International Review of Economics and Finance xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

International Review of Economics and Finance

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

The growth and welfare analysis of patent and monetary policies in a Schumpeterian economy

Chien-Yu Huang[a,b], Yibai Yang[c,*], Chu-Chuan Cheng[d]

[a] Institute of Urban Development, Nanjing Audit University, Nanjing, Jiangsu, 211815, China
[b] School of Economics, Southwestern University of Finance and Economics, Chengdu, Sichuan, 611130, China
[c] GEP China, IAPS and School of Economics, University of Nottingham Ningbo China, Ningbo, Zhejiang, 315100, China
[d] Department of Accounting, Feng Chia University, Taichung, 40724, Taiwan

ARTICLE INFO

JEL classification:
O30
O41
E41

Keywords:
Economic growth
Patent policy
Monetary policy
Social welfare

ABSTRACT

This study compares the growth and welfare implications of patent policy and monetary policy in a Schumpeterian growth model where the market power of firms is subject to patent breadth whereas consumption and R & D investment are subject to cash-in-advance (CIA) constraints, respectively. The main findings are as follows. First, monetary policy is more effective than patent policy and the mix of these policies in terms of stimulating economic growth if initial patent protection in the economy is strong. Second, the welfare difference between patent policy and monetary policy is ambiguous, depending on the levels of predetermined instruments under these policies. However, these policy regimes are (weakly) dominated by their combination in terms of raising social welfare.

1. Introduction

What is the effect of monetary policy on economic growth and social welfare given a degree of Intellectual Property Rights (IPR) protection and vice versa* How does the interaction of two policy authorities (monetary and IPR protection) affect mutual optimal policy targets* Does the coordination of these two authorities possibly achieve a higher level of welfare than the non-coordination situation* In this study, we build up an endogenous Schumpeterian growth model to stress the above interesting questions. Specifically, in our model, we introduce IPR protection by imposing patent breadth on the markup that determines the market power of firms, and simultaneously incorporate the money demand by imposing cash-in-advance (CIA) constraints on households' consumption and R & D investment.

Our study is motivated by two series of well-known policy events. First, most of developed countries have strengthened their IPR protection as a result of policy reform according to World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).[1] For example, the empirical survey of Park (2008) shows that 107 out of 122 countries have experienced an increase in the strength of patent rights during 1995 and 2005.[2] In particular, he finds that developing countries experienced a higher average increase in the strength of patent rights than developed and under-developed countries, because developing countries have

* Corresponding author.
E-mail addresses: hqy@swufe.edu.cn (C.-Y. Huang), yibai.yang@hotmail.com (Y. Yang), ccheng@fcu.edu.tw (C.-C. Cheng).

[1] The WTO's TRIPS Agreement, which was initiated in the 1986–94 Uruguay Round, establishes a minimum level of intellectual property rights protection that must be provided by all member countries by 2006.

[2] According to Park (2008), the measure of IPR protection, which is called Ginarte-Park index, includes 122 countries and sets a scale of 0 to 5. Of 122 countries, 107 countries experienced an increase of IPR protection, in which the average scale of Ginarte-Park index rises from 2.58 in 1995 to 3.34 in 2005, showing a high degree of IPR protection across countries.

http://dx.doi.org/10.1016/j.iref.2017.03.010
Received 19 October 2016; Accepted 20 February 2017

larger market size and innovative capacity allowing them to implement a stronger patent system.[3]

In addition, a very low (close to zero) level of nominal interest rate target has recently been announced in several countries one after another. Since December 2008, the federal funds rate in the US has been targeted at around 0% to 0.25%. In October 2012, Federal Open Market Committee (FOMC) guaranteed a long-term low level of nominal interest rate target till mid 2015. In August 2015, the Fed reclaimed that it would postpone its low level of federal fund rate until the economy recovers. Similarly, the benchmark interest rate in Japan has been fluctuating between 0% and 0.1% since December 2008. Moreover, from 2014 to mid 2015, China lowered its nominal interest rate several times in response to the collapse of its stock market. In this study, we find that a zero-nominal-interest-rate policy is optimal regardless of the degree of IPR protection, but the optimality of IPR protection does depend on the level of nominal interest rate target.

