International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 8, Issue 4, 2019

The Determinants of Total Factor Productivity Across MENA Region

Nayef Al-Shammari[a], Monira Al Rakhis[b], [a,b]Economics Department, College of Business Administration, Kuwait University, Email: [a]alshammari@cba.edu.kw, [b]monira.alrakhis@gmail.com

This research aims to analyse the main determinants of total factor productivity of selected developing countries in the MENA region, with a focus on human capital as the main source of endogenous growth in these economies. The study employs macroeconomic factors to study the effect of human capital on productivity in a regional panel approach using a two-stage Fixed Effects regression. In a parallel model, Stochastic Frontier Analysis is used to determine the technical efficiency of factors of production in order to confirm the role of human capital in the performance of the selected countries. Microeconomic factors are then used using cross-sectional data to determine the role of education on firms' performances. The study provides positive and significant results for the effect of human capital and education on productivity, suggesting several policies towards the sustainable growth of these economies.

Key words: *Economic Growth Theories, Human Capital, Returns on Education, Total Factor Productivity.*

Introduction

Endogenous growth theories provide great insight on the differences between countries' standards of living. The reason why developing countries lag in their economic performance transcends income levels and is explained by the economies' productivity factors. This is illustrated in the 'vicious circle' phenomenon where low-income countries have low saving rates, which, in turn, leads to low investment and productivity levels. Thus, low-income levels are evident (Bauer, 1965). This emphasises the role of productivity in economic growth and development and creates the framework of this study.

This study aims to analyse the contributing factors of productivity in selected developing Arab and MENA states. Prior to analysing these determinants, it is important to examine the economic performance of these selected countries. As for per capita income levels, Figure 1 in Appendix A shows the different per capita income levels (measured in GDP per capita in constant 2010 US$) of different regions around the world as of 2015. This clearly illustrates the significant differences between regions in terms of standards of living. As shown in Figure 1, the lowest two regions are the Arab World and Sub-Saharan Africa with $6,412 per capita and $1,657 per capita, respectively. This reveals the importance of specifically selecting Arab states (some of which are in Sub-Saharan Africa) countries in the sample of developing economies to analyse in this research.

In considering the labour intensive nature of these developing economies, it is crucial to examine the role of human capital. Human capital is a factor of production that drives the growth and prosperity of these economies through increased productivity. A comprehensive indicator of human capital is the Human Development Index (HDI), which measures the education and health levels, as well as standards of living, of a certain population (Human Development Index, 2016). Along with South Asia, Figure 2 of Appendix A compares HDI levels of the Arab and Sub-Saharan Africa worlds. These countries are considered to have the lowest HDI levels in the world, with rates equal to .687 and .523, respectively. This study will consider specific indices of each country.[1].

The effects of human capital on the economic performance of selected developing economies will be examined in this study. The impact on economic growth of these countries will be investigated through measuring the productivity and technical efficiency of employed production factors. This study is made to confirm that human capital not only drives the productivity of these economies, but also plays a role in producing in the most efficient ways possible. As mentioned previously, since the Human Development Index measures several factors of human well-being, it is only used in aggregate regional models with macroeconomic variables. To specifically test the effect of education levels on productivity, a microeconomic model will be used to examine which level of education specifically leads to higher productivity. This will provide a detailed analysis for future policy recommendations towards creating knowledge-based economies and, subsequently, higher standards of living.

Following a review of current income and human development trends, this paper will present a comprehensive research on the how total factor productivity occurs. Section II presents a selection of the literature covering topics in economic growth, human capital, and productivity. Section III explains the data methodology and empirical models used in each section of the paper. Section IV will provide a description of the regional and firm-level data used in the analysis. Section V will present empirical results and will provide an analysis for the regional (OLS and SFA) as well as the firm-level models. Finally, sections VI, VII, and

[1] Countries were selected based on availability of data.

VIII will provide concluding remarks as well as policy and further research recommendations.

Literature Review

This section provides a selection of literature on basic theoretical frameworks related to economic development and growth theories. Secondly, the role of human capital in economic development and its effect on productivity is highlighted. Finally, case studies analysing the role of education on economic productivity are reviewed.

