Intellectual Property Protection and Foreign Direct Investment into Less Developed Economies in the post-TRIPs Period

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Abstract

In this paper we study the relationship between the strength of intellectual property (IP) protection that less developed countries provide and foreign direct investment (FDI) flows into these countries, in the post-Trade Related Intellectual Property Rights ($TRIPs$) agreement period 2004-2015. Our sample period is appropriate insofar as it comes after the ten year period that the developing countries were allowed for implementing IP reforms in accordance with the $TRIP$ agreement. Further, it is long enough to permit the modelling of a delayed FDI response to the IP reform stimulus. Our modelling strategy attempts to capture the heterogeneity of the impact of the IP reform on the FDI inflows by estimating varying effects in a conditional difference-in-differences specification. Thus, we allow for the fact that the impact of IP reform can vary significantly across countries and time depending on the magnitude of intellectual property that they own for which they seek such protection, for that would indicate the importance that they attach to IP protection. Our results from a varying coefficient model provide strong evidence of a positive effect of IP reform on FDI inflows into less developed countries. Further, we find that although the effect of such reform remains more or less unchanged across countries with zero to small magnitudes of intellectual property, it weakens progressively for countries that own larger amounts of intellectual property. Furthermore, lagged terms of the IP variables do not add to our understanding of this phenomenon. Disaggregating our sample into the sub-groups of developing countries and least developed countries, we find that our results for less developed countries are driven by the sub-group of developing countries.

Keywords: Foreign direct investment, Intellectual property protection

JEL Codes: O34, O24, O11

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1. Introduction

A characterizing feature of less developed economies has been noted to be the shortage of reproducible tangible capital, as is evident from earlier growth models which emphasized the centrality of physical investment in the process of economic growth. Even with the advent of endogenous growth models asserting the importance of knowledge capital, the importance of physical investment remained (for instance, Basu 2003, chapter 3). The significance of foreign direct investment (FDI) in the context of developing economies then becomes self-evident, as this investment from abroad serves to ease the domestic resource constraint and/or the foreign exchange constraint on physical capital (McKinnon 1964). This significance of FDI for the growth prospects of recipient nations is further enhanced if the inflow of capital also facilitates the import of relatively advanced technology embodied in the physical capital, as with advanced machinery.

In addition to this direct technology transfer that may piggyback on inward FDI flows, there are also a number of indirect channels through which the host nation may benefit technologically in the longer run (Clark et al. 2011). Thus, greater proficiency from emulating the production, management and marketing practices of (affiliates of)

multinational firms may enhance the productivity of the existing technology of host country firms. Further, competition for survival in the domestic market may coerce the host nation firms to step-up innovation themselves. This process of induced technological innovation may be further facilitated by the transfer of skilled workers from the multinational affiliates located in the host country to domestic firms. Furthermore, domestic firms supplying intermediate inputs to the multinational affiliates may benefit from technical assistance and training provided by the latter.

Given the importance of foreign direct investment in a resource-constrained milieu such as that in the less developed economies, instruments that potentially augment this flow become relevant to outcomes in those economies. One such instrument is supposedly the strength of intellectual property protection that nations provide. On the supposition that the sole interest of the source country firm is profit, whether that accrues from arms-length exports or FDI or from licensing technology to the destination country, studies argue that progressive strengthening of intellectual property rights (IPR) in the destination country is likely to initially induce a switch from exports to FDI, and then a switch from FDI to licensing, by the source country firm. By this argument, 'stronger' IPR in the destination country would be associated with *increased FDI* into that country, and 'still stronger' IPR with *decreased FDI* into that country.

However, the strength of intellectual property protection provided by the (potential) host country would be relevant in our context only if the foreign direct investment involves the transfer of proprietary intellectual property and/or involves the subsequent generation of proprietary intellectual property in the host country. By implication, if the foreign direct investment does not involve the transfer or subsequent generation of technology, and constitutes merely a transfer of resources that augment the domestic capital stock of the

receiving economy, then the strength of intellectual property rights should not be a matter of concern to the foreign investors.[1] A caveat, though, may be in order here. Markusen (1995) asks rhetorically "What then is being traded when we observe multinational production?", and proceeds to suggest that these could be firm-specific assets such as management and engineering services (in addition to any intellectual property such as patents, trademarks and design rights). To the extent that firms are protective of even non-technological intellectual property, the strength of intellectual property protection in the host nation may serve to signal the ease with which these can be copied. Therefore, even when no technology transfer occurs with the FDI inflow, intellectual property protection in recipient nations could be relevant in its signaling role when knowledge-based assets are involved.

The upshot of this discussion is, that theoretically, stronger IPR in the destination country may be associated with a positive response, no response, or even an inverted-U shaped response of FDI into that country; and the empirical studies appear to be at least in partial consonance with these possibilities. Thus, Lee and Mansfield (1996), Seyoum (1996), Primo Braga and Fink (1997), Maskus (1998), Smith (2001), and Awokuse and Yin (2009), all find a strong positive association between FDI and IPR. Park and Lippoldt (2003) further show that the strength of this positive association is stronger for developing countries than for developed countries, because the former have not yet reached the strongest levels of protection. They also find that in industries in which the reverse engineering of technology is difficult (such as metals, machinery and transportation) FDI is not responsive to IPR, whereas in industries in which technology imitation is easy (such as computer services and chemicals) IPR matter significantly for FDI. In similar vein, Javorcik (2004) shows that weak IPR deter FDI in manufacturing and R&D, and divert it to sales and distribution. On the

other hand, Ferrantino (1993), Mansfield (1993), Maskus and Konan (1994), Kondo (1995), and Seyoum (1996) for developing countries, do not find any statistically significant relationship between FDI and IPR.

The present study adds to the informative existing literature in a number of ways. First, it is unclear to what extent earlier results ought to be acceptable, insofar as the IP variable(s) used therein may not have been exogenous. In our study, we restrict ourselves to less developed countries (LDCs) in the post-TRIPs period, because it has been shown that the strengthening of intellectual property rights by LDCs post-$TRIP$s agreement was forced upon them by certain developed countries (Kanwar 2012, Ivus 2010, Qian 2007), and was therefore exogenous.[2] Second, unlike earlier studies, our modelling strategy captures the heterogeneity of the impact of IP reform on FDI inflows, by estimating a varying coefficient model in a conditional difference-in-differences specification context (see Frölich and Sperlich (2019) for the different strategies of causality analysis). Thus, we allow for the fact that the impact of IP reform can vary significantly across countries and time depending on the magnitude of intellectual property that they own for which they seek such protection, for that would indicate the importance that they attach to IP protection. Studies that do not correct for such heterogeneity are not that informative, and very likely suffer from inconsistent estimates, a problem that can conveniently be handled by varying coefficient models (Sperlich and Theler 2015). Third, we attempt to uncover the possibility of a lagged relationship between FDI inflows and intellectual property rights in the recipient nations. To this end, our sample period 2004-2015 is long enough to permit the modeling of a delayed response to the stimulus of stronger intellectual property laws adopted by the less developed countries. Our sample period starts from the expiry of the ten year implementation period that the TRIPs agreement designated for developing countries,

which allows us to better gauge the effect of IP reform on FDI inflows into less developed countries, to the extent that these countries would have completed the adjustments in their intellectual property laws.

