Economic Growth Analyses under the TRIPS Transitions: Evidence from Selected Cross-Country Samples

Rozilee Asid

School Of Business and Economics

Universiti Malaysia Sabah

Locked Bag 2073, 88999 Kota Kinabalu, Sabah, Malaysia

Tel: 60-88-320-000 Ext. 1608   E-mail: rozilee@ums.edu.my

Abstract

Previous research had identified various determinants in view of growth disparities across nations. In this paper some restriction will be made to the determinants variables and resolved instrumental regression technique. Undoubtedly, the role played by foreign direct investment (FDI) stock of human capitals and countries openness are very significant in achieving higher economic growth. However, when the TRIPS agreements effectively enforced within the WTO framework in 1995, changes in multilateral economic activities were found to be obvious. The partial role played by the intellectual property (IP) to attract FDI as an alternatives channel to improved economic competitions had proven to become a strategic policy to achieve better growth. In this paper, two stages of econometric model will be used. All the selected endogenous variables will be estimated in the first-stage and the partial strength of the selected endogenous variables will then be re-estimated into the growth model in the second stage.

Keywords: Economic Growth, TRIPS transitions, Research and development (R&D), Openness, Human capital, Instrumental Variables regression

1. Introduction

The issue of economic growth disparities between riches and poor nations is one of the central questions in economic growth theory. One major explanation of growth disparities for open economies is due to fundamental development strategy and international policy regime. According to Quibria (2002), openness, consistent macroeconomic stability, labor market flexibility and education policy will lead to better economic progression.

Although Solow (1957), Mankiw et. al (1992) and Mankiw et.al (1995) had found that source of economic growth were almost driven fundamentally but changes in the world economic outlook as proposed by the liberal economist would results in rapid growth phenomenon. Liberal economists believe that freer trade or openness that relates to international trading policy might provide the definite answer to faster growth. As suggested by Romer (1992), Grossman and Helpman (1991) and Barro and Sala-i-Martin (1995), countries with more open to the rest of the world would have greater chances and ability to absorb technological advances such as innovation generated from leading nations geared via various investment channel.

It is worth to mentioned that, over the last three decades, the landscape of economic development around the globe had improve tremendously in terms of capital formations and technological advancement promoted by increasing inflow of FDI within an open economy. One of the important sources for technological advancement and capital formation is to promote better incentives for attracting investment. Continuous government intervention in the economy such as improving regulation on international trade setting and market transparency, amending taxation structure and provision of infrastructure services may generally boost the economic performance.

In the modern economy however, innovations and knowledge is the key ingredients. Internationally, the protection of innovations and knowledge-based output is protected under intellectual property law and regulations. The importance of IPR protection in trading activities across nations has gain considerable concerned from majority of the developed economies, as they believe the optimal protection of intellectual property rights (IPR) might influence the economy from various aspects. The importance of innovations and knowledge economy had been strongly recommended among the supporters and then translated into reality when the Trade related aspect of intellectual property agreements (TRIPS) enforced within the World Trade Organization in 1995. Since then, the way that the international trading system works had change systematically.

The impact of TRIPS agreement under the transition periods is an interesting issue to be investigated. The advantage of strengthening IPR regime especially for emerging and developing nations, give alternative options and approaches in promoting and enhancing their foreign investment policies and preparation that need to be taken

if these nations get in touch with desired certain level of development. As clearly stated under Article 7 of the agreements:

"The promotional of technological innovation and transfer and dissemination of technology will hopefully benefit such users and producers so as to reach the conducive social and economic welfare with balanced rights and obligation." (WIPO: 1996, pg.18)

Under such comprehensive agreement, country members are given one (for developed countries) to four years (developing countries) to comply and upgrade (i.e. Article 65.1 and Article 65.2) their existing IP law and practices in order to meet the ceiling standard of protection requirement

In this paper, the significance role played by countries openness, human capital and foreign direct investment (FDI) towards growth is one of the subject to be analyzed within the compliance period stipulated under TRIPS agreement. Due to the fact that determinants of FDI, among others, restricted by various channel namely IPR, research and development (R&D), market transparency (trade distortion) and current saving, the effect towards economic growth will be analyzed in stages. A cross-country data were collected from various trusted database and limited to observation started from 1995 to 2000, the time limit given under TRIPS agreement.

