Structural Change, Productivity, and the Shift to Services: The Case of Indonesia

Nabil Rizky Ryandiansyah[a,*], and Iwan Jaya Azis[b]

[a]*Department of Economics, Faculty of Economics and Business Universitas Indonesia*
[b]*Cornell University & Universitas Indonesia*

Abstract

Since Chenery & Syrquin (1975), the pattern of transition from agriculture-heavy economies to industry and then later to services has been central to growth literatures. But recent empirical works have casted doubts on whether developing countries are able to follow the same path. This paper analyzes whether structural change in Indonesia has been productivity-enhancing. This paper finds that structural change from 1998-2014 has not been able to generate impact on economy-wide productivity. This paper also explores possible determinants of the direction of structural change. This paper does not find commodity dependence nor human capital to have clear association with low structural productivity that is observed.
Keywords: structural change; human capital; productivity; commodity boom

Abstrak

Sejak Chenery & Syrquin (1975), transformasi struktural dari sektor pertanian menuju industrialisasi dan kemudian ke sektor jasa dianggap sangat penting dalam pertumbuhan. Meski demikian, beragam penelitian terkini telah menunjukkan bahwa banyak negara-negara berkembang tidak mengikuti pola yang sama dan mengalami deindustrialisasi prematur. Penelitian ini mencoba melihat apakah proses transformasi struktural di indonesia telah berdampak baik pada produktivitas dan pertumbuhan. Penelitian ini menemukan bahwa transformasi struktural di Indonesia pada tahun 1998 hingga 2014 belum mampu memberikan dampak yang positif perekonomian secara menyeluruh. Penelitian ini juga mencoba melihat faktor-faktor yang mampu menjelaskan fenomena tersebut. Penelitian ini menemukan bahwa ketergantungan akan sumber daya mineral dan human capital tidak memiliki pengaruh yang nampak terhadap rendahnya komponen structural productivity di Indonesia.
Kata kunci: *transformasi struktural; produktivitas; commodity boom; human capital*

JEL classifications: J21; J24; O41; O47

1. Introduction

Discussion regarding the progression of economic development often stresses the transition from an agriculture-heavy economy to a manufacturing-based economy, and later shifts to the services sector. Literature theorizing the importance of such flow of development can be traced back to Kuznets (1955) and Lewis (1954). It was hypothesized (and later proved) that labor reallocation from the traditional agriculture sector to modern sectors such as in manufacturing and services is of crucial importance for the transition of an economy to reach high-income status. As labor moves from the traditional agriculture sector to more modern sectors in manufacturing and services, alongside with modernization in the agriculture sector itself, aggregate productivity rises and income increases.

Corresponding Author: Gedung Dekanat FEB UI Kampus Widjojo Nitisastro, Jl. Prof. Dr. Sumitro Djojohadikusumo, Kukusan, Beji, Kukusan, Beji, Kota Depok, Jawa Barat 16424. Email: nabil.rizky51@ui.ac.id.

The story of how this flow of labor reallocation impacts overall productivity relates to the fact that manufacturing and service sectors typically have higher productivity (see Rodrik 2012). However, recent empirical works have raised concerns on whether developing countries have been able to consistently follow this path of structural change (see Rodrik 2016, Bah 2007, Eichengreen & Gupta 2013). It is found that many developing countries, including most in Southeast Asia (Azis 2018), have started to reallocate their labor away from manufacturing to services sector at lower levels of income/development, often before their industry matures. The extent to how their development in the services sector can substitute the welfare and productivity-enhancing role of the manufacturing sector and whether policy failures have contributed to this phenomenon is itself a subject of scrutiny.

Indonesia is not immune to this phenomenon. As displayed in Figure 1, by 2014 the value-added shares in the service sector in total had exceeded industry. After the early 2000s, however, the industry and manufacturing value-added share steadily declined.
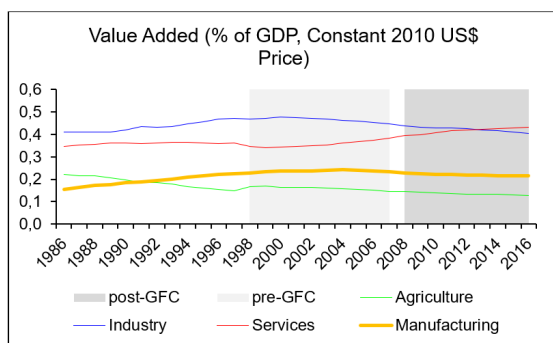

Figure 1: Sectoral Value-Added Shares of GDP in Indonesia
Source: Author's calculation from WDI World Bank Database

There have been no rigorous theoretical and little empirical exercises to explain how and why this reallocation pattern exists in developing countries, particularly Indonesia. Empirical works on devel-

oping countries, on the other hand, have not been able to explain the mechanism behind this phenomenon[1]. This paper aims to see whether the sectoral structural change in Indonesia has been productivity enhancing. This paper then takes two possible main variables that may help to explain the sectoral structural change. Those variables are resource windfall and human capital.

The choice of those variables is not arbitrary. The first variable was chosen in consideration of the fact that Indonesia had to some extent benefited from the commodity boom. It is very likely that commodity exports boom induces crowding out to non-manufacturing sectors through real exchange rate appreciation and loss in the competitiveness, and may help explain the increasing share of services (see Wihardja 2016, Kim, Sumner & Yusuf 2017).

The commodity-induced crowding out from manufacturing, however, does not necessarily have negative impacts on aggregate productivity. Human capital may also affect the direction of structural change, as it also relates directly to sectoral and aggregate productivity (Caballé & Santos 1993, Buera & Kabolski 2009,2012, Acemoglu & Dell 2010, Hicks et al. 2017).

This paper builds on theoretical constructs developed by Kuralbayeva & Stefanski (2013), who describe how resource windfall induces sectoral reallocation of labor to non-manufacturing sectors and leads to lower productivity in non-manufacturing sectors. For empirical analysis, this paper borrows heavily from McMillan, Rodrik & Verduzco-Gallo (2014), which documents structural change patterns across countries in different continents.