The Classical Keynesian Model of economic growth was introduced by Harrod (1939) and Domar (1946), and states that economic growth depends on the level of saving and productivity of capital. Carrying implications for less-developed countries, it is assumed that the lack of capital investment is the source of the slow economic growth since these countries do not have sufficient income to have high levels of saving. It is criticised, however, in the sense that this model treats economic growth and development equally, whereas growth is in fact a subset of development and a long-term phenomenon (Solow, 1994).

This model was then followed by the Neoclassical Exogenous Growth Model of Solow (1956) and Swan (1956) which introduces labour to the Harrod-Domar model and, therefore, differentiates between short and long-term economic growth. In the short-term, the economy moves at a steady pace by changes in capital investment, labour force, and depreciation. In the long-term, however, growth is only achievable through technological progress; an exogenous variable in the model that measures increases in total factor productivity attributable to improvements in production efficiency. This exogenous variable is measured by what is known as the Solow Residual of the Solow-Swan Model (Romer, 2012).

Endogenous Growth Theory considers economic growth as the result of internal causes such as investment in human capital, innovation, and knowledge. Lasting growth rates and the development of an economy depends on policy measures directed at a knowledge-based economy (Romer, 1994). Such policies include promoting openness, competition and innovation. Fischer, Scherngell, and Reismann (2009) provide evidence of the knowledge spill-over effect on productivity and is consistent with the idea of growth from within.

The role of innovation is emphasised in Schumpeter's Theory of Economic Development where he claims that innovation is what drives the business cycle and leads to development (Schumpeter, 1934). Tan (2013) provides evidence of the effect ICT advances on total factor productivity and supports endogenous growth theories of knowledge-based economies as well.

The importance of investing in people and the role of human capital is highlighted in Theodore Schultz's work. He underlines the importance of health, education, and improved capabilities to transform human resources into human capital (Schultz, 1972). Human capital is considered a main component of the overall development of nations, as opposed to short-term economic growth brought about by other factors of production. Investing in human capital and its formation is therefore crucial in order to sustain growth, especially in labour-abundant countries such as the developing countries that will be used in this research.

Mankiw, Romer, and Weil (1992) provide an augmented Solow model that includes human capital accumulation that contributes to economic growth and is measured by levels of education. The relevance of this contribution centres on how levels of GDP per person, per capita, is explained by investment rates in human capital compared to other indicators of productivity. Becker and Mincer explain the role of training, education, and knowledge on human capital and the productivity gains realised from investing in such areas (Becker, 1993).

Human capital is also central to the United Nation's approach of evaluating the economic development of different countries through the Human Development Report. This Report estimates human capital using the Human Development Index (HDI) and measures standards of living as well as health and education levels of a certain population as a proxy for human capital (Human Development Report, 2016). The Human Development Index is underpinned by Amartya Sen's 'capabilities approach' and explains that human capabilities in functioning depends on available capacities and options, such as freedom, education, and health (Sen, 1989). Human capital is linked to the wealth of nations through education and leads to differences in total factor productivity (Manuelli and Seshadri, 2014). Moreover, in a firm-level study, the role of human capital was found to significantly contribute to firms' performances, encouraging investment in training firm-specific human capital (Crook et. al, 2011).

Methodology

The model used to analyse the determinants of total factor productivity (TFP) is based on new endogenous growth theories where economic growth is driven by productivity initiatives: capital and labour. The analysis can be conducted using a pooled approach of a fixed effect technique. Since the ultimate goal of the study is to investigate the determinants of TFP in selected developing economies, the process will be divided into two stages.

The Cobb-Douglas production function $Y = AK^{\alpha}L^{\beta}$ is used as the base to estimate TFP in the first step and is similar to the approaches used by Hall and Jones (1999), Cole and Neumayer (2006) and Islam (2008). This extracted variable then is used as a dependent variable in the second step. The standard Cobb-Douglas production function is used as specified below:

$$Y = AK^{\alpha}L^{\beta}, 0 < \alpha < 1 \qquad (1)$$

Y is the real GDP, A is TFP, K is the capital stock, and L is the total labour force. The per capita intensive form of the model is obtained and rewritten in a natural logarithm:

$$lny = lnA + (\alpha + \beta - 1)lnL + \alpha\, lnk \qquad (2)$$

For empirical estimation purposes, the previous equation will be written in the form:

$$\ln y_{it} = \phi_i + \alpha \ln k_{it} + (\alpha + \beta - 1)\ln L_{it} + \varepsilon_{it} \qquad (3)$$

Hence, total factor productivity is generated as follows:

$$tfp_{it} = (\phi_i + \varepsilon_{it}) = lnA \qquad (4)$$

The subscripts "i" and "t" denote the country and time, respectively, for the panel data of eight countries during the period from 1990-2014. The total productivity factor can now be defined as ($\phi_i + \varepsilon_{it}$) and is equal to lnA in the natural logarithm equation of the per capita intensive form of the model.

