ESTIMATING DETERMINANT OF INNOVATIONS BY GENERALIZED METHODS OF MOMENTS WITH PERSISTENCE OF PANEL DATA ON DEVELOPING COUNTRIES

Nurnaddia Nordin
Department of Economics
Faculty of Management & Muamalah
Selangor International Islamic University College
Bandar Seri Putra, Bangi, Selangor, Malaysia
nurnaddia@yahoo.com

Nurhaiza Nordin
Department of Business and Finance
Faculty of Entrepreneurship and Business
University Malaysia Kelantan
Kelantan, Malaysia
nur_haiza@yahoo.com.my

Norzalina Zainudin
Department of Economics
Faculty of Management & Muamalah
Selangor International Islamic University College
Bandar Seri Putra, Bangi, Selangor, Malaysia
norzalina@kuis.edu.my

ABSTRACT

This paper addresses the empirical analysis of determinant of innovations in developing countries by using Generalized Methods of Moments (GMM) estimating on panel data that consists of 52 countries. Innovation defined as a process that attempt to try out new or improved products, processes or ways to do. In order to achieve this phase, past studies address a few determinants of innovations such as human capital, patent, trademark, regulation, stock market and trade openness. This paper analyses the question: which factor will contribute to successful innovation? By using GMM method, we estimate the data at the difference and system GMM with one-step and two steps. The results addresses that trade openness are highly significant in determine innovation in developing countries. Thus our finding provides that free trade is the most important determinant to encourage innovation activities in developing countries.

Keywords: *Innovation, Generalized method of Moments (GMM), Panel data, Developing countries.*

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1. Introduction

Technological progress considered as a crucial determinant of growth. Host countries will have benefit from the diffusion of new technology from other countries. FDI is a particular channel whereby technology spillover from advanced to lagging countries. In some countries, new technologies are developed when innovation takes place. The role of innovation in economic development or growth is important and be among interested issue by economists. Kline and Rosenberg (1986), Bell and Pavitt (1995) define innovation that attempt to try out new or improved products, processes or ways to do. It includes not only technologically new products and processes but also improvements in areas such as logistics, distribution and marketing. In the neoclassical framework, Solow (1957) show the impact of innovation is treated as part of the Solow residual and hence a key contributing factor to economic progress and long-term convergence. In recent decades, due to the popularity of endogenous growth theories, Grossman and Helpman (1991) view that differences in innovation capacity and potential are largely responsible for persistent variations in economic performance. A stepped-up rate of innovation is needed to drive the faster productivity growth that will be required to sustain healthy economic growth rates. Increasing the rate of innovation in many nations can improve their productivity and prosperity and collectively speed the rate of world economic growth. Innovation performance is a crucial determinant of competitiveness and national progress. Additionally, innovation is important to help address global challenges, such as climate change and sustainable development.

The new technologies will emerge when there are healthy growth rate of innovation. The subtle aspects of a country's institutional and microeconomic environment play an important role in determining the productivity of investments in innovation. According to Gans et al. (2000) the determinants of national innovative capacity based on few areas. The first area is the strength a nation's common innovation infrastructure. The key elements of innovation infrastructure are resources for innovation, national knowledge stock and policy measures. Resources for creation and diffusion of new knowledge include R&D expenditures, investment in higher education and funding of basic research and size and quality of scientists and engineers. Innovation policy areas crucial for strong innovation infrastructure include the protection of intellectual property, the incentives supporting R&D and innovation (including tax exemptions), as well as the openness of the economy to trade and investment. A nation's common innovation infrastructure also depends on the level of overall technological development of a country. It is a result of prior investment in the development of technology reflected in knowledge accumulated in earlier periods.

The second area of national innovative capacity is defined as 'cluster-specific innovation environment' that reflects specific advantages for innovative activity concentrated in particular geographic areas. These advantages are a result of stronger local networks that link technology, resources, information and talent as well as higher competitive pressure within the industry cluster. The focus is on clusters rather than individual industries because there are knowledge spillovers and externalities that increase a rate of innovation. According to Gans and Stern (2003), the characteristics of innovative capacity seen from cluster-specific perspective is based on indicators that measure innovation finance and output, such as a percentage of R&D expenditures funded by private industry and concentration of patents across broad technological areas. R&D spending has been widely used as a measure of innovation performance; however, R&D is a measure of the inputs that go into the innovation process rather than of innovation output or success.