The paper is organized as follows: In Section II, review of literatures. Section III, describes of the methodology. In Section IV present the results and concluded with Section V.

2. Review of Literature

Generally, the speed up process of economic growth vary from country to country due to different economic development progress, level of new technological (knowledge stock), accessibility to infrastructure, availability and dissemination of information and other economic environment including international trade policy, political stability and even culture. The TRIPS agreement (Article 7; WIPO, 1996) had provide an opportunity for developing nations to reap the benefits, which has already experienced from the developed nations as critically discussed by Ganguli (1998), McCalman (2001) and Lall (2003), among others.

Major empirical studies found that, economic growth or productivity growth were endogenously driven through input factors (Solow, 1957) and technology only assimilates through the process of capital accumulation and human capital creation exogenously to the model to indirectly measure productivity (Mankiw et.al, 1992; Miller and Upadhyay, 2000). But the effect of technology to economic growth shared among all nations was differed at least by several channels inter-alia trading, licensing, and foreign investment. Borensztein et.al (1998) which was inspired by the endogenous growth model through the technological progress of capital deepening process has found the evidence on how FDI originated from industrial nations become an important vehicle for developing countries to achieve better foundation conditionally to the human capital stock avail by the host countries. Markusen and Venables (1999) however found some linkages (forward and backward) on how FDI largely become a catalyst for local industrial development.

Rapid economic developments over the past three decades change view of many developing and least-developed countries to the importance of FDI through an aggressive campaign of investment promotions to attract investment. However, the important role of FDI to industrial development much depends on countries policies reforms (Wint and William, 2002) and other internal factors as viewed by Gastanga et.al (1998), Smarzynska and Wei (2000) and Wei and Wu (2001). Gastanga et.al (1998) examines the issues from the perspective of host country reform specifically involving the majority of less-developed countries. However, the results proposed that investment climate and effectiveness of individual policy reforms are complement rather than substitutes.

Research and Development (R&D) activity or innovation oriented efforts are becoming a major engine for technological progress (Coe and Helpman, 1995). Source of innovation could be either domestic or foreign. The R&D activity is an integral part of level of technological transfer through internalize of FDI (UNCTAD, 2003). The rapid R&D activity as a consequence of rapid FDI, viewed as a pull factors for investors to invest through an attractive package. This would result a spillover effect tinto the industries and finally promote sound economic growth into the countries. It is found that a commitments to an R&D project are capable to create future option for patenting and market introduction influence in promoting productivity growth (Takalo and Kanniainen, 2000), especially when firm's own R&D expenditure (Wakelin, 2001) and national culture with strong IP protection (Varsekelis, 2001) taking into account.

Studies on IPR protection and its relation to economic growth are contentious. Long argument about the policy have open-up an opportunity to uncover new evident specifically involving issues of providing stronger IPR framework. Apparently by providing stronger IPR framework, issues of cost and benefits has always visible (Rapp and Rozek, 1990).   It was proved that, stronger patent protection in an open economic regime have strong impact

on affecting the economic growth (Gould and Gruben, 1996), enhanced technical progress (Maskus and McDaniel, 1999), attracting more investment (Liu and Wang, 2003) that would translated into higher TFP growth and development of local industry (Markusen and Venables, 1999). According to Eaton and Kortum (1996), half of the growths in the selected OECD countries were mainly driven by technology diffusion originated from the United States, Germany and Japan. As pointed out by Kwan and Lai (2003), under investment of R&D would substantially affect in welfare loss due to under-protection of IPR.