The second stage uses the TFP estimated in the first stage as the dependent variable to largely estimate the effect of human capital (represented by Human Development Index) on productivity. This indicator offers an overall indication of individual education and health levels, including welfare. The other independent variables used in the model include economic activity, trade openness, labour force, and investment following previous growth and productivity studies.

The model is as follows:

$$TFP_{it} = \delta_i + \theta_1\, Trade_{it} + \theta_2\, HDI_{it} + \theta_3\, GDP_{it} + \theta_4\, Investment_{it} + \theta_5\, Labour_{it} + \varepsilon \qquad (5)$$

With regard to the above model, (i) '*TFP'* is the Total Factor Productivity, (ii) 'Trade' represents trade openness, (iii) 'HDI' is the Human Development Index as a proxy for human capital, (iii) 'GDP' the annual GDP growth to represent economic activity, (iv) 'Investment' represents the investments measured by capital stock, and (v) 'Labour' represents the total labour force. In light of previous studies and economic theories, it is expected that these factors will have a positive effect on total factor productivity.

As introduced by Aigner, Lovell, and Schmidt (1977), Stochastic Frontier Analysis is used to identify the technical efficiencies of a country's production factors and how these impact 'production frontiers'. A Stochastic Production Model is created in order to measure the degree of technical efficiency, or how efficiently inputs are used given the technology levels embedded in production function. The nature of the Stochastic Frontier Model is as follows:

$$q_i = f(z_i, \beta) \qquad (6)$$

This analysis assumes that each firm (or in the context of this research, country) potentially produces less than its potential output owing to a degree of inefficiency. The Frontier Model with this level of inefficiency is as follows:

$$q_i = f(z_i, \beta)\ \xi_i \qquad (7)$$

Where the level of technical efficiency is denoted by ξ_i and must be in the interval (0,1]. If the firm (or country) produces optimal output with the available technology, then $\xi_i = 1$. Otherwise, $\xi_i < 1$ will be the case of producing with certain levels of inefficiency (Kumbhakar and Lovell, 2003).

The technical efficiency is subsequently extracted and used as a dependent variable, This dependent variable is seen as a proxy parallel in total productivity in order to find the main determinants of technical efficiency. The variable is presented as follows:

$$TE_{it} = \delta_i + \theta_1\ Trade_{it} + \theta_2\ HDI_{it} + \theta_3\ GDP_{it} + \theta_4\ Investment_{it} + \theta_5\ Labour_{it} + \varepsilon \qquad (8)$$

A regional-level model provides a holistic view of human capital effect on productivity. On the other hand, a cross-country firm level analysis uses microeconomic data to specifically test the effect of a labour force's education on a firm's productivity. This makes possible a microeconomic analysis of the role human capital plays in a firm's performance. Similar to conclusions were reached by Crook et al (2011).

The model of this analysis will take the following form:

$$\text{Sales}_{it} = \alpha + \beta_1\text{Infrastructure}_{it} + \beta_2\text{Innovation}_{it} + \beta_3\text{RD}_{it} + \beta_4\text{Capital}_{it} + \beta_5\text{AvgEdu}_{it} + \beta_6\text{HighEdu}_{it} + \varepsilon \qquad (9)$$

With regard to the Model above, the dependent variable 'Sales' represents total annual sales of all goods and services and is used as a proxy for the firm's productivity. Concerning the independent variables, 'Infrastructure' represents exactly that and is measured by the experience of power outages (no doubt expected to yield a negative correlation with sales).

'Innovation' is measured by the number of new methods for input, production, or sales; 'RD' denotes Research and Development, 'Capital' is that which measures the purchase of assets, lands, etc. Regarding the final sets of vaiariables, "AvgEdu" represents the average level of education and "HighEdu" the highest level of education obtained by employees (university degree or higher). The last two variables "AvgEdu" and "HighEdu" are the interest variables of this model and at least one of them is expected to yield a positive correlation with firm sales.

