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Intellectual Property Rights and Technology Transfer to Developing Countries:
A reassessment of the current debate

Marco Valenza

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Development Studies Institute

London School of Economics and Political Science

Houghton Street **Tel: +44 (020) 7955 7425/6252**

London **Fax: +44 (020) 7955-6844**

WC2A 2AE UK **Email: d.daley@lse.ac.uk**

Web site: www.lse.ac.uk/depts/ID

ABSTRACT

Advanced countries' endeavours to harmonise stronger intellectual property rights (IPRs) sparked a heated debate over their role as catalysts for technology transfer (TT). This essay investigates the impact of stronger IPRs on TT across developing nations. It argues that such impact is highly dependent on structural specificities of the transferee-country, such as technological capabilities and institutional quality. The provision of more stringent IPRs in itself cannot compensate for structural deficiencies to promote TT. The necessity to account for country-specific, structural factors also calls for a methodological rethinking in conducting empirical research. Particularly, focus should be redirected away from aggregate studies and towards country-focused analyses that could contextualise the IPR regime within the broader context.

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1. INTRODUCTION

In the last three decades the North-South political economy has been animated by a heated debate over the benefits and costs of strengthening intellectual property rights (IPRs). Provisions for more stringent IPRs have been frequently incorporated into bilateral and regional trade agreements (RBTAs), and included in the multilateral agenda through the WTO's Trade-Related Intellectual Property Agreement (TRIPS). The result was a distinct movement towards the global harmonisation of a Western-style IPR regime, with RBTAs being the prime catalyst in this direction (Sell 2011).

The traditional debate on the role of the IPR regime opposes those who emphasise the *static costs* it entails and those who point to the *dynamic benefits* it can yield. Advocates of lax IPRs stress the static dimension: the increased market power that stringent IPRs confer to patent-holders would curve access to IPR-protected goods. This is a theme that has repeatedly grabbed the attention of activists and NGOs in developing countries (DCs), since it extends to humanitarian-related fields such as pharmaceuticals and foodstuff. Stronger IPRs also hinder imitation and reverse engineering, which have been fundamental mechanisms of technology acquisition in DCs (Chang 2001). Additionally, the enforcement of IPR laws requires the establishment of proper governmental bodies. This might prove challenging in situations of chronic budget constraint, typical of DCs.

On the other front, supporters of more stringent IPRs underline the potential dynamic benefits they can bring along. Strong IPR protection spurs local innovation efforts by ensuring more appropriability to inventors who have to bear upfront investments. Moreover, they promote international transfer of technology via market-mediated mechanisms (trade, FDI, licensing). Those who endorse tighter IPR regulations are also confident that the objective of striking a balance in the trade-off between technology innovation and technology dissemination can be successfully met.

In order to evaluate the impact of stronger IPRs in the developing world, one should simultaneously consider all these inter-related components and trade-offs. This goes beyond the scope of this paper, which focuses exclusively on the dynamic dimension of the debate, and particularly investigates under what circumstances stronger patent protection[1] promotes international technology transfer (TT) to DCs.

Some definitional clarifications are in order. First, this paper conceives technology as any information that allows transforming inputs into outputs. Hence, not only physical capital but any production process, organisational model or management technique that contributes to enhanced productivity (Maskus 2004). The transfer of technology is thus a process by which an actor gains access to particular information and learns how to exploit it to boost its own productivity. This can occur via a number of market-mediated (voluntary) and non-market-mediated (involuntary or informal) channels, notably imitation and reverse engineering. Either way, it is crucial to understand that TT is not an immediate process, whereby technology automatically flows from high- to low-technology actors. This owes to the non-codified

[1] IPRs also cover copyrights, trademarks, geographical indications and trade secrets, which are not covered here for time and space constraints. Patents are however the single most relevant IPR tool for DCs.

component of technology, commonly referred to as "tacit knowledge" (Polanyi 1967). The TT process hence requires the technological capabilities to learn and adapt foreign technologies, or "absorptive capacity", as defined by Cohen and Levinthal (1990).

The main argument of the paper is that the impact of IPR strengthening on TT critically depends on a host of structural factors in the recipient country, including its absorptive capacity or its institutions supporting innovation and technological upgrading. In fact, these structural factors – it is argued – play a more decisive role than IPR regulation in itself. The relevance of such factors motivates the critique of that empirical literature that seeks to analyse the relationship between IPRs and TT through aggregate studies. By simultaneously considering several host-countries, these studies cannot capture their structural specificities. This disregard – along with other inherent empirical concerns – may explain the inconclusive and often conflicting findings of this branch of literature.
It follows that a more fitting approach to study the relationship between IPRs and TT is perhaps one that allows a more thorough and country-focused analysis. Case-study analyses, as the Thailand experience demonstrates, can help refining the traditional debate and provide more insightful recommendations to policy-makers.

The essay is structured as follows. The next section illustrates the traditional debate and critically weighs in the arguments in favour of stronger vs. weaker IPRs as drivers of TT. Section 3 goes on analysing the empirical literature. It examines how IPRs affect the various channels of TT and draws attention on the several limitations that plague this body of literature. The critique of the aggregate studies' approach motivates the case-study analysis of Thailand, which is conducted in section 4. Section 5 offers some concluding remarks.

2. THEORETICAL FRAMEWORK: STRONGER VS. WEAKER IPRS AND TT

A prime overview of the theoretical literature allows to identify the traditional arguments in favour of stronger vs. weaker protection of IPRs. By combining the seminal work of Machlup (1958) and Mazzoleni and Nelson (1998)[2], we can identify three main sets of arguments favouring the view that stronger IPRs promote TT:

i. The *induce commercialisation theory* (Mazzoleni and Nelson 1998): innovating firms in the developed bloc will be more prone to transfer their technology to counterparts in the developing world via *market-mediated channels* (trade of technology-intensive goods, FDI, licensing or establishment of joint ventures). The enhanced appropriability of the fruits of their R&D efforts – the basic argument goes – prompt firms in the North to engage in technology transactions with actors in developing markets. It is not only a matter of volume, but also of *quality* of technology transactions: foreign TNCs will be more likely to transfer advanced technologies, rather than mature and obsolete ones.

[2] The authors actually take a sceptical view on whether stronger patent protection is beneficial to innovation and TT. However, it is useful to recall these arguments to offer a clear understanding of the positions taken by stronger IPRs advocates.

ii. The *exchange-for-secret thesis* (Machlup 1958): the patent itself can serve the function of disseminating knowledge, as IPR law requires patent information to be disclosed. Potential entrants and imitators can therefore inspect such data and exploit the underlying technology to develop competing products and processes, without infringing the patent-holder's rights (Maskus 2004).

iii. The *invention motivation theory* (Mazzoleni and Nelson 1998). This argument emphasises the patents' function of promoting innovation, rather than the function of knowledge dissemination. However, the theory may have relevant implications for the latter as well. To the extent that providing incentives for innovation can enhance the R&D efforts and the absorptive capacity of firms, it will make the process of technology transfer less costly. On the transferee side, increased absorptive capacity ensures greater ability to predict what technology is mostly needed, to make effective use of it and to invent around it (Cohen and Levinthal 1990). In this respect, this third thesis can be seen as a mechanism to amplify i) and ii).

Supporters of a stronger IPR regime therefore insist on the potential role of market-based channels of TT, as well as on the function of patents as vehicle of knowledge dissemination. Nevertheless, this line of thinking has attracted criticisms from many sides.

The premise of the critique made by advocates of weaker IPRs lies in the observation that the IPR regime serves different functions across North and South. In the developed world, it is fair to think as IPRs as an effective way to spur innovation through guaranteeing greater appropriability; and to accommodate the goal of disseminating technology via market-mediated channels. This owes to the fact that enterprises in advanced countries have sufficient technological capabilities to innovate at the frontier and to effectively absorb foreign technology. In addition they operate within more efficient national innovation systems (NIS) and are supported by more functional institutions and policies. Differently, firms in DCs exhibit scarce innovative and absorptive capacity and lagging technology. This makes them unlikely to be able to reap the benefits of stronger IPRs in terms of enhanced indigenous innovation. Their catch-up process instead relies more on importing and adapting foreign technology, particularly via imitation.

This North-South structural divide constitutes the rationale for a lax IPR regime that would allow DCs to gain access to foreign technology via *informal* (or involuntary) *channels*, such as imitation and reverse engineering. Chang's (2001) historical analysis indeed documents how such mechanisms were crucial in the catching up process of East Asian countries like Japan, South Korea and Taiwan. A corollary of the analysis is that the IPR system should be devised strategically according to the country's own stage of development and national objectives. This introduces a second main criticism to the harmonisation of stronger IPRs: the IPR regime is to be defined endogenously, rather than being imposed by external pressures.

Advocates of weaker IPRs underline how the structural divide also hampers the functioning of market-mediated TT. Transactions in technology markets are fraught with asymmetric information problems (Hoekman et al. 2005, Archibugi and Filippetti 2010): the transferor cannot fully reveal information underlying the technology without jeopardising the object of trade. On the other side, the transferee rarely knows in advance the real potential of the

technology, nor is he fully capable of understanding what technology is more apt for his own uses. These market failures may result in distortions in the pricing of technology. The wider the technological gap between the counterparts – in particular, the lower the technological endowment of the transferee – the wider the price distortions, which are likely to hit the transferee. Technological imbalances are then an amplifying mechanism for market failures. This discredits the induce commercialisation argument, at least so long as transactions between actors at different technological rungs are considered. Additionally, stronger IPRs will fail to stimulate local innovative efforts in those DCs where the inventive capacity is limited. The latter detracts from the aforementioned invention motivation theory as well.

