JOURNAL OF ENGINEERING annals OF FACULTY OF ENGINEERING HUNEDOARA

THE STRENGTH OF INTELLECTUAL PROPERTY PROTECTION AND THE TRANSFER OF TECHNOLOGIES

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Abstract:
In the wake of the 21st Century achievements of the intellect are gaining in importance in production. Who has the knowledge, also has the advantage in competition. Countries are striving to produce knowledge, or else acquire knowledge elsewhere produced to remain competitive.
Intellectual property rights (IPR) facilitate technology transfer by assuring foreign innovators that transferring knowledge produced by them into the country they will still be able to collect returns.
In this paper I am going to present one possible way of measuring the effect of relative IPR protection strengths of trading partners on the magnitude of technology transfer between their countries.
Keywords:
IPR, Intellectual Property Rights, patent-index, technology transfer, international trade

1. INTRODUCTION

In the last decades it becomes increasingly clear, that those countries will be able to benefit from the new kind of international competition which can better adapt to the challenges of the knowledge-based economy. Knowledge is gaining in importance as an input to the production process. Therefore it is in the best interest of the countries and governments to facilitate knowledge production and try to manipulate its international spread in their own favour. Intellectual property rights (IPR), or property rights more broadly, are institutions which are taken as given or exogenous by neoclassical economic models. In this paper, however, what is seen to influence knowledge production and diffusion is the design and especially the strength of this institution itself. The IPR regime is not an exogenously given variable any more, but can be adapted endogenously to reach a desirable outcome. I tackle this problem from an institutional point of view.

The economic aspects of institutions have just recently started to be explicitly investigated. Starting with the influential works of R. H. Coase as far back as the 1930s, the new institutional economics a) views institutions as not being neutral, but influencing economics outcomes, b) rather than discarding the whole apparatus of the neoclassical economics, tries to link functioning of the institutions with the marginalist methodology and c) tries to use institutional variables as endogenous within the neoclassical framework. One of these institutions endogenously inserted into the neoclassical economic model is the institution of property rights.

Thinking about property rights found its way to economic thinking only recently. In his 1960 paper, the Problem of Social Costs, Coase emphasises the economic importance of property rights. Property right in economics means “actual power to control or affect the use of an object, or some aspect thereof” [5]. This controlling or affecting can typically mean 3 things: a) usage of the object (usus), b) appropriating the returns thereof (usus fructus) and c) the transferring of these rights partly or fully to another person (abusus). Clearcut property rights and their guaranteed enforcement are perquisites of (but not guarantee) a well-functioning, Pareto-optimal market economy.

The third of these rights is in connection with the freedom of contracts and trade. As Makaay writes ([5], p. 248., italics mine): “A person who controls the use of an object may find it *profitable* to allow another person to use it, [...] To this end, the owner enters into an agreement with the other person. The agreement [...] *confers* on him or her *some economic property rights*.” The above quote implies that either using our property ourselves or selling it to someone is driven by the profit-motive and leads to the efficient usage of the property. If there are any limitations to any of these parts of the property (that is, limiting the economic property right that can be conferred on someone, or limiting this conferring itself), efficiency cannot be ascertained.

We also have to be aware of the fact, that the property right system is not static, but dynamically changing. Since it is, in the institutionalise view, an endogenous variable, it is not merely a given factor that determines other variables, but is itself dependent on other economic variables and processes. The tailoring of property rights to different objects with different characteristics can be a natural,

evolutionary process, left to the market, but more often than not it is done by the government. This is the case with products of the intellects, or, as I will refer to them, knowledge. The creation of knowledge is encouraged through better or worse IPR systems in every country. The spreading of knowledge, however, will depend on the international differences of these IPR protection systems from country to country.

2. INTELLECTUAL PROPERTY PROTECTION AND TRADING WITH INTELLECTUAL PRODUCTS

Establishing a clear intellectual property rights (IPR) system makes trading with intellectual product possible. The possibility of trading in turn leads to specialisation, meaning that producers can have the necessary knowledge and technology from the researchers, and researchers do not have to bother with the commercial development of their ideas, like they had to in earlier centuries [4]. Knowledge can then be acquired from specialists through the market. This specialisation and cooperation is rendered possible by the market for intellectual products by way of intellectual property protection measures. Research and development can be detached from production.