1.2 Issue of Study

For many years, researchers have debated about the economic growth and total factor productivity. Among the key factors of growth and productivity are the inflows of FDI. FDI is believed to have beneficial effects on economic growth in the host country due to advantages related to the introduction of new technologies and innovation, new managerial techniques, development of additional skills, increased capital, job creation and improvement of working conditions, improving the human capital, the development of the industrial sector in the host country, broadening of the tax base transfer of the technology and other skills, boosting the economic activity, boosting of export, better integration into the world markets and etc. (Caves 1974; Perez 1997; Haddad and Harrison 1993; Markusen and Venables 1999; Babic and Strucka 2001). The inflow of FDI will benefit the host countries through the technology spillovers specifically R&D. Supported by the Shahrin (2004), among the role of FDI is to facilitate the transfer of new technology to the host economy. FDI provides the fastest and most effective way to deploy new technologies in developing host countries (UNCTAD 2000). Doing R&D is important for productivity and also economic growth. Cohen and Levinthal (1989) express the dual role of R&D activities, that means R&D served both for the creation of new knowledge which is innovation and for the ability of firms to absorb and deploy of knowledge that available externally. Firms that invest in R&D not only directly pursue the innovation, but also keep up with the latest research findings and development in the industry and at the same time gaining first mover advantages in the deployment in the new technologies. According to Cohen and Levinthal (1989) and Goldberg and Kuriakose (2008), R&D is the key input into innovation. The increase of innovation capacities has played a vital role in the growth dynamics of successful developing countries. Previous studies discussed about the determinants of innovation and some of them examine the determinant of innovation solely on the growth.

Based on the arising issue that discusses previously, the further discussion need to be conduct to answer the issue. The panel covers the period from 2000 to 2010 yearly because data for R&D only available late 1990 and most of countries have complete data of R&D starting 2000 onwards. From 105 developing countries only 52 countries selected for this study based on the availability of reliable data over the sample period. In this study, there are six determinants of innovation that list by researchers namely intellectual property rights; financial structure; human capital; trade mark, trade openness and regulation. Table 1 summarizes the definition of variables.

Table 1: Data Definition

Variable	Measurement	Source of data
Innovation	R&D/GDP	Penn World Table (PWT)
Human Capital	Life Expectancy	World development Indicators (WDI)
Patent	Total Patent application	WDI
Trade Mark	Total trade mark application	WDI
Regulation	Rule of law	WDI
Stock Market	Stock market capitalization of listed companies (% of GDP)	WDI
Trade Openness	Import plus Export /GDP	WDI

The rest of the paper is structures as follow. In section 2, we provide an overview of related empirical work. In section 3, we describe the data set that we use and methodology to analyze. The empirical analysis based on Generalized Methods of Moments (GMM) in section 4, in section 5 is conclusion and finally recommendation.

2. Literature Review

Innovation is a new or significantly improved product in term of good or service that introduced to the market or the introduction within a company of a new or significantly improved process. Innovation is based on the results of new technological developments, new combinations of existing technology or utilization of other knowledge acquired by the company. Tidd et al. (2002) organizations to being sustained competitive the most important factor is innovative. Utterback (1994), innovation like life or death ingredient of firms. The innovation processes that are creation, dissemination and application of knowledge have become a major engine of economic growth and become to be more and more precious tool for corporations and countries. According to Morrison et al. (2006) innovation has become a key determinant of competitiveness and growth of nations, region and clusters and firms.

Pioneer economist and policy makers; Solow (1956); Romer (1990); Aghion and Howitt (1992) broadly diffused idea that the innovative capacity and the ability to imitate new technology across regions are the key factors in determine the growth rate of an economic system. The role of innovation in economic development or growth have for a long time been interested by economists. Innovation today is crucial source of effective competition, of economic development and the transformation of society, and this is a "Schumpeterian renaissance". The main components that drive economic growth and increase standards of living are innovation, enterprise and intellectual assets. Innovation is instrumental in creating new jobs, providing higher incomes, provide investment opportunities, control and solve social problems, protect from disease, protect the environment, and protecting our security (Torun and Cicekci; 2007).

In the neoclassical framework, Solow treated the impact of innovation is as part of the residual and hence a key contributing factor to economic progress and long-term convergence (Solow 1957, Fagerberg 1994). The endogenous technological change to explain the growth patterns of world economics had been discussed by Romer (1986), so-called endogenous growth model. According to Romer technological innovation is created in the R&D sectors using human capital and the existing knowledge stocks, then it is used in the production of final goods and leads to permanent increases in the growth rate of output. These models postulate that endogenously determined innovation enables sustainable economic growth, given that there are constant to innovations in terms of human capital employed in R&D sectors.