Good governance measured by the efficiency of resources allocation may have some effect towards economic progress. However, due a bureaucratic maze the effectiveness of economic delivery system in formalizing open macro economic policies becomes inefficient especially in attracting foreign investment (Gelos and Wei, 2002). A lack of transparency, high country risk, black market activity, exchange rate distortion, high tariff rate and strong barrier and corruptions widely blamed in many research findings. Gould and Gruben (1996), Smarzynska and Wei (2000), Wei and Wu (2001), Park and Lippoldt (2003), Gastanga et.al (1998) and Paldam (2002) agreed that those factors are examples of self-created instrument, which slowly retards the economic progress.

3. The Methodological Framework

This section discusses the methodological framework. The technique of instrumental variable (IV) regression will be employed due to the process of transmission mechanism involved in explaining the growth process. The IV regression technique is developed by series of multiple endogenous variables along with series of included and excluded instruments. However the selections of endogenous variable and series of excluded instruments must at least satisfy several requirements and some testing procedures will be used as part of the validation process.

3.1 Model Setup

The IV regression model is actually the second stage regression with one endogenous and multiple exogenous. The reduced form model is depict as below:

$$y_1 = \beta_0 + \beta_1 \hat{y}_2 + \beta_k Z'_k + \delta_1 \hat{v}_2 + u_1 \qquad (3.1)$$

Where;

y_1 : Endogenous variable

$\hat{y}_2$: Expected value for instrumented variable

Z'_k : Set of included instrumental variables

β_0 : Model Intercept

β_1 : Coefficient first stage endogenous variable

β_k : Coefficients for included instrumental variables

$\delta \hat{v}_2 + u_1$: Composite error has zero mean and uncorrelated with $\hat{y}_2$ and Z'_k.

$E(u_1) = 0, \ Cov(Z'_j, u_1) = 0 \ \ \forall \ \ j = 1, ... k.$

For the economic disparities fractions, one dummy variable created as a proxy. The dummy variable takes a value of 0 and 1, which represents developing and developed economies respectively. The dummy variable is included in one of the Z'_k instruments so that sets of $Z'_k = \left\{ z_1, z_2, z_3, ..., \sum_{d=0}^{k} z_d \right\}$. According to equation (3.1), the endogenous variable y_2 is theoretically correlated with u_1. The Z'_k variable is assumed uncorrelated with u_1 and some of the omitted variables contained in $\hat{y}_2$ were assumed correlated to u_1.

The first-stage regression of y_2 however is developed as below:

$$y_2 = \pi_0 + \pi_{1i} Z' + \pi_{2i} Z'' + v_2 \qquad (3.2)$$

Where;

y_2 : Instrumented variable

Z' : Set of included instrumental variables

Z'' : Set of excluded instrumental variables

π_0 : Model Intercept

π_{1i} : Coefficients for included instrumental variables

π_{2i} : Coefficients for excluded instrumental variables

$$E(v_2) = 0; \quad Cov(Z_j^{"}, v_2) = 0 \quad \forall \quad j = 1.....k$$

For all π_k coefficients in the above equation (3.2) to become valid endogenous IV for y_2 it must be assumed to be non-singular i.e $\pi_k \neq 0$ and the error term v_2 is assumed to follow standard normal distribution. A good instrumental variable for an endogenous explanatory variable is easy to proof theoretically than reality. This is because according to Wooldridge (2002, pp. 87-88), the variable must satisfy two different (even conflicting) criteria in different stages, i.e $\pi_k \neq 0$ and $Cov(Z_j', u_1) = 0 \quad \forall \quad j = 1,.....k$.

Several statistical tests will be conducted assessing the validity of the instruments in the IV regression model. Shea (1997) has provided a simple measure and testing procedure for IV relevance in multivariate linear model. If in fact, the instruments are not relevant (i.e. weakly correlated with the endogeneous regressor), the sampling distributions of the IV statistic are in general non-normal for asymptotic and the inferences are unreliable. Stock and Yogo (2005) however have an alternative solution based on test developed by Cragg and Donald (1993). According to the procedure, testing of the instruments validity restriction for excluded instruments assumed that all instruments are orthogonal to the error under the null hypothesis. Both tests are asymptotically optimal even when encountering a large number of variables

The hypothesis testing procedure for the validity of all excluded instruments from equation (3.2) are as follows;

$H_0 : all \; \pi_{2i} = 0$

$H_1 : at \; least \; one \; \pi_{2i} \neq 0$

These are tests of, the joint null hypothesis that the excluded instruments are valid instruments, i.e., uncorrelated with the error term and correctly excluded from the estimated equation. A rejection casts doubt on the validity of the instruments.