Our empirical results provide evidence of a strong positive effect of IP reform on FDI inflows into less developed countries, and show that this effect is quite heterogeneous across these countries. Thus, while the effect of such reform remains more or less unchanged across countries with zero to small magnitudes of intellectual property, it weakens progressively for countries that own larger amounts of intellectual property. Furthermore, lagged terms of the IP variables do not appear to add to our understanding of this phenomenon. Disaggregating our sample into the sub-groups of developing countries (DCs) and least developed countries ($LEDC$s), we find that our results for less developed countries are primarily driven by the sub-group of developing countries.

United Nations Conference on Trade and Development data (UNCTAD 2019) for the year 2000 reveal that FDI net inflows for the world as a whole totaled some $1.38 trillion, of which more than 86% or $1.18 trillion went to the developed (or high income economies), a smaller but significant $188 billion or a little more than 13% to developing (or low and middle income) economies, while a mere $3.2 billion or about 0.2% went to the least developed countries. By 2005, the year which marked the end of the implementation period for the Trade Related Intellectual Property Rights (TRIPs) agreement for developing countries, the developing country share in world FDI net inflows had more than doubled to a little more than 34% ($330 billion), mostly at the expense of the high income countries whose share had declined to a little more than 65% ($620 billion), whereas that of the least developed countries still stood at a trivial 0.4% ($3.6 billion). Data reveal that this trend has continued through 2017, with the developing country share rising steadily to about 40%

($609 billion) of the world total ($1.51 trillion), eating into the high income country share which declined further to a little in excess of 58% ($879 billion), with the least developed countries accounting for a small 1.3% ($20 billion). Of course, from these magnitudes and changing shares over time, one cannot gauge which factor(s) best explain the phenomenon of foreign direct investment inflows into recipient countries, and for that one must turn to the formal analysis below.

Section 2 outlines our modelling strategy and estimation equation. Section 3 briefly discusses the dataset, and construction of the variables employed. Section 4 analyses the empirical results, and section 5 presents the resulting conclusions.

2. Modelling Strategy and Estimation Equation

It is recognized that the post-1994 strengthening of intellectual property rights in less developed countries was largely externally driven (Kanwar 2012; Ivus 2010; Qian 2007). Less developed countries, evidence shows, were coerced into strengthening their protection of intellectual property as per the Trade-Related Intellectual Property rights (TRIPs) agreement of 1994, which they signed under pressure from certain developed countries. We utilize this exogeneity to determine the effect of IPR reform on foreign direct investment into the less developed economies. We represent the influence of intellectual property protection in terms of a variable based on the Ginarte-Park index of patent rights (Ginarte and Park 1997; Park 2008), modified suitably to buttress the implementation aspect of these rights (Yu 2010). The procedure employed for computing this variable is described in section 3 below.

The dependent variable in our study is real foreign direct investment inflows into country i in year t, which we denote by $RFDI\_INF_{it}$. The factor whose impact on the dependent variable we intend to test for is the intellectual property regime in country i in

year t, measured by the modified Ginarte-Park index $MODGPI_{it}$. We model the impact via a conditional difference in differences approach, using a fixed effects panel data model. Given the exogeneity of the IP reforms, the effect of the reforms may be directly identified as the average impact of an unknown function, say m, in the panel regression

$$RFDI\_INF_{it} = M_{it}(MODGPI_{it}) = m(MODGPI_{it}) + \alpha_i + \varphi_t + \varepsilon_{it} \qquad (1)$$

where M and m are unknown functions in which the former can change over country and time. The first equality is rather general, whereas the second conjectures that there is a systematic impact of the property rights measured by $MODGPI_{it}$ that can be additively separated from fixed deviations by country and time (country fixed effects α_i, and year fixed effects φ_t), and a mean-independent additive deviation ε_{it}. Typically, people specify m as linear, being equal over time and space, i.e. setting $m(MODGPI_{it}) = \beta\,MODGPI_{it}$, adding perhaps some (additive, linear) terms with confounders or other control variables. Putting apart the latter, it is clear that the strengthening of intellectual property protection does not have an identical impact on all countries in all years; rather, it is expected to be quite heterogeneous. Consequently, the information provided by a parameter such as β is extremely limited. Moreover, deviations from such an over-all average effect are more likely to be systematic than random, nor can they be expected to be independent of $MODGPI_{it}$. Formally, when looking at $RFDI\_INF_{it} = \beta\,MODGPI_{it} + (\beta_{it} - \beta)\,MODGPI_{it} + \alpha_i + \varphi_t + \varepsilon_{it}$, which is equivalent to (1) but highlights the implications of a standard linear specification, we see that although our indicator variable is exogenous in the classical sense, it is not necessarily so if one omits the second term which would then merge with ε_{it}. This is problematic in the sense of rendering our indicator endogenous, if the deviation from the average effect or $(\beta_{it} - \beta)\,MODGPI_{it}$ is not independent of $MODGPI_{it}$. Note that a random coefficient approach for capturing the heterogeneity of the treatment effect leads to the

same endeneity problem. This problem cannot be rectified by instrumental variable estimation, because that would require an instrument for $MODGPI_{it}$ that is not only correlated with $MODGPI_{it}$ but at the same time independent of $(\beta_{it} - \beta)\, MODGPI_{it}$, which is a tall order. Apart from this, as noted, it might even be of interest to explore the heterogeneity of the treatment effect. Therefore, a preferable alternative is to model β_{it} suitably, for instance via a so-called varying coefficient model.[3] In other words, instead of searching for much more complex estimation procedures whose functioning strongly depends on non-testable, difficult to understand, and thus hardly justifiable assumptions for obtaining a rough idea of the average effect, we propose to use a slightly more flexible model with a standard estimator under weak assumptions, but one that is more informative about the impact of $MODGPI$ on FDI.

