

The Effects of Economic Growth, Investment and Human Capital on the Structural Changes in ASEAN Countries: A Dynamic Panel Model

Tippawan Chakphet

Suan Sunandha Rajabhat University, Bangkok, Thailand
tippawan.ch@ssru.ac.th

Norawat Charoen-Rajapark

Suan Sunandha Rajabhat University, Bangkok, Thailand
s58584916010@ssru.ac.th

Chonthicha Somjai

Suan Sunandha Rajabhat University, Bangkok, Thailand
s61584917009@ssru.ac.th

Article Info

Volume 83

Page Number: 6336 - 6347

Publication Issue:

March - April 2020

Article History

Article Received: 24 July 2019

Revised: 12 September 2019

Accepted: 15 February 2020

Publication: 02 April 2020

Abstract:

The prime objective linked with this research is to examine the impact of economic growth, investment and human capital on the structural changes in ASEAN countries. The data were extracted from the database of World Bank from 2001 to 2017 and logistic model has been employed to test the hypotheses. The results revealed that significant economic growth, high level of investment and skilled human capital have positive effects of the changes of structure in the ASEAN countries. These findings give the insight to the managers and policy developers that they should focus on these essential elements such as human capital, investment, and economic growth that enhance the structural improvement of the nation.

Keywords: Investment, Economic Growth, Structural Changes, Human Capital

1. Introduction

Since early 1990s, determinant analysis of economic growth availability is due to the extensive literature availability. Some researcher Mauro (1995), Mankiw, Romer, and Weil (1992); Barro, Sala-i-Martin, Blanchard, Hall (1991), Rungtornsupavan, Jermjitiparsert, & Thanetpaksapong (2019), and Phrakhrupatnontakitti, Watthanabut, & Jermjitiparsert (2020) has estimated the certain variables affect on the growth of economic with the help of cross-sectional analysis and thus concluded that in the economic growth important role is played by human capital. Similarly,

Endogenous Growth and Neoclassical theory also explain and analyzed some economic growth determinants, i.e. geography, government consumption, institutions in case of political instability and foreign trade etc. (Moral-Benito (2012) and Acemoglu and Robinson (2006). However, common determinant of the analysis was human capital as studied by Aisen and Veiga (2013); Hanushek and Woessmann (2012). Human capital concept analyzed as intangible resources and the same are part of labor market which improves productivity of the ASEAN countries as highlighted in the study of (Panés et al., 2016). According to Becker (1962) these productivities

relates to the acquired skills and knowledge with the help of education, medical care and experience. Economic growth is directly impacted by human capital because qualified people are more innovative and productive which leads to new product creation and make productivity factors better, explained in the study of Bodman and Le (2013); A. A. Teixeira and Queirós (2016). On the other hand, in the study of A. A. Teixeira and Queirós (2016) it is highlighted that human capital improves the technological acceptance of neighboring countries by including import ideas and devices.

Indirect effect of Human capital is also observed, in particular through interaction with the country's production structure. Especially a technologically specialized country's have positive impact on economic growth of human capital as explained by (Castro e Silva & Teixeira, 2011). Evolutionary economics of theoretical approaches have shown that the analysis of economic growth must be extended with demand side factors (Jordan et al. (2001); P. J. Teixeira, Carraça, Markland, Silva, and Ryan (2012). Hidalgo and Hausmann (2009) studied that certain demand fluctuations lead to more complex and diverse products which lead to change in structure and which change in the economic specialization and industrial composition through the stimulation of technological innovations and developments of new products. From this perspective, higher productivity growth rates are linked with high-tech industrial growth, therefore, economic growth is disproportionately contributed. This factor tends to increase with the capacity of absorption increased and have associated innovation with the increase in human capital (P. J. Teixeira et al., 2012). Aim of this paper is to combine supply variables compared to theory of endogenous growth and variables of demand compared to evolutionary and structural approaches, that is, the country specification

model (Hussain et al., 2012). This article aims in particular to evaluate the direct effects on economic growth by human capital and the indirect effects of the interaction of country's production structure with human capital structure, while keeping other factors under consideration (Hussain, Mosa, & Omran, 2018).