Testing for endogeneity of explanatory variable solved using Durbin-Wu-Hausman (DWH) approach. As DWH concerned, the endogeneity test was actually testing and comparing the results of the coefficient vectors if one specific model estimated using both by OLS and IV technique. The hypothesis testing procedure of endogeneity test from the reduced form equation (3.1) are as follows;

$H_0 : \beta_1 = 0 \quad ; \; \delta \hat{v}_2 + u_1 \; (uncorrelated)$

$H_1 : \beta_1 \neq 0 \quad ; \; \delta \hat{v}_2 + u_1 \; (correlated)$

Under the null hypothesis of DWH procedure, the endogenous explanatory variable is considered exogenous and if the endogenous regressor (i.e. regressor under the reduced form regression model) had failed to reject under null hypothesis, simply say the v2 and u1 are uncorrelated and y2 is exogenous in the second-stage of the estimation (Wooldridge, 2002). In order for y2 become a valid endogenous instrument in the IV regression, a rejection of null hypothesis needed i.e v2 and u1 are serially correlated. Several standard tests will be conducted to detect the existence of heteroscedasticity and functional form or model specifications by using series of testing procedure proposed by Pesaran-Taylor (1999) and Pagan-Hall (1983).

3.2 Data and Measurements

In this paper, Economic growth for each country will be assessed using real gross domestic product per worker (RGDPW) as an indicators for countries level of productivity (Heston, Summer and Aten (2002). Alternatively, technical output resulted from intensive research and development (R&D) activity are also an indicator used as a catalyst for growth. It was proved that the stock of new accumulated knowledge originated from R&D such as patent significantly contribute to economic growth (Gould and Gruben 1996, Eaton and Kortum 1996 and Kwan and Lai 2003). However due to data availability, patent protection (IP) index instead of total number of patent registered will be employed.

All variables obtained from various trusted secondary databases sources. The selection of countries is limited by the available information after controlling the data quality. Data for inflow of FDI were obtained from United Nation Conference on Trade and Development (UNCTAD, 2003). All data quoted in $US million Dollars for the respective reported years. R&D expenditure is obtained from UNESCO Institutes of Statistic which available online. The R&D expenditure data are quoted as a percentage of Gross National Product (GNP) for each country set. The patent protections index (IP) is adapted from Ginarte and Park (1997) and value for the year of 2000 is obtained from Park and Wagh (2002). Since the selected countries taking periods from 1996 up to the year 2000, therefore indices for the year 1996, 1997, 1998 and 1999 for each country sample were calculated using the same

framework used by the authors. Data for human capital (HCAP) taken from Barro and Lee (2000) and data for current saving (CSAVE) and openness (OPENK) adopted from Heston, Summer and Aten (2002). The black market index (BMI) is obtained from Gwartney et.al, Economic Freedom of the World (various issues). The fractions denoting economic growth disparities between groups are the proxies to income group based on newly release data by the World Bank.

4. Empirical Results and Discussion

As reported by UNCTAD, FDI is the largest source of external financing for developing countries. Most of the developing countries over the last three decades recorded the highest receiver of foreign investment. As shown in Table 4.1, four groups had been identified namely front-runners, above potential, below potential and under-performer respectively. Emerging and developing economies as such Bahamas, Bahrain, Botswana, Brunei Darussalam, China, Chile including Malaysia, Trinidad and Tobago and United Arab Emirates were classified as countries in the Front-runners group. The Front-runners group is defined as countries with high performance and high potential in terms of FDI. Moreover, as reported by UNCTAD in 2003, Botswana is one of the African countries that benefited from receiving higher foreign investment as they are now classified as middle-income instead of low-income countries for years. However, majority of the developing countries is classified as Under-performers such as countries from South Asia like Bangladesh, India, majority form African countries such as Ghana, Kenya, Rwanda, Senegal, some countries from South America and Asia.