Likewise, the acknowledgement of the technological gap also questions the exchange-for-secret thesis. The information disclosed by the patent-holder is often vague and insufficient for potential competitors to exploit it profitably. The information that the patent system binds to disclose do not allow in practice third agents to replicate, develop or invent around the patented content (Macdonald 2002). This misalignment limits TT via patent inspection. Once again, this becomes a bigger challenge for firms that lag further behind from a technological standpoint.

For all these reasons, advocates of weaker IPRs are right in complaining about the harmonisation of a western-style IPR regime and about the excessive emphasis placed on market-mediated TT. To some extent, however, they are guilty of the same sin of their counterparts: they fail to recognise heterogeneity *within* the developing bloc[3] (rather than between developed and developing nations, as the advocates of stronger global IPRs). The statement that a relatively weaker IPR regime automatically ensures TT via informal channels relies on the assumption that all DCs have the absorptive capacity necessary to imitate or reverse engineer foreign technologies. Yet, the uneven distribution of R&D activities confirms this is not the case, since technological capabilities still remain concentrated in industrialised countries and emerging middle-income countries (UNCTAD 2005). The Thailand case-study will reaffirm how a weak IPR system is not necessarily one that promotes technology diffusion, owing to more structural deficiencies.

The issue of country heterogeneity has been partially tackled through the concept of imitative threat (Smith 1999). IPRs become a relevant concern to foreign actors facing decisions of TT only when the host-country has sufficient technological capabilities to imitate; and it has lax IPR regulations. When the two conditions hold, the host-country poses an imitative threat, making IPR discipline a salient factor in transferors' decisions. Broadly, the technology recipients that pose an imitation threat are middle-income and emerging countries. Industrialised countries, which already enforce stringent IPR laws, and smaller DCs with their lagging absorptive capacity instead do not pose a credible threat. The threat-of-imitation analytical framework, while fundamental in recognising the differential impact of IPRs across groups of countries, partially fails the litmus test of empirical evidence. As section 3 underlines, many studies confirm that IPRs do play a role to attract TT in emerging countries. Nevertheless, empirical evidence also documents a large role in industrialised countries, which benefit from more stringent IPRs despite not posing a threat-of-imitation.

[3] An exception can be found in the work of the UK Commission on Intellectual Property Rights (2002), which in its report recognised the importance of not considering DCs as a uniform bloc.

Theory has also emphasised heterogeneity in the impact of IPRs across sectors. This relates to some industries being inherently more exposed to IPR infringement, because of low costs of replication and high upfront costs. The pharmaceutical and entertainment industries represent the most evident examples. IPR regulations are thus a greater concern for these businesses relatively to other sectors, *ceteris paribus*. Another source of sectoral heterogeneity lies in the fact that technological capabilities are typically sector-specific. TT via market- and non-market-mediated channels will be less costly in more technologically equipped industries and IPRs will become more relevant.

These observations shed a light on how IPRs' impact on TT is to be examined in conjunction with country-specific factors, such as the technological endowments across different sectors. The disregard for such country specificities has been a major flaw in the conventional debate. However, as the next section shows, it has not concerned the theoretical framework only, but has extended to the empirical literature as well. This neglect, together with various econometric problems that are inherent to the subject matter under exam, has made the findings of the literature broadly inconclusive.

3. THE EMPIRICAL LITERATURE: A CRITICAL ANALYSIS

Before turning to the empirical concerns that plague studies on IPRs and TT, a quick overview of the most influential papers is in order. This section addresses the question of how stronger IPRs influence the TT channels (trade, FDI, licensing and patenting) that TRIPS advocates endorse. It also highlights the potential mechanisms at play.

3.1 IPRs and TT channels

FDI

IPR-related concerns are only one among many elements that TNCs factor in when taking location decisions. The overall "investment climate" indeed extends well beyond the discipline of IPRs, and depends on a host of structural factors: aggregate growth, size of the domestic market, human capital and absorptive capacity, institutional quality, regulatory framework and so on (Maskus 2004).

Keeping that in mind, a number of authors have attempted to assess the relevance of stronger IPRs on FDI. A major input came from the survey-based study conducted by Mansfield (1994). The survey asks executives from US-based TNCs to what extent IPR regulation influenced their investment decisions in a host of major DCs. The findings have been extensively used to make a case for stronger IPRs: the survey reveals that TNCs tend to transfer less advanced technology and to establish less R&D facilities in countries with a lax IPR regime. In addition, the role of IPRs proved more significant in chemicals and pharmaceuticals – consistently with the expectation that sectors characterised by high replicability are more responsive to IPRs.

Branstetter et al. (2006) find similar results with a different empirical strategy. By analysing firm-level data on royalties paid to parent firms by affiliates in emerging countries that were undergoing IPR reforms, they find that TT, as measured by intra-firm royalty payments,

increased as IPR protection becomes stronger. An additional finding is that the positive relationship between IPRs intensity and TT becomes more sizeable with parent firms that already used the patent system intensively at home.

Park and Lippoldt (2008) expand both the sample size, splitting their panel of countries between advanced, developing and LDCs, and the channels considered (FDI, imports and licensing). They present a model in which every channel is regressed on an indicator of IPR strength and a set of host-country control variables. Taken at face value, the results confirm the hypothesis that the benefits from stronger IPRs accrue mostly to already industrialised countries. The impact of IPRs in developing countries and LDCs is limited or not significant.

A more sceptical view on the role of IPRs is taken by Kumar (2001), who focuses on FDI in R&D. He considers R&D expenditures of US- and Japan-based TNCs in a panel of countries at different stages of development. The main finding is that the intensity of the IPR regime is not a significant determinant of FDI-related R&D over-time.

Javorcik (2004) chooses a different lens, by focusing on the effects of IPRs on the *composition* of FDI, rather than on its mere volume. The main question is whether firms operating in patent-intensive industries are more likely than firms in other sectors to invest in transition countries with a stronger IPR regime. Consistently with insights from Mansfield and Branstetter et al., but at odds with Kumar, lax IPR enforcement deters inflow of FDI in high-tech sectors.

TRADE

Drawing on Maskus and Penubarti (1995), it is possible to identify two conflicting mechanisms that make the effect of stronger IPRs on trade ambiguous. A market-expansion effect operates because international firms face less transaction costs to avoid technology leakage. Nonetheless, the reduced ability of the importing firm to imitate may prompt it to lower purchases (market-power effect).

The *net* effect may critically depend on structural factors, including the host-country's absorptive capacity and the competitive level (i.e. are there any substitute goods for the imported, IPR-protected technology?), the trade regime, the possibility of serving the host-country via FDI or licensing (Maskus and Penubarti 1995, Maskus 2000).

Maskus and Penubarti (1995) seek to test which effect prevails by incorporating an IPR strength index into a model of bilateral trade, accounting for other structural and policy factors. The results suggest there is a positive relationship between IPR strength and trade flows – especially in large and middle-income DCs. Less relevant instead is the sectoral response to IPR intensity: the effect of stronger IPRs on trade does not vary by sector considerably.

Smith (1999) applies the threat-of-imitation concept to the previous study, by classifying importing countries according to whether they pose an imitative threat. The results conform to the theoretical expectations: trade flows in countries that pose an imitative threat increase with stronger IPRs. A market-power effect instead prevails in countries that do not have sufficient technological capabilities or already guaranteed strong patent protection.

Less advanced DCs do not benefit from increased protection in the study by Blyde and Acea (2002) either. The authors evaluate how OECD exports respond to IPRs Latin America. The sensitivity of trade (and FDI) inflows to IPRs increases with host-country's income. The results are consistent with the predictions of the previous analysis by Smith, since Latin America is mostly composed by middle-income, industrialising countries and has a weak IPR regime vis-à-vis the advanced countries (Blyde 2006). Hence, countries in the region are likely to pose an imitative threat, which is likely to be increasing in their income.

Standard theoretical predictions have been instead defied by a study from Fink and Primo Braga (2005), who introduce an IPR strength index into a model explaining trade patterns in a large cross-section of countries and across two sectors: non-fuel and high-tech. This sectoral variation allows to test the hypothesis that more technology-intensive goods are more sensitive to IPRs variations. Nevertheless, the figures are not supportive of this hypothesis: they point to a positive and significant relationship between IPR strength and non-fuel trade flows, whereas a negative sign is observed as regards with high-tech products.

LICENSING

Licensing is another channel of TT that does not lend itself easily to quantitative analysis. There is highly heterogeneity among licensing schemes, in terms of contracting parts (affiliated/ unaffiliated firms, joint ventures), provisions of technical assistance to transfer technology, forms of payments and so on (Falvey and Foster 2006). The different typologies of agreement affect the process of TT and possibly the quality of the technology that is object of the transaction.