To be precise, we could capture such heterogeneity by modelling β_{it} as a function of country-specific drivers of the likely benefit from strengthening intellectual property rights. A self-evident (treatment) effect driver for this is the extent to which countries value intellectual property, and this country-specific valuation may vary over time, so that we can write it as X_{it} for country i in year t. Since IP protection is possibly correlated with other factors relevant for the dependent variable $RFDI\_INF_{it}$, we control for those other factors as well. Working with our fixed effects specification (1) is sufficient to account for country-specific time varying confounders such as market size, political stability, ease of doing business, etc., say Z_{it}, resulting in the specification:

$$RFDI\_INF_{it} = \beta(X_{it})\, MODGPI_{it} + \theta\, Z_{it} + \alpha_i + \varphi_t + \varepsilon_{it} \tag{2}$$

where $\beta(X_{it})$ indicates a function of X_{it}. Given our discussion above, driver X_{it} should be represented reasonably well by the total patents of a given country in a given year registered at the United States Patent and Trademark Office ($USPAT_{it}$). There are several

advantages to using this measure. While the patent statutes and patent grant efficiency probably vary significantly across less developed countries, those of the United States Patent and Trademark Office ($USPTO$) would (supposedly) be the same for all applicants from the LDCs, serving as a common denominator. Further, this common benchmark of $USPTO$ patents is exogenous to all the less developed countries, whereas their own patent regimes may or may not be exogenous to their patenting activities. Furthermore, the US market is probably the largest and the most sought after by entrepreneurs wishing to benefit from their innovations. As a result, the more important innovations in countries across the world tend to be registered for patent protection at the $USPTO$ (USPTO 2019). Given these observations, the more patents a country owns at the $USPTO$, the stronger its likely valuation of intellectual property.

Therefore, the varying coefficient β_{it}, i.e. function $\beta(X_{it})$, is modelled in our study as a function of the total patents of a given country at the US Patent and Trademark Office ($USPAT_{it}$). What this function does is to explore the heterogeneity of the causal effect of *MODGPI* on *RFDI_INF*; it is not (necessarily) about the causal effect of *USPAT* on *RFDI_INF*. Therefore, we do not further discuss a potential endogeneity of *USPAT*, and we prefer not to call it 'interaction'; rather, one estimates for each given value of *USPAT* the average causal effect of *MODGPI* on *RFDI_INF*. An additional factor that could provide information about the value that a country attaches to intellectual property is its research and development investment, but in practice including this variable is hindered by a severe lack of data availability. In sum, our preferred specification is model (2) with *X* being *USPAT*.

Finally, one could argue that legislating and implementing a certain level of intellectual property protection may have a lagged effect on foreign direct investment, on

account of various reasons such as uncertainty, financial frictions, or simply mistakes, etc. Taking all these points into account, we rewrite specification (2) as:

$$RFDI\_INF_{it} = \sum_{l=0}^{L} \beta_l \left(USPAT_{i(t-l)} \right) * MODGPI_{i(t-l)} + \theta Z_{it} + \alpha_i + \varphi_t + \varepsilon_{it} \qquad (3)$$

where L is the maximum lag length. In this specification we model the varying coefficients of a particular lagged $MODGPI$ to be a function of $USPAT$ of the *same* time lag, simply because variations of those lag combinations did not yield any deeper insight. A detailed discussion of the sample dataset and the control variables Z_{it} follows.

3. Sample Dataset and Variables Employed

Given our objective of understanding if and to what extent FDI inflows into developing countries vary significantly with the intellectual property regime of these nations in the post-TRIPs period, we use country-level data for the period 2004-2015 for our analysis. Although firm-level data across all countries may have been preferable, such FDI data are presently not available for the post-$TRIP$s period.[4] Note also, that the choice of period is not only dictated by our desire to study the post-TRIPs-implementation situation, but also by data availability. Dropping all records for which data are missing on one or more right hand side variables, we are left with 769 observations for 71 less developed countries,[5] with an average of about 11 observations per country, spanning our sample period 2004-2015.

Foreign direct investment inflows refer to the direct investment equity inflows into the recipient economy associated with the ownership of at least 10% of the ordinary shares of voting stock of a given firm(s), and have been computed as the sum of equity capital, reinvested earnings, and other intra-firm loans (UNCTAD 2019).[6] We deflate these current dollar figures by the country-specific GDP deflator to derive the real foreign direct investment inflows ($RFDI\_INF$).

The factors driving FDI, as well as their relative importance, need not remain fixed in time. While in earlier decades such investment decisions may have been predicated on the 'basic' considerations of market size, factor costs and politico-economic stability, in more recent times other complex factors such as intellectual property protection may have become relatively important for a number of reasons. Greater competition amongst less developed nations to attract FDI (Harding and Javorcik 2011), and a greater incidence of trade in higher-value-added technology-intensive products in recent years, both imply an increasing prominence of intellectual property rights (Frischtak 1993). Accordingly, as we mentioned above, our treatment variable is the modified Ginarte-Park index of patent rights ($MODGPI$). The Ginarte-Park index (Ginarte and Park 1997; Park 2008) incorporates five aspects of patent protection – namely, coverage, duration, subscription to international intellectual property bodies, provisions to prevent patent revocation post-grant, and certain enforcement procedures. It ranges from 0 to 5, with larger values indicating stronger protection. Although the original Ginarte-Park index is quinquennial, the fact that it exhibits steady increase over time for the sample countries (and no fluctuations), allows us to derive the annualized series assuming proportional growth in the intervening years. We then modify this annualized index to strengthen its implementation dimension. To do so, we use the so-called 'Area-2' sub-index from the Economic Freedom dataset of the Fraser Institute (Economic Freedom 2018), that captures various facets of legal enforcement in a country, such as contract enforcement, judicial independence, impartiality of courts, property rights protection, impediments to property sale, and military intervention. Re-scaling this sub-index to lie between 0 and 1 (in keeping with the five components of the Ginarte-Park index), we add it to the Ginarte-Park index to derive the modified Ginarte-Park index $MODGPI$, and employ this in our empirical analysis reported below.[7]

To flesh out the model specification, we now discuss the other covariates. The rich extant literature suggests that foreign direct investment decisions have traditionally turned upon considerations of market size, political stability, and factor costs in the recipient nations. In addition, the 'domestic business climate' or the legal-institutional factors which determine the 'ease of doing business' also matter. We take up each of these factors in turn.

Domestic market size is represented by gross domestic product per capita measured in constant (2011) purchasing power parity units ($GDPPC$), as well as by population size (POP), both extracted from World Bank data online (World Bank 2019c and World Bank 2019d, respectively). It is preferable to use these two factors separately, than to multiply them and define market size in terms of gross domestic product alone as some studies do, for the latter would imply that countries with a larger gross domestic product have greater purchasing power, which is evidently untrue as a comparison of China and India with many smaller economies would reveal. Moreover, gross domestic product moves up and down with the business cycle without really reflecting changes in the purchasing power of the economy. Furthermore, gross domestic product tends to be a portmanteau or catch-all variable insofar as it subsumes a number of other macro-economic variables, and not just demand-side variables alone.

Evidently, the variables $GDPPC$ and POP signal the size of the domestic market at a somewhat theoretical level, and several other factors may work to determine the true business potential of an economy. One such complex of factors is the business climate. The domestic business climate comprises the legal and institutional factors that together determine the 'friction' in the system, and hence the ease with which businesses can transact. A conducive business climate is marked by lower friction and hence lower

transactions costs, thereby increasing economic potential and performance. On the contrary, an adverse business climate stifles potential and performance, rendering the domestic market much less attractive to foreign investors. We capture the domestic business climate via the ease of doing business score ($EASE$), which attempts to measure regulations that directly impinge on businesses (World Bank 2019a). It is computed as the unweighted mean of 10 sub-indices[8] pertaining to the procedures, time and cost of launching a business venture, obtaining construction permits, obtaining an electricity connection, registration of property, obtaining credit, protecting investors, paying taxes, trading across borders, enforcing contracts, and resolving insolvency (World Bank 2019b). The ease of doing business scores thus allow us to compare the business climate across economies, whereas a change in the ease of doing business score for a given country indicates the change in the regulatory environment for entrepreneurs in that country over time.