Four different IV regression model were estimated. Model 1 is the original, Model 2 includes income group whereas Model 3 and Model 4 estimates the interaction of income classification with two of the exogenous variables, openness and human capital.

FDI is strongly affecting growth in all models. In fact all models reports a stable and consistent sign of coefficient. The contributions of FDI vis-à-vis contributions of IPR, R&D, transparency and current saving towards growth found highly significant. Moreover the validity instruments test in all model are found stable and within the accepted level as suggested by Wooldridge (2002). The endogeneity test of FDI in all model were also found stable and acceptable.

Human capital effects are found highly significant and stable in all models. Majority of studies suggested that human capital is one of the critical elements in achieving higher productivity and growth (Mankiw et.al.,1992 and Miller and Upadhyay, 2000). However, It was also proposed that, the enormous productivity growth and complexity of modern economics were arisen from specialization. An increase in returns to human capital is utilized even if production technology exhibits constant return to scale.

Openness is found to be positively related but weakly significant in some of the model. Though majority of literature found that openness is a significant contributor towards growth (Yanikkaya, 2003), but the strength is some how restrictive when factors such as market size, trade distortion, country policy reform and heavy government intervention is taken into account. Moreover, according to Edwards (1998), the roles of openness to economic growth are somewhat consistent even when different alternative measurements are used. This is an evident that subject to human capital intensity, openness could become the explanations of cross-country growth disparities. This is supporting the statements proposed by Romer (1992), Grossman and Helpman (1991) and Barro and Sala-i-martin (1995) that country with more open have greater ability to advances in terms of absorbing technology generated in the leading nations.

The interactions of income with openness and human capital exhibit some interesting findings. It is found that developing countries growth rates are found 5 percent significantly higher than the developed economies as exhibits by Model 3 and Model 4. Openness among the developing countries found significant in the model (Model 3) with around below 0.5 percent and higher around 0.2 percent compared to developed economies. The contributions of human capital for developing countries was estimated around nearly one percent and more than half percent higher compared to developed nations. This interaction figure exhibit in the model is highly significant in favour of developing economies.

The results for all IV regression model are presented in Table 4.2. On the First stage regression the signed for each excluded instruments coefficient is as expected. Therefore, it suggests that all (excluded) instruments are valid instrument. Validity test also found that, all four variables is found highly significant and accounted around 50 percent of total partial variations. Weakly identification test shows that, all four (excluded) variables are weakly related (accepted) with at least 10 percent relative bias. The test is conducted based on critical value suggested by Stock and Yogo (2005). Weak identification arises when the excluded instruments are correlated with the endogenous regressors but only weakly. Estimators can perform poorly when instruments are weak, but for all models the figure are found to be stable. Over identification test as shown by Sargan and Hansen suggest that the

joint null hypothesis of excluded instruments is statistically insignificant and correctly excluded from the estimated equation. Furthermore, the Durbin-Wu-Hausman (DWH) test for endogeneity in the second stage is for all model found to be highly significant and this would suggests that the endogenous regressors' effects on the estimations are meaningful and accepted.

5. Conclusion

Periods of 1995 to 2000 had significantly changed the way international trading system is manipulated. For the first time, when WTO is established, the cooperation among nations under TRIPS agreements had purposely imposed some standard that need to be followed by all nations. However, the harmonization system is found to be critically and equally important. This paper is an attempt to investigate the role played by FDI, human capital and openness towards growth. However, due to fact that a dynamic feature of macroeconomic variables and evolutions in the growth models, growth in an economy is best explained in various integrated stages. Therefore two-stage least square is deployed. The increase of IPR regime, R&D and saving in emerging and developing countries might help to boost their economy through massive foreign investment. Higher IPR regime will reflect high security to foreign investor whereas stronger R&D activity will reflect the ability of that country to absorbed technology. Meanwhile, higher stock human capital will strengthen the economy through specialization. Openness in general will lead to higher growth for both groups although some analysts have argued that protectionism may help economies to perform swiftly as well.

