

Inter-linkages between Manufacturing Sector Efficiency and Economic Growth of Developing Countries: Evidence from Kaldor's Growth Model

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Abstract: This study examine the inter-relation between productive efficiency of manufacturing sector, technological innovations and economic growth of developing countries, the Kaldor's growth model was empirically tested taking 105 developing countries taking dataset for the period of 2000-2018. The pooled OLS and GMM Models were used for empirical analysis and Random and Fixed Effect Model were regressed to examine dynamic & static return to scale. The heterogeneity variable was included in the regression analysis for capturing the unobserved effects of the manufacturing sector. The findings have shown that the manufacturing sector has had an appreciable impact on the growth of developing countries. Further, the analysis of the study confirms the existence of increasing returns as the values of the co-efficient turned out to be significant in the fixed and random effect model. Technological innovations play an equally crucial role in enhancing the productive efficiency of the manufacturing sector, thus leading to a remarkable contribution to the economic growth of developing countries. The results of the study are consistent with the theoretical and empirical framework of Kaldor's growth model.

Keywords: Efficiency of Manufacturing Sector, Growth of Developing Economies, Technological Innovations

1. Introduction

It is generally perceived that the growth of manufacturing sector leads to rapid economic progress that leads to development expansion, productive efficiency and growth in other sectors of economies. The importance of manufacturing sector is such a vibrant fact that many economic analysts considered it as the main driving force of economic growth, prosperity and development and called it as "engine of economic growth for the economies" (McCausland & Ioannis, 2012; and Kathuria & Natarajan, 2013) and without growth of manufacturing sector, development is far from realization (Gereffi, 2015). In emerging economies, usually the economic and financial crisis is accompanied by bottlenecks that need urgent redress while ensuring a

well-functioning and stable financial sector is a prime concern of policymakers, therefore, the manufacturing sector remains in the limelight for its multidimensional role in the growth and development of the economies (Felipe, Aashish, & Changyong, 2014; and Lavopa, 2015).

Broadly speaking, throughout the world, the prominence of manufacturing sector has witnessed various stages of development, from traditional to moderate, from moderate to largely technology-driven economies. The emerging economies have experienced the same –a transition from resource-driven economies to efficiency-driven ones, and so on, although at a slower pace in comparison to the developed world. However, the reliance of developing countries on primary manufacturing products has created gaps in supply and demand between the developing, emerging and the advanced world countries in the output of manufacturing sector, productive efficiency as well as desired contribution towards the growth of developing economies (Tregenna, 2015).

Aside from all this, manufacturing sector persists in being one of the basic and imperative sectors for economic development and growth in developing and developed economies. Manufacturing sectors elevate all dimensions of the economy from basic to more moderate and through technological diffusion trigger a speedy increase in the growth of economies by raising productive efficiency and output growth (Amirapu & Arvind, 2015). The manufacturing sector is the way of innovation, advancement, and competitiveness elevating to increase the productive capabilities, raise the exports and to fulfill the demand of basic needs and requirement of the individuals of their country. In addition to all this, the manufacturing sector has transformed both opportunities and challenges that can rely on traditional techniques in the contemporary manufacturing environment (Banister, 2005).

Transformations of economies from agriculture to manufacturing sector effect the growth and development in a number ways i.e. increase in the productive efficiency, productivity, increase in output, improves the quality of products, increase in exports, stabilize the trade balance, earning of foreign exchange through in international trade, increase in government, technological diffusion etc., however, more importantly it also increases in employment rate, bring reduction in poverty, increase in the skilled labor, increase income of the worker, increase per capita income and thus raises the well-beings of the individuals and citizens. When economies move from a primarily traditional economy to industrialization, it raises its share in the GDP via increases employment opportunities, raises production, bring development in infrastructure and expands the overall development due to increase in growth of the manufacturing sector (Timmer, Gaaitzen-de & Klaas-de, 2015). The rise in the purchasing power of the consumer or a rising growth rate of the service sector as a result of increase in providing better job opportunities, increase in wages and reduction in poverty making this sector more significant and valuable as compared to the other sectors for its contribution to GDP growth, development and employment (Allwood et al., 2013).

Nevertheless, the comparative contribution and size of the manufacturing sector differs across economies according to its stage of development. It is expected that by 2025, a new international consumer class may appear, and the leading part of its consumption activities will go on in developing economies which will create bountiful new business opportunities. In the short run, in developed business sectors demand is diversifying as customers demand more kinds of output and benefits (Giuliani and Macchi, 2014).