Although the market size and business climate variables discussed above provide signals about the expected return that potential foreign investors may expect in a given economic milieu, what may also be of importance to the foreign investors is the risk attaching to these expected returns on account of inadequate political stability. Given our context, we prefer to define political stability in terms of the absence of social unrest and political violence, phenomena which pose a threat to life and property. Empirical evidence shows that lack of political stability tends to retard investment (Alesina and Perotti 1996; and the studies cited therein), and foreign investment is no exception to this. We represent this factor in terms of the political stability index ($POLSTAB$) that we derive as follows. We start off with four *in*stability sub-indices pertaining to ethnic wars (range 0 to 4), revolutionary wars (range 0 to 4), regime changes towards more autocratic rule (range 1 to

4), genocides and politicides (range 0 to 5), created by the Center for Systemic Peace, based on studies of these phenomena across countries and time (Systemic Peace 2017). Using the Center's data on terrorism-related deaths, we create a fifth sub-index (ranging from 0 to 4). Higher values of each of these five sub-indices indicate greater social unrest and violence, i.e. greater *in*stability. Therefore, subtracting the values of each sub-index from its highest possible value, yields sub-indices reflecting greater *stability* across countries and time. Adding these five transformed sub-indices, we derive our index of political stability $POLSTAB$, where higher values indicate greater political stability.

Another supposedly important driver of foreign direct investment into countries is factor costs; certain countries attract more FDI than others insofar as labour and capital there are cheaper than elsewhere. Unfortunately, despite efforts by the International Labour Organisation (ILO), wage data across countries and years are scanty. As a proxy, therefore, we use labour productivity ($LABPROD$) or output per worker modelled estimates of the ILO (ILO 2018). While movements in labour productivity may explain movements in wages fairly well in the long(er) run, several factors could be responsible for their divergence in the short(er) term (Van Biesebroeck 2015). In many sectors of the economy, wages constitute only a part of the total employee emoluments, and do not reflect other benefits such as stock options, pension, and employer contributions towards post-retirement payouts such as gratuity and provident fund; and movements in the wage and 'other' components need not match over time. Further, empirical evidence shows that workers are often discriminated against on the basis of gender, race, religion, etc., and given lower wages even when their productivity exceeds that of the favoured groups. Furthermore, given that labour productivity is difficult to assess, firms typically use alternative factors such as individuals' education and experience to determine their wages.

Finally, in the face of labour market imperfections in specific segments of the economy, emanating from monopsony power on the part of firms and trade union power on the part of workers, for instance, wage adjustments might lag behind productivity changes or vice versa. It is useful to be aware of these shortcomings of our productivity data, used in lieu of wages.

The second factor cost variable that we employ is the real lending rate of interest ($INTRATE$), defined as the lending rate of interest adjusted for inflation (World Bank 2019e). In addition to FDI flowing into economies with relatively inexpensive capital, Alfaro and Chauvin (2017) draw our attention to situations where the cheaper local capital actually exceeds the foreign funds that the foreign affiliates bring in. However, these interest rate data are rather patchy, and are not available for a number of sample countries for our sample time period.

We capture the openness of the economy ($OPENNESS$) in terms of the so-named 'Area-4' sub-index available in the Economic Freedom dataset mentioned above (Economic Freedom 2018), which encompasses various aspects of the "freedom to trade internationally" such as tariffs, non-tariff barriers, black market exchange rates, restrictions on foreign ownership and investment, and capital controls. This index varies from 1 to 9, with larger values indicating greater freedom to trade internationally.

None of the control variables confound the effect of the treatment variable, since they do not impinge on $MODGPI$, which was exogenously determined as we argued above. While the covariates potentially influence the dependent variable, they are not themselves associated with $MODGPI$. Thus, the domestic market size, political stability, ease of doing business, and the factor cost variables are not motivated by $MODGPI$. Table 1 reveals that the correlation between $MODGPI$ and these covariates ranges between –0.06 and 0.50 for

our estimation sample. Summary statistics for the variables are also presented in Table 1. Corresponding to specification (3) of the previous section, an investigation of the conditional distribution suggests that the FDI inflow should enter the model on the log-scale. That is, our specification becomes the semi-log model:

$$Ln\ RFDI\_INF_{it} = \sum_{l=0}^{L} \beta_l \left(USPAT_{i(t-l)}\right) * MODGPI_{i(t-l)} + \theta Z_{it} + \alpha_i + \varphi_t + \varepsilon_{it} \qquad (4)$$

where Z_{it} comprises the control variables real per capita income ($GDPPC$), population (POP), ease-of-doing business ($EASE$), political stability ($POLSTAB$), the real wage rate proxied by labour productivity ($LABPROD$), the real lending interest rate ($INTRATE$), and openness of the economy ($OPENNESS$).

4. Empirical Results

4.1 *Modelling effect $\beta(\bullet)$ as a cubic spline function*

Functional misspecification of $\beta(\bullet)$ could lead to erroneous conclusions about the effect of $MODGPI$ on FDI inflows, for reasons already explained in section 2. While introducing quadratic, cubic or higher order terms of variable $USPAT$ is one way of avoiding such errors, a more flexible alternative is to use cubic splines, which we employ here. They produce a superior fit compared to parametric estimation procedures such as polynomial regressions, because they adapt to the data locally. We find, further, that the distribution of $USPAT$ is extremely skewed to the left, with almost half the observations being 0 patents, although the largest sample value is 12575 patents. Therefore, to facilitate the application of our spline fit, we first transform this variable. Using the square root of an inverse hyperbolic sine transform, i.e. $USPATR = \sqrt{\ln\left(USPAT + \sqrt{USPAT^2 + 1}\right)}$, results in a variable with a peak

at 0 but a distribution that is otherwise rather flat, with mean and median both between 0.9 and 0.95. In other words, our estimation equation is:

$$Ln\ RFDI\_INF_{it} = \sum_{l=0}^{L} \beta_l \left(USPATR_{i(t-l)}\right) * MODGPI_{i(t-l)} + \theta Z_{it} + \alpha_i + \varphi_t + \varepsilon_{it} \qquad (5)$$

Based on the distribution of the transformed variable $USPATR$, we opt for knots at values 0, 1, 1.8 and 2.5, for creating the cubic spline terms.[9]

We first estimated a regression with contemporaneous IP terms as well as lagged IP variables for lags $l = 1\ to\ 4$ (results not reported for brevity). An F-test of the hypothesis that variables $\beta_l \left(USPATR_{(t-l)}\right) * MODGPI_{(t-l)}$ are all zero for $l = 4$ had a p-value of 0.6353; and those for $l = 3, 2, 1$ had p-values 0.7590, 0.0818 and 0.0882, respectively. This indicates that lagged IP terms do not add very much to our understanding of FDI inflows, and we therefore restrict ourselves to including just the contemporaneous IP terms.[10] These are the results discussed below.