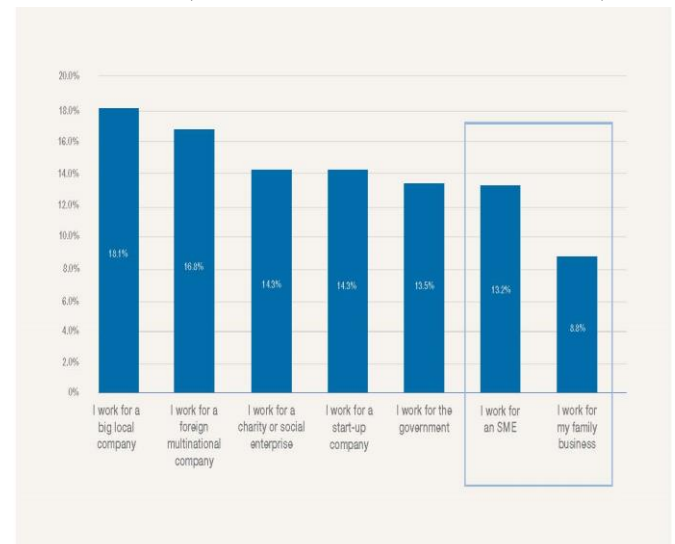


Figure 1: The Statistics Regarding the Employment in ASEAN Countries

In the above graph responses of the ASEAN countries are shown according to the skills which employees got during the job training and on the work practices and skill management techniques. These are the responses taken from all the six ASEAN countries. Almost 18.1% of the workers are the part of big local firms and take their training from local organizations to increase the productivity of the firm also aid to achieve the goals of the firm. Employees that are willing to work in an organization are self-motivated. While 16.8% employees are part of multinational company and they got their skills from their training programs that are held by their representatives. Almost 14.3% employees work for the charity houses and social enterprises while same figure of employees work for the start-up companies their employees are energetic to give their potential to the firm for their better growth

also getting competitive edge. Similarly, 13.2% employees are working for the SME and almost 8.8% employees run their own family businesses despite of this only 13.5% employees work for the government sectors. These are percentage of the employees which got their skills on the job at different sectors and become assets for the organizations and are effective human capital of organizations. Human capital of ASEAN countries are distributed over seven categories as described above according to which Human capital utilization can be measure and analyzed for effective use.

According to the Human Capital index of 2015 ASEAN countries lies in the range of 24 to 112 on the basis of their Human Capital Index score. In the following table scores and global ranking of ASEAN countries are ranked accordingly. Singapore got 78 scores in human capital index of 2015 and the highest among the other ASEAN countries and lies at top the list among others and at globally Singapore lies at ranked 24 while Philippines got 71 scores in human capital index of 2015 and got second position among other ASEAN countries and ranked 46 globally. Similarly Malaysia got 70 scores human capital index of 2015 despite of the Asian emerging economy and lies at third position among other ASEAN countries and globally ranked at 52.

Table 1: Human Capital Index of ASEAN Countries

Human capital index ranking of ASEAN countries		
Global rank	Country	Scores
24	Singapore	78
46	Philippines	71
52	Malaysia	70
57	Thailand	69
59	Vietnam	68
69	Indonesia	67
97	Cambodia	59
105	Lao PDR	56
112	Myanmar	53

While Thailand score is 69 in human capital index of 2015 and take fourth position among ASEAN countries and globally ranked at 57. Vietnam got 68 scores in human capital index of 2015 and lies at fifth position among ASEAN countries while ranked 59 globally. Indonesia got 67 scores and ranked sixth among ASEAN countries and at rank 69 globally. While Cambodia got 59 scores in human capital index 2015 and ranked at seventh among other ASEAN countries while 97 ranked globally. Similarly, Lao PDR got 56 scores in human capital index of 2015 and lies at second last among other ASEAN countries and got 105 rank globally. Myanmar got 53 scores in human capital index 2015, lies at last of list of ASEAN countries while got 112 global rank. Despite of this data for ranking we have very rare data to cover the 2015 index of human capital of Brunei Darussalam internationally show in table no 1.