In a related study, Chu, Lai, and Liao (2012) establish a potentially theoretical interaction between the effects of monetary policy and IPR protection policy on growth and welfare. This paper thereby complements their study by extending their analysis of the interaction of monetary and patent policies to the comparison of the optimal design for these policies. Analytically, we firstly find that given two policy authorities that execute their policy independently, the optimal monetary policy generates a higher (a lower) equilibrium growth rate than the optimal patent policy if the initial scope of patent breadth is larger (smaller) than a critical level. This result in fact implies that the growth effect of monetary policy depends on the degree of IPR, which affects the structure of firm's market power.[4] On the one hand, a larger patent breadth enhances firms' incentives for innovations, leading to a higher level of labor employment in the R & D sector and a higher rate of economic growth. On the other hand, the rate of nominal interest exhibits a monotone decreasing relationship with economic growth, given that a higher nominal interest rate implies larger costs for innovations in the presence of a CIA constraint on R & D. Then, optimal monetary policy that happens at zero nominal interest rate (i.e., the Friedman rule) indicates the growth-maximizing level for a given degree of patent protection. Hence, a sufficiently large patent breadth along with the Friedman Rule can create a larger growth effect than a single patent breadth policy. This argument provides a policy recommendation such that the policy choice between money and patent for boosting economic growth depends on the strength of IPR. For this reason, those developing countries that experience a recent increase in the strength of IPR protection may find that it is more effective to enhance economic growth by choosing monetary policy rather than patent policy.

Furthermore, we find that the welfare difference between optimal patent policy and optimal monetary policy is ambiguous, depending on the levels of the predetermined instruments under these policy regimes. This is because the interactions of the predetermined instruments cause a difference in labor allocations between the policy regimes, and this can have different impacts on the contribution of consumption, growth, and leisure to welfare, leading to an ambiguity in the welfare comparison.

To better understand the important roles of the predetermined instruments in the underlying welfare levels under these optimal policy regimes, a policy experiment is conducted in the sense that policymakers are allowed to coordinate their decisions on both patent and monetary tools. The purpose of performing such an exercise is to analyze how far the welfare improvement of an optimal single policy can be according to the level of the predetermined instrument. As expected, the coordinated optimal policy always yields a higher welfare level for the economy than the non-coordinated scenarios. The reason is as follows. First, optimal combined policy would generate a higher welfare level than optimal patent policy, because the nominal interest rate is lower under the former than under the latter. Therefore, more labor is assigned to R & D under optimal combined policy yielding a larger growth effect on welfare, whereas less labor is allocated to manufacturing under this regime yielding a smaller consumption effect and leisure effect on welfare; the former effect dominates the latter two effects resulting in a higher level of welfare when policies are coordinated. In addition, optimal combined policy would generate a higher welfare level than optimal monetary policy. Intuitively, given that the Friedman rule is optimal for both policy regimes and therefore the consumption-leisure decision of individuals is not altered, the amount of leisure is identical under these two regimes. The welfare difference between these regimes mainly stems from the different extent of patent breadth. Interestingly, the extent of patent breadth only plays a role on labor reallocation between R & D and manufacturing production in this case. If patent protection under optimal monetary policy is stronger (weaker) than the counterpart under optimal combined policy, the former policy devotes too much (too little) labor to R & D yielding a stronger (weaker) growth effect but a weaker (stronger) consumption effect. Nonetheless, the welfare level is lower under the former policy in either situation. In other words, the optimal combination of instruments may serve as a benchmark to account for sizable welfare losses when policies cannot be coordinated.

Finally, we calibrate our model to match the US data. Although the theoretical analysis implies an ambiguity in the welfare difference between optimal patent policy and optimal monetary policy, our quantitative analysis shows that under a wide range of plausible parameter values, optimal monetary policy is superior than optimal patent policy in most cases in terms of promoting growth and raising welfare. This result suggests that in practice, policymakers can help the economy achieve a better welfare outcome by using monetary policy than using patent policy in an environment where the two policies instruments could not be coordinated. We also consider an extension with the log-log utility function that leads to a more general result in which the Friedman rule under the policy regimes could be optimal or suboptimal, depending on whether there is R & D under- or over-investment. Some analytical results in this extension may change, however, the quantitative results are robust to those in the baseline model.

[3] See Gillman and Kejak (2005) for a survey of this literature.

[4] See Chu and Lai (2013) for a similar prediction.