1.1. Research Objectives

The main research objectives of this study are

- i. To investigate the role and connection of the manufacturing sector in the growth of developing countries
- ii. To investigate the relevance of Kaldor's growth model for 105 developing economies.

2. Literature Review

The role of the manufacturing sector in driving economic growth and development has been investigated by many researchers. Some have used panel data, others have relied on time series; while many of the researchers used cross-sectional analyses and majority of them were came up with the conclusions that the manufacturing sector plays significant and momentous supportive role in uplifting of an economy, that's why most of the investigator called it as "engine of growth for the economy" (McCausland & Ioannis, 2012; and Kathuria & Natarajan, 2013). By examining the share of the manufacturing sector from value-added production and GDP per capita growth (Szirmai and Verspagen, 2015) have used random and fixed effect models, between effects models and Hausman-Taylor approximations for the asymmetrical panel of 92 economies and concluded that manufacturing sector performs a driving role in economic growth in the low and middle-income countries when adequate and efficient human resources are available.

Necmi (1999) investigated that whether Kaldor's growth model are still useful and considered important for the rapid growth and boom of industrial sector utilizing an instrumental variable empirical technique for the data of 45 developing economies during the time period of 1960-1994. The results significantly confirmed that Kaldor's growth model pronouncements that "manufacturing sector act as engine of growth" for most of the developing countries. The study of (Tybout, 2000) also found and concluded that the manufacturing sector performed the key role of being a growth engine for developing economies and findings were consistent with the study of (Necmi, 1999). Chakravarty & Mitra (2009) investigated the hypothesis of Kaldor's growth model for India and found the significant role of manufacturing sector in the country's economic development and growth. Moreover (Kathuria & Natarajan, 2013) also examined the Kaldor's theory of the growth engine of manufacturing sector for 15 states of India for the specified time period of 1994-1995 to 2005-2006 and found that manufacturing sector performed the role of a growth engine for India.

Shiferaw and Hailu (2016) and Rodrik (2015) deliberated the motivating nature of the growth of the manufacturing sector and the mechanisms through which countries have effectively transmuted their arrangements to take advantage of this growth engine towards their contribution to GDP and overall development. Both the studies concluded that the manufacturing sector exhibited a rapid real convergence in the productive efficiency of labor and that mobility of labor from less to more productive sectors caused more rapid growth in Asian countries than in other regions.

In short, past literature endorses the concept that the manufacturing sector "acts as an engine of growth" and is that this proves to be especially significant for some economies, particularly for countries with more human capital. This study is going to investigate the hypothesis of Kaldor's growth

model that the manufacturing sector acts as a growth engine by assessing, in particular, the relationship between the productive efficiency of manufacturing sector, technological innovations and growth of 105 developing countries during 2000-2018.

3. Methodological Framework

3.1. Theoretical Framework of the Study

The policy and economic advisors across the globe are analyzing the factors that influence and boost the growth and development of economies. From the emergence of globalization and especially over the last two decades it has been observed that for sustain and rapid growth of economies, endogenous growth especially of the manufacturing sector is quite necessary. In this subsistence the return to scale effect in productive efficiency in manufacturing sector plays an imperative role. Kaldor's growth model is considered as foundational in this regard that highlighted the enactment of increasing return to growth of economies via manufacturing sector (Bosetti, Carraro & Galeotti, 2006; and Felipe, Aashish&Changyong,2014). Kaldor (1967) studied aspects of rapid growth for the developed economies with respect to the growth of the manufacturing sector, industrial revolution and its impact on economic growth. According to (Cantore, Lennon& Clara, 2016) Kaldor's growth model is considered the root of the relationship between economic growth and manufacturing sector growth by increasing output productivity.

Kaldor (1967) examined the performance of the growth of the manufacturing sector of developed economies from 1952 to 1964 and concluded that it acts as a catalyst in the rapid growth of developed economies. Kaldor assumed that output productivity is mainly dependent on productive efficiency of industrial sector, i.e.

$$Q_i = \alpha_i + \beta_i(Q_{mi}) \quad (1)$$

Where "Q_i" is the output productivity, "Q_{mi}" is productive efficiency of manufacturing sector, "α_i" and "β_i" are the estimators showing the rate of endogenous growth function.

