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Patent rights protection and Japanese foreign direct investment

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ABSTRACT

This paper estimates the link between Japanese foreign direct investment (FDI) and the host country's patent rights protection (PRP) in 1985–2004. Regressions performed on data that are aggregated in a variety of ways identify a positive and significant link that is concentrated in countries with a high innovative (imitative) ability and technology-intensive industries. Firm-level logistic regressions show that the link is stronger for firms that depend more on patents to protect innovations than their industry peers. These patterns lend strong support to the argument that PRP and FDI are correlated across countries because the strengthening of PRP ameliorates investors' concerns about the spillover of proprietary technology.

1. Introduction

The relationship between a country's patent rights protection (PRP) and its inflow of foreign direct investment (FDI) has considerable implications for national development policies and the location strategies of multinational corporations (MNCs). If PRP increases FDI inflows, as suggested by many authors and institutions [e.g., The World Bank (2002)], then policymakers designing national patent systems should consider this effect in addition to the traditional trade-off between domestic innovation and technology diffusion. However, if PRP is unimportant to the location decision of MNCs, then the merit of the TRIPS (Trade-Related Aspects of Intellectual Property Rights) agreement (and other international initiatives to strengthen global PRP) might be exaggerated, especially for countries with low innovative ability.

A growing body of research has estimated the PRP–FDI link across countries, using mostly U.S. data. Consistent with the view that PRP stimulates FDI inflow by protecting investors from unintended spillovers of proprietary technology, many authors have identified a positive and statistically significant link between a country's PRP and FDI inflow from the U.S. (e.g., Lee and Mansfield, 1996; Maskus, 1998; Smith, 2001). However, at least two issues remain unclear in this literature. The first is the role of foreign PRP in the geographical distribution of non-U.S. FDI. The second is whether the PRP–FDI link is caused by firms that depend largely on patents to protect innovations. If the link is not driven by the investment behavior of these firms, then the conventional wisdom becomes dubious because the link could merely reflect the collective effect of other policy and institutional factors coevolving with patent laws that remain uncontrolled for in these estimations (Primo Braga and Fink, 1998; Lall, 2003).

In this paper, I help resolve these ambiguities by using microeconomic data on Japanese FDI over two decades. Japanese FDI provides an interesting case because, as Mansfield's (2000) international survey of managers suggests, the location decision of Japanese MNCs is just as sensitive to foreign PRP as that of their U.S. counterparts. Nevertheless, no previous studies have estimated the effects of foreign PRP on the geographical distribution of Japanese FDI. Another unique feature of this study is that it takes a more detailed look at the cross-sectional variations of this PRP–FDI link. If PRP is correlated with FDI because of the direct effects of patent laws on the reduction of technology spillover, then the correlation should be particularly strong for the FDI of firms that largely depend on patents to appropriate innovations. On this critical issue, research has supplied only limited and mixed evidence at the industry level while supplying no evidence at the firm level. In this paper, I provide unusually detailed evidence on the heterogeneity of the PRP–FDI link across industries and firms. In particular, I estimate how a firm's sensitivity to foreign PRP varies with its innovative activities (especially patenting) by matching FDI and patent data at the firm level.

My empirical focus is on FDI undertaken in 1985–2004 by industrial firms listed on the Tokyo Stock Exchange (TSE). I estimate factors influencing these firms' FDI location in two steps. First, data are aggregated for cross-country regressions to estimate the country-level determinants of FDI flows. After controlling for geographical distance and a variety of development variables, I find a statistically and economically significant link between Japanese FDI

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and the host country's PRP. Consistent with Smith's (2001) findings for U.S. MNCs, this link concentrates in host countries with a high ability to imitate foreign technology. In addition, disaggregating FDI by industry reveals that the link is specific to technology-intensive industries such as chemicals and electric machinery. These results are consistent with the view that the strengthening of PRP alleviates foreign investors' concerns about the spillover of proprietary technology and thereby increases the FDI inflow into a country.

In the second step, I perform logistic regressions based on firm-level data to estimate a firm's likelihood of investing in a country. I find that after controlling for various country- and firm-specific factors, a country's PRP significantly increases the probability of a firm's investing in the country. In addition, the estimated pattern of inter-firm variation in PRP–FDI links is highly consistent with the direct effect of technology protection because the link is stronger for firms that depend heavily on patents as compared to their industry peers. An interesting result is that a firm's sensitivity to foreign PRP increases with its patent intensity, even in industries for which aggregate estimations fail to identify a positive PRP–FDI link. The PRP-sensitivity of FDI is therefore a function of the investing firm's technology strategy as well as industry characteristics. Regressions also reveal that PRP increases FDI inflow into a country mainly by affecting the initial investment decision of new investors rather than the expansion decision of incumbent firms.