Data Description

The regional panel dataset used in the first two-step approach comprises eight selected countries from the Arab and MENA region[2] from 1990 to 2015. These countries were selected based on the availability of data for the variables chosen in this model. For the firm-level microeconomic analysis, data was collected from the World Bank Enterprise Surveys for three of the countries included in the regional dataset: Jordan, Morocco, and Tunisia for the year 2013.

The variables used in this model represent several institutional factors and are based on each firms' survey responses regarding that specific topic or issue. As for the first step in the regional panel dataset, the variables used to calculate Total Factor Productivity were: Real GDP (constant 2010 US$) as a proxy for output (Y), Gross Fixed Capital Formation (constant 2010 US$) as a proxy for capital, and total labour force as a proxy for labour. These indicators were all extracted from the World Bank's World Development Indicators Database.

The intensive per capita form is then derived using these variables. This is done to obtain real output per worker and real capital stock per worker so as to use in the first model to extract TFP[3]. The second step of the model focuses on the extracted TFP variable and is used as the dependent variable. The independent variables used were trade openness (total exports and imports as a percentage of GDP), GDP Growth (annual percentage), Gross Fixed Capital Formation (GCFC), and total labour force. These were acquired from the World Bank World Development Indicators while the Human Development Index (HDI) was obtained from the UNDP Human Development Reports (1990-2015).

Empirical Results and Analysis

After establishing the aggregate two-step and firm-level endogenous models, this section provides an analysis of the Fixed Effects regression results presented in Appendix B. The

[2] The countries included in this dataset are: Algeria, Egypt, Jordan, Morocco, Mauritania, Sudan, Tunisia, and Iran

[3] Appendix B.

results aim to identify the role human capital plays in roductivity (aggregate regional model) and specifically the role education plays in firm productivity via the firm-level analyses.

With regard to the natural logarithm of intensive-form variables (output per worker, capital per worker, and labour force) and by running a Fixed Effects[4] regression, the results in Table 1 show the significance of labour (Lnl) and capital per worker (Lnk). As expected, positive coefficients exist. An increase in labour force and in the amount of capital each worker has leads to an increase in output per worker. The coefficients of Lnl and Lnk are .476 and .009, respectively. Since the coefficient of Lnl is ($\alpha + \beta - 1 = .476$), the elasticity of output with respect to labour (β) is equal to 1.467. The production function has increasing returns to scale since $\alpha + \beta = .009 + 1.467 = 1.467$ and is greater than 1.

The overall R-squared value of the model, however, is low (.0827) and indicates that these variables inadequately explain the disparity in dependent variable (Lny). This contributing indicator to output per worker may be attributed to variables other than capital and labour. It is because of this that the Solow Residual, whereby output per worker is driven by exogenous variables, becomes evident (Solow, 1956). The error terms of this model were extracted and added to the constant to provide an estimate for total productivity as explained in section III. Total productivity estimates will be used in the second stage of this process to recognise the main determinants of total productivity.

The results of the aggregate model indicate findings consistent with those presented in the relevant literature. Fixed Effects regression was initially used (in Table 2) but the results demonstrated a problem with heteroscedasticity. A robust standard error in an OLS regression was subsequently used to amend this problem to provide reliable results as shown in Table 3.

The Human Development Index significantly and positively affects total productivity, in support of Mankiw, Romer, and Weil (1992). Clearly there are positive effects on the endogenous and economic growth of human capital and productivity. Since the variable of interest is consistent with the theoretical base of this analysis, it is also important to explore how other variables affect total productivity in the selected sample.

Trade openness has a positive and significant effect on productivity and is supported by the literature on increased productivity through trade openness and specialization (Weinhold & Rauch, 1999 and Yean, 1997). Investment, which is measured by gross fixed capital formation, likewise has a significant and positive effect on productivity. This is a rational

[4] Hausman Test confirms the use of the Fixed Effects model since the p-value is less than .05.

result whereby higher investments in capital provide an adequate base from which there is increased employment and production. Thus an increase productivity is achieved.