Yang and Maskus (2001) investigate the impact of IPRs on licensing fees paid to US firms by unaffiliated firms in a panel of countries (mostly industrialised and emerging nations). Stronger IPRs positively affects the volume of licensing payments. Smith (2001) adopts a better designed setup. She extends the sample of host-countries to include DCs and interacts the IPR index with an imitative threat dummy. In addition, FDI and export are also considered as a vehicle of TT. Data relates to US manufacturers' data. The research still yields evidence of a positive relationship between IPR intensity and licensing (while no significant impact on exports is found). This however is limited to countries that pose an imitative threat. The paper also finds that stronger IPRs cause a substitution away from export and FDI in favour of licensing.

PATENTING

Once again, theory is unable to predict the effect of increased IPR protection on patenting and TT. Stronger IPRs can encourage more foreign applications and signal the potential profitability of the host-country market (Maskus 2004). Nevertheless, enhanced protection means increased market power and more absolute rights of exclusion for patent-holders. In addition, one should not forget that taking out a patent is a costly process and that the host-country market has to appear profitable enough to recoup the upfront costs. For the latter condition to hold, favourable structural factors must be present in the host-country. Therefore, as for the other channels, patenting decisions hinge on a set of non-IPR-related factors.

Hence, the empirical literature has sought to explain patenting decisions through models that include several control variables that proxy for market size, trade barriers, innovative

capabilities etc in the host-country. Examples of such attempts are Eaton and Kortum (1996), Park (1999), Xu and Chiang (2005), and Falvey and Foster (2006). These studies broadly agree in finding a positive and significant impact of stronger IPRs on patenting decisions, *ceteris paribus*. The latter three studies, which extend the analysis to incorporate DCs, show how the benefits of stricter IPRs are likely to accrue more to wealthier countries.

3.2 The limitations of the empirical literature

The large divergence in outcomes might be driven by a number of empirical concerns. This section gives an insight into these problems, providing reference to the studies outlined above.

TECHNOLOGY MEASUREMENT

There are two main ways in which the empirical literature measures TT: employing the definition of total factor productivity (TFP) or using the channels (trade, FDI, patenting, licensing) as TT proxies. Owing to the nature of technology, both approaches are indirect forms of measurement and hide major problems. TFP is by definition constructed as a residual, by subtracting inputs from outputs – a process that in itself poses major measurement challenges (Keller 2004).

The use of the channels as a proxy for TT relies on problematic hypotheses as well. It assumes that a volume increase in a certain channel necessarily reflects higher TT to local actors. Single country-level analyses, however, document how that is not always the case – and how benefiting from, say, FDI in terms of technological upgrading hinges on several non-IPR-related factors. The Thailand experience analysed in section 4 underscores this measurement problem.

Measuring technology flows through market-mediated channels entails a further problem. If TT is quantified by the prices of the transferred content (for instance, royalties in the case of licensing, or import prices), there may be risk of overestimating the effects of IPRs on TT. This owes to the fact that an increase in the channel volume may simply reflect the enhanced market power in favour of the seller. In this case, the proxy for technology is picking up increases in market power rather than actual increments in the transferred technology. Yang and Maskus (2001) is an example where such problem may bias the results.

IPR MEASUREMENT

The two most commonly used indicators – the Ginerte-Park index (GPI) and the Rapp-Rozek index (RRI) – are highly imperfect tools to gauge IPR strength. First, the indices are based on legal standards, but fail to measure the actual enforcement of such standards. In effect, enforcement appears as a component of the GPI, but is measured by crude proxies – in the case of patents, they are legal provision of: preliminary injunctions, contributory infringement and burden-of-proof reversal – that are still based on statutory rules rather than practical enforcement.

A potential solution is to interact the IPR index with an indicator of overall law enforcement – for instance, the governance indicators developed by Kaufmann et al. (2007). This may mitigate the measurement problem, but introduce other sources of bias. Such indicators are to be treated with caution, especially in cross-country analyses, because often perception-based.

Beyond the difficulties in incorporating the enforcement dimension, the indices present further flaws. The RRI was devised as a static measure. It only describes the IPR regime at the time legal data was collected. Thus, the RRI is not a helpful tool in conducting dynamic analysis with time-series data, since it cannot capture over-time variation in IPRs.

The GPI instead covers a large range of countries over-time, thus allowing for analysis with panel data. Nevertheless, the weighting of the individual components still implies some discretionary element. It is difficult to understand why some components carry more weight than others, as no supporting explanation is provided (Ostergard 2007).

REVERSE CAUSALITY

Establishing the direction of causation between IPR strengthening and TT is a challenging task. As discussed in the theoretical background, the pro-strengthening argument predicts that the causation runs from stronger IPRs to increased TT. Yet, historical analyses of successful countries (Chang 2001, Odagiri et al. 2010) provide a different view. Both early and late industrialisers (like Korea or Taiwan) share a common ground: the IPR regime co-evolved *endogenously* with technological capabilities. At early stages of development, when their innovative skills were limited, these countries relied on lax IPR protection to allow imitation of foreign technology. Gradually, as their technological skills deepened, internal pressures for stricter IPRs built up and these countries converged towards stronger IPRs.

The lesson here appears to be that the direction of causation runs from technological development (and thus transfer) towards stronger IPRs. This reverse causality issue raises concerns over how to identify sources of *exogenous* variation in the explanatory variable (IPR strength). Some studies simply treat the timing of internal patent reforms in recipient countries as exogenous. For instance, Branstetter et al. (2006) make this claim and substantiate it by showing that at the time prior to reform the degree of TT did not systematically increase. They also notice that their sample is composed of heterogeneous countries, so it is unlikely they all reached the same level of technological deepening. Nevertheless, this remains suggestive evidence. As there was cross-country heterogeneity in income, there was also heterogeneity in initial IPR regimes. In addition, measurement of TT via licensing fees poses severe measurement problems.

Other studies exploit more sophisticated econometric techniques. Javorcik (2004) for example uses a sort of difference-in-differences technique to isolate some exogenous variations, by comparing similar transition countries across different sectors. Provided the inherent difficulties posed by the operationalisation of the variables of interests and their relationship however, these efforts can only mitigate the problem.

As suggested by Arora (2009), addressing the problem of endogeneity primarily requires a deeper understanding of the determinants of IPRs strength. If TT is measured by its channels,

that must be integrated with a thorough understanding of the determinants of trade, FDI, licensing and patenting as well.

OMITTED VARIABLE BIAS

Omitted variable (OV) biases arise particularly when the channels of diffusion are adopted as proxies for TT.

Let's focus, for instance, on FDI. TNCs decisions on where to locate their overseas subsidiaries are based on many non-IPR factors, including market size, overall growth, absorptive capacity, competitiveness of local workforce and such (UNCTAD 2005). These structural factors simultaneously affect both FDI (the dependent variable) and IPR strength (the explanatory variable) in many ways. The link between overall growth and IPR strength has been discussed in the previous subsection. Absorptive capacity may represent an OV as well: a high absorptive capacity would attract FDI by lowering TNCs' costs to transfer technology; and would also affect the IPR regime by triggering pressures for more stringent protection, insofar as local actors acquire the capacity to benefit from stronger IPRs themselves. A sound absorptive capacity (or likewise, stable overall growth) would thus result in overestimation of the impact of IPRs on TT.

Similar considerations hold for the other channels as well. To the extent that FDI (but also licensing, patenting and trade) determinants are known (and measurable), one could simply include a vector of host-country controls within the model. Moreover, adding country fixed-effects would (partially) control for unobserved heterogeneity. The latter will allow accounting for such factors as quality of institutions that are crucial for successfully transferring technology to local actors.

However, adding more control variables may in turn raise other econometric issues (e.g. multicollinearity). Moreover, fixed-effects estimation by definition fails to control for time-varying factors. It follows that, while knowing the determinants of each TT channel is crucial to understand the dynamics of TT, it still remains problematic to operationalise the related findings in aggregate studies.

SAMPLE SELECTION BIAS

Selecting only host-countries that pose an imitative threat, i.e. that have sufficient technological capabilities and have a lax IPR regime, might upward bias the estimate of the effect of IPRs on TT. If host-countries, however, do not pose a credible imitative threat, the relevance of the IPR regime is limited, considering the costs of filing a patent. Hence, the effect of IPRs on TT would be downplayed.

These considerations might be a partial explanation for the diverging results across studies with different samples of host-countries. For instance, the sample choice might explain the contrasting results obtained by Kumar (2001) and Branstetter et al. (2006) on the impact of IPRs on FDI. The former chooses a wide range of DCs at different stages of development – and finds no significant impact of IPRs on FDI-related R&D. The latter instead selects a more

homogeneous sample with mainly emerging countries, which pose an imitative threat – and finds a significantly positive relationship.

OTHER ISSUES

First, some studies focused on a single channel of TT at a time (e.g. Yang and Maskus 2001, Fink and Primo Braga 2005). The problem with this approach is that there is evidence that stronger IPRs might induce a substitution effect from one mode of transfer to another (evidence hints at a shift from trade to FDI and licensing, all else equal – Smith 2001). If trade is considered by itself, the risk is that an observed drop in trade flows could be replaced by an increase in FDI (or licensing) that is not accounted for. More recent studies have therefore tried to simultaneously include the main channels (e.g. Smith 2001, Park and Lippoldt 2008).

Secondly, surveys have often been adopted to isolate the effect of IPRs on TT decisions. The problem with such approach lies in potential respondent biases: the interviewees, typically executives from TNCs, may have an incentive to overrate the importance of IPRs, in order to extract higher rents from the quasi-monopoly status accorded to inventors. Despite being selected randomly (e.g. Mansfield 1994), TNCs are systematically more likely to benefit from stronger IPRs.

