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Foreign Direct Investment Inflows and Intellectual Property Rights: A Further Empirical Look*

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Abstract

This study documents a richer empirical look on the role of intellectual property rights (IPRs) on FDI inflows by considering global data including different income groups (i.e. high, middle, and low income groups classified by World Bank). It also looks at the (short-run) impact of the TRIPS (Trade-Related Aspects of Intellectual Property Rights) agreement which imposed during the Uruguay Round in 1995. The empirical model relates FDI inflows to IPRs, controlled by a set of known variables - GDP per capital, trade openness, real exchange rate, and real interest rate. The empirical computation covers panel data of between 35 and 100 countries for the period 1980-2014. The empirical results suggest cointegration (long-run relation) between IPRs and FDI inflow globally, regardless of different income groups. Their impact is estimated between 0.023 and 0.043, but insignificant in the short-run. Causality tests further support the role of IPRs on FDI. Various transmission channels have been identified, in particularly for low income countries. Positive finding is documented for the countries joining the TRIPS agreement. This study enlightens policymakers about the policy on creating a conducive and sustainable environment for IPRs in order to encourage FDI inflows to their countries. A small open economy in Asia - Malaysia is being considered as case study for Asian context.

JEL Classification Codes: F21, O30

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1. Introduction

Foreign direct investment (FDI) is generally a product of global financial account liberalization in early 1980s, and late 1990s. FDI flows are also known as long term capital flows, which are much preferable than of short term capital flows given that the latter are deemed volatile and could bring undesirable consequences to an economy (Singh, 2003, p.192). At a theoretical level suggested by Fischer[1] that global economic efficiency and increased social welfare are the benefits of liberalization of capital account (Singh, 2003). However, According to De Mello (1997), the empirical support of growth-FDI nexus varies across the country. Recently, global FDI inflows seems to have shrunk by 16% from $1.47 trillion in 2013 to $1.23 trillion in 2014, which could be due to the fragility of the global economy, inflated geopolitical risks and policy uncertainty for investors as well as some large divestment activities which cause a decline in global FDI inflows (UNCTAD, 2015a). FDI would benefits the home country with job creations, resources transfer in terms of capital and technology transfer as well as knowledge transfer (Nourbakhshian *et. al.*, 2012) these channels allow FDI to promote economic growth (Kinuthia and Murshed, 2015; Azman-Saini *et. al.*, 2010).

The influence of IPRs on innovation and economic growth has been the center of focus in research (i.e. Gould and Gruben, 1996). Yet, it is also believed that this can dampen innovation by hindering diffusion of knowledge as lesser diffusion of knowledge would lead to slimmer chances of follow-up innovation (Mohtadi and Ruediger, 2014). Considering appropriate IPRs protection would help an economy to sustain its competitive advantage on new technologies, there is competition in attracting FDI inflows among the developing countries through strengthening IPRs protection (Seyoum, 1996). Generally speaking, IPRs is recently getting much attention, in particular the TRIPS agreement (The Agreement on Trade-Related Aspects of Intellectual Property Rights) has been imposed in 1995 by WTO (World Trade Organization). Cardwell and Ghazalian (2012) used the Park's (2008) IPRs index found that there is significant effect on IPR protection in developing countries after the implementation of TRIPS agreement whereas there is only marginal effect on developed countries. Lee and Mansfield (1996) indicate that developed countries consider IPRs protection a key factor when deciding the destination of investment. Poor IPRs protection would discourage FDI inflows because the destination of foreign investment lies

[1] Stanly Fischer is the former First Deputy Managing Director of the International Monetary Fund (IMF) from September 1994 to August 2001.

in which region offer better IPRs protection (Javorcik, 2004; Du et al., 2008; Adams, 2010, and Awokuse and Yin, 2010).

Hence, the objective of this study is to find an empirical answer whether the IPRs protection has favorable impact on FDI inflows both in the long-run and short-run, respectively. Panel data approach is applied.