The following chapters are structured as follows. Chapter 2 first provides an overview of early liter-

---

[1]Bah (2007), Eichengreen & Gupta (2013), and Mcmillan, Rodrik & Verduzco-Gallo (2014) show that several developing countries have followed a distinct pattern but did not explore the underlying mechanisms of the recent trend of early rise of services.

ature on structural change and how they relate to more recent trends and shows the theoretical background underpinning this paper. Chapter 3 explains the productivity decomposition methods and statistical techniques used in this paper. Chapter 4 lays out some stylized facts of productivity and structural change dynamics in Indonesia and presents the exploratory analysis of the variables discussed. Chapter 5 concludes.

2. Literature Review

Structural change has been a major topic of economic research for decades. Among the contributors to this issue were Lewis (1954), Kuznets (1955), and Chenery & Syrquin (1975). The patterns of development, as documented and theorized by these early literary works, entail structural change. In Lewis (1954), such structural change happens as labor moves from agriculture to modern sectors with higher productivity. Kuznets takes the process further by stating that countries follow two steps of structural transformation. In the first phase, labor is reallocated from agriculture to industries and services. After a certain point of development, the economy reallocates its labor from industries and agriculture to services.

The recent stories for some developing economies, however, are not similar. Rodrik (2016) coined the term "premature deindustrialization" as a reference to the phenomenon experienced by developing countries. It is documented that developing countries have started to deindustrialize sooner than developed countries did. Buera & Kaboski (2009) also shows that traditional theories of structural change cannot explain the pattern in more recent period, with a steep decline in manufacturing and a rise in services. Bah (2007) also confirms that although developed countries follow a similar path of structural transformation, only a few developing

countries did.

While it is not clear whether such deviations in development patterns of developing countries is necessarily bad, it is important to stress the role of industries in development. Rodrik (2012), using large set of disaggregated panel data of 118 countries, found that manufacturing sectors (specifically those formal and organized sectors) exhibit unconditional convergence in labor productivity. However, such convergence may not aggregate up to the overall productivity due to misallocation of labor (labor moves toward non-convergence sectors over time). Furthermore, convergence in labor productivity is not found in agriculture nor services. As such, in terms of productivity convergence, employment growth in industry is still preferable for developing countries than services.

A recent study on Indonesia found that growth in services per se is not inclusive (see Gonzalez & Resusodarmo 2016). Tadjoeddin (2016) also found that while productivity in services has increased, wage-earnings in service sectors in Indonesia have instead decreased since 2003 onwards, contradicting what economic theories suggest.

One possible explanation of the early shift to services is the commodity boom experienced by Indonesia. Patunru & Rahardja (2015) argued that exchange rate appreciation of Indonesian currency during 1998–2013 was due to commodity boom. As the boom ended, Indonesia's competitiveness of traded goods has already dropped, thus manufacturing declines. The commodity boom story was also emphasized by Kim, Sumner & Yusuf (2017) who argued that commodity boom from early to late 2000s has squeezed other tradable sectors' development.

Other variable that is considered in this paper is human capital and their relation to endogenous growth. The theory of endogenous growth was first introduced by Romer (1990), Caballé & Santos (1993),

and Aghion & Howitt (1998). Although the models vary, they generally involve externality and human capital accumulation. Human capital is seen as the key to productivity as it enables learning by doing and knowledge spillovers. In empirical studies, Hicks et al. (2017) uses longitudinal micro data in Indonesia and Kenya and finds that 80% of productivity differences across sectors are driven only by human capital, confirming its importance in productivity.

The papers mentioned above have not been able to establish links between sectoral labor allocation and how increase in services may be undesirable. The papers have also not been able to link the variables considered with its relation to productivity. The lack of explanation for more recent pattern by the available structural change theories has motivated this paper to consider the presence of external shocks than may alter the path of structural change. In relation to commodity boom, Kuralbayeva & Stefanski (2013) proposed a model to explain how resource windfall affect structural change and sectoral productivity. Resource windfall induces reallocation of labor away from manufacturing. A region that benefited resource windfall will experience increase in demand for both manufacturing and non-manufacturing (non-tradable) products. While the increase of demand for manufacturing products can be met by import, this is not the case for non-manufacturing product. As such, non-manufacturing employment will have to increase to meet the increasing demand, leaving manufacturing in smaller size.

This section will develop a simple small, open economy, four-sector general equilibrium model modified from Kuralbayeva & Stefanski (2013) that includes human capital as determining factor. This paper assume that an economy produces four goods: manufacturing (m), high-productivity services (HS), low-productivity services (LS), and natural resources. Manufacturing goods and natural resources is assumed to be traded internationally, while high-productivity and low-productivity services are needed to be produced locally. For simplicity, natural resources are assumed to be exported abroad, and all other sectors exhibit perfect competition. Though these assumptions are very strong and may not be sufficient to represent real condition in Indonesia, it is still useful to help analyze how changes in sectoral composition can alter aggregate productivity.

Households. Representative household has a CES preference given by:

$$\mathrm{u} = (\mathrm{c}_{\mathrm{m}}^{\rho} + \delta \mathrm{c}_{\mathrm{HS}}^{\rho} + (1 - \delta) \mathrm{c}_{\mathrm{LS}}^{\rho})^{1/\rho}, \qquad (1)$$

where $\rho, \delta \in (0, 1)$. We shall refer δ as a parameter associated with human capital.

The consumer's budget constraint is given by:

$$\mathrm{p}_{\mathrm{m}} \mathrm{c}_{\mathrm{m}} + \mathrm{p}_{\mathrm{HS}} \mathrm{c}_{\mathrm{HS}} + \mathrm{p}_{\mathrm{LS}} \mathrm{c}_{\mathrm{LS}} \leq \mathrm{w} + \mathrm{p}_{\mathrm{o}} \mathrm{O}, \qquad (2)$$

where $\mathrm{p}_{\mathrm{o}} \mathrm{O}$ is windfall revenue associated with export of natural resource. It is assumed that consumer is benefited from stream of natural resources O with price p_{o} determined in international market.