Another concern that plagues policy evaluation lies in the difficulty to assess the lag between the implementation of the policy (IPRs strengthening) and the response of the actors involved (foreign investors and local innovators). This may complicate the attribution of increased TT to the enforcement of stronger IPRs.

Finally, the empirical literature has overlooked the fact that foreign firms will be concerned with the host-country's IPR regulation only if the technology they transfer is to serve the recipient country's domestic market (Arora 2009). In case foreign TNCs exploit the recipient country exclusively as an export platform, the relevant IPR regime will be that of the export market. The business strategy of the transferor-firm should therefore be accounted for in studies linking IPRs to TT.

4. EVIDENCE FROM THAILAND

4.1 The rationale for case study analyses

The previous section has highlighted the several flaws in the methodology of aggregate studies. Yet, the concern is not only with the methodology (*how* the research question is addressed), but also with the research question itself. Aggregate studies typically investigate whether on average stronger IPRs are conducive to TT. This question should instead be rephrased into one that asks *under which specific conditions* a stronger IPR regime can be beneficial for TT. In order to address this question a more country-focused analysis needs to be conducted, one that contextualises the IPR system within the broader technological, institutional and policy environment. Taking into account these structural, country-specific variables is a prohibitive task for the type of study examined above.

This constitutes the rationale for conducting case-study analyses that account for the various country specificities affecting the relationship between IPRs and TT in DCs.

4.2 Choice of the country, methodology and limitations

Contrarily to other nations in East Asia (Japan, South Korea, Taiwan or Singapore) during their catch-up period, Thailand has failed to significantly deepen its technological capabilities. TT to local actors has in general remained limited, *both* during the lax and the stronger IPR regime. This allows both a within-country, over-time analysis; and an inter-country analysis that takes into account more successful East Asian economies. This twofold approach can enlighten on the role played by IPRs in promoting TT, and expand the analysis to account for non-IPR-related factors.
In addition, Thailand received large inflows of FDI, which played a crucial role in the country's development. This enables us to study the channel that is commonly regarded as prime vehicle for TT.

Methodologically, the case-study analysis is structured into two sub-sections: one broadly focusing on Thailand across the two periods, with references to other East Asian countries (section 4.3); and the following one (section 4.4) centred on a sector-level analysis. The latter assesses the role played by IPRs and other structural factors in promoting TT in the automobile and pharmaceutical industries. The dataset combines primary numerical data gathered from the World Bank Indicators and the Thai Department of Intellectual Property (DIP), secondary information from qualitative researches on TT, governmental innovation surveys, and sector-level studies.

For time and space considerations, the analysis focuses on two TT channels: FDI and patents. This might be a limitation in the light of the substitution effect between modes of TT that IPR reforms can induce. Endogeneity concerns might also be raised. Yet, the purpose of the analysis mitigates both issues. Here the goal is not to precisely quantify the impact of stronger IPRs on TT, but rather to offer a more nuanced picture of how IPRs interact with structural, non-IPR-related factors in promoting TT. Furthermore, to the extent that IPR reform was triggered by external pressures and that local technological capabilities have remained under-developed throughout the period considered, one might observe that the IPR reform is somehow exogenous to technological upgrading and TT (Charoenporn 2007).

4.3 IPRs and the TT process in Thailand

History of the IPR regime in Thailand

The source of variation in our main explanatory variable, i.e. IPR strength, is given by the 1992 amendment to the patent law, which marked a sizeable discontinuity in the Thai IPR discipline. There have been three major turning points in the evolution of the Thai IPR regime:

1. The Patent Act of 1979, introducing for the first time legal protection for inventors. The declared goal of the initiative was to spur national innovation and R&D efforts (Intarakumnerd and Charoenporn 2010).

2. The aforementioned 1992 amendment. This drastically extended the protection to patent-holders, by providing for broader patentability coverage, longer terms of protection and restrictions in the scope for compulsory licensing. The role of external pressures, particularly the threat of removal of preferential trade treatment by US (Kwon 1995), proved a decisive catalyst for reform.
3. Compliance to TRIPS in 1999. Contrarily to conventional wisdom, the TRIPS agreement did not introduced much stronger IPR requirements, since the major changes in that direction had already been incorporated in the 1992 amendment. Compliance to TRIPS instead required the establishment of a petty patent system, which has yielded favourable results.

The evolution of the Thai IPR system therefore allows us to distinguish two periods: a weak protection period (1979-1992) and a stronger protection period (1992-today).

FDI and TT

A preliminary glance at the chart in figure 1 reveals how inward FDI has been more responsive to business cycle dynamics than to IPRs in Thailand. If anything, the inflow started decreasing after the 1992 reform, contrarily to what advocates of stronger IPRs would predict. Instead, the main fluctuations in FDI numbers are coincident with the two major times of economic distress – the Asian financial crisis of 1997-1998 and the current global slump.

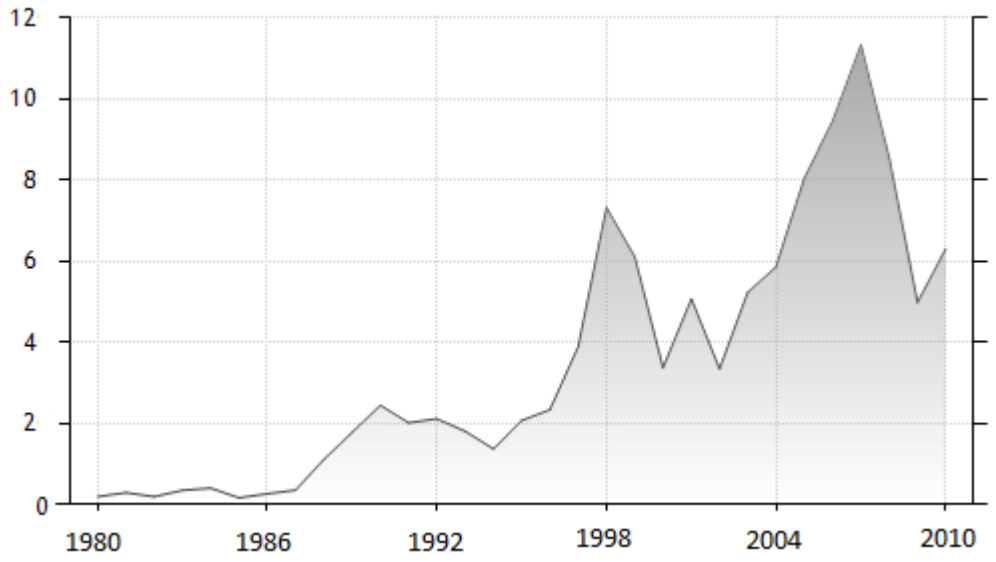

Figure 1. Net FDI inflows in Thailand, US$ billions. Source: World Bank Indicators, compiled by Trading Economics. http://www.tradingeconomics.com/thailand/foreign-direct-investment-net-inflows-bop-us-dollar-wb-data.html

As remarked in the empirical review however, raw data on FDI cannot give a thorough picture of the level of technology dissemination. We therefore turn to more qualitative studies documenting the technological evolution of Thai firms over the two IPR periods concerned.

The first insight that the empirical literature on Thailand offers is that even during the period of lax IPR enforcement, FDI-related TT remained rather limited. Despite the substantial volume of inward investment, TT remained confined to the operational level (Intarakumnerd and

Charoenporn 2010). Foreign technology came in mostly as turn-key products, thereby hindering any process of active learning and absorption of intermediate processes (Kwon 1995). Moreover, TNCs generally retained full ownership of the technologies and often limited the scope for affiliates to enter technology-related agreements with other local firms (*ibid.*).

The limited degree of TT throughout the weak IPR period cannot be attributed to fear on the part of foreign TNCs of technology leakage. In fact, it is hardly attributable to IPR discipline in general. Instead, four sets of motives can be identified, all of them pertaining to more structural, institutional and policy failures:

i. Low initial level of *technological capabilities* at the firm level.

ii. *Science and Technology (S&T) policy failures*, especially in the domain of regulation of foreign investors. Contrarily to other countries in the region such as Korea and Taiwan (Kim 1993, Chang 1997), Thailand prioritised the goal of attracting FDI over the goal of developing local capabilities through FDI. A very lax investment regulation did not impose any restriction to entry or performance requirement on foreign companies. This strategy was indeed successful in attracting a large volume of FDI. Nevertheless, it did not enable indigenous firms to enhance their absorptive capacity, thereby making the TT process more costly.

iii. A *weak national innovation system (NIS)*, intended as the network of public and private entities that interact to produce innovation within national borders (Intarakumnerd et al. 2002). This was also the product of the governmental neglect of education policy (Arnold et al. 2000).

iv. *Institutional flaws* related to the lack of institutional specialisation, shortage of adequate resources to equip the relevant offices and a substantial lack of public-private cooperation (Arnold et al. 2000) – which was instead a fundamental prerogative of the developmental state in other East-Asian countries (Evans 1995).

These deficiencies contributed to a situation where both ends of the TT process were not interested in engaging in any technology transaction: indigenous firms did not have the absorptive capacity to do so; and foreign companies would face excessively heavy costs in upgrading Thai enterprises so as to transfer technology effectively.