We hope that a country with more human capital will specialize more quickly in the knowledge-intensive and high-tech sectors where skilled workers play an important role. In methodology term, we apply the latest techniques of panel dynamic data based on the Generalized Moments Method (GMM) as explained by Blundell and Bond (1998) with ASEAN countries only for a long period. Following section provides an overview of the literature with relationship between three most important variables of this study and economic growth i.e. structural change, human capital and their interactions. Section 3 contains statistical description of data and methodological considerations of the relevant variables. In paragraph 4 empirical results will be discussed and at last part important contributions of this study presented, the limits and possibilities of future research and the political implications.

2. Literature Review

In recent decades, numerous publications have been published on the role of human capital (Rungsrisawat & Jernsittiparsert, 2019) as studied by Aisen and Veiga (2013) which determine the growth and level of GDP per capita. The "Growth Account Literature" underlines the quality of work measuring changes in the work quality that result from the improvement of skills and competences when it comes to taking economic growth into account in the EU. The "new theories of growth" focus on broader economic growth determinants Wilson and Briscoe (2004) and emphasize on delivery of human capital. In growth models of endogenous, economic growth can continue for indefinite period due to the (physical and) return on capital does not necessarily reduce overtime. The exchange of information between external benefits and the producers for improving human capital are included in this process due to compensate for the tendency to decrease performance. The acquisition of knowledge and skills is a main source of capital formation to increase future income by consumption modification. Quality of work improves by human capital which increases productivity (Murat, 2011). In general, efficiency and productivity of employees can be increase by increase in education which results increase in their income. The differences of growth rates of country relate to the education level between countries as studied by (Benos & Zotou, 2014). ASEAN countries lower economic growth low due to the lower rate of enrollment as founded by Easterly and Levine (1997) Research and Development (R&D) is engineered by the source of human capital, due to which promotes technological and innovation progress increased which leads to new product creation and increased productivity (Bodman & Le, 2013). We can conclude that by making training of personnel better of any country leads to R&D activities

advantage for growth of economy. Absorption capacity of new idea promotes by increasing human capital and other products that already been developed by foreign countries. Bodman and Le (2013); Nelson and Phelps (1966). Studied that introduction of technology and devices leads to the faster convergence of economical growth. Above described method encourage to invest in physical capital by human capital (Benhabib & Spiegel, 1994). At last, performance of economy is indirectly affected by human capital with the help of networks with institutions. Accumulation of human capital contributes to the development of effective policies, political stability and less violence Alesina, Glaeser, and Glaeser (2004) which results in economic growth promotion. According to above discussion and study of Sianesi and Reenen (2003), it is demonstrated that human capital, particularly in its dimensional education, tends to improve productivity of health, conditions of environment, rate of crime and increase labor productivity, social cohesion and citizen participation. As a result, investments in education (that is, the accumulation of human capital) have a domino that leads to social benefits effect and not only affect returns of individual although Soar et al. (2015) recognize that empirical impact of human capital on growth is very difficult to access while most of the studies shown that significantly positive relation between growth of economy and human capital (Bodman and Le (2013); Hall and Jones (1999) and Easterly and Levine (1997) regardless of human capital used proxy (e.g. labor registry or initial registration) (Benos & Zotou, 2014). We can assume from the above discussion that:

H1: Economic growth have positive nexus with the structural changes in the ASEAN countries. .

Despite the enormous human capital importance for the accumulation, differences in growth of economy between different countries must be attributed to production structures complexity and structural changes. In fact, some other studies explain that production structure and its dynamics of an economy, that is, "structural changes" (changes of the industry composition in which certain industries acquire a relative share of the economy) are important determinants of the economy for economic action (Saviotti & Frenken, 2008). The structural changes influence of economic growth is a very controversial literature issue studied by Hartwig (2012). Studies on care approaches related to the attention of (Baumol, 1967). generally recommend that structural change lead to a decrease in overall growth (Sergeev, Webb, & Hartwig, 2012). Baumol states that the composition of production in fast-growing ("progressive") productivity sectors (for example, industry) is relatively economically quiet compared to ("non-progressive") with stagnant (public services) technologies. Overall productivity growth was delayed. In contrast to it, development of economic approaches aimed at developing innovation and demand together with economic dynamics generally create a linkage of positivity and have a linkage between growth of economy and structural changes. In the theories of evolutionary of structural change, process of continuous transformation results the formation of market that is the result of innovations. Saviotti and Frenken (2008) studied that Schumpeterian views suggest that development of economy is significantly contributed by drastic innovation changes. Both endogenous and exogenous forces can cause structural changes, such as the sectors dynamics life cycle and patterns of consumption of goods favor with highly elastic demand. While sectors pass through a complete life cycle from the point of birth to the point of adulthood, certain