This study contributes to the existing literature by adding a generalization on the impact of IPRs on FDI inflows. A wider range of countries is considered a total of sampled 100 countries between the periods 1980 and 2014. In fact, the linkages between IPRs protection and FDI inflows are ambiguous. The existing studies such as Lee and Mansfield (1996), and Glass and Saggi (2002) considered the United States as single sample provide mixture findings. Lee and Mansfield (1996) shows a positive correlation between IPRs protection and FDI inflows, while, Glass and Saggi (2002) reject their finding with a strong IPRs pose disincentive effects which reduce FDI inflows. Similarly, in Kyrkilis and Koboti's study (2015) that IPRs has no significant impact on FDI inflows to Greece. There are two studies available that assess the cointegration relationship between IPRs and FDI inflows, namely Fedderk and Romm (2006), and Asid *et. al.* (2012) for South Africa and Malaysia, respectively. Both studies concluded IPRs and FDI inflows are cointegrated. Given that these studies used single country only, though there are studies such as Adams (2010), Awokuse and Yin (2010), Hsu and Tiao (2015) and Koury and Peng (2011) considered a group of countries, yet none has conducted panel (long-run) cointegration test. Also, none of them identify the potential causation (Granger causality) between these variables. Seyoum (1996) has randomly picked up 27 countries from 5 continents and found that IPRs protection in certain countries pose greater positive effect on FDI inflows.

The next section is a review of the existing empirical works on IPRs and FDI. Section 3 provides a brief description of the empirical specifications, variables and data. The empirical results are presented and discussed in the Section 4. The last section concludes the study.

2. Literature Review - Intellectual Property Rights (IPRs) and FDI inflows

This section generally updates the existing literature on the determination of FDI inflows, in particular those consider the impact of IPRs. Blonigen (2005) surveyed the studies that empirically examines the FDI decisions of multinational enterprises (MNEs) and the resulting aggregate location of FDI across the world. Recently, Aw and Tang (2010, Table 1, p.60-62) and

Tang, et al. (2014, Table 1, p. 288) have reviewed a bulk of FDI related studies, but excluded Lee (2015), Chan et al. (2014), Tang et al. (2014), Jadhav (2012), Mottaleb and Kalirajan (2010), Choong and Lam (2010), Ismail (2009), Ang (2008), and Bevan and Estrin (2004) are added in this study.[2] Most of them examined a country's FDI inflows in *ad hoc* basis with a set of macroeconomic variables or determinants such as inflation rate, real exchange rate, trade openness, trade balance, and so on, but 'innovative' factors is ignored.[3] This 'innovative' factor relates to new technology, innovation, invention, and the protection from imitation.[4] One of the 'innovative' is reflected by intellectual property rights (IPRs), which is conventionally employed in understanding inflows of FDI. Few studies are available, among them are Kyrkilis and Koboti (2015), Hsu and Tiao (2015), Jeong (2014), Asid et al. (2012), Khoury and Peng (2011), Lo (2011), Awokuse and Yin (2010), Adams (2010), Du et al.(2008), Fedderk and Romm (2006), Javorcik (2004), Glass and Saggi (2002), Maskus (1998), Seyoum (1996), and Lee and Mansfield (1996).

Lee and Mansfield (1996) found that the strength of IPR protection, as perceived by 100 United States (U.S.) firms surveyed in 1991, has positive correlation against the volume of U.S. FDI inflows into 14 countries. It is in line with *a prior* intuition that countries with weaker IPRs protection are perceived to attract lower FDI inflows from U.S., in addition the ratio of FDI over research and development facilities and final production are lower as well. Glass and Saggi (2002) developed a 'product cycle model', and found that when IPR protection is strengthen, it gives a sense of security and confidence to the multinationals but this is not the case for Northern America firms. Given more resources are used in imitation, it crowds out FDI and subsequently contracts innovation. Javorcik's (2004) paper documented the effect of IPRs (i.e. Ginarte and Park index) on the composition of FDI on firm level of Eastern Europe and Russia over the period of 1989 to 1994. Using time series multiple regression analysis, the study unveiled that poor IPR protection discourages FDI inflows to the host country, which is technology-intensive sectors while also

[2] Summary table is available from the corresponding author upon request.
[3] See, Chan et al. (2014), Tang et al. (2014), Alam and Zulfiqar (2013), Jadhav (2012), Aw and Tang (2010), Ismail (2009), Yol and Ngie (2009), and Ang (2008).
[4] Other branch of literature looks at the effects of IPRs on major macroeconomic variable such as economic growth (Gould and Gruben, 1996), technological development (Kanwar and Evenson, 2009), trade for high technology aggregate (Braga and Fink, 1999), exports (Yew *et. al.*, 2015), and so on.

drives existing or potential foreign investors to switch to distribution projects rather than domestic production given the weak IPR protection.[5]