In order to further identify the impact (if any) of IPRs in promoting TT via FDI, let's now examine what happened in the post-reform period. Generally, these non-IPR-related flaws were not corrected.

Firstly, Thai firms have failed to make significant progresses in terms of technological development, compared to their competitors in other countries in the region (Arnold et al. 2000, Brimble 2002). This can be interpreted both as a result of the still limited TT and as a premise for reduced future TT, in a vicious loop. In addition, the sheer volume of FDI, as observed above, did not increase and in fact fell until 1995.

If absorptive capacity has remained limited, institutional and policy factors have not changed significantly either after the IPR reform. On the institutional front, the same limitations have

persisted, with S&T entities such as public research institutes and universities disconnected from the reality of the local firm (Intarakumnerd and Charoenporn 2010). Policy-wise, the Thaksin government has embarked on a new, ambitious S&T Action Plan (2003-2013) which emphasises attracting innovation and fostering indigenous capabilities, through the deployment of an unprecedented selective industrial policy. Nevertheless, while the design of the policy seemed fitting, its implementation has been disappointing, primarily because of lacking bureaucratic capacity (*ibid.*). In addition, education policy remained neglected (*ibid.*).

Given these premises, it is not surprising that the intensity of TT has remained limited in the stronger protection period as well (*ibid.*). Nonetheless, it would be misleading to impute the lack of TT expansion to the introduction of stronger IPRs. What this analysis rather shows is that more structural factors have prevented Thailand from taking advantage of the IPR legislation to catch up, *both* in the weak and in the strong protection periods.

Kwon's survey (1995) reinforces the thesis that the IPR reform had a minor impact on FDI inflow, relatively to structural factors and macro dynamics. The author interviewed representatives of US-based companies investing in Thailand, asking what the drivers of their location decisions were. Adequacy of patent protection was cited as the least relevant of all the options, preceded by: regional market opportunities, political stability, adequacy of industrial infrastructure, favourability of investment law, cost and productivity of workforce.

Despite the persistency of these flaws, the end of the 90s witnessed a timid increase in R&D efforts, a signal of the will to enhance the technological base (Arnold et al. 2000, National Science and Technology Policy Committee 2006). Nevertheless, the increased expenditure in R&D was undertaken by larger firms and confined to some sectors (automotive and electronics in particular). A survey conducted by the Thailand Development Research Institute (1998) investigates the motives behind this surge. It confirms the previous findings: macro factors, in particular intensified competitive pressures due to the globalisation of production, explained the bulk of increased R&D efforts. IPRs instead do not appear to be a concern to the firms studied.

Patenting and TT

Unlike FDI, the number of patents granted significantly increased after the introduction of stronger IPRs in 1992 (see figure 2). A closer look underscores how the surge is due to a great extent to foreign patenting, while figures for Thai residents had stalled until the mid-90s when they tepidly started to grow, also thanks to the introduction of petty patents in 1999.

However, in terms of actual TT to local actors the situation is rather similar to that portrayed above: structural and institutional flaws have prevented indigenous firms to effectively benefit from foreign technology (this also restates the fact that using TT channels as proxies for actual technology diffusion might be misleading). We now explore such structural flaws that once again have characterised both the weak and the stronger protection periods.

Among these, the longstanding lagging technological performance of Thai firms has been a major constraint. A passive behaviour in imitating and learning implied that they could not fully benefit from the large volume of patent data filed by foreign companies (Intarakumnerd and Charoenporn 2010). The lack of sufficient absorptive capacity at the firm level also inhibited

another mechanism of disseminating patent-embodied technology, i.e. via pre-grant opposition (*ibid.*). The practice of pre-grant opposition should prompt firms operating in the same field of the patent-applicant to challenge the award of the patent, thereby stimulating monitoring and diffusion of information. Nonetheless, the wide technological gap with foreign companies put indigenous firms at a comparative disadvantage. The general lack of internal competition – another structural issue – has further exacerbated the problem.

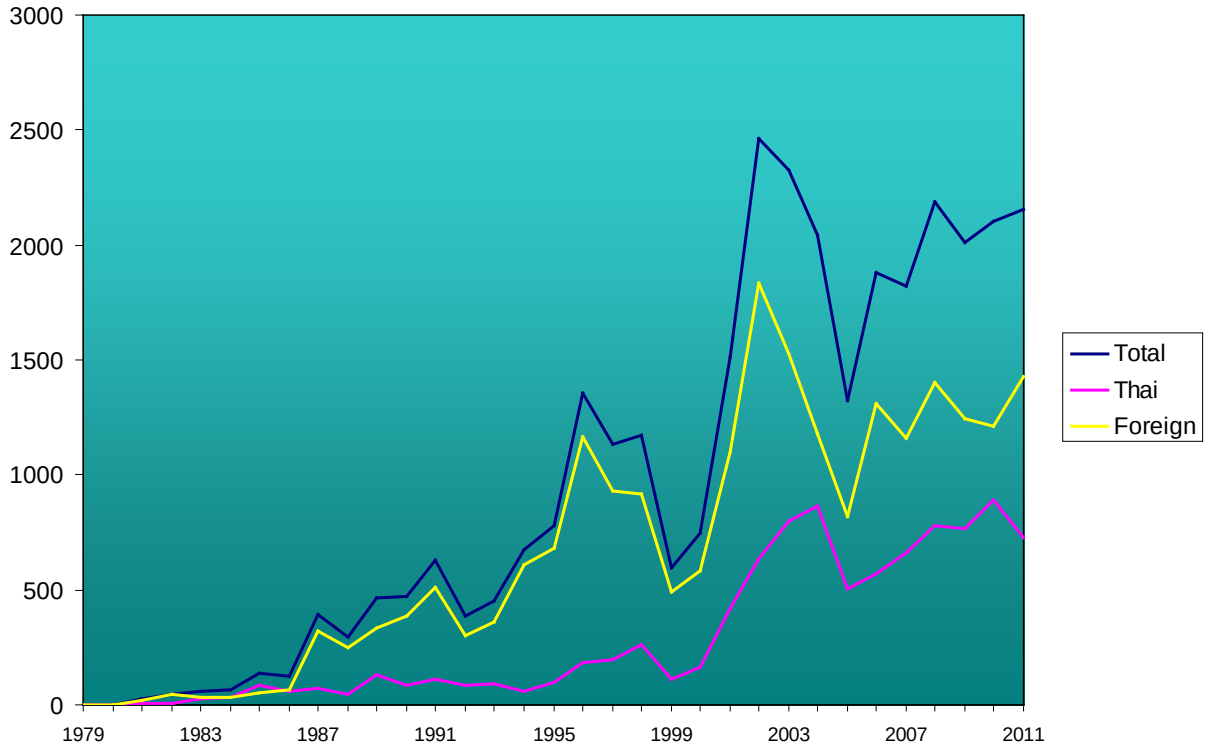

Figure 2. Patents granted (1979-2011) by ownership. Source: DIP.

The little patent-related TT has been also a result of inadequate institutional arrangements. The comparative analysis carried out by Intarakumnerd and Charoenporn (2010) may demonstrate this point. Successful countries like Japan and Korea had set up entities – the National Centre for Industrial Property Information and Training and the Korea Institute of Patent Information respectively – specifically to serve the function of disseminating patent-embodied knowledge to the private sector. The Thai equivalent, the Intellectual Property Centre, was only established in 2006. In addition, it has not been properly equipped with the adequate resources and does not have sufficient capacity to examine, classify and circulate patent information (*ibid.*).

As a result, it is possible to conclude that patent-related TT, despite a post-reform increase in non-resident patents, remained shallow. Further evidence of this is offered by the same authors, who compare data from Thai and Korean innovation surveys (for the years 1999, 2001 and 2003, when the IPR regime had already acquired its ultimate form, to comply with the TRIPS). They show how Korean firms value much more patent data as a source of information, while Thai firms lag behind (Intarakumnerd and Charoenporn 2010). Their main findings are reported in table 1.

	Thailand	Korea
Patent disclosures	32,0	59,8
Fairs and exhibitions	53,1	65,5
Internet	63,0	64,9
Universities or other higher education institutes	35,8	53,6
Governmental or private non-profit institutes	29,5	52,6
Clients	77,4	77,7
Competitors	42,1	69,3
Enterprise within the group	61,2	52,9

Table 1. Importance of different vehicles of information for innovative activities. Adapted from Intarakumnerd and Charoenporn (2010).

Under stricter IPRs, a tool that yielded beneficial results in terms of TT was the petty patent. Its use increased dramatically since its introduction in 1999 (see figure 3). The less stringent patentability requirements have made petty patents more accessible to Thai firms. Likewise, the level of knowledge embodied in petty patents is more ready for use to Thai firms. It comes without surprise then that the statistics in figure 3 are antithetic to those in figure 2: the lion's share of petty patents granted belong to Thai residents, as opposed of the great majority of foreign grants in regular patents.