Producer. Producer in an economy are homogenous in a competitive market and produce with constant-returns to scale production function:

$$\mathrm{Y}_{\mathrm{i}} = \mathrm{A}_{\mathrm{i}} \mathrm{L}_{\mathrm{i}} \qquad \mathrm{i} \in \mathrm{m}, \mathrm{HS}, \mathrm{LS}, \qquad (3)$$

where A_{i} is sector-specific technology and L_{i} is labor input in each sector i. Since this paper is only interested in sectoral labor composition, this paper abstract from the use of capital. Kuralbayefa & Stefanski (2013) have also shown that adding capital input will not affect the general solution.

Trade. As mentioned earlier, it is assumed that natural resource stream is not consumed locally but rather exported abroad. The revenue generated from resource windfall can then be used to import

manufactured goods so that budget constraint is balanced ($m - p_o O = 0$).

Market clearing. The market clearing condition for manufacturing and services goods are given by:

$$c_m = Y_m + m, \qquad c_{HS} = Y_{HS},$$

$$c_{LS} = Y_{LS}, \quad \text{and} \quad L_m + L_{HS} + L_{LS} = \bar{L}$$

Solution. It will be assumed that wages are equalized across sector so that labor allocation are in equilibrium. For producer, first order condition of equation (3) will then yield $p_i = \frac{1}{A_i}$. Maximizing (1) subject to (2) to solve consumer's demand for goods and substitute for market clearing equations, we can write sectoral labor allocation as:

$$L_{HS} = \frac{1 + p_o O}{1 + \delta^{\frac{1}{\rho-1}} \left[\left(\frac{A_{HS}}{A_m} \right)^{\frac{\rho}{\rho-1}} + \left(\frac{A_{HS}}{A_{LS}} \right)^{\frac{\rho}{\rho-1}} \left(\frac{1}{1-\delta} \right)^{\frac{1}{1-\rho}} \right]} (4)$$

$$L_{LS} = \frac{1 + p_o O}{1 + (1-\delta)^{\frac{1}{\rho-1}} [(\frac{A_{LS}}{A_m})^{\frac{\rho}{\rho-1}} + (\frac{A_{LS}}{A_{HS}})^{\frac{\rho}{\rho-1}} (\frac{1}{\delta})^{\frac{1}{1-\rho}}]},$$

$$L_m = \frac{1 - p_o O[\frac{1}{A_m} + (\frac{A_m}{A_{HS}})^{\frac{\rho}{\rho-1}} (\frac{1}{\delta})^{\frac{1}{\rho-1}} + (\frac{A_m}{A_{LS}})^{\frac{\rho}{\rho-1}} (\frac{1}{1-\delta})^{\frac{1}{1-\rho}} - 1]}{1 + (\frac{A_m}{A_{HS}})^{\frac{\rho}{\rho-1}} (\frac{1}{\delta})^{\frac{1}{\rho-1}} + (\frac{A_m}{A_{LS}})^{\frac{\rho}{\rho-1}} (\frac{1}{1-\delta})^{\frac{1}{1-\rho}}}.$$

The resulting labor equilibrium above shows that labor composition is affected by human capital, resource windfall, and sectoral productivity differences. The latter is in line with Duarte & Restuccia (2010) which shows that structural transformation is endogenous to sectoral productivity difference. For the rest of this section, it will be assumed that $A_{LS} < A_{HS} = A_m$ so that the effect of unbalanced productivity can be captured. This yields the following propositions:

Proposition 1. *Consider two regions j and k which are identical in almost all aspects except that $p_o O^j > p_o O^k$. Region j will have lower employment in manufacturing than region k.*

Proof. The proof can be seen directly from the fact that $\frac{dL_m}{dp_o O} < 0$.

Proposition 2. *Consider two regions j and k which are identical in every aspect except that $\delta^k > \delta^k$.*

Then, $\frac{L_{HS}^j}{L_{LS}^j} > \frac{L_{HS}^k}{L_{LS}^k}$.

Proof. The proof can be deduced directly from the fact that $\frac{dL_{HS}}{d\delta} > 0$ and $\frac{dL_{LS}}{d\delta} < 0$. It follows from the definition of derivation that $L_{HS}^j > L_{HS}^k$ and $L_{LS}^j < L_{LS}^k$. Suppose that L_{HS}^j is greater than L_{HS}^k by α^1 such that $L_{HS}^j = \alpha^1 L_{HS}^k$ and L_{LS}^k is greater than L_{LS}^j by α^2 such that $\alpha^2 L_{LS}^j = L_{LS}^k$ and $\alpha^1, \alpha^2 > 1$. We can then write $\frac{L_{HS}^j}{L_{LS}^j} = \frac{\alpha^1 \alpha^2 L_{HS}^k}{L_{LS}^k} > \frac{L_{HS}^k}{L_{LS}^k}$.

Proposition 3. *Consider two regions j and k which are identical in every aspect except that $\frac{L_{HS}^j}{L_{LS}^j} > \frac{L_{HS}^k}{L_{LS}^k}$ and that $L_{HS}^j, L_{LS}^j, L_{HS}^k, L_{LS}^k > 0$. Aggregate labor productivity in region j will be higher than k.*

Proof. Suppose otherwise. Then $\frac{L_{HS}^j}{L_{LS}^j} > \frac{L_{HS}^k}{L_{LS}^k}$ will yield $\frac{\sum Y_{ij}}{L} \leq \frac{\sum Y_{ik}}{L}$. Since Y_m and L are identical, we can reduce the relationship as

$$A_{HS} L_{HS}^j + A_{LS} L_{LS}^j \leq A_{HS} L_{HS}^k + A_{LS} L_{LS}^k.$$

Suppose A_{HS} is higher than A_{LS} by η so that we can write $A_{HS} = \eta A_{LS}$ for $\eta > 1$. The relationship can then be written as $\eta A_{LS} L_{HS}^j + A_{LS} L_{LS}^j \leq \eta A_{LS} L_{HS}^k + A_{LS} L_{LS}^k$, or alternatively,

$$\eta L_{HS}^j + L_{LS}^j \leq \eta L_{HS}^k + L_{LS}^k.$$

Since the two regions are equal in other aspects, we can establish

$$L - L_m = L_{HS}^j + L_{LS}^j = L_{HS}^k + L_{LS}^k,$$
$$\text{or altenatively,} \quad L_{HS}^j - L_{HS}^k = L_{LS}^k - L_{LS}^j$$