The empirical studies on role of innovation have been conducted by researchers. Sarel, (1997); Nelson and Park, (1999); Iwata et al.(2002) and Park, (2010), some Asian countries have succeeded in mobilizing another powerful source of growth which contributed to their rapid catch-up based on the role of technological change, and more generally innovation, in the catching-up process. Porter and Stern (2000) find that innovation is positively related to human capital in the R&D sectors and national knowledge stock. Hulya (2004) both developed and developing countries in OECD and non-OECD countries show that innovation has a positive effect on per capita outputs. However, only the large market OECD countries are able to increase their innovation by investing in R&D and the remaining OECD countries seem to promote their innovation by using the know-how of other OECD countries. Rosenberg (2004), long term economic growth is dependent on technological innovation, with the latter, most commonly expressed in terms of the investment made in research and development (R&D).

The role of innovation that discussed previously show that the important of innovation to economic performance. The key drivers of innovation has broadly explored by the researchers. Economist tend to introduced there are various determinant of the innovation such as an intellectual property rights; market structure; financial structure; corporate governance; geography; demand; human capital; technology policy and also regulation. To shape the economic growth, intellectual property helped make possible the conditions for innovation, entrepreneurship and market-oriented. The system of property right (IPRs) protection may affect the pace of innovation. IPRs protection is needed because it is the way through which incentives to inventive activities are provided. IPRs are policy instruments that play an increasingly important and positive role in driving innovation and expanding information. By stimulating innovation, information and creativity, IPRs directly affect economic performance and create economic growth through increased productivity, increased trade and investment, and expanded economic activity. Intellectual property refers to the exclusive rights granted by the state over creations of the human mind, in particular, inventions, literary and artistic works, distinctive signs and designs used in commerce. Intellectual property is divided into two main categories: industrial property rights, which include patents, utility models, trademarks, industrial designs, trade secrets, new varieties of plants and geographical indications; and copyright and related rights, which relate to literary and artistic works.

Early studies by Kamien and Schwartz (1972, 1976) investigate how R&D spending varies a by considering market structure as an exogenous variable and pointed out that innovation does not increase monotonically with concentration but, intermediate market environments between perfect competition and monopoly, are more likely to produce the best conditions to perform innovative activities. According to Schumpeter ideas, Scherer (1983) found that larger firms provide better conditions to invest in new technologies. The empirical literature on the relationship between market structure, firm size and innovation is extensive, and there are studies that agree with market structure be the determinant of innovation. Cabagnols and Le Bas (2002), one of the determinants of innovation used is market structure (measured by the Herfindahl Hirschman Index). Baldwin et al. (2002) have reported various determinants of product and process innovation such as firm size, ownership (foreign vs. local), number of competitors, R&D activity, patents, trade secret protection, and collaboration agreements. Mohnen and Dagenais (2002) found that the propensity to innovate in Denmark is significantly determined by industry type, firm size (measured by number of employees) and group subsidiary. Cainelli et al. (2001) study on Italy by examines the determinants of innovation in terms of explanatory variables such as firm size, geographical areas, and industry type.

The financial structure play crucial role to attract the investment in innovative purposes. Hall (2002) state that innovative processes are characterized by extreme uncertainty, assets' intangibility, relevant asymmetrical information and moral hazard problems; on the other hand, Levine, (1997, 2004) state that financial systems, composed by markets, institutions and instruments, have constant functions and changeable structures. Firms that involve in innovative activities basically hold the specialize assets equipment and a large share of immaterial assets, such as patents and research knowledge, so then innovative firms will have much financial structure compare to the low innovative firms. Firms with a higher productivity and guarantee higher aggregate productivity are more capable to get funding by financial systems because differences in the propensity to innovate are likely to translate into difference total factor productivity[1].

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[1] Griliches and Lichtenberg, 1984.

The empirical literature presents some evidence in favor of a positive role of human capital in shaping the pace of innovation. As an example Benhabib and Spiegel (1994), using cross country data, do not reject the presence of an additional source of influence of human capital on economic growth due to the interaction with technology. Cross-country data are used as well by Hall and Jones (1999) who detect a strong correlation between human capital and TFP. the level of human capital, which can be represented by the level of schooling, skills and competencies of a given population, is seen as a key determinant of economic growth (Lucas, 1988; Mankiw et al., 1992).