The growth rate of economies, however, depends on the output of manufacturing sector as it also contributes to the non-manufacturing sectors such as primary, tertiary, and other factors of growth (Cantore, 2011; Banjoko, Iwuji&Bagshaw,2012; De-Marchi & Grandinetti, 2013; andLee& Mathews, 2013). Thus, the economic growth of countries depends on both manufacturing and non-manufacturing sectors. But, in in capital intensive countries, the growth rate and contribution of the manufacturing sector is dominant in comparison to less intensive capital economies i.e.;

$$GDP_i = \sigma_i + \delta_i (m_i - \varphi m_i) \quad (2)$$

"φm_i" denotes the non-manufacturing sector output and contribution to growth. Kaldor (1967) viewed that growth in output of the manufacturing sector profoundly depends on the non-manufacturing sector, providing in return raw materials and other essential materials and speeding up the process of manufacturing. So the relationship of the non-manufacturing sector to manufacturing sector is

$$\varphi m_i = \vartheta_i + \phi_i (m_i) \quad (3)$$

Therefore, the availability of capital stock in the manufacturing sector, treated as technological change is added and regressed in Kaldors growth law. With this slight change in the basic theoretical model, Koldar's, equation (2) takes the form

$$GDP_i = \sigma_i + \delta_i (\beta m_i) + \gamma k_i \quad (4)$$

In the above equation “GDP_i” is the economic growth “m_i” is output growth of the manufacturing sector and “k_i” is the capital stock (technological growth).

3.2. Empirical Framework

Despite of the noteworthy contribution, Kaldor's growth law of the manufacturing sector didn't attracted considerable attention from analysts and economic policymakers initially. But, after a successful investigation of the Kaldor growth model in studies of (Pacheco-Lopez and Thirlwall, 2014; and Marconi et al., 2016) and concluded that Kaldor's model successfully explains both the dynamic and static condition of increasing return to scale that progressively improving the efficiency and productive capacity (output) of manufacturing sector leads to its momentous contribution to growth of economies. Afterward, an overwhelming number of studies have rigorously investigated the same model through various approaches and diverse econometric techniques and come up with the conclusion that Kaldor's growth model is effective for understanding the impact of improvements and efficiency in the output of the manufacturing sector in various economies (Romero and McCombie, 2016).

This study using pooled data for 105 developing countries from 2000-2018 to empirically investigate and test the hypothesis of Kaldor's growth model, regressing the impact of the productive efficiency of manufacturing sector and technological innovation on the growth of developing countries. For that purpose, the following pooled specification can be regressed followed by equation (4)

$$GDP_{it} = \beta_0 + \beta_1 m_{it} + \beta_2 k_{it} + \beta_3 z_{it} + \mu_{it} \quad (5)$$

“GDP_i” represents the growth rate of the study's developing countries, “m_i” the output growth of the manufacturing sector, “k_i” is the capital stock (technological growth) and as there may be chances of heterogeneity these are to dealt with by an instrumental variable “Z” as well as elaborating the time invariant and unobserved effect that mostly affect the capital stock leading to impacts on the growth.

The study applied Pooled OLS, a fixed and random effects model for in depth analysis to examine the Kaldor's growth model. We also empirically investigated the impact of the productive efficiency of manufacturing sector on growth of developing countries. Further, the Generalized Method of Movement (GMM) was applied in order to control the endogeneity problem and to strengthen the analysis and outcome of this study.

4. Empirical Analysis, Results & their Interpretation

For increasing return to scale—whether static or dynamic in the manufacturing sector, the analysis and empirical examination of Kaldor's growth model are more suitable as it explains the inter-relation and role of the manufacturing sector in the growth of economies appropriately (Roodman, 2009). The increasing return to productive efficiency of the manufacturing sector leads to an affirmative role in the economic growth of developed, emerging, and developing economies. Thus, proportionately

increasing output productivity and satisfactory contribution of the manufacturing sector in developing economies enables them to enter and confront the world competitive markets, achieve stability in exchange rates, foreign reserve, increase the efficiency of the domestic and international markets of developing countries, brings sustainability in growth and development, increase exports, stabilize the balance of payments, etc. (Kaloudis, Sandven & Smith, 2005; and Cozza et al., 2012; Ju, Lin & Wang, 2015). That's why growth of manufacturing sector and its contribution to GDP for achieving rapid growth has considered essential especially for developing countries.