As such, we can rewrite

$$\eta \left(L_{HS}^j - L_{HS}^k \right) \leq L_{LS}^k - L_{LS}^j$$

Since $\eta > 1$, the last relationship is contradictory to $L_{HS}^j - L_{HS}^k = L_{LS}^k - L_{LS}^j$. Thus, it must be that $\frac{\sum Y_{ij}}{L} > \frac{\sum Y_{ik}}{L}$.

The three propositions developed in this chapter

will be the main theme of the empirical exploration in the later chapters. Since both $\frac{dL_{HS}}{dp_oO} > 0$ and $\frac{dL_{LS}}{dp_oO} > 0$, we cannot directly determine whether dp_oO will result in higher aggregate productivity. The sign of this effect will be dependent on sectoral productivity differences and δ, which is associated with the level of the human capital involved. Only when $\frac{dL_{HS}}{dp_oO} < dL_{LS}dp_oO$ does resource windfall be harmful to productivity.

It should be noted that the model is very simplistic and its strong assumptions may make it insufficient to be analyzed empirically. However, the last proposition derived above helps to understand how sectoral composition alone can affect aggregate productivity, even leaving sectoral productivity as constant. Aggregate productivity, by definition, can decline when sectoral productivity declines. However, even if sectoral productivity remains constant, changes in sectoral composition alone can also affect aggregate productivity. This result will be crucial for the remaining of this paper.

3. Method

The measurement that is used in this paper is a simple labor productivity – namely, GDP over labor in a sector. The GDP data is obtained directly from *Badan Pusat Statistik* (BPS or Statistics Indonesia) website for the year 2000 to 2014 with 2000 constant price. The data on 1998–1999 and all provincial GDP data are obtained from CIEC Indonesia Premium Database with nominal and 1993 constant price. The data were then converted to constant 2000 price. This paper uses SAKERNAS (*Survey Tenaga Kerja Nasional* or Labor Force Survey) for all years of analysis. SAKERNAS is an employment survey conducted yearly (more recently, semi-annually) by the BPS.

One note and possible limitation of the data used in this study is that for the year 1998 and 1999, Business Services and Other Financial Services have not been classified. However, both subsectors do not constitute a large share of employment. Thus, the absence of these data is expected to not substantially change the result.

This paper decomposes the dynamics of labor productivity by the simple shift-share analysis:

$$\Delta y_t = \sum_i \theta_{i,t-k} \Delta y_{i,t} + \sum_i y_{i,t} \Delta \theta_{i,t} \qquad (5)$$

where θ_i denotes the share of employment of sector i.

The first term of the right-hand side of the above equation denotes the "within" component of labor productivity. It essentially captures the productivity change that happens within each of every sector. Examples of the sources can range from technological shock, capital accumulation, or reduction of misallocation across plants, to name a few. The second term of the above equation, the focus of this paper, denotes the reallocation term or the "structural" component. It captures the movement of labor[2] from one sector to another with varying degrees of productivity. A positive structural component may be interpreted as that labor has moved from low productivity sector to higher productivity ones, increasing aggregate productivity.

Another method for examining how successful a country's structural change has been is by looking at the detailed picture of employment change and productivity in each sector. This is done by plotting each sector in terms of their log relative productivity in end period and change in employment share and running a linear regression of the following: A positive slope will imply that the change in employment

---

[2]It is important to note that the notion that labor moves from one sector to another should not be taken in its literal meaning, but only for brevity. It should instead be interpreted as that one sector absorbs more labor than another.

share is positively correlated with relative productivity of each sector. It can also be interpreted as whether growing sectors are the ones with relatively high productivity. The scale of this slope will relate to how fast has the structural change happened by reallocation of labor to more productive sectors.

4. Results

This section will examine the dynamics of labor productivity and structural change patterns in Indonesia. Figure 2 shows the results of labor productivity decomposition from Equation (5). The figure highlights a concerning fact of productivity development in Indonesia. It is shown that during the latter period, productivity growth was slower. The source of this slowdown is the decline of sector-specific or within-sector productivity. Productivity changes caused by structural change, on the other hand, contributed very minimally (almost 0) in the latter period and contributed negatively during the pre-GFC period.

Figure 2: Labor Productivity Decomposition: Indonesia
Source: Author's calculation. Data from BPS, SAKERNAS, and CEIC Premium Database

Negative or close to zero structural change is undesirable for several reasons. First, negative structural change means that more labor is employed in less productive sectors, which, by definition, worsens inequality in the labor market. On the other hand, structural change that is almost indistinguishable from zero means that structural change has not been able to reduce inequality. The fact that structural change has been very low and even negative also implies that productivity improvement came mainly from sector-specific technological progress and was not diffused to the overall economy.

While it is obvious from the above figure that within-sector productivity has declined during more recent periods, we need a more detailed view on sectors that contributed most negatively to this trend. For this, Table 1 shows a detailed comparison of change in employment share and relative productivity during the two periods.

As can be seen from Table 1 most sectors experienced lower relative productivity. Only communication, air transport, land transport, transport services and agriculture (albeit only slightly) experienced an increase in log relative productivity. Unfortunately, those sectors were also the ones to experience less change in employment share in 2009–2014 compared to 1998–2007[3].

To analyze how the relationship has changed overtime, Figure 3 plots and draw linear regression trends for the 9-sector aggregated data at the left-hand side and only the service sub-sectors at the right-hand side. It is obvious from both figures that services sector (9, "other services") was the sector that expanded the most, while having negative and even declining relative productivity.