Lucas (1988), investments in human capital produces positive externalities that enhance the economic system's productivity and foster his growth's rate. This can be explained because technological change is positively affected by the average level of human capital which determines, as Schultz (1975) argued, the ability of individuals to adapt to an environment characterized by technological dynamics. Nelson and Phelps (1966) gave a seminal contribution in the study of the interaction between human capital and technological change. Roughly speaking, the intuition is that different levels of human capital determine differences across countries in the technology adopted and affect the way in which those technologies are used. Recently Acemoglu et al. (2012), build a model in which they found explicitly that a country with less skilled workers would have greater difficulties in implementing effectively technologies belonging to the innovation possibilities frontier, because of the derived lack of absorptive capacity.

3. Methodology

3.1 Empirical Model Specification: Dynamic Empirical Model

Dynamic panel data (DPD) approach is usually considered the work of Arellano and Bond (1991) that extended from the Holtz-Eakin and Rosen (1988). The DPD models show the ability of first differencing to remove an unobserved heterogeneity. This model may contain one or more lagged dependent variables that allowing for the modeling of a partial adjustment mechanism. Our empirical specification is aimed at explaining the determinant of innovations in developing countries. The model can be expressed as follows:

$$INNO_{it} = \alpha INNO_{i,t-1} + \beta_1 HC_{it} + \beta_2 PTN_{it} + \beta_3 TM_{it} + \beta_4 REG_{it} + \beta_5 TO_{it} + \beta_6 SM_{it} + \mu_i + \epsilon_{it} \quad (1)$$

where i is country index, t is time index, INNO is logarithm of expenditure on R&D percentage of GDP, HC is logarithm of human capital, PTN is logarithm of patent, TM is logarithm of trade mark, REG is logarithm of regulation, TO is logarithm of trade openness, SM is logarithm of stock market μ_i is unobserved country specific effect term and ϵ_{it} is the usual error term.

3.2 Estimation Procedure: Generalized Method of Moments (GMM)

This study applies the generalized methods of moments (GMM) panel estimators by Holtz Eakin et al, (1988) and extended by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). This study estimate the DPD using GMM because the present lagged dependent variable give rise to autocorrelation, to control for country specific effects, which cannot be done using country specific dummies due to dynamic structure of the regression equation, control for a simultaneity bias caused by the possibility that some of the explanatory variables may be endogenous and the panel data set has a short time dimension (T) and larger country dimension (N) (Arellano and Bond,1991; Arellano and Bover, 1995;

Blundell and Bond, 1998). Based on the Arellano and Bond (1991) model Equation (1), we transform our model as follows:

$$INNO_{i,t} - INNO_{i,t-1} = \alpha(INNO_{i,t-1} - INNO_{i,t-2}) + \beta_1 (HC_{i,t} - HC_{i,t-1}) + \beta_2 (PTN_{i,t} - PTN_{i,t-1}) + \beta_3 (TM_{i,t} - TM_{i,t-1}) + \beta_4 (REG_{i,t} - REG_{i,t-1}) + \beta_5 SM_{i,t} - SM_{i,t-1}) + \beta_6 (TO_{i,t} - TO_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (2)$$

This model eliminate the country specific effects, but at the cost of (i) introducing serial correlation in the error term and introducing regressor error correlation (endogeneity). To address the possible simultaneity bias of explanatory variables and the correlation between $(INNO_{i,t-1} - INNO_{i,t-2})$ and $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$, Arrelano and Bond (1991) this lagged of the regressor used as a instruments variables. This is valid under the assumptions that the error term is not serially correlated and lag of the explanatory variables are weakly exogenous. This approach is known as difference GMM estimation.

The consistency of GMM estimators depends on two specification test. First Arellano and Bond (1991) proposed to test the overall validity of the instrument with Sargan's over identification test, which is based on the overall validity of the instruments by analyzing the sample analogue of the moment conditions used in the estimation process (Baltagi 2005). The hypothesis is being tested with the Sargan test is that the instrumental variable are uncorrelated to some set of residuals, and there for they are acceptable, healthy instruments or "the instruments as a group are exogenous". If the null hypothesis is confirmed statistically (that is not rejected) the instrument pass the test. They are valid by this criterion. Therefore, the better estimation indicates with the higher the p-value of the Sargan test. The test statistics result do not mislead of the model.