An unforeseen result in this model was to do with one control variable, labour, being significantly negative to total productivity. This could be explained by diminishing marginal returns of labour (Varian, 1992). As capital investment positively influences productivity as mentioned above, it is critical to mention that countries in this sample are developing countries and such investment may not yet be sufficient to accommodate an increasing labour force. It is also possible that even though the labour force is increasing, workers are not accurately allocated to positions that match their skills and qualifications. This mismatch leads to a decline in their productivity.

Table 4 provides a model paralleling one displayed in Table 3. The dependent variable in this model, however, is the technical efficiency of labour and capital per worker derived through a Stochastic Frontier Model[5]. Technical efficiency measures how efficiently resources are used to produce output as opposed to that being produced given a certain input (productivity). In order to clarify the importance of human capital on the overall development of an economy, a model for technical efficiency determinants is used. As expected, the Human Development Index has a positive and significant outcome on technical efficiency. This outcome highlights the importance of human capital on both productivity and efficiency of these economies. This analysis relied on robust estimates presented in Table 5 and only after resolving the issue of heteroscedasticity in the Fixed Effects results of Table 4.

The firm-level analysis focuses on the effect of education (average education and high-level education) on the annual sales of sample firms. This section is important as it specifically tests the levels of a workforce's education. It also assesses the performance of firms so as to confirm the positively significant HDI results previously achieved in the aggregate model. Additionally, cross-section regression is applied for Jordan (results are not reported due to space limit). Results show that the highest levels of education obtained by employees (university degree or higher) have a significantly positive effect on firms' annual sales.

The variable used to represent infrastructure is negatively significant and indicative of power outages. Given this, it is evident that that improved infrastructure and less power outages will lead to higher productivity and annual sales for firms. Finally, Research and Development is negatively significant and can be attributed to the high allocation of resources and low productivity of researchers in generating new ideas during that specific year (Bottazzi and Peri, 2007).

[5] Stochastic Frontier Model results are provided in Table 5 – Appendix B.

Consistent with the main hypothesis of this study and, in the case of Morocco (results are not reported due to space limit), findings show that higher education levels of employees are also positively significant. Also apparent is that Research and Development negatively affects sales, for possibly the same reasons as those identified for Jordan. The results for Tunisia (not reported due to space limit), are positively significant for higher education as well, while innovation (representing new methods of input, production, or sales) has a significantly negative effect on annual sales. This could be explained by cases of "trial and error" where new methods are yet to meet firms' requirements for a positive effect in productivity.

Conclusion and Policy Implication

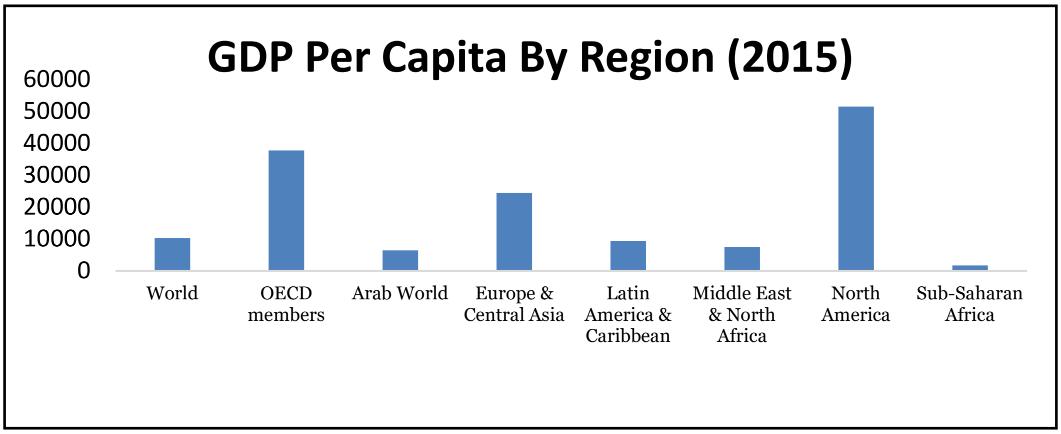
Endogenous growth theories emphasise the role of productivity in driving economic growth as provided in the literature and select empirical studies. When analysing select countries in the Arab and MENA region, the aim of this research was to analyse the determinants of total factor productivity in order to influence and direct policies. The focus was to consider how variables indirectly driving the growth of these economies can be improved. The results found that, at a regional level, human capital plays an influential role for total factor productivity (and technical efficiency). This is consistent with the fact that education and health are vital components of economic productivity.