4.1.1 *Less Developed Countries*

We begin by discussing the estimation results for the group of less developed countries as a whole, presented in column (1) of Table 2. The country-specific effects are found to be highly correlated with the regressors, with an absolute correlation coefficient of 0.65, and the Hausman test strongly supports the fixed effects specification estimated. The regressors are jointly significant in explaining the dependent variable, with the p-value of the associated F-test being 0. We test for linearity in the effect of $MODGPI$ on the dependent variable by testing the null hypothesis that the coefficients of the non-linear (quadratic and cubic) IP spline terms are all zero. The p-value of 0 strongly supports our specification. However, given the complex nature of the model, we prefer to rely on graphical analysis rather than look at the spline coefficients. Figure 1a depicts the plot of the estimated values

of the dependent variable on $MODGPI$, and reveals an overall positive relationship between them. Thus, countries offering stronger protection of intellectual property manage to attract larger net inflows of real foreign direct investment. To understand the heterogeneity of this association, or how this relationship varies across countries and time, we plot the effect β of $MODGPI$, against $USPATR$. Figure 1b shows a number of findings. It confirms our previous observation (based on Figure 1a), that there is a positive relationship between real FDI inflows and intellectual property protection, as is evident from the fact that the range of function β ($= \partial Ln\, RFDI_{INF}/\partial MODGPI$) remains positive over the entire domain of $USPATR$. Second, the effect of a change in $MODGPI$ on FDI inflows remains roughly unchanged for countries with zero to small numbers of patents, as is revealed by function β remaining more or less unchanged at about 0.7 as we move from countries with zero patents at the USPTO to those with essentially 'small' numbers (about 10 to 15) of such patents. Third, as we move to countries that own a larger number of patents, the effect of intellectual property protection falls steadily and almost monotonically. Eyeballing the plot, we find that it decreases from about 0.7 for $USPATR = 1$ to about 0.1 for $USPATR = 2.5$, or a decline of about 45%.[11]

As for the other results, we find that market size and domestic investment climate are strongly significant in explaining FDI inflows. Thus, real per capita income ($GDPPC$), and ease of doing business ($EASE$), both exert a strong positive influence on the dependent variable. The factor cost variables also have the expected signs, and are statistically strongly significant; a higher wage rate, proxied by labour productivity ($LABPROD$), as well as a higher real lending rate of interest ($INTRATE$), both significantly reduce FDI inflows into less developed countries. Finally, more open economies ($OPENNESS$) imply a greater inflow of foreign direct investment.

Even a seemingly homogeneous group such as the less developed countries hides considerable heterogeneity. Therefore, we dis-aggregate our sample of Less Developed Countries ($LDCs$) into Developing Countries (DCs) and Least Developed Countries ($LEDCs$), and repeat the above empirical analysis for the two sub-groups (see section 3 for the list of countries in each group). The results are discussed in sub-sections 4.1.2 and 4.1.3 below.

4.1.2 *Developing Countries*

As above, we first estimate a regression with both contemporaneous as well as lagged IP terms for lags $l = 1 \, to \, 4$ (results not reported for brevity), and find that the p-values for the F-tests that variables $\beta_l \left(USPATR_{(t-l)} \right) * MODGPI_{(t-l)}$ are all zero for $l = 4, 3, 2, 1$ are 0.5386, 0.8218, 0.1919 and 0.3690, respectively. This strongly indicates the insignificance of the lagged IP terms in explaining FDI inflows, and so we confine ourselves to including just the contemporaneous IP terms. The results of this regression are reported in column (2) of Table 2, and are discussed below.

The joint hypothesis that all regressors are uniformly zero is strongly rejected, the p-value of the associated Wald test being 0. The absolute correlation coefficient between the country-specific effects and the regressors is a high 0.7, and the Hausman test strongly supports the fixed effects specification estimated. An F-test of the null hypothesis that the non-linear (quadratic and cubic) IP spline terms are all zero has a p-value of 0, which supports our specification. Of course, given the complex nature of the model, we rely on graphical analysis to gauge the effect of the IP variables. Figure 2a reveals an overall positive relationship between real FDI inflows and $MODGPI$. Further, Figure 2b shows that this association is heterogenous, and that it varies across countries and time periods in accordance with $USPATR$ or the magnitude of the patents owned at the USPTO. As was

found for the group of less developed countries as a whole, the effect of a change in $MODGPI$ on FDI inflows remains roughly unchanged for countries with zero to small numbers of patents, with the effect of function β being more or less unchanged at about 0.6 as we move from countries with zero patents to those with 'small' magnitudes (about 10 to 15) of such patents. However, as we move to countries with larger patent stocks, the effect of intellectual property protection on FDI inflows decreases steadily, from about 0.6 for $USPATR = 1$ to about 0.175 for $USPATR = 2.5$, or a decline of about 35%.[12]

Moving on to the other regressors, once again the results are in line with those that we found for less developed countries as a whole. Thus, real per capita income ($GDPPC$) and political stability ($POLSTAB$) both exert a strong positive influence on the dependent variable, although the ease of doing business is weakly significant. Both factor cost variables have the expected signs and are strongly significant in explaining FDI inflows; such that higher wage rates (proxied by $LABPROD$) as well as higher real lending interest rates ($INTRATE$) reduce FDI inflows into developing countries. Finally, relatively open economies ($OPENNESS$) experience greater inflows of foreign direct investment. Note that all these results for developing countries are in line with those that we observed for the group of less developed countries as a whole.

4.1.3 *Least Developed Countries*

The countries comprising this group do not exhibit much variation with regard to patents owned at the USPTO. Most of these countries own zero patents, while a handful of them own a small number (maximum three) of such patents. Therefore, it does not make sense to use a cubic spline specification for this group to specify and estimate effect β. In fact, if we do that mechanically, the high degree of collinearity in the lagged IP terms leads to several

of these terms being dropped during estimation. To remedy this problem, (in addition to the linear and quadratic transforms) we use only the cubic transform of $USPATR$ to create the IP variables in our preferred specification.

We first estimate a regression with both contemporaneous as well as lagged IP terms for lags $l = 1 \ to \ 4$ (results not reported for brevity), and find that the p-values for the F-tests that variables $\beta_l \left(USPATR_{(t-l)} \right) * MODGPI_{(t-l)}$ are all zero for $l = 4$, 3, 2, 1 are 0.1656, 0.4124, 0.2441 and 0.0189, respectively. This strongly indicates the insignificance of the lagged IP terms for lags 2, 3 and 4, in explaining FDI inflows. However, when we re-estimate the regression with just the contemporaneous and lag one IP terms, the p-value for the significance of the lag one terms turns out to be 0.1838. Consequently, we prefer to estimate a specification with contemporaneous IP terms only. The results of this estimation are reported in column (3) of Table 2, and are discussed below.