The second test is serial correlation that refer to first order and second order serial correlation in the residuals. When we use time series data auto-correlation generally occurs. Autocorrelation is a special case of correlation, and refers not to the relationship between two or more variables, but to the relationship between successive values of the same variable. One of the assumptions of regression analysis is that the error terms are independent from one another. Formally, this assumption is expressed as $E(\varepsilon i \varepsilon j) = Cov(\varepsilon i \varepsilon j) = 0$ for all $i \neq j$. The violation of this assumption gives rise to auto correlation. If this assumption is not satisfied it means that the values of the error term are not independent, that is, the error in some period influences the error in some subsequent period next period or beyond. Windmeijer (2005) has shown that the estimated asymptotic standard error of the two step GMM estimator can be severely biased downward in case of small sample. Hence the auto correlation test in the dynamic panel model is very important together with the parameter estimations. The first and second order serial correlation tests are reported by the AR (1) and AR(2) respectively. At 5% significant level the first order serial correlation test AR(1) usually rejects the null hypothesis. The second order test AR(2) is more important because it will detect auto correlation in levels. The second order serial correlation and the Hansen over identification test indicate that the model is adequately specified. The GMM estimators is consistence if there is no second order serial correlation in the residuals. The dynamic panel data model is valid if the estimator is consistence and the instrument are valid and failure to reject the null of both test provides support to estimated model.

4. Results and Discussion

At the first and second stage of estimation with Difference GMM and System GMM that we discussed, the best estimations are list in Table 2. The time dummy variable has no impact on significant level that means this model does not influence by time dummy. The specification test showed the consistence result without include time dummy. The valid result for Difference GMM and System GMM is at two-stage estimation.

Table 2: Specification of Difference and System GMM

Variable	Two-Step Difference GMM	Two-Step Difference GMM with Robust SE	Two-Step System GMM	Two-Step System GMM with Robust SE
Constant	0.7097	0.7097	0.5127	0.5127
	(1.46)	(1.15)	(1.33)	(0.66)
Lag Inno	0.4576	0.4576	0.6499	0.6499
	(13.48)***	(4.29)***	(25.69)***	(6.34)***
HC	0.0418	0.0418	0.0409	0.0409
	(5.76)***	(3.52)***	(7.53)***	(2.16)**
PTN	0.1653	0.1653	0.2009	0.2009
	(3.82)***	(2.95)**	(7.05)***	(2.34)**
TM	-0.1687	-0.1687	-0.1673	-0.1673
	(-2.71)***	(-2.36)**	(-4.34)***	(-2.06)**
REG	0.6006	0.6006	0.1350	0.1350
	(2.83)***	(2.12)**	(0.87)	(0.27)
SM	-0.0817	-0.0817	-0.0456	-0.0456
	(-3.55)***	(-2.41)**	(-1.68)*	(-0.87)
TO	0.2053	0.2053	0.2363	0.2363
	(3.36)***	(2.55)**	(3.55)***	(1.98)**
Sargan Test	10.5440		15.7830	
	(0.6490)		(0.6077)	
AR(1)	0.1574	0.1448	-0.2396	-0.2263
	(0.8749)	(0.8849)	(0.8106)	(0.8209)
AR(2)	0.0268	0.02519	-0.4026	-0.3860
	(0.9786)	(0.9799)	(0.6872)	(0.6995)
N (number of instrument)	21	21	26	26
Observation	52			
T	2000-2010			

Notes: All models are estimated using the Arellano and Bond dynamic panel GMM estimation (Stata xtabond command). The variables are defined as follows: INNO = innovation, HC = human capital, PTN = patent application, TM= trademark, REG= regulation, SM= stock market, TO= trade openness, AR(1) = Auto-covariance of order 1, AR(2)= Auto-covariance of order 2, N= number of instruments, T= time Figures in parenthesis are t-statistics, except for Sargan test, which is p-value *** and ** indicate significance at the 1% and 5% levels, respectively.

Since the lagged dependent variable of difference GMM (0.4576) is underestimate than the value at system GMM (0.6499) based on Table 4, so we decide to select the System GMM specification. As Blundell and Bond (1999) note “If the instruments used in the first-differenced estimator are weak, then the difference GMM results are expected to be biased in the direction of within groups.” Although, the Sargan test does not reject our choice of instruments (p=0.6490), it does not exclude the weak instruments problem. The systems GMM provide sensible parameter estimators with greater value of lagged dependent variable and supported there the Sargan test clearly indicate the validity of all instruments.