On the left-hand side of Figure 3, the 2009–2014 period has a flatter slope than 1998–2007. A positive slope indicates a positive relationship between

---

[3]This research has also tried to omit 1998-1999 period to isolate the impact of AFC. However, even calculating for only 2000 onwards, the structural change component is still negative and the pattern does not change much. To capture for longer period, this paper still includes 1998-1999 in the analysis.

Table 1: 1998–2007 & 2009–2014 Period Comparison

ID	Nomenclature	Change in change in Employment Share		Change in Log of Sectoral Productivity over Total Productivity		% change	
		Increase	Decrease	Increase	Decrease	Employment Share	Log of Sectoral Productivity over Total Productivity
12	Communication		-0.9739	0.2566		-4.1482	0.2483
8	Land Transport		-0.9833	0.1827		-5.5231	0.4377
11	Transport Services		-0.6750	0.0886		-0.7923	4.4934
10	Air Transport		-0.0212	0.0856		-1.3292	0.0765
1	Agriculture		-2.0927	0.0282		-0.5788	0.0623
6	Retail and Wholesale Trade	2.5670			0.0000	1.2716	0.0092
7	Hotel and Restaurants		-3.2852		-0.0131	-0.9510	-0.1195
5	Construction		-0.1336		-0.0467	-0.1070	-0.4932
3	Manufacturing		-0.0180		-0.0589	-0.0168	-0.1600
9	Water Transport	0.0397			-0.0701	0.8951	-0.1330
20	Household and Personal Services	2.2206			-0.0741	1.7872	-0.7587
18	Social Services	0.4159			-0.0879	0.4769	-0.1723
19	Entertainment Services		-0.0994		-0.0992	-0.5015	-1.2156
4	Utilities	0.0327			-0.1058	4.8296	-0.1714
17	Government Services	2.3198			-0.1407	1.2190	-0.6746
15	Other Intermediary Services		-0.0311		-0.1444	-0.7257	-0.6497
16	Real Estate	0.3822			-0.1822	1.3334	-0.1410
14	Non-Bank Financial Insitutions	0.0275			-0.2042	0.1002	-0.5271
2	Mining		-0.0770		-0.2096	-0.3381	-0.2171
13	Bank	0.3723			-0.2345	4.9472	-0.2210
21	Corporate Services	0.0128			-0.2633	0.0253	-0.4835

Source: Author's calculation. Data from BPS, SAKERNAS, and CEIC Premium Database
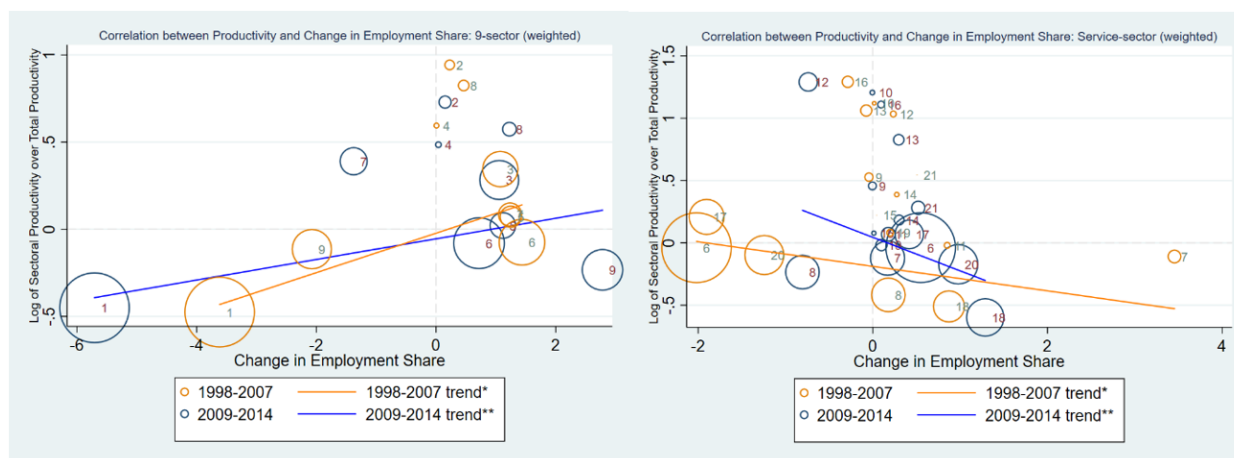

Figure 3: Correlation between Sectoral Productivity and Change in Employment Share
Source: Author's calculation. Data from BPS, SAKERNAS, and CEIC Premium Database

change in employment share and log relative productivity. This means that the sectors to which labor reallocates have higher productivity than sectors labor from which labor reallocates. As such, the interpretation of the results above is that during the more recent period, growing sectors experienced lower productivity. The lower trend of structural change can be caused by lower *within-sector productivity* growth in the expanding sectors.

On the right-hand side of Figure 3, the more recent period shows a more negative slope, which means that structural change has been even more growth-reducing in services sector. This is because

the growing service sectors are the ones with low productivity. In the above figure, it can also be seen that in the more recent period, almost all subsectors classified as services experienced growth except communication (12) and land transport services (8). On the other hand, the growing sectors with the largest shares of employment are also the ones with the lowest productivity (retail and wholesale trade (6), household and personal services (20), hotel and restaurants (7), and government services (18)). Not only that they have low (even negative) productivity, they experienced even lower productivity in the more recent period.

It is therefore reasonable to conclude that sectoral composition change in Indonesia has not been productivity-enhancing. Expansion in employment in the service sectors mentioned earlier has not been able to generate economy-wide spillovers. Not only are the growing sectors those with lower relative productivity, sectors with higher relative productivity such as Manufacturing are shrinking and their sector-specific productivity has declined. While the unproductive agriculture sector's contraction story is similar to the general pattern of development, it is those in unproductive services sectors that expands. As such, the process of structural change out of agriculture by using traditional distinction of sectors is not to be taken as generally welfare-enhancing if the productivity of the sectors labor reallocate to is not that higher.

