate on fertility, economic growth and social welfare in a macro-model with endogenous fertility by adopting both analytical and numerical approaches. To the end, we incorporate the role of endogenous fertility into the Barro (1990) and Rebelo (1991)-type endogenous growth framework with money in the utility function. Based on this amended model, we obtain several novel and interesting results. In a benchmark model in which consumption and real balances are independent, we find that the superneutrality of money is not valid. Intuitively, monetary expansion raises the inflation rate and thus increases the cost of real money holdings, which in turn decreases real money balances. Given an endogenous fertility rate, this gives rise to the co-called wealth-narrowing effect (a large population dilutes the stock of wealth per person) which reduces the households' cost of raising children. As a result, the fertility rate increases and, accordingly, the balanced-growth rate decreases. In the related literature, Van der Ploeg and Alogoskoufis (1994) introduce the uncertain-lifetimes approach of Blanchard (1985) with the money-in-the-utility-function setting of Sidrauski (1967) to Lucas's (1988) model and show that an increase in the rate of monetary growth through open-market operations raises long-run growth. Mino and Shibata (1995) construct an overlapping-generations model with a simple convex production technology and Sidrauski's (1967) money-in-the-utility-function approach. They conclude that an increase in the money growth rate has a positive impact on the long-run growth rate through the intergenerational redistribution effects. Based on Sidrauski's (1967) framework, Chang and Lai (2000) develop a monetary endogenous growth model, in which the AK production technology is adopted and money enters the utility function, and refer to the superneutrality of money. Our result obviously contrasts with those of previous studies.

In an extended model with interdependence between consumption and real balances, in addition to the wealth-narrowing effect, the preference effect also plays a role in terms of influencing the effects of monetary policy on fertility and growth. A particular emphasis is that if consumption and real balances are substitutes, the preference gives rise to an opposite impact, perhaps resulting in a lower fertility rate and a higher growth rate. Besides, we also find that even if the intertemporal elasticity of substitution equals unity, fertility behavior crucially induces the transitional dynamics of the economy in response to an *anticipated* change in the money growth rate. This outcome differs from that of Chang and Lai (2000), who show that when the intertemporal elasticity of substitution equals unity, the economic growth rate does not react to an *anticipated* rise in the money growth rate.

The traditional welfare analysis indicates that the optimal monetary policy follows the Friedman (1969) rule in the sense that, to achieve the social optimum, the government should eliminate the wedge between the private and social costs of money holding by setting a zero nominal interest rate, corresponding to a zero inflation tax. However, our normative analysis shows that, in the presence of endogenous fertility, the Friedman rule is no longer optimal and crucially depends on households' fertility behaviors.¹ Due to the wealth-narrowing effect stemming from the variable fertility rates, the government should tax the holding of money by setting a positive nominal interest rate. Interestingly, either a lower cost of child-raising or a stronger fertility preference amplifies the wealth-narrowing effect, leading to a higher level of the nominal interest rate.

Finally, we emphasize that in some respects endogenous fertility and endogenous leisure share similar characteristics, but our study provides very different implications of endogenous fertility for monetary policy from the analysis with an endogenous labor-leisure choice, e.g., Brock (1974). His model predicts that monetary neutrality holds if leisure and real balances are separable in the utility function. By contrast, this paper predicts that even if fertility and money are separable in the utility function, monetary policy can still affect economic growth. More importantly, due to the wealth-narrowing effect stemming from endogenous fertility, we can provide a distinctive and novel welfare implication for monetary policy, compared to the study with an endogenous labor-leisure choice.

The remainder of this paper is organized as follows. Sections 2 and 3 build a monetary endogenous growth model with endogenous fertility and, accordingly, examine the effects of an increase in the money growth rate on fertility, growth, and welfare. In addition, transition analysis is also conducted. Section 4 further provides extended analyses and performs a simple numerical exercise. Section 5 concludes.

¹ Van der Ploeg and Alogoskoufis (1994), Mino and Shibata (1995), and Chang and Lai (2000) do not engage in welfare analysis.

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