variables, whether the demand rate of growth or profit rate, are expected to increase as the sector falls. This dynamic can encourage Schumpeterian entrepreneurs for creation new sectors which may include temporary monopoly (Saviotti & Frenken, 2008). This ability to create new sectors is generally longer in system of economic that offers many different resources for research and development. The sectors with greater elasticity of demand according to income perceive their relative importance for economic growth (Peneder, 2003), and the most productive sectors obtain a greater share related to the economies of nation because better wages can be offered and are attractive to more people. These phenomena have a direct influence on growth of economy by creating of new methods production that lead to very efficient redistribution of employability and resources (Zagler, 2009). Therefore, change in structure is always favor of technologically specialization in advanced sectors which leads to growth of economy.

In the light of this context, structuralist theories emphasize that growth of economy is not only generated by economic specialization (Aditya & Acharyya, 2013), but depends on sector which are economy dominants. According to Marelli (2004) in most regions of industries seem to be experiencing stronger growth of economy than predominantly region of agricultural. In addition, country become more sensitive for foreign stocks when their agriculture sector produces better and become agriculture specialized as defined by (Aditya & Acharyya, 2013). In the era of 1950-60s, it was emphasized that the structural change direction was aimed at increasing the differentiation and complexity in system of economy. By making changes in the structural change or production structure of a country are result into two joint processes in which new products are created based on the combinations of capacity already investigated and

accumulation. Skills that interact with already available other skills to develop some extra or additional skilled products as per study of (Hausmann, 2009). Although this factor was relatively ignored in the traditional analysis of method of growth of economy that only analyze supply primarily demand change is important fuel change structure when needed. The underlying concept of this process is the cause of the reinvention and creation of new goods and innovations (Pyka et al., 2012).

Some change in pattern of consumption shows changes in knowledge, specialization and learning Saviotti and Frenken (2008) studied that, the increasing productivity efficiency in historical sectors and combination with employment effects associated with new sector creation, which increase income availability of consumers. As with the increase in growth of society, income of public also increase which is more spending new products which are better and different which leads to more advanced economic goods and systems (Hausmann et al., 2009) The joint development of innovation and demand is, therefore, a "basic mechanism for economic development, which is essential to understand the long-term processes of structural change and structural change". Pack and Nelson (1999) empirically state that ASEAN countries are catching up quickly due to the increasing inactivity of high-tech specialization, and their rapid growing economies is the assimilation of technological innovations and structural change innovations. Aditya and Acharyya (2013) also believe that specialization in the export of high-tech products has a positive linkage with the growth of economy, which is accompanied by demand problems. From above discussion we assume that:

H2: High level of investment have positive nexus with the structural changes in the ASEAN countries.

Human capital is an essential determining factor for growth of economy as per structuralist approach, because changes in structure are reinforced by these factor (Justman & Teubal, 1991). Therefore, human capital is seeming as very crucial for the development of specialization of a country (Krishna & Levchenko, 2013). The economy productive specialization depends upon characteristics, because industries are advanced by technologies are generally installed in countries with large human capital reserves. Ciccone and Papaioannou (2009) explained that there is positive linkage between 'virtuous' structural change and education, that is, when growth of economy has a relative participation of the technology-intensive activities. The process of recovery of technological and changes in structure have a linkage with the transmission of technology from industrialized countries to towards developing countries (in terms of economic growth) can be strengthened as the human capital of the country increases and its participation in absorption. This procedure allows developing countries to maintain more technological with productive structures with the help of imitation. However, very low human capital threshold is required for the successful imitation as explained by A. A. Teixeira and Queirós (2016) and Van Knippenberg, Martin, and Tyler (2006). He also explains in future, more human capital will be needed for creative and innovative processes. Gürbüz, Alonso, Bond, and Dumesic (2011) explained interaction within structural change and human capital, which emphasizes on the situation of southern and northern countries. The countries of south have labor-intensive specialized services in the tertiary sector and have hired low-skilled workers to move to the country.