The joint hypothesis that all regressors are uniformly zero is strongly rejected, the p-value of the Wald test being 0. The (absolute) coefficient of correlation between the country-specific effects and the regressors is a substantial 0.52, and the Hausman test strongly supports the fixed effects specification that we have estimated. An F-test of the null hypothesis that the non-linear (quadratic and cubic) IP terms are jointly zero has a p-value of 0.0024, which supports the cubic specification. Figure 3a reveals an overall positive association between real FDI inflows into least developed countries and $MODGPI$. Figure 3b sheds light on the heterogeneity of this effect, and shows that it varies across countries and time periods in accordance with $USPATR$ or the magnitude of the patents owned at the USPTO. As indeed we found for the sub-group of developing countries, the effect of a change in $MODGPI$ on FDI inflows remains roughly unchanged for countries with zero to small numbers of patents, with the effect of the IP terms more or less unchanged at about

1.0 as we move from countries with zero patents to those with 'small' magnitudes (about 10) of such patents. However, as we move to countries with larger patent stocks, the effect of intellectual property protection on FDI inflows increases, from about 1.0 for $USPATR = 1$ to about 1.25 for $USPATR = 1.35$, or an increase of about 28%.[13] Note, however, that there are very few observations in the non-zero $USPATR$ domain, as noted at the beginning of this sub-section, and therefore this latter result is best taken with reticence.

Of the control variables, the domestic investment climate variable 'ease of doing business' ($EASE$) has a weak positive influence on FDI inflows, while political stability ($POLSTAB$) is weakly positively significant using a one-tail test. Of the factor cost variables, the wage proxy variable $LABPROD$ exerts a mild negative effect on the dependent variable, using a one-tail test. Apparently, the relatively small number of observations in this sub-group underlies the reduced variation of the regressors and their statistical insignificance.

From the empirical evidence presented in sub-sections 4.1.1 to 4.1.3, it is evident that the results for the group of less developed countries as a whole are driven by those for the sub-group of developing countries, as indeed one would expect given the preponderant weight of developing countries in total less developed country FDI inflows.[14] Intellectual property considerations do appear to be important for FDI inflows into less developed countries, as indeed the sub-groups of developing and least developed countries. Furthermore, this association is not uniform across countries and time periods, and appears to become weaker for countries with greater ownership of intellectual property as measured by patents at the USPTO.

4.2 *Economic Significance*

One way to understand the economic significance of $MODGPI$ as a policy instrument, would be to use the elasticity of real foreign direct investment inflows with respect to the modified Ginarte-Park Index. For the group of less developed countries as a whole, Table 3 shows this elasticity to be 2.42 at the median value of $USPATR$. Given that real foreign direct investment inflows in 2010 (roughly the midyear of our sample period) were about \$5377.90 million (at constant prices), the annual real FDI inflow due to an annual 1% increase in $MODGPI$ works out to \$130.15 million. Since $MODGPI$ increased by about 9.77% over the sample period 2004-2015 for our sample countries, this implies an increase in real foreign direct investment inflows of \$1271.47 million over our sample period, which is about 2.10% of the total real foreign direct investment inflows over this period. If LDCs had raised their 2015 level of intellectual property protection to that of the developed countries (i.e. $MODGPI$ = 4.97), that would have meant real FDI inflows of about \$7614 million, or almost five times larger than what they actually received over our sample period.

While the above exercise is useful, a comparison of the elasticity of real FDI inflows with respect to $MODGPI$, over time or across countries, would suffer from a 'level effect' insofar as the level of the regressor in question could differ substantially over time or between countries. Therefore, we prefer to comment on the economic significance of a regressor by using the associated semi-elasticity, which gives us the percentage change in the dependent variable for a unit change in the regressor. For the group of less developed countries as a whole, Table 3 shows the semi-elasticity of real FDI inflows with respect to $MODGPI$ to be 70% at the median value of $USPATR$, which is the largest response amongst all regressors, as a comparison of this value with the coefficients in column (1) of Table 2 reveals. If LDCs had raised their 2015 level of intellectual property protection to that of the developed countries (i.e. $MODGPI$ = 4.97), that would have meant an increase in $MODGPI$

by about 2.18 units, implying that real net FDI inflows would have gone up by about 153% or $5526 million over the sample period 2004-2015. Of course, these predictions do not suppose a general equilibrium or an international FDI (budget) constraint, but are rough estimates intended to provide readers a sense of their relative importance. These figures are very substantial, and cogently reveal the potential of stronger intellectual property protection as a policy instrument for attracting foreign direct investment inflows into less developed countries.

5. Conclusions

For various reasons, foreign direct investment flows into the economy are seen to be highly desirable, and even more so for less developed countries that are short of reproducible tangible capital and 'high' technology. Of the various factors that impinge on such flows, one that appears to have become more salient over time is the strength of intellectual property protection that countries provide. Given the steep increase in FDI inflows into less developed countries in the recent past, and the exogenously imposed strengthening of intellectual property protection in these countries post-TRIPs agreement, one is naturally led to ask whether a significant relationship exists between the two. In addressing this issue, our modelling strategy attempts to capture the heterogeneity of the impact of the IP reform on the FDI inflows by estimating a varying coefficient conditional difference-in-differences specification. Eschewing this, one would be deprived of both consistent estimation as well as an acceptable interpretation of the empirical results. Thus, the impact can vary significantly across countries depending on the magnitude of intellectual property that they own for which they seek such protection, for that would indicate the importance

that they attach to IP protection. We explicitly model this heterogeneous impact via a varying coefficients model.

Our sample period of 2004-2015 is appropriate insofar as it comes after the ten year period that the developing countries were allowed for implementing IP reforms in accordance with the TRIPs agreement. Further, it is long enough to permit the modelling of a delayed response to the stimulus. Our empirical results provide evidence of a clear positive effect of IP reform on FDI inflows into less developed countries, and we find that although this effect is more or less unchanged for countries with zero to small magnitudes of intellectual property (as proxied by patents owned at the USPTO), it wanes for countries owning relatively larger amounts of intellectual property. Furthermore, lagged terms of the intellectual property variables do not add to our understanding of the phenomenon in question. Our results for less developed countries seem to be driven mainly by those for the sub-group of developing countries, which is understandable in view of the fact that the predominant bulk of foreign direct investment flowed into developing countries, rather than least developed countries.