These facts also give rise to further questions on whether growth in service sectors can be a reliable source of growth in Indonesia. The four low-productivity sectors mentioned above are typically known for low innovation creation (see Evangelista (2000) for a case in Italy). Moreover, 42% of workers in trade, hotel, and restaurant – the growing service sector with largest share of employment – are still in informal sectors These informal jobs typically employ workers with low education levels. We can then safely suspect that the growth of these sectors

will not bring much improvement to the process of knowledge diffusion to the overall economy.

The above section has highlighted how sectoral structural change has contributed to worsening growth during the more recent period nationally. In the remaining of this chapter we will turn our analysis to exploratory analysis on the variables that may affect structural productivity. We are specifically interested in possible factors that alter sectoral structural change processes to become less growth-enhancing.

Indonesia consists of provinces with varying characteristics. Figure 4 illustrates the heterogeneity. The bulk of natural resources are concentrated in several regions such as Aceh, Riau, South Sumatera, East Kalimantan, and Papua. By 2014, however, provinces such as Aceh and Papua had begun to be less dependent on natural resources, while East Kalimantan became more dependent. Other provinces either have less natural resources or have developed more, such that they became less dependent on natural resources[4].

The structural change component of productivity can be examined in Figure 5[5]. In Figure 5, all provinces experienced negative structural change. This confirms the results in Figure 2 which shows the calculations on national level. Furthermore, as displayed in Figure 5, provinces that are more dependent on resources (such as Aceh, Riau, and Papua) experienced more negative structural change during the pre-GFC period. This pattern also persists in the right-hand side of Figure 6, with East Kalimantan as a notable exception.

On the surface, the figures above support the findings in Mcmillan, Rodrik & Verduzco-Gallo (2014)

---

[4]Provinces such as Banten,Kepulauan Riau, Kepulauan Bangka Belitung, Kalimantan Utara, Gorontalo, Maluku, and Papua Barat are included in their pre-1999 province GDP calculation.
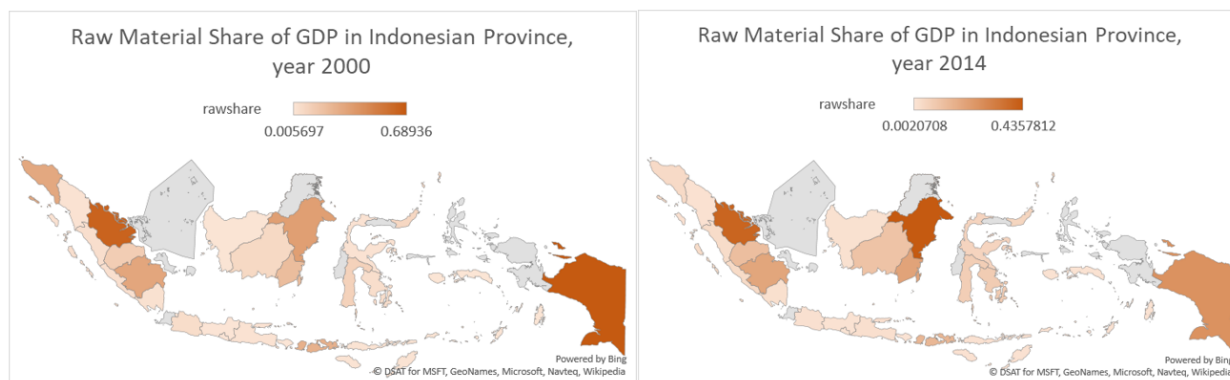[5]The calculation for the figures use 9-sector level disaggregation.

Figure 4: Raw Material Share in Indonesian Provinces
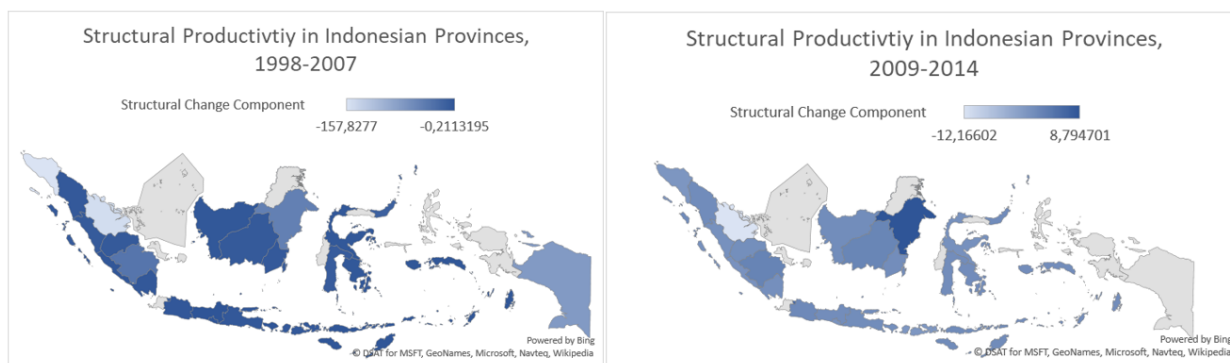Source: Author's calculation. Data from BPS and SAKERNAS data

Figure 5: Structural Productivity Component in Indonesian Provinces
Source: Author's calculation. Data from BPS and SAKERNAS data

which shows that commodity dependence affect structural productivity negatively. However, looking at the East Kalimantan case alone, one may suspect that the relationship is far from clear-cut. A further look on the data is needed.

Table 2 show provinces where the share of mineral GDRP over total GDRP is below or above 0.5, indicating whether one region has high dependence on raw mineral production. The result of simple Pearson's Chi-Square test shows no clear association between high dependence on mineral GDRP and the sign of structural productivity. Only two years (2000 and 2003) that we see the chi-square is significant at 5% level (Pr=0.041 and 0.032).