There exists a number ways to transfer knowledge[1] from one country to another. "International technology transfer refers to the process by which a firm in one country gains access to and employs technology developed in another country" ([1], p. 23.). This has many ways and methods, that can and has been both theoretically and empirically explored. The possible ways include international trading in technology-intensive products, international flow of foreign direct investments, cross-country licensing, or even patenting in a different country. International trading in intellectual products is one the market-conform ways technologies can spread in the globalised world[2]. Clearly established national intellectual property rights regimes enables trade in intellectual property, but national differences can influence this trade. As to how exactly national differences in the strength and design of the IPR system influence international trade in knowledge, no generally accepted theoretical explanation has yet emerged in the literature. There are at least two characteristics of a country's IPR regime, that can influence the inter-country flow of intellectual products, namely its design and its strength. The effects of both have been explored at the model level. The model of Taylor [11][12] explore how the differences in design between countries affect knowledge transfer. Design differences mean the symmetry of asymmetry of protection, that is whether foreign inventions enjoy the same protection as domestic or not. The model's conclusion is, that the more symmetric the IPR protection, the more it encourages knowledge creation and transfer. In Naghavi's model [6] the strength of the protection determines the outcomes, namely whether the foreign company will enter at all the domestic market, and if yes, will it be by way of direct investment or export. These models conclude that more symmetric and stricter IPR protection attracts more knowledge into the country.

3. EMPIRICAL STUDIES OF THE LINK BETWEEN IPR STRENGTH AND TRANSFER OF TECHNOLOGY

To test empirically, whether a link between the strength of IPR systems in a country and transfer of technology to that country could be established, two questions have to be answered: first, how to measure the strength of national IPR regimes, and second how to measure the magnitude of transfer of technology.

For the measurement of the strength of IPR regimes, Ginarte and Park developed a composite index in their 1997 paper [3][3]. Their index measures IPR strength along 5 dimensions, giving a number 0-1 to each, and then taking the sum of these to be the patent index, thus ranging from 0 to 5. The five dimensions are coverage (meaning what can and what can not be subject of protection), membership in international treaties (the Paris Convention, the Patent Cooperation Treaty and the International Convention for the Protection of New Varieties of Plants), enforcement (whether the legislation provides adequate mechanism for the law to be enforced), and restrictions to exercising IPRs (eg. compulsory licensing), and duration of protection.[4] The higher value a country is scoring in this index, the more strict IPR protection is taken to be in that country.

[1] In this paper I am talking about knowledge transfer in a very general sense. The model I use and the empirical test of its predictions are at the macro level. These do not say anything about the actual process, how knowledge is being transferred from one country to another. Neither is it important here, how individual firms find out, what knowledge and what innovations it is worth to acquire from outside the home country, or what determines the regional spreading of knowledge and innovations. Although these are all certainly important questions, I will concentrate here only on the aggregate, macro level.

[2] As opposed to certain non-market-conform ways like non-market transactions and spillovers [1].

[3] Beside this Ginarte-Park index, empirical studies use another, called Rapp-Rozek index to which due credit is given both in [3] and [1].

[4] In a 2008 paper [9], this patent right index is developed further, and an index for the strength of copyright protection and trademark right protection is included.

For the measurement of the magnitude of transfer of technology many different indicators can be used. [1] enumerate 4 basic channels through which technology can flow from one country to another: through a) international trade, b) foreign direct investment, c) licensing agreements and d) cross-national patenting.

In their original study [3], the aim of the study was to examine, what determines the Ginarte-Park Index as a dependant variable. In [8] the authors conducted an empirical study to examine whether a statistical relationship can be established between the strength of IPR regimes as an independent variable and technology transfers, either in the form of foreign direct investment or in the form of technology-intensive merchandise import as a dependant variable. They conducted a regression analysis where they used the above mentioned Ginarte-Park Index to measure the strength of the IPR system as an explaining variable[5]. Beside that, their regression analysis has many control variables (like country-risk or per capita GDP), accounts for individual, country-specific effects like culture or quality of institutions [8].

In a later paper, Park and Lippoldt present a developed model. [9] has the methodology of what to measure and how to measure. They regress a) stock of inward FDI, b) technology-intensive merchandise imports and c) technology-intensive service imports to the Ginarte-Park Index of Patent Rights. In their paper, they use data from altogether 120 countries, which they divide into three groups: developed countries (25), developing countries (68, including Hungary) and least developed countries (27). What they find is, that 1% rise in the Ginarte-Park index is accompanied by a 1,65% rise in inward FDI to developing countries (as opposed to 11,2 to developed and 1,66 to least developed countries). A 1% rise in the Patent Right Index goes together with 1,34% rise in merchandise imports to developing countries (compared to 9,86 to developed countries and 0,54 to least developed countries). Also, the coefficient for service imports to developing countries is 0,99 (9,99 to developed countries and 0,97 to least developed countries).