With regard to firm-level analysis, the role of human capital is emphasised through testing the effect of education on the productivity of firms. Although the HDI variable proved significant in the regional analysis, this section is used to exclusively elaborate on the role of education as opposed to an alternative that measures education, health, and per capita income. As expected, education meaningfully affects firms' productivity levels. It is important, however, to identify the levels of education that brings about this impact. As discussed previously, higher levels of education (university degree or higher) is what drives firms' annual sales and verifies the importance of undergraduate and graduate degrees as opposed to average school enrolment levels.

Sufficient evidence on the relationship between human capital and increased productivity exists. As such, it is important to examine policy recommendations that aim to improve select variables in order for developing countries to reach their production frontiers. Policies should be directed towards improved education quality and delivery. Increased rates of school enrolment and completion will not be sufficient to bring about increased productivity. Such improvements could begin with implementing new and improved teaching curricula as well as investing in new materials such as books, programs, and learning technologies and software. The continued training of teachers and instructors in new teaching methods is highly important and enhances and provides for a contextually modern teaching approach.

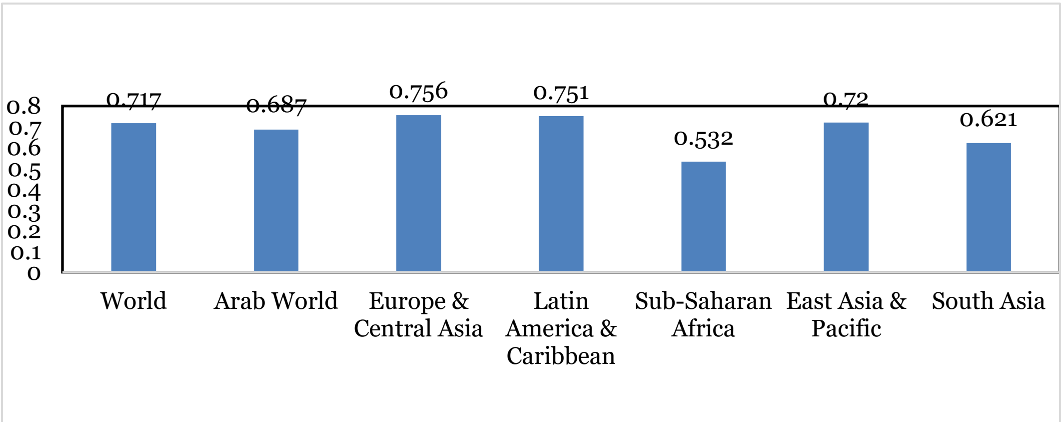
The creation of motivational learning environments in schools is also crucial. Motivational learning environments will drive students to pursue higher education levels such as university and graduate school degrees.

Figure 1. Appendix A



Source: World Development Indicators – World Bank

Figure 2: Human Development Index by Region (2016)



Source: Human Development Report, 2016

Appendix B

Table 1: Estimates of Cobb-Douglas Production Function

Lny	Coef.	Std.Err.	T	P>|t|	[95% Conf.	Interval]
LnL	.4762041	.0364035	13.08	0.000	.4044043	.5480039
Lnk	.0091686	.0033908	2.70	0.007	.0024809	.0158563

Table 2: Fixed Effects Results – Determinants of Total Factor Productivity

TFP	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Trade	0.1639225	0.0624954	2.62	0.009	0.0406485	0.2871965
HDI	0.8818813	0.2310994	3.82	0.000	0.4260313	1.337731
GDP	-0.0301779	0.1991005	-0.15	0.880	-0.4229094	0.3625535
Investment	-8.67E-13	8.87E-13	-0.98	0.330	-2.62E-12	8.83E-13
Labour	-1.01E-08	5.23E-09	-1.93	0.055	-2.04E-08	2.26E-10

Table 3: OLS Regression - Determinants of Total Factor Productivity

TFP	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Trade	.44355	.1044572	4.25	0.000	.2375521	.6495479
HDI	2.46042	.2553549	9.64	0.000	1.95684	2.964
GDP	-.1252444	.5424014	-0.23	0.818	-1.194903	.9444139
Investment	8.71e-12	8.33e-13	10.46	0.000	7.07e-12	1.04e-11
Labour	-6.96e-08	3.82e-09	-18.20	0.000	-7.71e-08	-6.20e-08