Kaldor's growth law has sufficiently explained the paramount importance of manufacturing sector in growth of economies through increasing return to scale both in empirical observation and theoretically. This study has experimentally tested Kaldor's growth model and has carefully examined the possible effect of productive efficiency of the manufacturing sector in the growth of developing economies. The Pooled OLS technique was used for regression analysis of the study to examine the effect of productive efficiency on growth of developing economies. A fixed and Random Effect model was conveniently used for the static and dynamic return to scale effect while GMM used for endogeneity. The availability of capital stock (treated here as innovative technology)—is commonly considered a prerequisite for the productive efficiency of the manufacturing sector. Moreover, the static and dynamic function of production with the property of homogeneity is required for the level of return to scale and hence presume substitutability among manufacturing sector productivity, technological innovations, and the growth of developing countries. However, every so often it may be challenging to distinguish the two methodologies (static and dynamic) empirically. The results of Kaldor's growth model for the potential impact of the productive output of the manufacturing sector and technological innovation on the economic growth of developing countries is given in the table (1) below.

Table 1. Empirical Results of the Study

Variables	Pooled OLS		Fixed Effect		Random Effect		GMM Est.	
	β value	t-value	β value	t-value	β value	t-value	β value	t-value
C	0.372	1.526	0.324	1.257	0.273	0.958	0.173	1.437
M	0.593	2.963*	0.437	2.039***	0.396	3.375*	0.567	3.173*
K	0.416	3.562*	0.376	3.468*	0.423	3.653*	0.447	3.975*
Z	0.093	1.916***	0.113	2.296**	0.074	1.852***	0.128	2.658**
R ²	0.714814		0.737936		0.685471		0.673819	
Adj. R ²	0.695619		0.721738		0.669361		0.656108	

(***), (*) & (*) shows robust results at 10%, 5% & 1%

Kaldor's growth model was empirically regressed by applying Pooled OLS, Fixed effect, Random Effect, and Generalized Method of Movement (GMM). The Pooled OLS technique was applied to examine the relative impact of the productive efficiency of the manufacturing sector in the growth of developing economies. The fixed effect model was regressed to examine the individual and static effects of a return to scale. The random effect model was used for finding varying trends in the data and for indicating the dynamic effect

of a return to scale. The GMM model was applied to control for the endogeneity problem that seems useful for relative analysis, conditional upon that the consequent composition error ($Z_i = \theta_i + \eta_{it}$) that may be associated with the independent variables. The findings of the regression analyses are given in table (1).

The findings of the study given in table 1 show that the productive efficiency of the manufacturing sector had a positive and significant effect on the growth of developing economies during 2000-2018. The outcome of pooled OLS and GMM methods confirms that an increase in the output productivity of the manufacturing sector leads to an affirmative increase of 0.59% in the growth of developing countries. Further, the findings of fixed and random effect models are also positive and significant from their estimator values thus showing an increasing return to scale effect of the growth of the manufacturing sector to the economic growth of developing countries. The findings of this study confirm the applicability of Kaldor's growth law and are consistent with the studies conducted by (Necmi, 1999; Roodman, 2009; Cozza et al., 2012; Pacheco-Lopez and Thirlwall, 2014; Romero and McCombie, 2016; Cantore, Lennon & Clara, 2016; and Marconi et al., 2016).

In Kaldor's growth model, the parameters depend on fixed coefficients such as available capital stock in the manufacturing sector or technology, not on such flexible parameter functions as labor supply (Marconi et al., 2016). That is why in this study labor supply is not included and available capital stock in the manufacturing sector in developing countries is regressed and its effect is found significant in that incorporates that increase in the availability of capital stock treated as technology increases the productive efficiency of the manufacturing sector through increasing returns to scale.

The findings of the study indicate that an increase in technical and capital transformation not only push productive efficiency (output) but also increase the efficiency and contribution of other sectors related to the manufacturing sector, i.e. the agriculture sector that provides raw materials, employment, labor productivity, business cycle, etc. Generally, an increase in the growth rate of the manufacturing sector accelerates the economic growth of economies, however the share of the manufacturing sector in the GDP growth of developing economies is low, and its share of aggregate productivity is less as compared to capital intensive, emerging, and developed economies. Worth mentioning is the output productivity of the manufacturing sector which depends on the product demanded locally, regionally, nationally, and internationally. Kaldor (1967) also concluded that the output growth rate depend on exogenous growth and effectual demand for manufacturing sector production.