4. IPR STRENGTH AND KNOWLEDGE INFLOW TO HUNGARY

Neither the original 1997 study by Ginarte and Park, nor the 2003 study by Park and Lippoldt includes Hungary. Park in his 2008 paper ([10] p. 2.), however gives the values of the Ginarte-Park index for Hungary. For the years 1960-1990 Hungary scores an average of 2,20. For the year 1995 the index is 4,04 remaining unchanged for 2000, and rising to 4,5 to the year 2005[6]. Having the scores of the patent right index for different years, and having the model of [9], we can see, whether the Hungarian data support my predictions.

Park and Lippoldt give in their 2008 paper an interpretation of knowledge-intensive products and services, listing those parts of merchandise imports and service imports which are the most likely to bring along with them the transfer of new technologies to see how these are related to the strength of the IPR system[7]. In the case of the merchandise imports these are: pharmaceuticals, office and telecom equipments, organic and inorganic chemicals, electrical and electronic products, aircraft and spacecraft-related products and optics and precision equipment ([9], p. 37). In the case of services imports they list communication services, computer and information services and royalties and license fees ([9], p. 43). I also acquired data for Hungary in these categories.

Table 1 shows foreign direct investment, technology-intensive merchandise import and technology-intensive services import for the years 2000 and 2005 into Hungary. As a reference, I indicate in the first column the Ginarte-Park index for Hungary.

Table 1: knowledge transfer to Hungary (values are in Mio current USD)

Year	G-P Index for HU	Inward FDI	Technology-initensive merchandise import	Technology-intensive services import
2000	4,04	22 869,9	16 101,3	461,0
2005	4,50	61 970,1	32 842,4	1 956,8

Source: MNB, KSH, UNCTAD

Even if we take the strictness of IPR protection as a determinant of knowledge inflow into a country, it may not be the absolute, but the relative strictness of the protection that matters. Next I will use the Ginarte-Park index of countries to measure the differences in the strictness of IPR protection between trading partners, and see whether and how this influences knowledge inflow as understood by Park and Lippoldt ([8] [9]). Based on the above studies of Park and Lippoldt, *my prediction is, that as*

[5] The strength of intellectual property regime is certainly not the only determinant of knowledge diffusion. Some other influencing factors, the effects of which could even be studied at the model level might be the extent of the market, the quality of the labour force, the infrastructure, political stability etc.

[6] The Patent Rights Index for Hungary is, however, different, being 3,71 in 2000 and 3,37 in 1995 ([7], p.40).

[7] The model certainly also uses control variables.

domestic IPR protection gets stricter relative to that of the trading partner's, this encourages knowledge inflow, while as it gets looser, it discourages knowledge inflow.

Having data on the knowledge-intensive merchandise and service inflow into Hungary broken down to countries of origin it is now possible to see, whether any connection can be seen between change in Hungary's relative IPR strength to its trading partners and the change in stock of inward FDI, technology-intensive merchandise imports and technology-intensive service imports, respectively. To see this I used data for only those countries, for which [10] gives a Patent Right Index, which is, 120 countries. Not having the control variables the original study used I made a plot diagram of the percentage changes in inward FDI stock, technology-intensive merchandise import and technology-intensive service import against change in the patent right index of the trading partner compared to Hungary. I tried to identify a pattern. *According to my prediction, the dots should scatter around a positively sloped trend line.* From the sample I excluded those items, where trade or FDI stock was 0 in at least one of the years, and also excluded outliers, where the change in either way was more than tenfold during the five-year interval. After these exclusions my data account for 86,7% of the inward FDI stock in 2000 and 76,68% in 2005, in the case of merchandise import these percentages are 99,45% and 98,58, respectively and for the services import they are 97,28% and 83,42%, respectively. I got the plot diagram on figure 2 for all three categories.