Fedderk and Romm (2006) employed time series methods and the estimated VECMs reveals that property rights protection, besides political risk and corporate tax rate, is one of the key determinants of FDI inflows into South African for 1960-2002. Similar to Javorcik's (2004) paper, Du et al.(2008) adopted multiple regression analysis with data collected from 6288 U.S. multinationals which are investing in China over 1993-2001. Their work reveals that the location choice of investment by the US multinational companies in different regions of China is up to which region offers better IPR protection, lower degree of government intervention and corruption. Using a panel data of 75 developing countries (1985-2003), Adams (2010) demonstrates that there is positive effect on FDI by the reinforcement of IPR as suggested by the estimated Seemingly Unrelated Regressions (SUR). This effect is strengthened after the implementation of TRIPS agreement (Agreement on Trade-Related Aspects of Intellectual Property Rights). Using gravity framework, Awokuse and Yin (2010) examined the determinants of FDI by using panel data of 38 countries (14 low-income countries and 24 high-income countries) over a sample period of 1992-2005. Their empirical results show that strengthening the IPR protection in China would pose positive impact to FDI inflows. Lo (2011) employed multiple regression on 5829 U.S. patent granted by investors and assignees dwelling in Taiwan from 1984 to 1991 to assess the impact of reinforcing patent rights in Taiwan. Empirical result show that the patent reform of Taiwanese in 1986 has attracted more FDI in Taiwan as the reform stimulated additional R&D spending in Taiwan. Khoury and Peng (2011) employed simple correlation analysis on a panel data consisting of 18 Latin American and Caribbean countries over the period of 1990 to 2003 shows that patent reform in developing countries does matter for FDI inflow.

A recent empirical study conducted by Hsu and Tiao (2015) focused on 11 Asian countries (India, Indonesia, Japan, Korea, Malaysia, Saudi Arabic, Singapore, Taiwan, Thailand, Turkey and Vietnam) for 1985-2010 found that from OLS and GMM (generalized method of moment) estimators the patent rights protection exerts positive effect in Asian countries' FDI inflows. Similar finding is concluded by Seyoum (1996) who based on multiple regression estimated using pooled-time series (1975-1990) survey data compilation of 27 countries randomly picked from 5

[5] Other explanatory variables, population, corporate tax rate, progress in reform, legal effectiveness, corruption, privatization and openness have been taken into account.

continents, to study the relationship FDI inflows and IPRs. Empirical findings show that IPRs in certain countries with limited industrial and technological infrastructure as well as the economic environment is less engaging for investment is more influential in posing positive effect on inward investment compared to other economic policy variables.

Maskus (1998) is also interested in examining the prospective pros and cons of FDI inflows and technology transfer as well as the impact of IPRs. The study considered the data over the period 1989 until 1992 on United States majority owned manufacturing affiliates covering 46 countries to explore the strength of IPR protection with four channels of technology transfer namely exports, patent applications, affiliate sales and assets. The main finding is all four channels of technology transfers are positively influenced by stronger IPRs, though only weak impact on patent application in developing countries. Jeong's (2014) study covered 34 sample countries over the period of 2002 to 2006 found that business services industry are strongly affected by system-related factor conditions which consist of transparency, bribery and corruption, feasibility of running business, and IPRs.

Recently, Kyrkilis and Koboti (2015) studied the role of IPRs in determining the behavior of FDI inflows into Greece over the period 2002-2006. Their analysis considers the Ginarte and Park Index (GPI). Their study demonstrated that IPRs protection exerts no significant impact on the FDI into Greece, though level of the industrial sector technological intensity pose rather small impact to foreign investor's ultimate option of entry mode into Greek market. Asid et al. (2012) studied the key determinants of FDI inflows to the Malaysian economic context for the sample period 1970 - 2005. The ARDL (Autoregressive Distributed Lags) tests showed a cointegration relation between FDI (as ratio to GDP) and IPRs. Also, IPRs significantly influences FDI in short-run.

3. Specifications, Data and Methods

This study serves to extend the existing *ad hoc* specification(s) of FDI inflows determination (see, Jadhav, 2012; Mottaleb and Kalirajan, 2010; Ismail, 2009; Bevan and Estrin, 2004) by including IPRs variable. In a panel setting (see, Hsiao, 2007), the baseline model takes the positive impact of IPRs on FDI inflows, *ceteris paribus* in a bivariate framework as baseline equation (1).

$$FDI_{i,t} = f(IPR_{i,t}^{+}) \quad (1)$$

In order to minimize possible omitted variables bias on the coefficients of focused variables, we include a number of control variables namely GDP, along with some basic indicators of macroeconomic stability such as real exchange rate, real interest rate and trade openness in the baseline model that are standard in FDI inflow relationship, see Equation (2).