From the findings of the study, it is concluded that fundamentally the available capital stock and technological association give obvious proof of increasing returns to scale in production that raises the productive efficiency of the manufacturing sector leading to an encouraging effect on the growth of developing economies. So, the empirical findings and evidence of Kaldor's growth law indicate the existence of a significant and positive relationship between the productive efficiency of the manufacturing sector, technological innovation, and economic growth of developing countries during the period 2000-2018.

4. Conclusion

Perceptions are that growth of developing economies in the middle of the 20th century relied upon the productive efficiency of the manufacturing sector that led to the noteworthy effect and speedy

rate of growth of many developing entered in to emerging and fast growing economies due to the substantial growth in manufacturing sector i.e. Korea, Hong Kong, Singapore, Taiwan, Malaysia and etc. This study empirically investigated the Kaldor's growth model and examined the relationship between the productive efficiency of the manufacturing sector, technological innovation and economic growth of developing countries. The study found the significant effect of manufacturing sector on growth of the developing economies. Furthermore, technological innovations also had a positive effect on the economic growth of developing countries through raising productivity and to the presence of static and dynamic economies of scale in the manufacturing sector. Thus from the findings it can concluded that this study exhibited the kaldor's growth model as well of affirm the reliability of the basic hypothesis that manufacturing sector plays the role of "an engine of growth".

4.1. Recommendations

As far as policy recommendations are concerned, this study suggests that

- i. The exports (manufactured goods) of developing countries usually are sub-standard having low quality while competition in the international markets is always high because of the availability of higher quality products. Therefore, developing economies need specialization in order to make their products competitive at local, national, and international levels. Specialization always yields more returns and contribution to growth.
- ii. Since, Kaldor's growth law emphasizes the worth of increasing returns to scale; therefore, the developing countries need a diversion towards increasing returns to scale for bringing productive efficiency into manufacturing sector thereby ensuring more gains from production, output, and in the export sectors.
- iii. Developing countries are essentially required to make domestic policies more friendly and effective to ensure an expansion of productivity of the manufacturing sector.
- iv. Incremental efforts are required to provide skills in the labor pool of developing countries allowing increased use and adaptation to modern technology.
- v. The industrial policy arrangements of developing countries ought to be those that incorporate the rational practices and exercises of foreign investors. Some of major general challenges and difficulties in attracting FDI in the industrial sector are its tough business conditions and environment, corruption, and not applying the rule of law in developing countries needs to be addressed and removed.
- vi. The issue of reliable power sources in developing economies is one of the greatest deterrents for the advancement of the manufacturing sector, and therefore enhancing power generating capacities will be a vital driver of modern development and industrial sector improvement.