References

Alan Heston, Robert Summers and Bettina Aten. (2002). Penn World Table Version 6.1, *Center for International Comparisons at the University of Pennsylvania* (CICUP), October 2002.

Barro, Robert J., and Xavier Sala-i-Martin. (1995). *Economic Growth*. New York: McGraw-Hill

Barro, Robert J. and Lee, jong-Wha. (1994). Sources of Economic Growth. *Carnegie-Rochester Conference Series on Public policy*, 40(1): 1-46

Borensztein, E., J. De Gregorio and J-W. Lee. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics* 45: 115-135.

Coe, David T. and Elhanan Helpman. (1995). International R&D Spillovers. *European Economic Review* 39: 859-887.

Cragg, J. G., and S. G. Donald. (1993). Testing identfiability and specification in instrumental variables models. *Econometric Theory* 9: 222-240.

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

Ganguli, Prabuddha. (1998). Intellectual property rights in transition. *World Patent Information* 20: 171-180.

Gastanga, Victor M., Jeffrey B. and Bistra Pashamova. (1998). Host country reforms and FDI inflows: How much different do they make? *World Development* 26(7): 1299-1314.

Gelos, R. Gaston and Shang-Jin Wei. (2002). Transparency and International Investor Behavior. *National Bureau of Economic Research* Working Paper No. W9260. Cambridge MA.

Ginarte, Juan C. and Walter G. Park. (1997). Determinants of patents rights: A cross-national study. *Research Policy* 26: 283-301.

Gould, David M. and William C. Gruben. (1996). The role of intellectual property rights in economic growth. *Journal of Development Economics* 48: 323-350.

Gwartney, James, Robert Lawson and Neil Emerick. (2003). Economic Freedom of the World: 2003 Annual Report. Vancouver: The Fraser Institute. [Online] Available: www.freetheworld.com

Kwan, Yum K. and Edwin L.-C. Lai. (2003). Intellectual property rights protection and endogenous economic growth. *Journal of Economic Dynamics and Control* 27: 853-873.

Lall, Sanjaya. (2003). Indicators of the relative importance of IPRs in developing countries. *Research Policy* 32: 1657-1680.

Liu, Xiaohui and Chenggang Wang. (2003). Does foreign direct investment facilitate technological progress? Evidence from Chinese industries, *Research Policy* 32: 945-953.

Mankiw, N.G, Phelps, E.S., and Romer, P.M. (1995). The Growth of Nations. *Brookings Papers on Economic Activity* 1995 (1): 275-326

                              ISSN 1916-971X E-ISSN 1916-9728

Mankiw, N.G, Romer, D., Weil, D. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics* 107 (2): 407–437.

Markusen, James R. and Anthony J. Venables. (1999). Foreign Direct Direct Investment as a catalyst for industrial development. *European Economic Review* 43: 335-356.

Maskus, Keith E. and Mohan Penubarti. (1995). How trade related are intellectual property rights? *Journal of International Economics* 39: 227-248

Maskus, Keith E. and Christine McDaniel. (1999). Impact of the Japanese patent system on productivity growth. *Japan and the World Economy* 11:557-574.

McCalman, Phillip. (2001). Reaping what you sow: an empirical analysis of international patent harmonization. *Journal of International Economics* 55: 161-186.

Miller, Stephen.M and Mukthi P. Upadhyay. (2000). The Effect of Openness, Trade Orientation and Human Capital on Total Factor Productivity. *Journal of Development Economics* 63(2): 399-423

Paldam. Martin. (2002). The cross-country pattern of corruption: economics, culture and the seesaw dynamics. European. *Journal of Political Economy* 18: 215-240.

Pagan, A. R., and D. Hall. (1983). Diagnostic tests as residual analysis. *Econometric Reviews* 2:159-218.

