

Allred, Brent B. and Walter G. Park (2007). "Patent rights and innovative activity: Evidence from national and firm-level data." *Journal of International Business Studies* 38(6): 878-900.

Introduction

The paper investigates the effect of strength of patent right protection (PRP) on three different indicators of innovation and diffusion:¹ (1) The number of patents filed by domestic firms, (2) the number of patents filed by foreign firms, and (3) the amount of Research and Development (R&D) conducted by domestic firms. The authors investigate these issues by statistically examining a database of 100 countries during the period 1965-2000. Indicators (1) and (3) are used as proxies for (different stages of) innovation, whereas indicator (2) is used as a proxy for diffusion of (foreign firms') innovation.

Theory

Developed Countries

The authors first develop some expectations regarding the effect of increased PRP on innovation and diffusion, which they argue might differ between developed and developing countries.

In developed countries, the authors argue that increased PRP might positively affect innovation for three reasons. First, it can lead to increased appropriability of innovation and hence stimulate innovation. Second, it promotes knowledge diffusion from the innovator to other firms, since the innovator has to disclose his knowledge in the patent. Third, it provides incentives to pioneers in the market to take risks in innovation.

On the other hand, there might also be negative effects of PRP on innovation: It increases transaction costs because firms have to obtain permission to use patented technologies, it stimulates defensive use of patent portfolios in order to block competitors from building on patented innovations, and it could thus also reduce competition, which in turn may decrease innovation incentives for the (original) innovator.

Regarding the *diffusion* of innovation in developed countries, the authors also distinguish a positive and a negative effect of increased PRP. On the one hand, since increased PRP depresses imitation by local firms it could stimulate diffusion of innovation by foreign firms. On the other hand, it increases monopoly power for the foreign innovator, thus increasing his market power and reducing diffusion of his innovation.

¹ By diffusion the authors are referring to "the introduction of new products and processes into a marketplace beyond the resident patent applicant's home market." (p.882)

In sum, given the equal plausibility of positive and negative effects of increased PRP on innovation and diffusion in developed countries, the authors have no clear *ex ante* expectations for the empirical analysis.

Developing Countries

For developing countries, the positive effects of increases in PRP on innovation largely coincide with those for developed countries, although the positive effects on pioneers is probably not very strong, as these countries mainly engage in adaptive and imitative innovation. However, an additional qualification is made: The authors argue there might be an *optimal* degree of PRP in developing countries which lies somewhere in between the (hypothetical) minimum and maximum degree of PRP. The reason is that because innovations are often not very drastic in developing countries, the extent and time of PRP need not be that long. Excessive PRP could reduce competitive pressures to innovate. A more direct negative effect of PRP on innovation is the increased inability to imitate and adapt, reducing the ability to learn by doing (or learn by imitating).

Regarding the diffusion of innovation by foreign firms, again a positive effect of PRP is that it reduces imitation by local firms. Moreover, it also has a signaling effect which could increase (foreign) business confidence and lead to knowledge transfer. Yet on the other hand, next to increased market power, it could also increase the cost of technological inputs for local firms. Moreover, since markets in developing countries are often small, increased PRP has only marginal effects on R&D incentives. As such, its main effect might be to raise the cost and reduce the supply of existing technologies to monopolistic levels.

In sum, although again plausible positive and negative effects of PRP on innovation and diffusion exist in developing countries, the authors believe that the negative effects will dominate in developing countries.

Empirical Results

Developed countries

First the authors consider the effect of PRP on the rate of patenting by domestic (i.e. native) firms. For developed countries, they initially find a positive relationship, indicating that increased PRP induces innovation, as was expected from theory. Further investigation shows that there actually exists a mild U-shaped relationship between PRP and innovation: That is, starting at low levels of PRP, an increase in PRP first induces a decrease in innovation, until it reaches a minimum. From that point onward, an increase

in PRP starts to stimulate innovation. When including more control variables in the regression, the U-shaped relationship becomes more pronounced.²

Then the authors look at the effect of PRP on the rate of patenting by foreign firms in developed countries. In this case, the results demonstrate an inverted U-shaped effect: Starting at a low level of PRP, an increase in PRP first works to stimulate innovation by foreign firms, then reaches some maximum, after which further increases in PRP actually reduce innovation by foreign firms.

Finally, the authors investigate the relationship between PRP and the extent of R&D performed by domestic firms. They demonstrate a positive relationship, although again there is some mild evidence of a U-shaped relationship.

Developing countries

In developing countries, the authors find a negative relationship between PRP and patent filings by domestic firms. When including more control variables (cf. footnote 2) there is some very mild evidence of a inverted U-shaped relationship, but statistically this is hardly significant.

When looking at patent filings by foreign firms in developing countries, the authors find no effect of PRP whatsoever. The same result appears when looking at the relationship between PRP and R&D undertaken by domestic firms.

Discussion

Considering the empirical results in developed countries, it appears that they are rather consistent. Regarding the effect of PRP on domestic innovation (patent filings and R&D) there seems to be a U-shaped relationship. An explanation for this is that at relatively low levels of PRP, an increase in PRP could first work mainly to increase transaction costs and defensive patenting, leading to lower innovation incentives. Only when a sufficient level of PRP has been reached, the positive effects – such as increased appropriability and knowledge spillovers – start to kick in.

In developing countries, results are rather different. Specifically, there appear to be different effects of PRP on different stages in the innovation process. To see this, it is instructive to note that patent filings can be regarded as output of the innovation process, whereas R&D mainly serves as an input. The reason that there appears to be no effect of PRP on R&D could be that an increase in PRP exactly balances the increased incentives of doing R&D on the one hand, with the additional (transaction) costs of doing so on the other,

² Control variables are variables that are included in the analysis to make sure that estimated relationship between the variable of interest (i.c. PRP) and the dependent variable (i.c. patent filings) is not confounded by the influence of other, mediating factors or variables. Hence, including control variables makes the estimated relationship of interest more precise and more valid.

leaving a zero net effect. However, at the output side, increases in PRP lift the bar regarding the patentability of innovation outcomes. Since innovations in developing countries are more likely to be incremental, chances are that increases in PRP will depress patent filings in these countries.

Regarding the diffusion of foreign innovation, as measured by patent filings made by foreign firms, there exists an inverted U-shaped relationship with PRP in developed countries. Starting at a low level of PRP, an increase initially stimulates diffusion because it depresses imitation by local firms. However, after some point, further increases in PRP start to create excessive market power for the innovator, thus reducing the need for further innovation and hence diffusion.

In developing countries no relationship appears between diffusion and PRP. This could indicate that the positive and negative effects as mentioned in the theory section again more or less cancel each other out, leaving no net effect of increases in PRP.

As a final note, an important implication of these findings is that the interests of developed and developing countries may diverge when it comes to increasing PRP. Whereas for developed countries, increased PRP leads to an increase in domestic innovation, developing countries could actually be hurt since it becomes more difficult for their own innovators to obtain patents.

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