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REFERENCES

- Allwood, J. M., Ashby, M. F., Gutowski, T. G., & Worrell, E. (2013). Material Efficiency: Providing Material Services with Less Material Production. *Philosophical Transactions of the Royal Society*, 37(1), 1–15.
- Amirapu, A., & Arvind, S. (2015). Manufacturing or Services? An Indian Illustration of a Development Dilemma. *Center for Global Development Working Paper* 409.
- Banister, J. (2005). Manufacturing Employment in China. *Monthly Labor Review*, July 2005.
- Banjoko S., Iwuji, I., & Bagshaw, K. (2012). The performance of the Nigerian manufacturing sector: A 52 year analysis of growth and retrogression (1960-2012). *Journal of Asian Business Strategy*, 2(8), 171-191.
- Bosetti, V., Carraro, C., & Galeotti, M., (2006). The Dynamics of Carbon and Energy Intensity in a Model of Endogenous Technical Change. *The Energy Journal*, 27, Special Issue on Endogenous Technological Change and the Economics of Atmospheric Stabilization, 191–206.
- Cantore N., (2011). Energy Efficiency in Developing Countries for the Manufacturing Sector. *United Nations Industrial Development Organization Working Paper No. 15/2011*
- Cantore, N., Lennon, C., & Clara, M. (2016). Fast and Furious: Kaldorian Analysis of Dynamic Sectors. *Inclusive and Sustainable Development Working Paper Series* 5/2016
- Chakravarty, S., & Arup, M. (2009). Is Industry Still the Engine of Growth? An Econometric Study of the Organized Sector Employment in India. *Journal of Policy Modelling* 31, 22-35.
- Cozza C., Malerba F., Mancusi M., Perani G., & Vezzulli A. (2012). Innovation, profitability and growth in medium and high tech industries: evidence from Italy. *Applied Economics*, 44, 1963 - 1976.
- De-Marchi, V., & Grandinetti, R., (2013). Knowledge Strategies for Environmental Innovations: The Case of Italian Manufacturing Firms. *Journal of Knowledge Management*, 17(4), 569–582.
- Felipe, J., Aashish, M., & Changyong, R. (2014). Manufacturing Matters, but it's the Jobs that Count. *Asian Development Bank (ADB) Working Paper No. 420*.
- Gereffi, G. (2015). Global Value Chains and Development. *UNU-MERIT Working Paper No. 2015-047*
- Giuliani, E., & Macchi, C. (2014). Multinational Corporations' Economic and Human Rights Impacts on Developing Countries: A Review and Research Agenda. *Cambridge Journal of Economics*, 38(2), 479–517.
- Ju, J., Lin J., & Wang Y. (2015). Endowment structures, industrial dynamics and economic growth. *Journal of Monetary Economics*, 76, 244-26.
- Kaldor, N. (1967). Strategic Factors in Economic Development. Ithaca: New York State School of Industrial and Labor Relations, Cornell University.
- Kaloudis A., Sandven T., & Smith, K. (2005). Structural change, growth and innovation: the roles of medium and low tech industries, 1980 - 2000, in Bender G., Jacobson D., Robertson L. editions, Non research intensive industries in the Knowledge Economy. *Special Edition of the Journal: Perspectives of Economic Political and Social Integration*, 11, (1/2), 49 - 73.

- Kathuria, V., & Natarajan, R. (2013). Is Manufacturing an Engine of Growth in India in the Post-Nineties? *Journal of South Asian Development* 8(3), 385-408.
- Lavopa, A. (2015). Technology-Driven Structural Change and Inclusiveness: The Role of Manufacturing. *Inclusive and Sustainable Development Working Paper Series WP 14/2015*.
- Lee, K., & Mathews, J. (2013). Science, Technology and Innovation for Sustainable Development. *CDP Background Paper No. 16*
- Marconi, N., Froes, D., Borja, R.C., & Araujo E. (2016). Manufacturing and economic development: The actuality of Kaldor's first and second laws. *Structural Change and Economic Dynamics*, 37, 75 - 89.
- McCausland, W. D., & Ioannis, T. (2012). Is Manufacturing Still the Engine of Growth? *Journal of Post Keynesian Economics* 35(1), 79-93.
- Necmi, S. (1999). Kaldor's Growth Analysis Revisited. *Applied Economics* 31, 653-660.
- Pacheco-Lopez, P., & Thirlwall A. (2014). A New Interpretation of Kaldor's First Growth Law for Open Developing Economies. *Review of Keynesian Economics*, 2(3), 384-398.
- Rodrik, D. (2015). Premature Deindustrialization. *NBER Working Paper Series 20935*.
- Romero, J. P., & McCombie, J. (2016). Differences in Increasing Returns between Technological Sectors: A Panel Data Investigation Using the EU KLEMS Database. *Journal of Economic Studies*, 43, 863-878
- Roodman, D. (2009). How to do Xtabond2: An Introduction to Difference and System GMM in Stata. *The Stata Journal*, 9(1), 86-136.
- Shiferaw, A., & Hailu, D. (2016). Job Creation and Trade in Manufactures: Industry Level Analysis Across Countries. *IZA Journal of Labor & Development*, 5(3), 223-237.
- Szirmai, A., & Verspagen, B. (2015). Manufacturing and Economic Growth in Developing Countries, 1950-2005. *Structural Change and Economic Dynamics* 34, 46-59.
- Timmer, M., Gaaitzen-de V., & Klaas-de, V. (2015). Patterns of Structural Change in Developing Countries. In *Routledge Handbook of Industry and Development*, ed. John Weiss and Michael Tribe, 65-83. New York: Routledge.
- Tregenna, F. (2015). Deindustrialization: An Issue for both Developed and Developing countries. *Inclusive and Sustainable Development Working Paper Series 2/2015*.
- Tybout, J. (2000). Manufacturing firms in developing countries: How well do they do, and why? *Journal of Economic Literature*, 38(1), 11-44.