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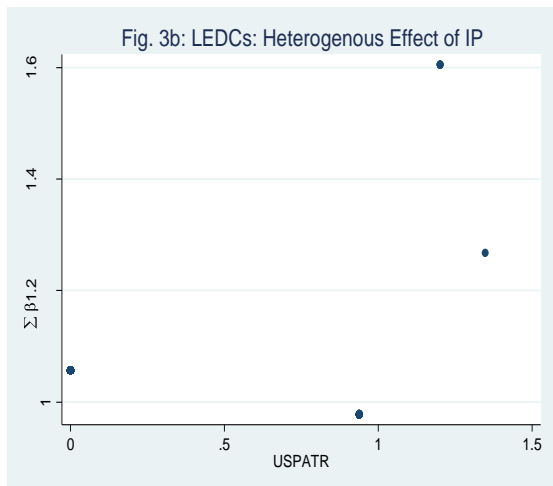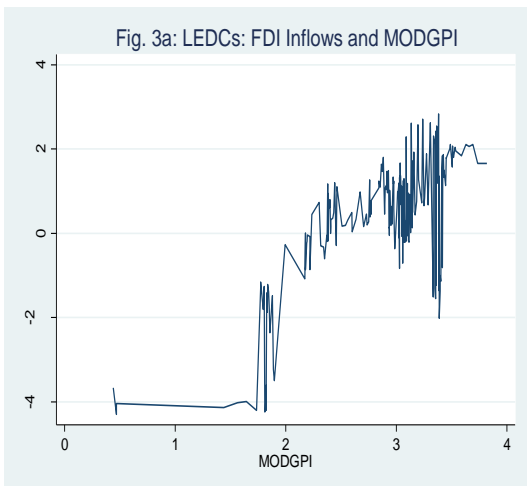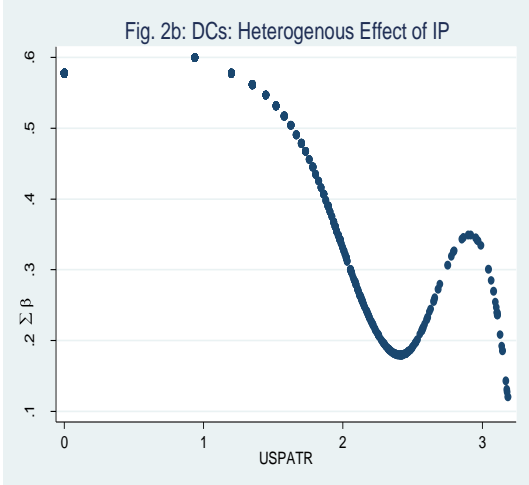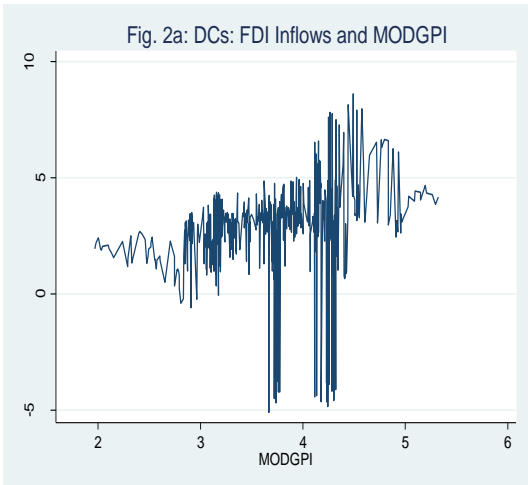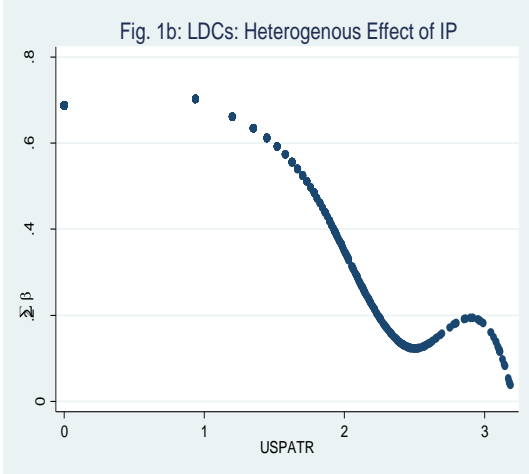https://www.wto.org/english/docs_e/legal_e/27-trips.pdf

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Table 1 Sample Statistics: Less Developed Countries 2004-2015					
Regressor	Units	Mean	Standard Deviation	Minimum	Maximum
$RFDI\_INF$	US$ million	61.62	172.49	0.0003073	1356.10
$GDDPPC$	$ '000 PPP	8.58	7.73	0.605863	45.22
POP_{it}	Million	68.15	175.36	0.01	1000.00
$EASE_{it}$	Index	52.31	11.63	23.45	85.29
$POLSTAB_{it}$	Index	20.56	1.07	14.50	21.00
$LABPROD_{it}$	$ '000 PPP	23.25	21.35	1.57	112.08
$INTRATE_{it}$	Percent	9.72	51.73	−32.00	1158.03
$OPENNESS_{it}$	Index	6.76	1.02	2.06	8.71
$MODGPI_{it}$	Index	3.44	0.73	0.44	5.32
$USPAT_{it}$	number	98.26	606.70	0.00	9004
$USPATR_{it}$	number	0.97	0.96	0.00	3.13
N	769	769	769	769	769

Table 2 Effect of IP Reform Post-TRIPs-Implementation: Nonlinear Specification using Cubic Spline of $USPATR$
Dependent Variable: $Ln\ RFDI\_INF_{it}$

Regressor	Less Developed Countries (1)	Developing Countries (2)	Least Developed Countries (3)
$GDPPC_{it}$	0.2305***	0.3183***	−0.0032
	(0.0789)	(0.0842)	(0.8890)
POP_{it}	0.0008	0.0030†	−0.0039
	(0.0015)	(0.0018)	(0.0031)
$EASE_{it}$	0.0318***	0.0229*	0.0402*
	(0.0094)	(0.0126)	(0.0226)
$POLSTAB_{it}$	0.0464†	0.0487**	0.0885†
	(0.0282)	(0.0223)	(0.0580)
$LABPROD_{it}$	−0.1151***	−0.1193***	−0.2645†
	(0.0387)	(0.0354)	(0.1960)
$INTRATE_{it}$	−0.0009***	−0.0013***	−0.0031
	(0.0002)	(0.0002)	(0.0101)
$OPENNESS_{it}$	0.3116***	0.2117***	0.3397
	(0.0867)	(0.0742)	(0.2870)
$MODGPI_{it}$	0.6880***	0.5775**	1.0569†
	(0.2403)	(0.2194)	(0.6991)
$USPATR * MODGPI_{it}$	0.4179	0.2818	−13.2991***
	(0.7492)	(0.7464)	(3.3933)
$USPATR^2 * MODGPI_{it}$	−0.6605	−0.4285	23.4683***
	(1.3616)	(1.3519)	(6.0617)
$USPATR\_CT1 * MODGPI_{it}$	0.2471	0.1635	−10.0040***
	(0.6071)	(0.6006)	(2.6132)
$USPATR\_CT2 * MODGPI_{it}$	−0.5180	−0.4148	
	(0.9184)	(0.9017)	
$USPATR\_CT3 * MODGPI_{it}$	1.1860*	1.2610*	
	(0.6718)	(0.6792)	
$USPATR\_CT4 * MODGPI_{it}$	−3.1491**	−4.0964**	
	(1.3169)	(1.5997)	
Intercept	−3.8715***	−2.6772**	−7.2779***
	(1.2225)	(1.0921)	(2.5369)
Year Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
P-value (all slopes 0)	0.0000	0.0000	0.0000
$\overline{R^2}$	0.1658	0.1995	0.2186
N	769	549	220