Another possible variable that may explain the structural productivity that is observed in Indonesia is Human Capital. This paper uses *Indeks Pembangunan Manusia* (IPM, equivalent to Human Development Index or HDI) as a proxy for human capital, which is published by the BPS yearly. In Figure 6, the provincial dispersion is presented. At a glance, provinces such as East Kalimantan and Central Kalimantan show relatively high IPM, while Aceh and Papua show relatively low IPM. At quite the same time, East Kalimantan and Central Kalimantan show relatively high structural productivity component during post-GFC period, while Aceh and Papua experienced relatively low structural productivity. However, as with the story on commodity dependence shown earlier, the relationship is not that clear-cut. In Riau province, for example, while the human capital is relatively high, the structural productivity remains negative after GFC.

Table 2: Simple Chi-Square Test for Independence for Commodity Dependence

Year	2000		2001		2003		2004		2005	
Mineral share of GDRP	<=.5	>.5	<=.5	>.5	<=.5	>.5	<=.5	>.5	<=.5	>.5
Negative or zero Structural Productivity	24	0	10	0	17	0	10	0	19	1
Positive Structural Productivity	4	1	14	2	6	2	14	1	5	2
Pearson's χ^2	4.1667		1.3542		4.6196		0.0525		0.8847	
Pr	0.041		0.245		0.032		0.819		0.347	

Year	2006		2007		2008		2009			
Mineral share of GDRP	<=.5	>.5	<=.5	>.5	<=.5	>.5	<=.5	>.5		
Negative or zero Structural Productivity	17	1	7	1	12	0	11	1		
Positive Structural Productivity	7	1	17	1	13	1	14	0		
Pearson's χ^2	0.3762		0.3762		0.8914		1.2133			
Pr	0.540		0.540		0.345		0.271			

Source: Author's calculation from BPS and CEIC Premium Database data
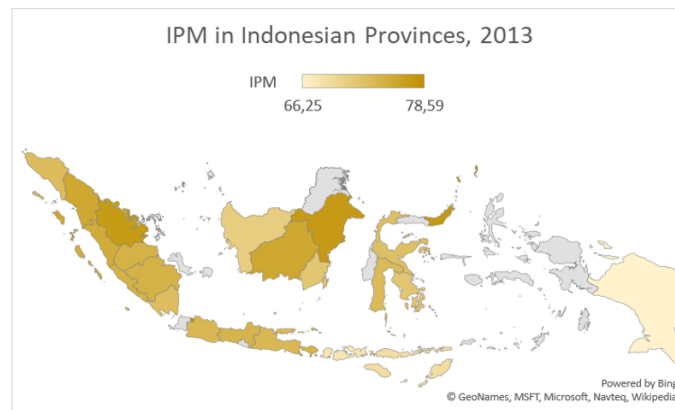
Figure 6: IPM in Indonesian Provinces, 2013
Source: BPS

To see whether there is notable association for human capital, Table 3 again show the chi-square test for independence between human capital and structural productivity. The columns show whether the IPM level is above or below national average at the year. Similar to commodity dependence story, there seem to be no obvious association between the human capital level and the sign of structural productivity. Only year 2011 that we see the test is significant at 5% level (Pr=0.019).

The above results seem to go against the common story on commodity dependence, human capital, structural change, and productivity. While some of the provinces showed parallel movement between either commodity dependence and structural productivity or human capital and structural productivity, others did not.

Although none of the above results show clear association between those variables, this paper remains agnostic as to whether we should neglect the variables altogether. What is clear, however, is that even if commodity dependence and human capital affect structural productivity (as examples in several provinces suggest), the relationship must be far from clear-cut. A further examination – both theoretical and empirical – is surely required and worth

Table 3: Simple Chi-Square Test for Independence for Human Capital

Year	2002		2004		2005		2006	
IPM Level	Above Mean	Below Mean	Above Mean	Below Mean	Above Mean	Below Below Mean	Above Mean	Below Mean
Negative or zero Structural Productivity	10	8	4	7	9	11	8	10
Positive Structural Productivity	4	2	7	8	3	3	5	3
Pearson's χ^2	0.2286		0.2760		0.0464		0.7222	
Pr	0.633		0.599		0.829		0.395	

Year	2007		2008		2009		2010	
IPM Level	Above Mean	Below Mean	Above Mean	Below Mean	Above Mean	Below Below Mean	Above Mean	Below Mean
Negative or zero Structural Productivity	3	5	7	5	6	6	4	8
Positive Structural Productivity	10	8	6	8	8	6	8	6
Pearson's χ^2	0.7222		0.6190		0.1327		1.4739	
Pr	0.395		0.431		0.716		0.225	

Year	2011		2012		2013			
IPM Level	Above Mean	Below Mean	Above Mean	Below Mean	Above Mean	Below Below Mean	Above Mean	Below Mean
Negative or zero Structural Productivity	4	0	7	7	8	7		
Positive Structural Productivity	8	14	6	6	5	6		
Pearson's χ^2	5.5152		0.0000		0.1576			
Pr	0.019		1.000		0.691			

Source: Author's calculation from BPS and CEIC Premium Database data

exploring.

5. Conclusion

The patterns of development, as documented by Chenery & Syrquin (1975), entails structural change to service sectors once the economy has developed. Services is thus often seen as the "final stage" of structural transformation as they usually consist of high productivity sectors. The finding of this paper, however, shows that Indonesia's rise of services has not been able to generate economy-wide benefit, as much of the growing services sectors have been featured by the growing share of traditional ones with low productivity.

This should raise concerns about the country's structural change and productivity. During most of

the years after the Global Financial Crisis, growth of labor productivity was lower than most of the years before the crisis. Lower sector-specific productivity experienced during post-GFC contributed to this problem. Productivity caused by sectoral composition change, on the other hand, has not been able to generate substantial economy-wide impacts. After the GFC, productive sectors such as manufacturing and communication services either experienced a decline in terms of employment growth, relative productivity, or both. Ironically, at the same time, the less productive sectors were the ones that expanded fast. The bulk of employment growth are concentrated in traditional services with low and even declining productivity; and they are also the ones that capture largest share of employment in Indonesia.