The northern countries, on the other hand, have high-tech negotiable products specialization that need human capital at high level. On the demand side, consumer become more demanding due to high human capital which means that when consumer is better informed are more likely to look for "high tech" products, which has a positive effect on positive structural changes (Justman & Teubal, 1991). Structural change is also reinforcing by entrepreneurs because more investment is made modern and innovative sectors. Noseleit (2013) studied that entrepreneurs recognize opportunity of business and create new companies that have efficient and advanced technology which contribute to structural change. In general entrepreneurs assumed to be more "talented" than organizations employees which invest in human capital to develop their own talents based on their work experience. The skills that entrepreneurs acquire help them to start new business and new development of idea (Iyigun & Owen, 1999). Entrepreneurs also help in redistribution of factors of production (for example, work between sectors as explain by (Noseleit, 2013). Entrepreneurs are more innovative and productive agents of the community as base of knowledge and skills, which results in creation of employee's attractive environment to attain and develop human capital with the help of skills and education and create high returns studied by (Noseleit, 2013). It can conclude that the more entrepreneurs and human capital there are, the greater the economic growth. In addition, the costs of technology implementation are reduced which results in growth of economy. Some human capital is required for the innovation process (Van Knippenberg et al., 2006). Industries that are the result of structural change require that workers in declining industries acquire new skills to be accepted by them (Zagler, 2009). Through formal education, people acquire some important skills to

attain some job, especially those skills which need to be adopted (Nelson & Phelps, 1966). In addition, productivity can be increased by increasing in technology which depends on the increase of human and physical capital which results in growth of economy.

H3: Skilled human capital have positive nexus with the structural changes in the ASEAN countries.

3. Research Methods

The leading objective connected with this research is to inspect the impact of economic growth, investment and human capital on the structural changes in ASEAN countries. The data were extracted from the database of World Bank from 2011 to 2017 and logistic model has been employed to test the hypotheses. The main variable such as structural changes (SC) is measured as the "share of high level industries in total employment" while the predictors such as economic growth is measured as the "GDP growth in percentage". The investment is measured as the investment rate (IR) while human capital is measured as the number of employees work in an industry (NOE), industry size is taken as control variable and measured as the logarithm of total assets (LNTA). On the bases of these variables, the present study develop the equation as follow:

$$SC_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 IR_{it} + \beta_3 NOE_{it} + \beta_4 LNTA_{it} + \epsilon_{it}$$

4. Findings

The results show the detail of the variable, correlation matrix, assumption of regression and logistic model to test the hypotheses. The descriptive show the 170 observations (10 countries x 17 years) along with means and standard deviation that also have minimum and maximum values. The descriptive statistics are given below in Table 2.

Table 2: Descriptive Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
SC	170	1.618	.567	-.179	3.437
GDP	170	.249	.256	0	.846
IR	170	.158	.214	0	.983
NOE	170	4.974	.841	2.862	6.399
LNTA	170	11.564	23.847	-203.023	65.89

The correlation matrix describe the relationships among the constructs that are used in this research and statistics describe that variables are positively correlated and also variables are not highly correlated and avoided the multicollinearity issue. The correlation matrix is given under in Table 3.

Table 3: Correlation Matrix

Variable	SC	GDP	IR	NOE	LNTA
SC	1.00				
GDP	0.173	1.00			
IR	0.099	0.241	1.00		
NOE	0.054	0.005	0.064	1.00	
LNTA	0.013	0.179	0.161	-0.106	1.000

The multicollinearity assumption can also be checked by using the variance inflation factor (VIF) and the values are lower than 5 that is the indication of no multicollinearity issue in the model. The VIF of the constructs are given below in Table 4.

Table 4: Variance Inflation Factor (VIF)

	VIF	1/VIF
GDP	1.579	.633
IR	1.241	.806
NOE	1.217	.822
LNTA	1.169	.855
Mean VIF	1.26	.