$$FDI_{i,t} = f(IPR_{i,t}^{+}, GDP_{i,t}^{+}, REER_{i,t}^{+}, RIR_{i,t}^{+}, TO_{i,t}^{+}) \qquad (2)$$

where, i is in country sample, and t is time dimension. FDI is net FDI inflow, and IPRs is Intellectual Property Rights proxied by Park index (Park, 2008). A set of control variables is being considered, namely real per capital GDP (GDP), real effective exchange rate (REER), real interest rate (RIR), and trade openness (TO). The expected sign is positive between FDI inflows and IPRs. Other determinants which correspond to common empirical findings are denoted in superscript form, positive sign – GDP (Hsu and Tiao, 2015; Chan *et. al.*, 2014), REER (Froot and Stein, 1991; Blonigen, 1997; Ismail, 2009), RIR (Ismail, 2009; Vanitha et al., 2015; Aw and Tang, 2010), and TO (Blonigen *et. al.*, 2004).

$$FDI_{i,t} = f(IPR_{i,t}^{+}, GDP_{i,t}^{+}, REER_{i,t}^{+}, RIR_{i,t}^{+}, TO_{i,t}^{+}, D\_TRIPS_{i,t}^{+,-}) \qquad (3)$$

$$FDI_{i,t} = f(IPR_{i,t}^{+}, GDP_{i,t}^{+}, REER_{i,t}^{+}, RIR_{i,t}^{+}, TO_{i,t}^{+}, D\_TRIPS{*}IPR_{i,t}^{+,-}) \qquad (4)$$

The alternative empirical specification (equations 3 and 4) adds a zero-one continuous dummy variable to capture the implementation of TRIPS in 1995 in which “1” for 1995 onward, and else “0”. We also look at the interaction between TRIPS agreement and IPRs (D_TRIPS*IPR) on influencing the decision on FDI inflows as in Equation (4), in addition also to examine whether there is differential effect of IPR before and post implementation in 1995. The TRIPS agreement is believed to improve a country’s IPRs enforcement and implementation, in a short-run.

Due to data availability for the candidate variables, in particular Park index (Park, 2008), the data covers annual observations from year 1980 to 2014 for between 35 and 100 sample countries for equations (1) and (2), respectively. The sampled countries are listed in ***Appendix A***. The definition and source for each variable are indicated in the Table 1.

<Insert Table 1 here>

As seen in Table 2, there is no huge difference in averages the natural log of FDI inflows across the three income groups given that the values are in natural logarithm, nonetheless low income groups register the lowest minimum *ln*FDI whereas as expected, high income countries collect the highest averaged score in IPRs which aptly reflect that high income countries have stronger IPRs protection compared to the middle and low income countries.

<Insert Table 2 here>

A pre-testing procedure for cointegration analysis is to to check if the series is order one, $I(1)$ to avoid the ‘spurious regression’. Tables 3 and 4 report the results. In Table 3, the test statistics of ADF-Fisher tests fail to reject the null hypothesis of a unit root for the variables in levels, expect for real interest rate (i.e. at 10%, 5% and 1%). The first-differenced of these variables (except for RIR) reject the null hypothesis of a unit root indicating that they are stationary, or in $I(1)$ process. However, Hadri’s (2000) stationarity test strongly (at 1% level) rejects the null hypothesis of stationary - real interest rate is non-stationary. The Hadri’s tests also suggest the same finding for the rest of variables. DeJong et al. (1992) found that unit root tests have low power against plausible trend-stationary alternatives with roots near unity. Hence, all the variables are being considered as non-stationary or in $I(1)$ process.

<Insert Table 3 here>

<Insert Table 4 here>

After identifying the degree of integration, $I(d)$ that all of the variables are non-stationary or integrated with order one, $I(1)$, Pedroni (2004) cointegration test is applied to test the presence of cointegration. Pooled Mean Group ARDL[6] (Autoregressive Distributed Lag) proposed by Pesaran *et. al.* (1999). For the purpose of empirical convenient, equations (1) - (4) are re-presented in a log-linear form (*ln*) of panel ARDL structure are specified below:

$$\Delta lnFDI_{i,t} = -\phi_i(lnFDI_{i,t-1} - lnIPR_{i,t-1}\theta) + \sum_{j=1}^{p-1} \Delta lnFDI_{i,t-j}\lambda_{i,j} + \sum_{j=0}^{q-1} \Delta lnIPR_{i,t-j}\beta_{i,j} + c + \epsilon_{i,t} \quad (5)$$

$$\Delta lnFDI_{i,t} = -\phi_i(lnFDI_{i,t-1} - lnIPR_{i,t-1}\theta - X'_{i,t-1}\theta') + \sum_{j=1}^{p-1} \Delta lnFDI_{i,t-j}\,\lambda_{i,j} + \sum_{j=0}^{q-1} \Delta lnIPR_{i,t-j}\beta_{i,j} + \sum_{j=0}^{q-1} \Delta X'_{i,t-j}\beta'_{i,j} + c + \epsilon_{i,t} \quad (6)$$

where c is constant; a set of control variables $X'_{i,t} = [\, lnGDP, lnTO, lnREER, RIR]$; θ and θ' is the long-run coefficient; ϕ_i represents the adjustment coefficient (or so-called error correction term).