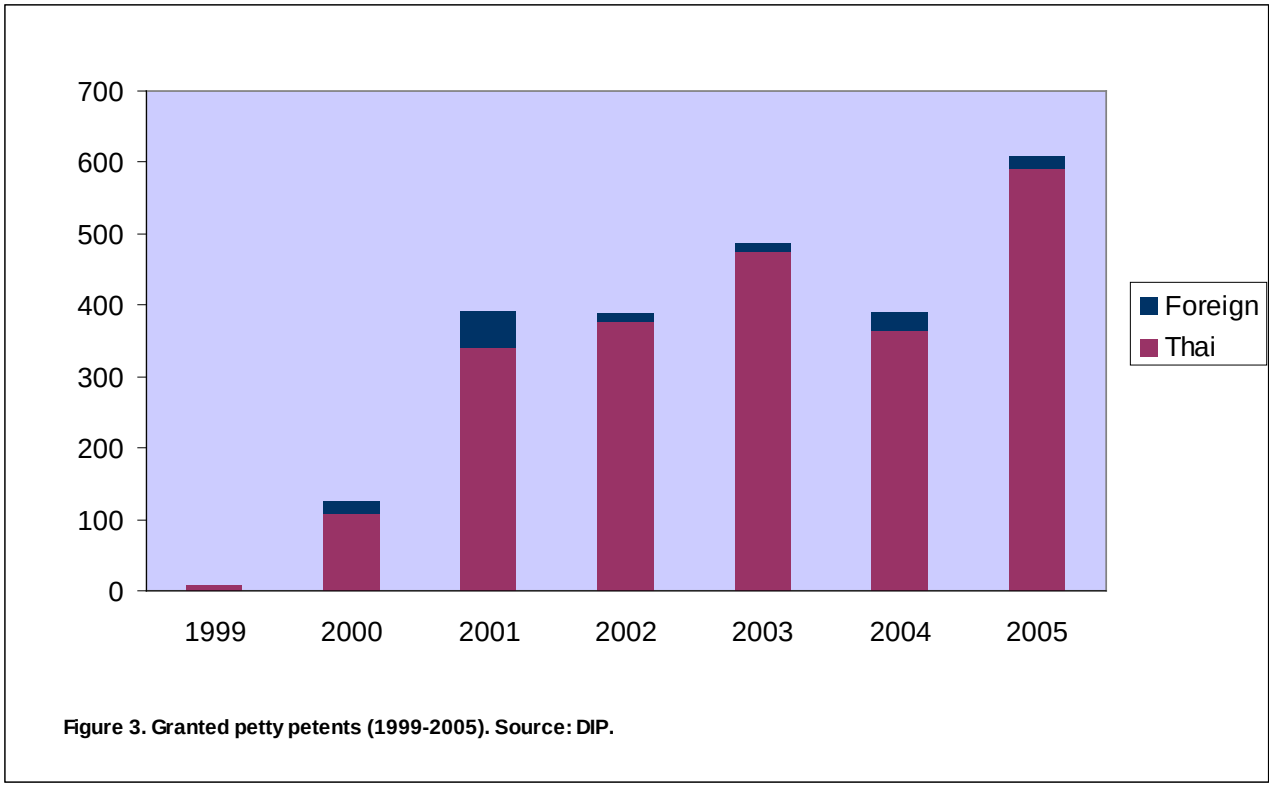

Figure 3. Granted petty petents (1999-2005). Source: DIP.

This broader picture of the Thai industrial landscape enables to conclude that IPRs have been a minor player as a catalyst for TT via FDI and patent data. It is important to underline that this does not mean that IPRs are irrelevant or have failed to promote TT. The point is rather that in Thailand the real binding constraints for transferring technology to local actors lie in structural

factors, as well as in longstanding institutional and policy flaws. The limited degree of TT over both the periods considered is instead to be attributed to these factors. The isolated success of petty patents as a vehicle of TT also testifies how the IPR regime is to be tailored to the country-specific structural endowments in order to be an effective tool for catch-up.

4.4 Sector-level analysis

The previous section has examined the determinants of the TT process in Thailand, its major obstacles and the role stronger IPRs played. Now the lens focuses on the impact of the IPR reform across two sectors. The inter-sector analysis can help testing two hypotheses:

(i) Different sectors have different responsiveness to IPRs. The choice of comparing the pharmaceuticals (high replicability) and the automobile industry (relatively lower replicability) allows to test whether that was the case in Thailand.
(ii) Structural factors at the sector-level play a more salient role as determinants of TT, relatively to IPRs. The sector-level variation in structural endowments is given by the deeper technological capabilities that the automobile industry had developed vis-à-vis the pharmaceutical industry. Examining the TT dynamics over-time and across sectors will allow testing this hypothesis.

TT in the pharmaceutical and automobile industries is first examined separately. The following sub-section takes a step back to evaluate what can be learnt from the Thailand experience.

TT in the pharmaceutical sector

National firms in the pharmaceutical industry are typically small-sized, have low productive capacity and can master simple technology (Intarakumnerd and Charoenporn 2010). They engage primarily in low value-added activities, such as packaging and drug formulation. No significant R&D is conducted in search of new drugs (*ibid.*). Given the low costs of replication however, Thai pharmaceutical companies may still pose an imitative threat to foreign companies interested in commercialising their products in the domestic market. With this premise, one would expect the enforcement of more stringent IPRs to spur TT. Evidence nevertheless points to a different conclusion.

First, as figure 4 documents, FDI figures in chemicals do not appear to respond to IPR variations, despite a tepid increase in 1993 (Supakankunti et al. 2001). While this data cannot tell much about post-reform TT, a survey-based study conducted by Supakankunti et al. (1999) reports that Thai executives in the sector did not perceive any significant increase in TT after 1992.

The reasons behind the limited degree of TT are again to be sought in structural factors, however. The Thai pharmaceutical sector has failed to attract foreign investors and to compel them to transfer their technologies because of the scarcity of trained personnel (which refers back to the failures in implementing education policies tailored to the industry's needs), the lack of a chemical base and the generalised passivity in learning and upgrading their technology (Intarakumnerd and Charoenporn 2010). The link between TNCs and local Thai manufacturers remained weak across the two periods under examination: after 1992, as Kuanpoth (2006)

reports, TNCs continued to import semi-finished pharmaceutical products into Thailand, rather than sourcing them locally. In addition, TNCs did not expand their activities beyond packaging and drug formulation. Under these circumstances, the degree of TT via FDI has inevitably remained limited.

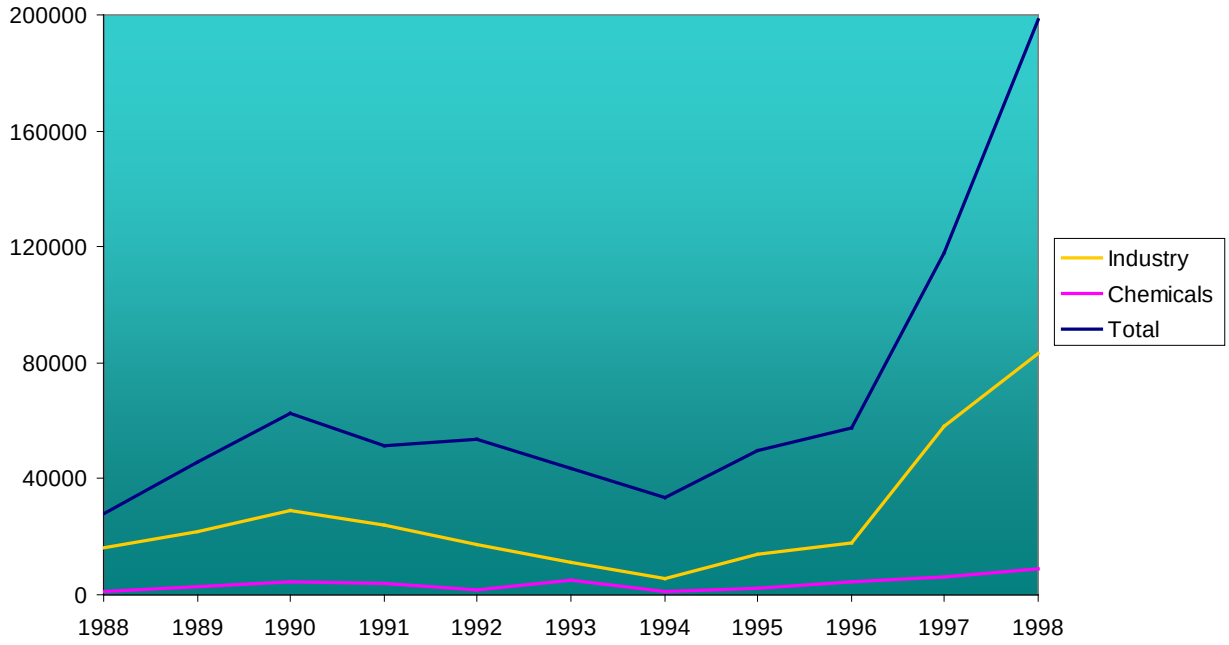

Figure 4. FDI trends across sectors, million Thai baht. Source: adapted from Supakankunti et al. (2001).

The enforcement of more stringent IPRs has not yielded the expected results in terms of patent-related TT either. Only in the last few years there have been some encouraging developments: Thai conglomerates are starting to place more value on IPR management and to profuse greater efforts in R&D activities (Intarakumnerd and Charoenporn 2010). The phenomenon however seems to remain an exclusive prerogative of large conglomerates.