The normality assumption is verified in this literature by using the test of Skewness and Kurtosis and statistics described that data has abnormality issue but this issue has no effects on the data because data has 170 observation and considered as large and in case of large data normality issues did not affected. The Skewness and Kurtosis analysis are given below in Table 5.

Table 5: Skewness and Kurtosis Test

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj_chi2(2)	Prob>chi2
SC	170	0.311	0.036	5.420	0.066
GDP	170	0.208	0.000	27.660	0.000
IR	170	0.000	0.002	26.130	0.000
NOE	170	0.000	0.000	64.410	0.000
LNTA	170	0.000	0.003	20.610	0.000

The autocorrelation assumption is verified by using the Wooldridge test that show that data has autocorrelation issues that means lag values correlated with current values and this issue is fixed by using the logistic model in the research. In addition, the homoscedasticity assumption is verified by using the Breusch-pagan test that show that data has heteroscedasticity issues that means error terms are not homoscedastic and this issue is fixed by using the logistic model in the research.

Firstly, the fixed and random models are run to check the appropriate method among them by using the Hausman test and the statistics of the fixed and random models are given below in Table 6 and Table 7.

Table 6: Fixed Effect Model

SC	Coef	S. E.	t-value	p-value	L.L	U. L.	Sig
GDP	1.037	.201	5.16	.000	.641	1.433	**
IR	-.138	.37	-0.41	.683	-.806	.521	
NOE	.951	.251	3.80	.000	.458	1.445	**
LNTA	.368	.95	3.87	.000	.555	.185	*
Const	1.909	.547	3.49	.000	.832	2.987	**
R-squared		0.460		Prob > F		0.000	

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 7: Random Effect Model

SC	Coef	S.E	t-value	p-value	L.L	U.L.	Sig
GDP	.958	.188	5.06	.000	.582	1.319	**
IR	-.039	.201	-0.19	.846	-.433	.355	
NOE	.597	.197	3.03	.002	.211	.983	**
LNTA	-.032	.062	-0.51	.611	-.154	.091	
Const	.357	.436	0.82	.413	-.498	1.212	
Overall r-squared		0.312		Prob > chi2		0.000	

*** $p < .01$, ** $p < .05$, * $p < .1$

The statistics of Hausman test show that random model is appropriate because the probability value is lower than 0.05 that is the indication of random is appropriate. The Hausman test is given below in Table 8.

Table 8: Hausman Test

	Coef.
Chi-square test value	11.743
P-value	.038

The path analysis with logistic model show that the GDP, investment and human capital has positive link with structural changes because beta values are linked with positive sign and it is also indicated that the relationship is significant because lower and upper limits along with t and p values are full filled their standards. The regression analysis with logistic model is given below as under Table 9.

Table 9: Regression Analysis (Logistic Model)

SC	Coef.	S.E.	t-values	P>t	L.L.	U.L.
GDP	1.037	0.128	8.070	0.000	0.754	1.320
IR	0.438	0.231	1.902	0.034	0.647	0.372
NOE	0.951	0.210	4.540	0.001	0.490	1.413
LNTA	0.668	0.217	3.078	0.002	0.844	0.109
_cons	1.909	0.922	2.070	0.039	0.340	4.159

5. Discussions and Conclusion

The main aim connected with this research is to inspect the impact of economic growth, investment and human capital on the structural changes in ASEAN countries. The results revealed that significant economic growth, high level of investment and skilled human capital has positive effects of the changes of structure in the ASEAN countries. The high economic growth improve the economic condition that enhance the structural improvement in the country while high level of

investment and skilled workforce enhance the performance of the firm that also increase the structural improvement in the country. These findings give the insight to the managers and policy developers that they should focus on these essential elements such as human capital, investment, and economic growth that enhance the structural improvement of the nation.

Lastly, it is concluded that the high economic growth improve the economic condition that enhance the structural improvement in the country while high level of investment and skilled workforce enhance the performance of the firm that also increase the structural improvement in the country. This study has future directions and limitations such as its findings will be implicated only in the ASEAN countries and further study should increase their scope by adding more countries in their evaluation.