Park, Walter G. and Douglass Lippoldt. (2003). The impact of trade-related intellectual property rights on trade and foreign direct investment in developing countries. *OECD Papers* Vol. 3, No. 11, Issues 294.

Park, Walter G. and Smita Wagh. (2002). Chapter 2: Index of Patent Rights, *Economic Freedom of The World: 2002*, Annual Report.

Park. Walter.G and Ginarte. Juan Carlos. (1997). Intellectual Property Rights and Economic Growth. *Contemporary Economic Policy* XV, July 1997: 51-61.

Pesaran, M. H., and L. W. Taylor. (1999). Diagnostics for IV regressions. *Oxford Bulletin of Economics and Statistics* 61: 255-281.

Quibria, M.G. (2002). Growth and Poverty: Lesson from Asian Miracle Revisited. *ADB Institute Research* Paper No. 33. Tokyo: ADB Institute.

Rapp, Richard T and Richard P. Rozek. (1990). Benefits and Cost of Intellectual Property Protection in Developing Countries. *Journal of World Trade* 24(5): 75-102.

Romer, Paul M. (1992). Two Strategies for Economic Development: Using ideas and Producing Ideas. *World Bank Annual Conference on Economic Development*, Washington, DC, the World Bank.

Shea, J. (1997). Instrument relevance in multivariate linear models: A simple measure. *Review of Economics and Statistics* 49: 348-352.

Smarzynska, Beata K. and Shang-Jin Wei. (2000). Corruption and composition of foreign direct investment: Firm level evidence. *National Bureau of Economic Research* Working paper No. 7969, Cmbridge MA.

Smith, Pamela J. (1999). Are weak patents rights a barrier to U.S exports? *Journal of International Economics* 48: 151-177.

Smith, Pamela J. (2001). How do foreign patents rights affect U.S exports, affiliate sale and licenses? *Journal of International Economics* 55: 411-439.

Solow, R. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics* 70(1): 65-94

Solow, R. (1957). Technical change and the aggregate production function. *Review of Economics and Statistics* 39: 312 – 320

Stock, J. H. and M. Yogo. (2005). Testing for weak instruments in linear IV regression. In Identification and Inference for Econometric Models: *Essays in Honor of Thomas Rothenberg, ed. D. W. K. Andrews and J. H. Stock*, 80-108. Cambridge: Cambridge University Press.

Takalo, Tuomas and Vesa Kanniainen. (2000). Do patents slow down technological progress? Real option in reasearch, patenting, and market introduction. *International Journal of Industrial Organization* 18: 1105-1127.

UNESCO Institute for Statistics. [Online] Available: http://www.uis.unesco.org/ev.php?URL_ID=4926&URL_DO=DO_TOPIC&URL_SECTION=201.

United Nations Conference on Trade and Development (UNCTAD). (2003). World Investment Report 2003 FDI Policies for Development: National and International Perspectives. United Nations, New York and Geneva 2003.

Varsekalis, Nikos C. (2001). The Impact of patent protection, economy openness and national culture on R&D investment: a cross-country empirical investigation. *Research Policy* 30: 1059-1068.

Wakelin, Katherine. (2001). Productivity growth and R&D expenditure in UK manufacturing firms. *Research Policy* 30: 1079-1090.

Wei, Shang-Jin and Yi Wu. (2001). Negative Alchemy? Corruption, Consumption of Capital Flows and Currency Crises. *National Bureau of Economic Research*, Working Paper W8187. Cambridge MA.

Wint, Alvin G and Densil A. William. (2002). Attracting FDI to developing countries: A changing role for government? *The International Journal of Public Sector Management* 15 (5): 361-374.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.

World Intellectual Property Organization (WIPO). (1996). *WIPO* Publication No. 223(E). Geneva 1996.

Yanikkaya, Halit. (2003). Trade Openness and Economic Growth: A Cross-Country Empirical Investigation. *Journal of Development Economics* 72: 57-89.