TT in the automobile sector

The Thai automobile sector started to develop in the 1960s, when TNCs established their first assembly lines (Intarakumnerd and Charoenporn 2010). The peculiarity of the sector is that it was the target of selective industrial policy measures, geared at enhancing local capabilities. As early as in 1975 local content requirements were set, remaining in force until 1999 (Techakanont and Terdudomtham 2004). Trade policy was also deployed strategically to nurture the national supplier base: high tariff protection was granted and an import ban on small cars introduced (*ibid.*). No other industry in Thailand was made object of such type of technology policy. The active integration of the Thai automobile industry within the global production chain is an indicator of the success of this industrial policy. It contributed to the creation of an efficient manufacturing base in less than 40 years (*ibid.*). Compared to the pharmaceutical, the automobile industry can thus boast relatively sounder initial technological capabilities.

The industrial policy was decisive in fostering TT between foreign assemblers and Thai suppliers. The rationale for the local content requirement and the protectionist tariffs lie precisely in compelling foreign companies to source their inputs domestically, thereby creating backward linkages. To remain competitive TNCs were prompted to constantly upgrade the productivity of their Thai suppliers and transfer technologies to them. As a result, local absorptive capacity gradually improved, reducing the costs of TT and facilitating the process in a virtuous circle. However, as the activity spectrum of Thai suppliers was confined to low value-added activities, mainly operations, so remained the scope for TT (Techakanont and Terdudomtham 2004).

Did the stronger IPR regime play a role in all this? Techakanont and Terdudomtham (2004)'s analysis of the evolution of inter-firm TT in the Thai automobile sector is useful to assess whether the strengthening of IPRs affected the process of technology dissemination. It identifies a discontinuity period between 1990 and 1995, roughly the time of the patent reform, after which TT became less intense. Before that period, as remarked above, foreign assemblers played an important role in disseminating technology, despite the relatively laxer enforcement of IPRs. As observed above, the transfer of technology concerned organisational and management practices, such as quality control and problem-solving procedures, but generally at the operational level only. The nature of the activities performed might explain why IPRs were not regarded as a major barrier to transfer.

Advocates of weak IPRs in developing countries could be tempted to attribute the reduction in TT to the enforcement of a more stringent regime. A deeper understanding of the Thai automobile sector discredits that view, however. First, as stressed above, TT was essentially confined to the operational level, making IPRs a marginal concern for assemblers. Above all, TT has diminished as a result of a change in the assembler-supplier relationship. Owing to intensifying competitive pressures, assemblers started to require higher design and engineering capabilities to their Thai suppliers (Techakanont and Terdudomtham 2004). Recalling the longstanding aversion of Thai firms to upgrade to such higher value-added activities, it is not surprising that only a few manufacturers could still collaborate with TNCs and benefit from TT. The trend towards reduced flow of technologies accentuated after 1999, as trade liberalisation proceeded (*ibid.*).

Overall, FDI-related TT seems to be driven more by the absorptive capacity of the transferee and by global competition dynamics, rather than by IPRs. This result is also consistent with the previously mentioned survey conducted by the Thailand Development Research Institute (1998).

As far as patent-related TT is concerned, compliance with TRIPS appears to have brought benefits in terms of patent grants. Until 1999, only foreign affiliates that were registered in Thailand were eligible to apply for a patent. After that, full compliance with the multilateral standards allowed a large number of foreign (especially Japan-based) carmakers to take out patents in Thailand (Intarakumnerd and Charoenporn 2010). While this might have been beneficial, it is likely that the aforementioned institutional flaws in the dissemination of knowledge and the lagging absorptive capacity of many Thai suppliers limited patent-related TT.

Lessons from the inter-sector analysis

Let's now take a step back to assess the two hypotheses stated above.

Do different sectors react differently to stronger IPRs? In particular, are sectors characterised by higher replicability more sensitive to variations in IPRs?
Both sectors observed an expected numerical increase in patents and, less remarkably, in FDI. A merely quantitative study would tend to read this information as a piece of evidence that IPRs promote TT via FDI and patenting. However, both surges are hardly attributable to IPRs. Structural factors have been identified as more proximate causes for those trends. In addition, while the volumes of those channels increased, the extent of TT appears to have fallen or remained low. This provides a concrete example of two empirical issues that were highlighted in the empirical review: the inadequacy of adopting channels as a proxy for TT and the difficulty in identifying a causal relationship running from IPRs to TT.

Being structural endowments different across sectors, it is problematic to evaluate the hypothesis that the pharmaceutical sector is more responsive to IPRs. The responsiveness of a sector firstly hinges on its structural endowment. Therefore, generalisations along the lines of "sectors with higher replicability are more responsive to IPRs" may be misleading, if structural variables like the sector-specific technological capabilities are overlooked.

A further qualification is in order. In both sectors, Thai firms have focused on low value-added activities – operations in the automobile, packaging and drug formulation in the pharmaceutical. Given the type of activities undertaken it comes with little surprise that IPRs played a marginal role. It is the *type of activity* (e.g. in terms of value-added generated) upon which emphasis should be placed, rather than the entire sector. Adopting a whole sector as the unit of analysis can be misleading as well: R&D or design activities in the automobiles (or other sectors with relatively low overall replicability) are likely to be more sensitive to IPRs than packaging in the pharmaceutical industry.

The second hypothesis about the relative weight of indigenous technological capabilities and IPRs as determinants of TT appears more straightforward. The automobile industry was relatively more successful in compelling foreign companies to conduct TT to local actors. The underlying reason lies in the technological capacity of Thai firms, which were more concentrated in the automobile sector. On the other hand, the pharmaceutical sector found it relatively more difficult to compel foreign actors to disseminate their technology, primarily owing to the lack of a chemical base in Thailand. The level of technological capabilities of the host-country thus seems the most important driver for TT.

In addition, where absorptive capacity was lacking (pharmaceutical), the provision of stronger IPRs did not compensate for it. The same happened in the automobile, as the analysis in Techakanont and Terdudomtham (2004) confirms: once the technological requirements demanded by transferors became unsustainable for local suppliers the TT process halted, and was not significantly affected by the enforcement of stronger IPRs. Stronger IPRs cannot offset, let alone substitute for, structural, institutional and policy deficiencies, in order to increase TT.

5. CONCLUSIONS

This essay has investigated the relationship between stronger IPRs and TT in DCs. The starting point was the recognition, oft-overlooked in the traditional debate, of structural heterogeneity within the developing bloc. Accounting for such heterogeneity is crucial, because structural, country-specific factors are key drivers of the TT process and carry a greater weight than IPR regulation.

The aggregate-study-based empirical literature is a reflection of the limitations of the underlying theoretical debate that has neglected structural specificities. Such disregard for country-specific factors has resulted in endogeneity biases, which have often made the findings look conflicting. Inherent difficulties in measuring technology and IPRs make the results even less reliable. This calls for a refocusing of the empirical research away from aggregate and purely quantitative studies and towards more comprehensive, country-focused analyses that investigate the specific circumstances under which stronger IPRs have promoted or hindered TT.

The Thailand case-study has confirmed the centrality of structural factors – absorptive capacity, institutional arrangements, long-term technology policy – as determinants of TT. The main lesson is that structural and macro factors, particularly the activity-specific absorptive capacity and global competition dynamics, play a more salient role than the provision of stronger IPRs in determining the intensity of TT. A corollary is that a weak IPR regime in itself does not guarantee adequate TT.

A comparison between China and Brazil, on one hand, and Thailand on the other can further substantiate this main thesis. China and Brazil – with their large domestic market and competitive workforce – have in the last decade attracted a large volume of FDI and compelled foreign actors to transfer technology despite their lax enforcement of IPRs. Thailand, a much smaller country with a weak technological base, instead has failed to do so. The comparison highlights how sound structural endowments are a more decisive determinant of TT decisions and confer the host-country a certain bargaining power to compel foreign companies to transfer technology to local actors. In other words, structural capabilities may compensate for lax IPRs, whereas the opposite does not hold.

This is not to say that the role of IPRs within the TT process has been overestimated. In fact, possibly the only unambiguous result from the empirical literature – both case-studies and aggregate researches – is that wealthier countries do benefit from stronger IPRs. Those developing countries that do not possess the technological and institutional endowments to do so, however, should be allowed to prioritise the objective of nurturing the national industrial base, like Thailand did in the automobile sector, the more successful in attracting TT.

Finally, the fact that the dynamic benefits of stronger protection are so dependent on country-specific, structural factors clashes with the movement towards IPRs harmonisation. While transition periods were granted to allow enough time for adjustment, it is unlikely that during such a short window of opportunity smaller DCs could manage to accumulate the technological and institutional absorptive capacity needed to benefit from stronger IPRs. Hence,

harmonisation means that less advanced developing countries might have an IPR regime that is not tailored to their own structural endowments.

BIBLIOGRAPHY

Archibugi, Daniele, and Filippetti, Andrea. 2010. "The Globalisation of Intellectual Property Rights: Four Learned Lessons and Four Theses." *Global Policy* 1: 137-149.

Arnold, Erik, Martin Bell, John Bessant, and Peter Brimble. 2000. *Enhancing Policy and Institutional Support for Industrial Technology Development in Thailand*. Washington, DC: The World Bank.

Blyde, Juan S. 2006. "The Effects of Intellectual Property Rights on Trade and FDI in Latin America." Inter-American Development Bank Occasional Paper 34. Washington, DC: Inter-American Development Bank.

Blyde, Juan S., and Acea, Cristina. 2002. "The Effects of Intellectual Property Rights on Trade and FDI in Latin America." Inter-American Development Bank Working Papers. Washington, DC: Inter-American Development Bank.