References

- [1] Acemoglu, D., & Robinson, J. A. (2006). De facto political power and institutional persistence. *American Economic Review*, 96(2), 325-330.
- [2] Aditya, A., & Acharyya, R. (2013). Export diversification, composition, and economic growth: Evidence from cross-country analysis. *The Journal of International Trade & Economic Development*, 22(7), 959-992.
- [3] Aisen, A., & Veiga, F. J. (2013). How does political instability affect economic growth? *European Journal of Political Economy*, 29, 151-167.
- [4] Alesina, A., Glaeser, E., & Glaeser, E. L. (2004). *Fighting poverty in the US and Europe: A world of difference*: Oxford University Press.
- [5] Barro, R. J., Sala-i-Martin, X., Blanchard, O. J., & Hall, R. E. (1991). Convergence across states and regions. *Brookings papers on economic activity*, 107-182.
- [6] Baumol, W. J. (1967). Macroeconomics of unbalanced growth: the anatomy of urban crisis. *The American economic review*, 57(3), 415-426.
- [7] Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *Journal of political economy*, 70(5, Part 2), 9-49.
- [8] Benhabib, J., & Spiegel, M. M. (1994). The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary economics*, 34(2), 143-173.
- [9] Benos, N., & Zotou, S. (2014). Education and economic growth: A meta-regression analysis. *World Development*, 64, 669-689.
- [10] Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, 87(1), 115-143.
- [11] Bodman, P., & Le, T. (2013). Assessing the roles that absorptive capacity and economic distance play in the foreign direct investment-productivity growth nexus. *Applied Economics*, 45(8), 1027-1039.
- [12] Castro e Silva, M., & Teixeira, A. A. (2011). A bibliometric account of the evolution of EE in the last two decades: is ecological economics (becoming) a post-normal science? *Ecological economics*, 70(5), 849-862.
- [13] Ciccone, A., & Papaioannou, E. (2009). Human capital, the structure of production, and growth. *The Review of Economics and Statistics*, 91(1), 66-82.
- [14] Easterly, W., & Levine, R. (1997). Africa's growth tragedy: policies and ethnic divisions. *The quarterly journal of economics*, 112(4), 1203-1250.
- [15] Gürbüz, E. I., Alonso, D. M., Bond, J. Q., & Dumesic, J. A. (2011). Reactive Extraction of Levulinate Esters and Conversion to γ -Valerolactone for Production of Liquid Fuels. *ChemSusChem*, 4(3), 357-361.
- [16] 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.
- [17] Hanushek, E. A., & Woessmann, L. (2012). Do better schools lead to more growth?