[6] GMM (Generalised Methods of Moments) is not adopted here due to the inconsistent and biased estimates and standard errors produced by two-step GMM when the regularity conditions are not always satisfied (see, Windmeijer, 2005). Hansen’s (1982) GMM is introduced to primarily cater for time series data, while Bowsher (2002) finds that many instruments can lead to a weakened over identification test.

By including the dummy variable for TRIPS (D_TRIPS) event and the interaction between TRIPS event and IPRs (D_TRIPS*IPR), respectively, the ARDL equations are demonstrated below:

$$\Delta lnFDI_{i,t} = -\phi_i(lnFDI_{i,t-1} - lnIPR_{i,t-1}\theta - X'_{i,t-1}\theta') + \sum_{j=1}^{p-1} \Delta lnFDI_{i,t-j}\,\lambda_{i,j} + \sum_{j=0}^{q-1} \Delta lnIPR_{i,t-j}\beta_{i,j} + \sum_{j=0}^{q-1} \Delta X'_{i,t-j}\beta'_{i,j} + \beta_i''D\_TRIPS + c + \epsilon_{i,t} \quad (7)$$

$$\Delta lnFDI_{i,t} = -\phi_i(lnFDI_{i,t-1} - lnIPR_{i,t-1}\theta - X'_{i,t-1}\theta') + \sum_{j=1}^{p-1} \Delta lnFDI_{i,t-j}\,\lambda_{i,j} + \sum_{j=0}^{q-1} \Delta lnIPR_{i,t-j}\beta_{i,j} + \sum_{j=0}^{q-1} \Delta X'_{i,t-1}\beta'_{i,j} + + \beta_i'''D\_TRIPS * lnIPR_{it} + c + \epsilon_{i,t} \quad (8)$$

The Pedroni test is based on Engle-Granger (1987) two-step (residual-based) cointegration test whereas the Fisher test is a combined Johansen test. Fisher test was not employed due to the objective of this study is set on investigating only one relation which is the FDI inflow determination, relation of other control variables such as exchange rate determination, and production (GDP) equation are of no interest. In brief, for the Pedroni (1999) test, the first panel *v*-statistic is a type of non-parametric variance ratio statistic, second panel ρ –statistic is similar to the Phillips and Perron rho-statistic, likewise, the third statistic is corresponding to the Phillips and Perron *t*-statistic. The fourth panel *t*-statistic, on the other hand, is a parametric statistic which is akin to the augmented Dickey-Fuller *t*-statistic. The remaining three statistics are based on a group mean approach with the fifth group ρ –statistic is similar to the Phillips and Perron rho-statistic, in the meantime, the last two statistics are parallel to the Phillips and Perron *t*-statistics and the augmented Dickey-Fuller *t*-statistics correspondingly. The details of the tests are not reported since it is widely applied and documented (see, Pedroni, 1999; 2004).

Following Pooled Mean Group ARDL (Autoregressive Distributed Lag) proposed by Pesaran *et. al.* (1999), the Pooled Mean Group (PMG) estimator of Pesaran *et. al.* (1999) is given below:[7]

$$\Delta y_{i,t} = \phi_i EC_{i,t} + \sum_{j=0}^{q-1} \Delta X'_{i,t-1}\beta_{i,j} + \sum_{j=1}^{p-1} \lambda^*_{i,j}\,\Delta y_{i,t-j} + \epsilon_{i,t} \quad (9)$$

[7] The ARDL models are the standard least squares regressions that include lags of both the dependent and independent variables as regressors. Standard regression estimation of ARDL models is problematic under the panel settings with individual effects due to bias triggered by correlation between the error term and the mean-differenced regressors. This bias can be alleviated by increasing the number of observations, *T* but not the number of cross-sections, *N*. Dynamic panel data GMM estimators is developed if the number of *T* is small but with large *N*. Nonetheless, GMM estimator breaks down when *T* gets larger, thus it is not appropriate for large *T*, this can be overcome by employing PMG estimator of Pesaran *et. al.* (1999).