Table 4.1. Matrix of inward FDI performance and potential, UNCTAD

	High FDI Performance	Low FDI Performance
	Front-runners (I)	Below potential (III)
High FDI Potential	Australia, Bahamas, Bahrain, Belgium, Botswana, Brunei Darussalam, Bulgaria, Chile, China, Croatia, Cyprus, Czech Republic, Dominican Republic, Estonia, Finland, Hong Kong (China), Hungary, Iceland, Ireland, Jordan, Kazakhstan, Latvia,Lebanon, Lithuania, Luxembourg, Malaysia, Malta, Netherlands, New Zealand, Panama, Poland, Portugal, Qatar, Singapore, Slovakia, Slovenia, Spain, Sweden, Trinidad and Tobago and United Arab Emirates.	Algeria, Argentina, Austria, Belarus, Brazil, Canada, Denmark, France, Germany, Greece, Islamic Republic of Iran, Israel, Italy, Japan, Kuwait, Libyan Arab Jamahiriya, Mexico, Norway, Oman, Philippines, Republic of Korea, Russian Federation, Saudi Arabia, Switzerland, Taiwan Province of China, Thailand, Tunisia, Turkey, Ukraine, United Kingdom and United States.
	Above potential (II)	Under-performers (IV)
Low FDI Potential	Albania, Angola, Armenia, Azerbaijan, Bolivia, Congo, Costa Rica, Ecuador, Ethiopia, Gabon, Gambia, Georgia, Guyana, Honduras, Jamaica, Kyrgyzstan, Mali, Mongolia, Morocco, Mozambique, Namibia, Nicaragua, Nigeria, Republic of Moldova, Romania, Sudan, Tajikistan, Uganda, United Republic of Tanzania, Viet Nam and Zambia.	Bangladesh, Benin, Burkina Faso, Cameroon, Colombia, Cote d'Ivoire, Democratic Republic of Congo, Egypt, El Salvador, Ghana, Guatemala, Guinea, Haiti, India, Indonesia, Kenya, Madagascar, Malawi, Myanmar, Nepal, Niger, Pakistan, Papua New Guinea, Paraguay, Peru, Rwanda, Senegal, Sierra Leone, South Africa, Sri Lanka, Suriname, Syrian Arab Republic, TFYR of Macedonia, Togo, Uruguay, Uzbekistan, Venezuela, Yemen and Zimbabwe.

Source: UNCTAD

Table 4.2. Empirical Results

LnRGDPW	Model 1	Model 2	Model 3	Model 4
LnFDI	0.3108 (0.0622)***	0.1624 (.0427)***	0.1634 (0.0429)***	0.1618 (0.0419)***
LnHCAP	0.9905 (0.2899)***	0.7199 (0.2163)***	0.6650 (0.2224)***	0.9054 (0.2404)***
LnOPENK	0.2132 (0.1271)*	0.1453 (0.1017)	0.2493 (0.1329)*	0.1206 (0.1008)
dlevel_1		0.7657 (0.1376)***	1.9486 (0.8983)**	2.3539 (1.0245)**
dlevel_1*open			-0.2279 (0.2124)	
dlevel_1*hcap				-0.7386 (0.4752)
constant	3.7952 (0.7341)***	5.5082 (0.5955)***	5.1718 (0.6767)***	5.2637 (0.6140)***
Model Diagnostic				
Inst. Validity F(4,43)	12.26***	10.94***	11.09***	10.84***
Weak ID #	12.26*	10.94*	11.09*	10.84*
Over ID	2.980	4.436	5.137	4.576
Endogeneity	27.5660***	18.1699***	17.1959***	18.1124***
Heteroscedasticity	8.171	10.523	11.467	11.10
Reset test	2.48	3.81*	2.76*	2.53
N	50	50	50	50
Root MSE	0.5918	0.3635	0.361	0.3537
Centered R-sq	0.4614	0.8012	0.8083	0.8122

Notes: Figure in bracket is standard error

               # Based on Stock-Yogo (2005) weak ID test critical value

               ***,**,* are significant level at 1%, 5% and 10% respectively

               Reset test is based on Ramsey/Pesaran-Taylor (1999) procedure