Table 4: Fixed Effects Results – Determinants of Technical Efficiency

TE	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Trade	0.0000214	8.96E-06	2.38	0.018	3.68E-06	0.000039
HDI	0.0001321	0.0000331	3.99	0.000	0.0000667	0.0001975
GDP	6.41E-06	0.0000286	0.22	0.823	0.0000499	0.0000627
Investment	-2.78E-18	1.27E-16	-0.02	0.983	2.54E-16	2.48E-16
Labour	-1.46E-13	7.50E-13	-0.19	0.846	1.62E-12	1.33E-12

Table 5: OLS Regression - Determinants of Technical Efficiency

TE	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Trade	-.0000449	.0000102	-4.40	0.000	-.000065	-.0000247
HDI	.0003391	.0000264	12.85	0.000	.0002871	.0003912
GDP	000099	.0000514	1.93	0.055	-2.34e-06	.0002003
Investment	6.02e-16	1.08e-16	5.60	0.000	3.90e-16	8.14e-16
Labour	-4.10e-12	4.18e-13	-9.82	0.000	-4.93e-12	-3.28e-12

Table 6: The Stochastic Frontier Model: Normal/Half-Normal Model

Wald chi2(2) = 57.95				Number of obs = 203		
Log likelihood = -120.07952				Prob > chi2 = 0.0000		
Lny	**Coef.**	**Std. Err.**	**z**	**P>z**	**[95% Conf.**	**Interval]**
Lnl	0.0809098	0.0268194	3.02	0.003	0.0283448	0.1334748
Lnk	560788	0.0089276	6.28	0	0.0385811	0.0735765
_cons	7.29313	0.4881973	14.94	0	6.336281	8.249979
/Lnsig2v	-1.654924	0.0996909	-16.6	0	-1.850315	-1.459534
/Lnsig2u	-9.82639	89.77067	-0.11	0.913	-185.7737	166.1209
Sigma_v	0.4371573	0.0217903			0.396469	0.4820213
Sigma_u	0.007349	0.3298611			4.57E-41	1.18E+36
Sigma2	0.1911605	0.019222			0.153486	0.228835
Lambda	0.0168108	0.3325727			-0.6350197	0.6686413
LR test of Sigma_u=0: chibar2(01) = 0.00				Prob >= chibar2 = 1.000		

REFERENCES

Aigner, D., Lovell, C. K., & Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Function Models. *journal of Econometrics*, *6*(1), 21-37.

Alvi, S., & Ahmed, A. (2014). Analysing the Impact of Health and Education on Total Factor Productivity: A Panel Data Approach. *Indian Economic Review, 49*(1), 109-123

Bhupat M. Desai, & N. V. Namboodiri. (1997). Determinants of Total Factor Productivity in Indian Agriculture. *Economic and Political Weekly, 32*(52)

Bottazzi, L., & Peri, G. (2007). The International Dynamics of R&D and Innovation in the Long Run and in the Short Run. *The Economic Journal, 117*(518), 486-511

Breton, T. R. (2013). The Role of Education in Economic Growth: Theory, History and Current Returns. *Educational Research*, *55*(2), 121-138.

Breton, T. (2013). Were Mankiw, Romer, and Weil Right? A Reconciliation of the Micro and Macro Effects of Schooling on Income. Macroeconomic Dynamics, 17(5), 1023-1054.

Cole, Matthew A. and Neumayer, Eric (2006) The Impact of Poor Health on Factor Productivity: An Empirical Investigation. Journal of Development Studies, 42 (6), 918-938.

Crook, T. R., Todd, S. Y., Combs, J. G., Woehr, D. J., & Ketchen Jr, D. J. (2011). Does Human Capital Matter? A Meta-Analysis of the Relationship Between Human Capital and Firm Performance.

Domar, E. (1946). Capital Expansion, Rate of Growth, and Employment. *Econometrica, 14*(2), 137-147.

Faruq, H., & Telaroli, P. (2011). Factors Affecting Manufacturing and Agricultural Productivity Trends among Asian Countries. *ASEAN Economic Bulletin, 28*(1), 45-60.