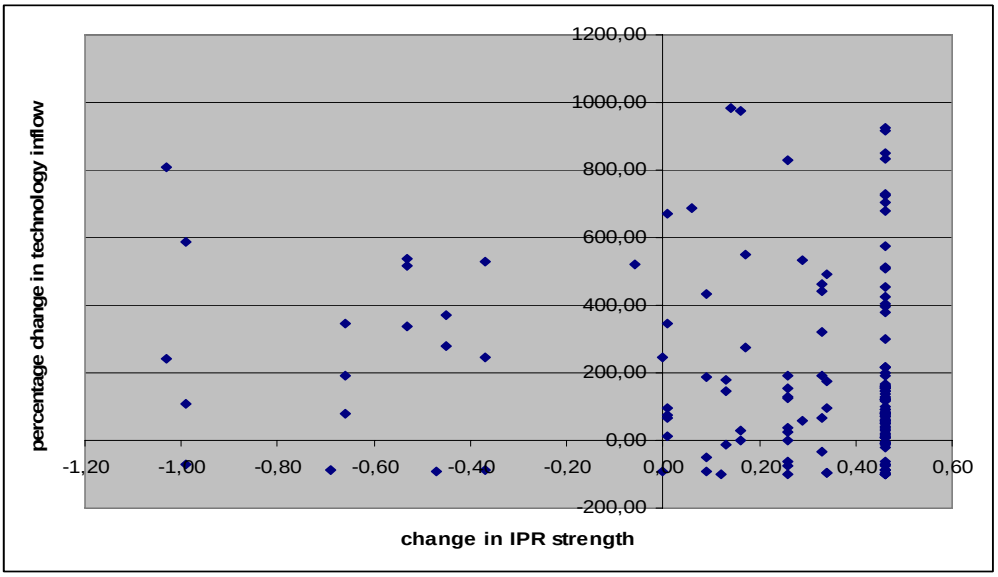

Figure 2: technology inflow in relation to change in relative IPR strength in Hungary, Source: KSH, MNB

What the figures show, instead of a positively sloped trend line, is a kind of "reverse funnel". The reverse funnel can be read meaning, that the change in the relative IPR strength does not, per se, determine technology transfer through these channels, but a greater positive change in Hungary's relative IPR strength is able to encourage technology transfer, while the smaller the positive change or the greater the negative change, the less it is able to do so. Put another way, the relative strengthening of the Hungarian IPR protection allows for greater variation.

5. TECHNOLOGY-INTENSIVE TRADE BETWEEN HUNGARY AND ROMANIA

Table 2 shows the trade in technology-intensive merchandise and services between Hungary and Romania in the years 2000 and 2005, for which Patent indexes are available.

Table 2: technology-intensive trade between Hungary and Romania (in Mio current HUF), Source: KSH, MNB

	2000	2005
to H from RO		
Patent right index for H	**4,04**	**4,5**
tech-intensive merchandise	20 881,5	64 673,0
tech-intensive services	957,7	7 385,9
to RO from H		
Patent right index for RO	**3,72**	**4,17**
tech-intensive merchandise	29 046,4	157 320,5
tech-intensive services	79,0	6 445,3

The data in the table throw light on some methodological problems already present in the previous section's conclusions. First, the variables to be explained (value of merchandise and services traded) are calculated at current prices, thus any rise in it is partially a result of inflation. Second, the increase in value is higher in merchandise trade then in services trade, the percentage increase however is just the opposite, the base being substantially lower in the services case. Third, even if relative strengthening of IPR protection would allow for higher technology-intensive product and service inflow, if there is nothing to import, then this effect can naturally not work out. Typically, technology-intensive product and services are being generated in countries with higher patent right index than Hungary or Romania. This is reflected in the fact that around 60% or technology-intensive merchandise and around 80% of technology-intensive services come to Hungary from countries with higher patent right index, like Germany, the United States, Japan and the United Kingdom.

6. CONCLUSION

Theoretical studies show, that the actual shape and built of a nation's intellectual property rights protection system can and does have effect on the international flow of intellectual products through the markets. If this is the case, different countries can shape their IPR regimes to profit more from the international flow of knowledge, while this can be a disadvantage for others. This way, appropriate fine-tuning of the IPR system can become a new way of competition between countries and also a new possibility for levelling off. Endowment with or accessibility to knowledge might be less predetermined, constrained than endowment with natural resources, capital or labour. If it can be proven that the type (strength) of IPR systems as a new tool in the hand of a national government can influence international flow of capital and technology transfer, than using Ghosh's words we can speak of a „new mercantilism", of a new tool a government can use to compete more efficiently at the international level ([2], p. 85).

It is up to further studies to examine, how varying strength of IPR systems influence other kinds of technology transfer, like the international flow of knowledge workers and human capital, and the resulting knowledge products.

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