Branstetter, Lee, Fisman, Raymond, and Foley, Fritz. 2006. "Do Stronger Intellectual Property Rights Increase International Technology Transfer? Empirical Evidence from U. S. Firm-Level Panel Data." *The Quarterly Journal of Economics* 121: 321-349.

Brimble, Peter. 2002. "Foreign Direct Investment: Performance and Attraction: The Case of Thailand." Paper presented at *Opportunities and Challenges for Cambodia, Laos and Vietnam*, Hanoi, August 2002. http://www.imf.org/external/pubs/ft/seminar/2002/fdi/eng/pdf/brimble.pdf.

Chang, Ha-Joon. 1997. "Institutional Structure and Economic Performance: Some Theoretical and Policy Lessons from the Experience of the Republic of Korea." *Asia Pacific Development Journal* 4: 39-56.

Chang, Ha-Joon. 2001. "Intellectual Property Rights and Economic Development: Historical lessons and emerging issues." *Journal of Human Development* 2: 287-309.

Charoenporn, Peera. 2007. "Co-evolution of Technological Development and IPR Regime: An Experience of Thailand." Paper presented at the *Third National Conference of Economists*, Bangkok, October 2007. http://www.thailandnce.eco.ku.ac.th/document/paper/2.5.pdf.

Cohen, Wesley, and Levinthal, Daniel. 1990. "Absorptive Capacity: A New Perspective on Learning and Innovation." *Administrative Science Quarterly* 35: 128-152.

Commission on Intellectual Property Rights. 2002. *Integrating Intellectual Property Rights and Development Policy*. London: Commission on Intellectual Property Rights.

Eaton, Jonathan, and Kortum, Samuel. 1996. "Trade in Ideas: Patenting and Productivity in the OECD." *Journal of International Economics* 40: 251-278.

Evans, Peter. 1995. *Embedded Autonomy: States & Industrial Transformation*. Princeton: Princeton University Press.

Falvey, Rod, and Foster, Neil. 2006. *The Role of Intellectual Property Rights in Technology Transfer and Economic Growth: Theory and Evidence*. UNIDO Working Papers. Vienna: UNIDO.

Fink, Carsten, and Primo Braga, Carlos. 2005. "How Stronger Protection of Intellectual Property Rights Affects International Trade Flows." In *Intellectual Property and Development: Lessons from Recent Economic Research*, edited by Carsten Fink and Keith Maskus, 19-40. Washington, DC: The World Bank/Oxford University Press.

Hoekman, Bernard, Maskus, Keith, and Saggi, Kamal. 2005. "Transfer of Technology to Developing Countries: Unilateral and Multilateral Policy Options." *World Development* 33: 1587-1602.

Intarakumnerd, Patarapong, Chairatana, Pun-arj, and Tangchitpiboon, Tipawan. 2002. "National Innovation System in Less Successful Developing Countries: the Case of Thailand." *Research Policy* 31: 1445-1457.

Intarakumnerd, Patarapong, and Charoenporn, Peera. 2010. "The Roles of IPR Regime on Thailand's Technological Catching Up." In *Intellectual Property Rights, Development, and Catch-up: An International Comparative Study*, edited by Hiroyuki Odagiri, Akira Goto, Atsushi Sunami and Richard Nelson, 378-411. Oxford: Oxford University Press.

Javorcik, Beata. 2004. "The Composition of Foreign Direct Investment and Protection of Intellectual Property Rights: Evidence from Transition Economies." *European Economic Review* 48: 39-62.

Kaufmann, Daniel, Kraay, Aart, and Mastruzzi, Massimo. 2007. "Governance Matters IV: Governance Indicators for 1996–2006." World Bank Policy Research Working Paper 4280. Washington, DC: The World Bank.

Keller, Wolfgang. 2004. "International Technology Diffusion." *Journal of Economic Literature* 42: 752-78.

Kim, Linsu. 1993. "National Systems of Industrial Innovation: Dynamics of Capability Building in Korea." In *National Innovation Systems: a Comparative Analysis*, edited by Richard Nelson, 357-383. Oxford: Oxford University Press.

Kuanpoth, Jakkrit. 2006. "TRIPS-Plus Intellectual Property Rules: Impact on Thailand's Public Health." *The Journal of World Intellectual Property* 9: 573-591.

Kumar, Nagesh. 2001. "Determinants of Location of Overseas R&D Activity of Multinational Enterprises: The Case of US and Japanese Corporations." *Research Policy* 30: 159-174.

Kwon, Howard. 1995. “Patent Protection and Technology Transfer in the Developing World: The Thailand Experience.” *George Washington Journal of International Law and Economics* 28: 567-605.

Macdonald, Stuart. 2002. “Exploring the Hidden Costs of Patents.” In *Global Intellectual Property Rights: Knowledge, Access and Development*, edited by Peter Drahos and Ruth Mayne, 13-39. New York: Palgrave Macmillan.

Machlup, Fritz. 1958. “An Economic Review of the Patent System.” Study of the Subcommittee on Patents, Trademarks, and Copyrights of the Committee on the Judiciary. Wahington, DC: Government Printing Office.

Mansfield, Edwin. 1994. “Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer.” International Finance Corporation Working Paper 19. Washington, DC: The World Bank.

Maskus, Keith. 2000. *Intellectual Property Rights in the Global Economy*. Washington, DC: Institute for International Economics.

Maskus, Keith 2004. “Encouraging International Technology Transfer”. UNCTAD-ICTSD Project on Intellectual Property Rights and Sustainable Development. Geneva, Switzerland: UNCTAD-ICTSD.

Maskus, Keith, and Penubarti, Mohan. 1995. “How Trade-Related are Intellectual Property Rights?” *Journal of International Economics* 39: 227-248.

Mazzoleni, Roberto, and Nelson, Richard. 1998. “The Benefits and Costs of Strong Patent Protection: a Contribution to the Current Debate.” *Research Policy* 27: 273-284.

National Science and Technology Policy Committee. 2006. *Thailand’s Science and Technology Indicators 2006*. Bangkok: Subcommittee on Science and Technology.

Odagiri, Hyroyuki, Akira Goto, Atsushi Sunami, and Richard Nelson. 2010. *Intellectual Property Rights, Development, and Catch-up: An International Comparative Study*. Oxford: Oxford University Press.

Ostergard, Robert. 2007. “Economic Growth and Intellectual Property Rights Protection: A Reassessment of the Conventional Wisdom.” In *Intellectual Property, Trade and Development: Strategies to Optimize Economic Development in a TRIPS-Plus Era*, edited by Daniel Gervais, 115-155. Oxford: Oxford University Press.

Park, Walter. 1999. “Impact of the International Patent System on Productivity and Technology Diffusion.” In *Competitive Strategies for Intellectual Property Protection*, edited by Owen Lippert, 47-72. Vancouver, BC: Fraser Institute.

Park, Walter, and Lippoldt, Douglas. 2008. “Technology Transfer and the Economic Implications of the Strengthening of Intellectual Property Rights in Developing Countries.” OECD Trade Policy Working Papers, No. 62. Paris: OECD Publishing.

Polanyi, Michael. 1967. *The Tacit Dimension*. New York: Doubleday.

Sell, Susan. 2011. "TRIPS Was Never Enough: Vertical Forum Shifting, FTAs, ACTA, and TPP." *Journal of Intellectual Property Law* 18: 447-478.

Smith, Pamela. 1999. "Are Weak Patent Rights a Barrier to U.S. Exports?" *Journal of International Economics* 48: 151-177.

Smith, Pamela. 2001. "How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?" *Journal of International Economics* 55: 411-440.

Supakankunti, Siripen, Wattana Janjaroen, Oranee Tangphao, Sauwakon Ratanawijitrasin, Paitoon Kraipornsak, and Pirus Pradithavanij. 1999. "Study of the Implications of the WTO TRIPS Agreement for the Pharmaceutical Industry in Thailand." Paper presented at the *Regional Consultation on WTO Multilateral Trade Agreements and Their Implications on Health*, Bangkok, August 1999.

Supakankunti, Siripen, Wattana Janjaroen, Oranee Tangphao, Sauwakon Ratanawijitrasin, Paitoon Kraipornsak, and Pirus Pradithavanij. 2001. "Impact of the World Trade Organization TRIPS Agreement on the pharmaceutical industry in Thailand." *Bulletin of the World Health Organization* 79: 461-470.

Techakanont, Kriengkrai, and Terdudomtham, Thamavit. 2004. "Evolution of Inter-firm Technology Transfer and Technological Capability Formation of Local Parts Firms in the Thai Automobile Industry." *Journal of Technology Innovation* 12: 151-183.

Thailand Development Research Institute. 1998. *Effective Mechanisms for Supporting Private Sector Technology Development and Needs for Establishing Technology Development Financing Corporation*. Bangkok: Thailand Development Research Institute.

UNCTAD. 2005. *World Investment Report 2005: Transnational Corporations and the Internationalization of R&D*. New York and Geneva: United Nations Publications.

Xu, Bin, and Chiang, Eric. 2005. "Trade, Patents and International Technology Diffusion." *Journal of International Trade and Economic Development* 14: 115-135.

Yang, Guifang, and Maskus, Keith. 2001. "Intellectual Property Rights and Licensing: An Econometric Investigation." *Weltwirtschaftliches Archiv* 137: 58-79.