Taken together, my results are consistent with the notion that strengthening PRP to improve the appropriability of innovation increases the inflow of FDI. The finding that this effect is mainly driven by technology-intensive firms implies that PRP affects the quality as well as the quantity of incoming FDI. It is important to recognize that the effect of PRP in attracting FDI concentrates in countries with relatively advanced technological ability. Governments must carefully weigh the costs and benefits of strengthening PRP in light of their country's technological needs and capabilities.

The organization of this paper is as follows. Section 2 reviews the background of this research. Section 3 introduces data. Section 4 performs cross-country regressions. Section 5 performs logistic regressions to estimate the PRP–FDI link at the firm-level. The final section concludes.

2. Background

2.1. Literature

The relationship between a country's PRP and FDI inflow is a highly empirical question. On the one hand, stronger PRP increases foreign firms' ability to reap profit from proprietary technology transferred via FDI. This effect would make the relationship positive as PRP increases a country's attractiveness to foreign firms, especially technology-intensive ones. On the other hand, PRP decreases the transaction costs of arms-length technology transfers such as licensing. This effect can make the relationship negative by inducing firms to substitute licensing for FDI. In the OLI framework of Dunning (1993), therefore, PRP increases a country's location (L) advantage to attract investment by firms whose ownership (O) advantage is in technology, but simultaneously decreases these firms' internalization (I) advantage.[1]

Empirical studies have shown that the cross-country correlation of PRP and inward FDI is generally positive. Lee and Mansfield (1996) make an early attempt to estimate the link. They find that the strength of PRP, as perceived by managers, is positively correlated with U.S. direct investment in a sample of fourteen developing countries. Ensuing studies use more objective PRP measures to examine a wider cross-section of countries. Maskus (1998) identifies a positive correlation between PRP and U.S. FDI stock in a panel of 46 countries. Smith (2001), studying a cross-section of 50 countries, finds that PRP and the foreign affiliate sales of U.S. MNCs are correlated positively and significantly. Unlike studies based on aggregate data, Smarzynska (2004) estimates the PRP–FDI link based on microeconomic data. She finds that a firm's probability of investing in a transition economy in Europe and the former Soviet Union increases with the strength of PRP in the focal economy.

Although evidence for the correlation of a country's PRP and FDI inflow abounds, the implications of this link are not unambiguous. As Maskus (2001) notes, PRP is likely to be only one element of the "cocktail" of policies and institutions considered by firms in deciding where to invest. PRP could be correlated with FDI merely because it picks up the collective effect of many coevolving factors. The PRP–FDI link could also arise because of a signaling effect if investors regard countries with stronger PRP as providing more favorable climates for private business and investment (Lall, 2003). These confounding effects can be serious after the mid-1990s because many countries that joined the World Trade Organization (WTO) strengthened PRP to comply with the TRIPS agreement while simultaneously liberalizing policies in many areas.

Studying the cross-sectional variation of PRP–FDI link can help resolve this ambiguity. If the link appears because of the direct effect of technology protection, it should be strong where the spillover of proprietary technology is a serious threat to foreign investors. For instance, firms investing in technologically sophisticated countries will face a large risk of losing technological advantage if they are not protected by strong patent laws because indigenous firms in such countries have a high ability to imitate advanced foreign technology. Smith (1999) finds that U.S. exporters are sensitive to foreign PRP when trading with technologically advanced countries. Likewise, Smith (2001) finds that sensitivity to foreign PRP of U.S. affiliate sales and licensing is significantly positive only if a country with high imitative ability is involved. Nunnenkamp and Spatz (2004) report that the cross-country correlation of PRP and U.S. FDI stock is positive only among countries with large endowments of human capital.

The PRP-sensitivity of FDI would also vary across firms because, as the innovation literature documents, industries and firms differ considerably in the extent to which they use patents to appropriate innovations (Levin et al., 1987; Hall et al., 2005). Unfortunately, research has generated only limited and mixed evidence on the inter-industry heterogeneity of PRP–FDI links and has generated no evidence on the intra-industry heterogeneity among firms. Lee and Mansfield's (1996) survey shows that managers in the chemical industry (including pharmaceuticals) are the most concerned about foreign PRP, which is consistent with the fact that patents are critical assets in this sector (Levin et al., 1987). Fink (2005) compares four technology-intensive industries, but fails to identify a significant link between the foreign affiliate sales of U.S. firms and the host country's PRP in any of the selected industries. By contrast, Smarzynska (2004) finds that PRP and FDI are only correlated positively and significantly in patent-sensitive industries.[2] Smarzynska (2004) does not examine whether the sensitivity to foreign PRP varies across firms because of firm-specific factors even though her estimations are based on firm-level data.

[1] For this reason, researchers should ideally look at alternative transaction modes simultaneously, such as exporting, licensing, and FDI, to estimate the total effect of PRP on international technology flows. Maskus (1998) and Smith (2001) are examples of such an attempt while using aggregate data. Data on alternative transaction modes are difficult to obtain at the firm level.

[2] These industries include drugs, cosmetics, health care products, chemicals, machinery and equipment, and electrical equipment. Smarzynska (2004) groups these industries into a single category.