Fischer, M. M., Scherngell, T., & Reismann, M. (2009). Knowledge Spillovers and Total Factor Productivity: Evidence Using a Spatial Panel Data Model. Geographical Analysis, 41(2), 204–220.

Galenson, W., & Leibenstein, H. (1955). Investment Criteria, Productivity, and Economic Development. *The Quarterly Journal of Economics, 69*(3), 343-370.

Gary S. Becker (1993). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education (3rd ed.). University of Chicago Press. ISBN 978-0-226-04120-9.

Georgiou, M. N. (2012). The Impact of R&D, Government Spending on Education and Trade Unions on Labour Productivity - A Panel Data Econometric Analysis.

Hall, R. E., & Jones, C. I. (1999). Why Do Some Countries Produce So Much More Output Per Worker Than Others? *The Quarterly Journal of Economics*, *114*(1), 83-116.

Harrod, R. (1939). An Essay in Dynamic Theory. *The Economic Journal, 49*(193), 14-33. doi:10.2307/2225181

Human Development Report. (2016). *United Nations Development Program*.

Human Development Reports (1990-2015) - United Nations Development Program. (n.d.).

Islam, N. (2008). Determinants of Productivity across Countries: An Exploratory Analysis. *The Journal of Developing Areas, 42*(1), 201-242.

Kumbhakar, S. C., & Lovell, C. K. (2003). *Stochastic Frontier Analysis*. Cambridge University Press.

Majeed, S., Ahmed, Q., & Butt, M. (2010). Trade Liberalization and Total Factor Productivity Growth (1971-2007). *Pakistan Economic and Social Review, 48*(1), 61-84.

Mankiw, N., Romer, D., & Weil, D. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics, 107*(2), 407-437.

Manuelli, R., & Seshadri, A. (2014). Human Capital and the Wealth of Nations. *The American Economic Review, 104*(9), 2736-2762.

Marrocu, E., Paci, R., & Pala, R. (n.d.). Estimation of Total Factor Productivity for Regions and Sectors in Italy. A Panel Cointegration Approach. SSRN Electronic Journal.

M., R. (1999). Total Factor Productivity Growth in Singapore: A Survey. *ASEAN Economic Bulletin,16*(1), 51-67.

Ost, B. (2014). How Do Teachers Improve? The Relative Importance of Specific and General Human Capital. *American Economic Journal: Applied Economics, 6*(2), 127-151.

Romer, D. (2012). Advanced Macroeconomics (4th ed.). New York: McGraw-Hill Companies

Romer, P. (1994). The Origins of Endogenous Growth. *The Journal of Economic Perspectives,8*(1), 3-22.

Saunders, R. (1980). The Determinants of Productivity in Canadian Manufacturing Industries. *The Journal of Industrial Economics, 29*(2), 167-184.

Schultz, T. W. (1972). Human Capital: Policy Issues and Research Opportunities. In *Economic Research: Retrospect and Prospect, Volume 6, Human Resources* (1-84).

Schumpeter, J. A. (1934). The Theory of Economic Development: An Inquiry Into Profits, Capital, Credit, Interest, and the Business Cycle (Vol. 55). Transaction publishers.

Sen, A. K. (1989). Development as Capability Expansion, S. FukudaYParr and AK Shiva Kumar. eds. Readings in Human Development.

Singh, N., & Trieu, H. (1999). Total Factor Productivity Growth in Japan, South Korea, and Taiwan. *Indian Economic Review, 34*(2), new series, 93-112

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

Swan, T. W. (1956), Economic Growth and Capital Accumulation. Economic Record, 32: 334–361.

Solow, R. (1994). Perspectives on Growth Theory. *The Journal of Economic Perspectives, 8*(1), 45-54.

Tan, B. S. (2013). Effects of Advances in ICT on Total Factor Productivity: Analysing Productivity Gains and Future Trends. SSRN Electronic Journal.
Varian, Hal, *Microeconomic Analysis*, 3rd ed. Norton 1992.

Weinhold, D., & Rauch, J. (1999). Openness, Specialization, and Productivity Growth in Less Developed Countries. *The Canadian Journal of Economics / Revue Canadienne D'Economique,32*(4), 1009-1027.

Yean, T. (1997). Determinants of Productivity Growth in the Malaysian Manufacturing Sector. *ASEAN Economic Bulletin, 13*(3), 333-343.