Note: $USPATR\_CT1$ refers to cubic term 1; similarly for cubic terms 2, 3 and 4 (in the cubic spline);
Clustered robust standard error in parentheses below the coefficient;
***, ** and * denote significance at the 1%, 5% and 10% levels, using a two-tail test;
† denotes significance at the 10% level using a one-tail test

Table 3 Effect of IP Reform Post-TRIPs-Implementation: Some Elasticities						
	Elasticity of $RFDI\_INF$ w.r.t $MODGPI^{*}$			$\partial Ln\ RFDI\_INF/\partial MODGPI$		
Percentiles of $USPATR$	LDCs	DCs	LEDCs	LDCs	DCs	LEDCs
50	2.42	1.95	3.03	0.70	0.59	1.06
55	2.27	1.85	3.03	0.66	0.50	1.06
60	2.18	1.67	3.03	0.63	0.46	1.06
65	2.04	1.46	3.03	0.59	0.40	1.06
70	1.76	1.30	3.03	0.51	0.35	1.06
75	1.48	1.15	3.03	0.43	0.31	1.06
80	1.25	0.94	3.03	0.36	0.26	1.06
85	0.93	0.76	3.03	0.27	0.21	1.06
90	0.59	0.66	3.03	0.17	0.18	1.06
95	0.43	0.80	2.81	0.12	0.22	0.98
Note: The elasticities have been computed at the mean value of $MODGPI$; LDCs – less developed countries; DCs – developing countries; LEDCs – least developing countries.						

Fig. 1a: LDCs: FDI Inflows and MODGPI

Fig. 1b: LDCs: Heterogenous Effect of IP

Fig. 2a: DCs: FDI Inflows and MODGPI

Fig. 2b: DCs: Heterogenous Effect of IP

Fig. 3a: LEDCs: FDI Inflows and MODGPI

Fig. 3b: LEDCs: Heterogenous Effect of IP

Endnotes

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[1] Thus, Article 7 of the 1994 *TRIP*s agreement (WTO 1994), that "The protection and enforcement of intellectual property rights should contribute to the … transfer and dissemination of technology … ", can be claimed to relate to *FDI* only to the extent that the *FDI* involves technology transfer.

[2] The lone exception in the received literature in this respect, is Park and Lippoldt (2003); who, however, consider the response of FDI 'stocks' that are not properly computed, insofar as the stock in a given year has been computed by simply adding up the stocks of earlier years without any discounting.

[3] Such models are decidedly superior to random coefficient models, where the response heterogeneity across countries is essentially random. Random response heterogeneity by definition does not model and, therefore, cannot explain either the factor(s) that the heterogeneity is a consequence of, or the factor(s) that it changes. All that we obtain from a random coefficient model is the distribution of the (random) treatment effects.

[4] For a study that uses pre-*TRIP*s firm-level data pertaining to the 'transition' economies of Eastern Europe, see Javorcik (2004). Her data, however, are essentially cross-section in nature.

[5] The group of Less Developed Countries (LDCs) comprises the sub-groups of Developing Countries (DCs) and Least Developed Countries (LEDCs). The developing countries for which data were available are: Algeria, Argentina, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Chile, China, Colombia, Costa Rica, Dominican Republic, Egypt, Fiji, Guatemala, Guyana, Honduras, Hungary, Iceland, India, Indonesia, Iran, Ivory Coast, Jamaica, Jordan, Kenya, Malaysia, Mauritius, Mexico, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Romania, Russia, South Africa, Sri Lanka, Swaziland, Thailand,

Trinidad Tobago, Ukraine, Uruguay, Venezuela, Vietnam, Zimbabwe. The least developed

countries for which data were available are: Angola, Bangladesh, Benin, Burundi, Congo

Dem Rep, Ethiopia, Haiti, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique,

Myanmar, Niger, Rwanda, Senegal, Sierra Leone, Tanzania, Togo, Uganda, Zambia.

[6] Strictly speaking, the UNCTAD data on foreign direct investment inflows relate to net FDI

inflows, i.e. FDI brought into a given country by foreign countries in a given year, minus FDI

that is taken out of the host economy by one or more foreign countries in that year. The net

inflows are negative in 21 out of the 790 cases for which the complete data are available.

Since the log transformation of the dependent variable is preferred to using the

untransformed variable, as well as to other transformations of the Box-Cox type, that

amounts to dropping the negative observations from our analysis.

[7] The exact formula is: $MODGPI_{it} = GPI_{it} + [-(1/9) + (AREA2_{it}/9)]$, where $MODGPI_{it}$

is the modified Ginarte-Park Index, GPI_{it} is the original Ginarte-Park Index, and $AREA2_{it}$ is

the 'Area2' sub-index.

[8] Alternative aggregation methods such as principal components and unobserved

components methods were found to yield virtually identical results to that of simple

averaging, because these alternative methods also assign roughly equal weights to the sub-

indices since the pairwise correlations between the sub-indices are roughly similar (see

World Bank 2019b).

[9] Appropriate variations in the knot values, we find later, leave our empirical results

unchanged.

[10] The reported p-values indicate that IP terms of lags 2 and 1 are weakly significant.

However, when we re-estimate the regression with just these lags, the IP terms with lag 1

turn out to be insignificant, with the p-value of the associated F-test being 0.1641. To jump

ahead momentarily, we also find the IP terms with lags 1 to 4 to be insignificant for both

sub-groups of developing as well as least developed countries (see sub-sections 4.1.2 and

4.1.3), implying that the significance of the IP terms of lag 2 for less developed countries is

probably just a statistical artefact.

[11] The y-axis magnitudes are in natural log scale.

[12] The y-axis magnitudes are in natural log scale.

[13] The y-axis magnitudes are in natural log scale.

[14] Since the group of less developed countries comprises only the sub-groups of developing

and least developed countries, evidently the results for LDCs will be a weighted average of

the results for DCs and LEDCs. The weight on the results for DCs is way larger than that for

LEDCs, for almost 99% of the total FDI inflows into LDCs went into DCs, as the introduction

noted. Further, given that the results for DCs are the same as those for LDCs (comparing the

sign and significance of each regressor), whereas the results for LEDCs are a little different, it

is apparent that the results for LDCs are driven by the results for DCs.