The other reasons of system GMM estimate has an advantage over difference GMM in variables that are “randomwalk” or close to be random-walk variables (Bond, 2002; Roodman 2006; Baum, 2006; and Roodman, 2007). The SGMM approach generally produces more efficient and precise estimates compared to DGMM by improving precision and reducing the finite sample bias (Baltagi, 2008). Hence, we proceed from the system GMM and keep in mind that the estimators are probably downward biased.

Several studies have assessed the role of trade openness on innovation. They generally find that openness to trade is one of the framework conditions that can strengthen innovation (e.g Coe and Helpman, 1995; OECD 2010; Aw et al. 2010; Van Long et al. 2011). In lines with the past literature, our empirical results indicate that in developing countries, trade openness play an important role in improving or enhance innovation. Based on results reported in Table 4, the coefficient values of trade openness is 0.2363. The economic interpretation of these coefficients is that 1 percentage point increase in trade openness would lead to increase 0.2363 percentage point in innovation in developing countries. The second determinant that shows highly influence innovation in developing countries based on our analysis is patent that shows positive sign with innovation and value of coefficient is 0.2009 by the differences only 0.0354 with trade openness. These results indicate that the important of patent in developing countries in improving or enhance innovation and this supported by OECD (2004) patents are important to new technology-based firms because such firms often have few assets need patent protection to attract venture capital.

Besides that, regulation also reported plays a significant role on innovation. The past literature had been discussed the effect of regulation, according to Geroski (1991); Koch et al. (2004); and Aghion et al. (2005) regulation there are positively effect of regulation on innovation. The role of human capital toward innovation show the coefficient value is 0.0409. Although the contribution of human capital is only 0.0409 on innovation when one percentage point increase in human capital, but the value show that there is positively impact to innovation. This is line with the past literature that human capital is a relevant driver of innovation (Hall and Jones, 1999; Benhabib and Spiegel, 1993; Zilibotti, 2001).

This study discussed and analyzes six determinants of innovation in developing countries. Four indicators discussed before show there are positively relationships with innovation, and the other two indicators show there are negatively relationship with innovation. From our analysis, trade mark and stock market indicate the negative sign with innovation with the coefficient value -0.1673 and -0.0456. These indicate that in developing countries, the role of stock market is failure in enhancing innovation activities. The ability of stock market as an internal source of funding in enhancing the innovation activities in developing countries is not enough to speed the innovation and need to support by the external funding. According to Rajan and Zingales (1998) industrial sectors in more need of external finance (from develop countries) to develop faster in countries with higher financial sector development. Trade mark shows negatively sign as the determinant of innovation, because according to the past literature trade mark should be as proxy or indicator for innovation (Godinho, 2011). Thus, we can state that in developing countries, trade openness play a crucial role to enhance innovation and followed by patent, regulation, human capital.

5. Conclusion and Recommendation

This study provides the empirical evidence of the determinants of innovation, based on panel data from 52 selected developing countries over the 2000-2010 periods. The empirical results utilizing dynamic panel GMM techniques that analyze trade openness, patent, regulation, human capital, stock market and trade mark as a determinant of innovation. Our results suggest that the main determinant of innovation in developing countries is trade openness and support by patent, regulation and human capital. Stock market show negatively toward innovation, which means that innovation in developing countries need to be supported by the huge or more develop stock market. Finally, the last variable that we used as a determinant of innovation that is trade mark should be use as a proxy for innovation and not to be as a determinant of innovation.

Developing countries have to open their trade in order to encourage innovation activities and supported by the regulation (social, government and institutional), because based on our empirical analysis, trade openness play a crucial role as a determinant of innovation. Thus, government play an important role in order to encourage inflows of trade in developing by providing the environment that conducive for foreign investors such as elimination of tariff and no-tariff barriers for goods and investment. Trade is one of the most important channels of technology spillovers as mention by Acharya and Keller (2009), Coe et al. (2009) and Ang and Madson (2013). Thus policy maker should not neglected trade policies or any changes of the regulation of trade and investment by government because it will impact the trend of trade and investment flows to host countries. Besides that, the role of human capital on innovation needs to give more attention. As we seen in developed countries, human capital plays an important role to their economic development.

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