- Cognitive skills, economic outcomes, and causation. *Journal of economic growth*, 17(4), 267-321.
- [18] Hausmann, R. (2009). *The global gender gap report 2009*.
- [19] Hidalgo, C. A., & Hausmann, R. (2009). The building blocks of economic complexity. *Proceedings of the national academy of sciences*, 106(26), 10570-10575.
- [20] Hussain, M. S., Mosa, M. M., & Omran, A. (2018). The impact of owners behaviour towards risk taking by Pakistani Banks: Mediating role of profitability. *Journal of Academic Research in Economics*, 10(3), 455-465.
- [21] Hussain, M. S., Ramzan, M., Ghauri, M. S. K., Akhtar, W., Naeem, W., & Ahmad, K. (2012). Challenges and failure of Implementation of Basel Accord II and reasons to adopt Basel III both in Islamic and conventional banks. *International Journal of Business and Social Research*, 2(4), 149-174.
- [22] Iyigun, M. F., & Owen, A. L. (1999). Entrepreneurs, professionals, and growth. *Journal of economic growth*, 4(2), 213-232.
- [23] Jordan, P., Fromme, P., Witt, H. T., Klukas, O., Saenger, W., & Krauß, N. (2001). Three-dimensional structure of cyanobacterial photosystem I at 2.5 Å resolution. *Nature*, 411(6840), 909.
- [24] Justman, M., & Teubal, M. (1991). A structuralist perspective on the role of technology in economic growth and development. *World Development*, 19(9), 1167-1183.
- [25] Krishna, P., & Levchenko, A. A. (2013). Comparative advantage, complexity, and volatility. *Journal of Economic Behavior & Organization*, 94, 314-329.
- [26] Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, 107(2), 407-437.
- [27] Marelli, E. (2004). Evolution of employment structures and regional specialisation in the EU. *Economic Systems*, 28(1), 35-59.
- [28] Mauro, P. (1995). Corruption and growth. *The quarterly journal of economics*, 110(3), 681-712.
- [29] Moral-Benito, E. (2012). Determinants of economic growth: a Bayesian panel data approach. *Review of Economics and Statistics*, 94(2), 566-579.
- [30] Murat, M. (2011). *Do Immigrant Students Succeed?: Evidence from Italy and France Based on PISA 2006*: Università degli Studi di Modena e Reggio Emilia, Dipartimento di Economia
- [31] Nelson, R. R., & Phelps, E. S. (1966). Investment in humans, technological diffusion, and economic growth. *The American economic review*, 56(1/2), 69-75.
- [32] Noseleit, F. (2013). Entrepreneurship, structural change, and economic growth. *Journal of Evolutionary Economics*, 23(4), 735-766.
- [33] Pack, H., & Nelson, R. R. (1999). *The Asian miracle and modern growth theory*: The World Bank.
- [34] Panés, J., García-Olmo, D., Van Assche, G., Colombel, J. F., Reinisch, W., Baumgart, D. C., . . . Kazemi-Shirazi, L. (2016). Expanded allogeneic adipose-derived mesenchymal stem cells (Cx601) for complex perianal fistulas in Crohn's disease: a phase 3 randomised, double-blind controlled trial. *The Lancet*, 388(10051), 1281-1290.
- [35] Peneder, M. (2003). Industrial structure and aggregate growth. *Structural change and economic dynamics*, 14(4), 427-448.
- [36] Phrakhruopatnontakitti, Watthanabut, B., & Jernsittiparsert, K. (2020). Energy Consumption, Economic Growth and Environmental Degradation in 4 Asian Countries: Malaysia, Myanmar, Vietnam and Thailand. *International Journal of Energy Economics and Policy*, 10(2), 529-539.
- [37] Rungsisawat, S. & Jernsittiparsert, K. (2019). Does Human Capital Improve Health Care Agility Through Health Care Supply Chain Performance? Moderating Role of Technical

- Orientation. *International Journal of Supply Chain Management*, 8(5), 792-803.
- [38] Rungtapisawat, S., Jermittiparsert, K., & Thanetpaksapong, S. (2019). Do the Crime and the Socioeconomic Strain Affect the Economic Growth? A Case of an Emerging ASEAN Economy. *Journal of Security and Sustainability Issues*, 9(2), 391-407.
- [39] Saviotti, P. P., & Frenken, K. (2008). Export variety and the economic performance of countries. *Journal of Evolutionary Economics*, 18(2), 201-218.
- [40] Sergeev, A. G., Webb, J. D., & Hartwig, J. F. (2012). A heterogeneous nickel catalyst for the hydrogenolysis of aryl ethers without arene hydrogenation. *Journal of the American Chemical Society*, 134(50), 20226-20229.
- [41] Sianesi, B., & Reenen, J. V. (2003). The returns to education: Macroeconomics. *Journal of economic surveys*, 17(2), 157-200.
- [42] Soar, J., Nolan, J. P., Böttiger, B. W., Perkins, G. D., Lott, C., Carli, P., . . . Smith, G. B. (2015). European resuscitation council guidelines for resuscitation 2015: section 3. Adult advanced life support. *Resuscitation*, 95, 100-147.
- [43] Teixeira, A. A., & Queirós, A. S. (2016). Economic growth, human capital and structural change: A dynamic panel data analysis. *Research policy*, 45(8), 1636-1648.
- [44] Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: a systematic review. *International journal of behavioral nutrition and physical activity*, 9(1), 78.
- [45] Van Knippenberg, B., Martin, L., & Tyler, T. (2006). Process-orientation versus outcome-orientation during organizational change: the role of organizational identification. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, 27(6), 685-704.
- [46] Wilson, R. A., & Briscoe, G. (2004). The impact of human capital on economic growth: a review. *Impact of education and training. Third report on vocational training research in Europe: background report. Luxembourg: EUR-OP.*
- [47] Zagler, M. (2009). Economic growth, structural change, and search unemployment. *Journal of Economics*, 96(1), 63-78.