To the extent a structural change from agriculture

and industry to services can be beneficial for productivity, the whole analysis of structural transformation need to include the analysis of sectoral productivity. This is precisely what is argued in the current study. Particularly, it examines possible explanations of Indonesia's low structural change. Following McMillan, Rodrik & Verduzco-Gallo (2014), we evaluate whether the dependence on raw materials contributes to a lower structural change component of labor productivity. We also consider the role of human capital in affecting the direction of structural change. At a first glance, regions with higher human capital level are also the ones to have a growth-enhancing structural change in general. At the same time, regions with high dependence on raw material production are also the ones to experience growth-reducing structural change. However, result from chi-square tests shows that there is no obvious and clear-cut association that can be inferred. Further study along this line is therefore needed preferably focusing on the transmission mechanisms about how the rise of low-productivity services affects long-term development trends, taking into account the presence of inter-sectoral linkages and the production network.

References

[1] Acemoglu, D & Dell, M 2010. Productivity differences between and within countries. *American Economic Journal: Macroeconomics*, 2(1), pp.169-88. doi: 10.1257/mac.2.1.169.

[2] Aghion, P & Howitt, P 1998. *Endogenous growth theory*. MIT press.

[3] Azis, IJ 2018. ASEAN Economic Integration: Quo Vadis? *Journal of Southeast Asian Economies (JSEAE)*, 35(1), pp.2-12.

[4] Bah, EM 2007. Structural Transformation in Developed and Developing Countries. *MPRA Paper No. 10655*. Munich Personal RePEc Archive. https://mpra.ub.uni-muenchen.de/10655/1/MPRA_paper_10655.pdf

[5] Buera, FJ & Kaboski, JP 2009. Can traditional theories of structural change fit the data? *Journal of the European Economic Association*, 7(2-3), pp.469-477. doi: https://doi.org/10.1162/JEEA.2009.7.2-3.469.

[6] Buera, FJ & Kaboski, JP 2012. The rise of the service economy. *American Economic Review*, 102(6), pp.2540-69. doi: 10.1257/aer.102.6.2540.

[7] Caballé, J & Santos, MS 1993. On endogenous growth with physical and human capital. *Journal of Political Economy*, 101(6), pp.1042-1067. doi: https://doi.org/10.1086/261914.

[8] Chenery, H & Syrquin, M 1975. Patterns of development 1950-1970. *A World Bank research publication 11913*. New York, NY : Oxford University Press. http://documents.worldbank.org/curated/en/482491468328816108/Patterns-of-development-1950-1970.

[9] Duarte, M & Restuccia, D 2010. The role of the structural transformation in aggregate productivity. *The Quarterly Journal of Economics*, 125(1), pp.129-173. doi: https://doi.org/10.1162/qjec.2010.125.1.129.

[10] Eichengreen, B & Gupta, P 2013. The two waves of service-sector growth. *Oxford Economic Papers*, 65(1), pp.96-123. doi: https://doi.org/10.1093/oep/gpr059.

[11] Evangelista, R 2000. Sectoral patterns of technological change in services. *Economics of Innovation and New Technology*, 9(3), pp.183-222. doi: https://doi.org/10.1080/10438590000000008.

[12] Gonzalez, I & Resosudarmo, BP 2016. A sectoral growth-income inequality nexus in Indonesia. *Departmental Working Papers 2016-15*. The Australian National University. Arndt-Corden Department of Economics.

[13] Hicks, JH, Kleemans, M, Li, NY, & Miguel, E 2017. Reevaluating Agricultural Productivity Gaps with Longitudinal Microdata. *NBER Working Paper No. w23253*. National Bureau of Economic Research. https://www.nber.org/papers/w23253.pdf. doi: 10.3386/w23253.

[14] Kim, K, Sumner, A, & Yusuf, AA 2017. How Inclusive is Structural Change? The Case of Indonesia. *ESRC GPID Research Network Working Paper 3*. Economic & Social Research Council Global Poverty and Inequality Dynamics. https://www.gpidnetwork.org/wp-content/uploads/2017/09/WP_3.pdf.

[15] Kuralbayeva, K & Stefanski, R 2013. Windfalls, structural transformation and specialization. *Journal of International Economics*, 90(2), pp.273-301. doi: https://doi.org/10.1016/j.jinteco.2013.02.003.

[16] Kuznets, S 1955, Economic Growth and Income Inequality. *The American Economic Review*, 45(1), pp. 1-28.

[17] Lewis, WA 1954. Economic development with unlimited supplies of labour. *The Manchester School*, 22(2), pp.139-191. doi: https://doi.org/10.1111/j.1467-9957.1954.tb00021.x.

[18] McMillan, M, Rodrik, D, & Verduzco-Gallo, Í 2014. Globalization, structural change, and productivity growth, with an

update on Africa. *World Development*, 63, pp.11-32. doi: http://dx.doi.org/10.1016/j.worlddev.2013.10.012.

[19] Patunru, AA & Rahardja, S 2015. *Trade Protectionism in Indonesia: Bad Times and Bad Policy*. Lowy Institute For International Policy. http://hdl.handle.net/11540/6410.

[20] Rodrik, D 2012. Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, 128(1), pp.165-204.

[21] Rodrik, D 2016. Premature deindustrialization. *Journal of Economic Growth*, 21(1), pp. 1-33. doi: https://doi.org/10.1007/s10887-015-9122-3.

[22] Romer, PM 1990. Endogenous technological change. *Journal of Political Economy*, 98(5, Part 2), pp.S71-S102. doi: https://doi.org/10.1086/261725.

[23] Tadjoeddin, MZ 2016, Earnings, productivity and inequality in Indonesia. *The Economic and Labour Relations Review*, 27(2), pp.248-271. doi: https://doi.org/10.1177/1035304616643452.

[24] Wihardja, MM 2016. The effect of the commodity boom on Indonesia's macroeconomic fundamentals and industrial development. *International Organisations Research Journal*, 11(1), pp. 48-70. doi: 10.17323/1996-7845/2016-01-48.