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Productivity and Global Value Chains: A Tale from the Indonesian Automobile Sector

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Abstract: Low productivity and quality of employment have always been a big problem in Indonesia, caused by the lack and mismatch of skills in the workforce. Labor productivity (LP) describes the company's ability to produce something. This can be determined by added value or output. Several factors influence LP, such as education, age, and training. The concept of global value chains (GVCs) has become an integral part of economic activity, and trade within global production networks has grown more rapidly than conventional trade in final goods. GVCs have both positive and negative impacts on employment opportunities. The automotive industry is categorised as one of the ten primary priority industries in the Indonesian manufacturing sector. This research analyses the impact of LP on GVC integration in the Indonesian automotive industry. The data used in this research comes from the World Input–Output Database (WIOD) and the Central Statistics Agency (BPS) from 1995 to 2014. The variables used include the number of workers, added value, real wages, and GVC, which were calculated by the author using the Inter-Country Input–Output (ICIO) approach. Using ICIO analysis, the following matrix should be constructed to determine involvement in GVCs. This research shows that LP in the Indonesian automotive industry has a positive trend, and the GVC position in the Indonesian automotive industry has a positive trend line. The domestic value chain increased from 4% to 33%. This improves the ability to produce higher value-added and intermediate export goods. LP increases the domestic value chain in the Indonesian automotive industry, leading to global value chain integration. Thus, LP goes hand in hand with integrating GVCs.

Keywords: labor productivity; global value chain; global production network; inter-country input–output; automotive industry

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1. Introduction

Due to skill shortage and mismatch, which lead to low productivity, employment quality is a perpetually major issue in Indonesia. Gains in labor productivity have been slow (Allen 2016), while low productivity growth leads to increasing prices, increasing cost of input factor price, and lower utilization of the domestic plant industry (Oyeranti 2000). As the Indonesian automotive sector proliferated over the last 30 years, production activities related to indicators involving value added, output, and production shop floor workers' numbers tended to increase from 1995 to 2014 (Statistics Indonesia). As production workers increased, production in the automotive industry increased. Productive work and decent hours can be used as statistical indicators of decent work. Krugman (1990) suggested that productivity may not be everything in the short run, but it is almost everything in the long run. Productivity concerns government bodies, trade unions, and other social institutions that may have different conceptualizations by different groups or persons. It is not only to be defined and managed but also to be measured. Productivity is likely guaranteed if its measurement balances es theory and practice (Oyeranti 2000). The global value chain concept has become integral to economic activities recently. Trade within global production networks has been expanding more rapidly than conventional final-goods trade.

Kimura and Ando (2005) prove that product-level international trade is more effective in assessing the degree of participation in production networks.

The automotive industry is categorised as one of the top ten industry priorities in Indonesia's manufacturing sector. Based on GAIKINDO, its market increased during the period 2006–2017, and in the last five years, it has become the largest market in ASEAN. It is driven by production networks and multinational companies that invest in Indonesia. Referring to a minister of industry, the structure of the automotive industry consists of car assemblers; component industry tier 1; component industry tier 2 and 3; an outlet, workshop, authorized sales service, and spare parts; and an outlet, workshop, non-authorized sales service, and spare parts. The global value chain of Indonesia's automotive industry faces difficulty in functional up-grading. The position is still at the lowest level in value chains (Wicaksono et al. 2019). The skills required to become first-tier suppliers, so the choices are either exiting the industry or becoming second-tier or third-tier suppliers (Doran 2004). The position in global value chains needed to be explicitly measured to obtain the result more precisely. Koopman et al. (2012) constructed the input–output matrices that can be used to measure GVC position. A GVC drives economic efficiency through productivity improvement and efficient allocation of resources. Integrating into global value chains is key to developing the manufacturing sector (Javorsek and Camacho 2015). Becoming part of GVCs increases firm productivity, while quitting GVCs hurts firm performance (Baldwin and Yan 2014). Global value chains have a positive and negative impact on employment. GVCs creates jobs in many developing countries. In addition, severe pressure has come through the stagnation of real wages and adverse workplace conditions, which are called a race to the bottom (Islam 2015) and (Islam et al. 2015). The World Input–Output Database (WIOD) provides the data that can be used to measure global value chains. This study attempts to analyze the impact of labor productivity on global value chain integration in the Indonesian automotive industry.

2. Literature Review

2.1. Global Value Chain and Global Production Networks

The value chain is a set of activities that bring a product to end users and beyond, either between firms or in a single firm (Gereffi and Fernandez-Stark 2016). The value chain integrates suppliers, manufacturers, and stores so that they make the production and distribution process time and efficiently. On a macro level, GVCs influence trade response to friction and change the nature of macro-spillovers across countries, while at the micro level, GVCs explain firm performance and labor market outcomes (Johnson 2017).

Global production networks (GPNs) are organizational platforms through which parties across regions and countries cooperate for a more significant share of value added, transfer knowledge, and capture geographically dispersed economic activity (Yeung and Coe 2014). The competitive dynamics become the drivers to be involved in global production networks. Quality of product, cost-capability, and response to time are several reasons to be involved in global production networks.

The hierarchical structure of GVC assumes that the leading firm has absolute control of the subsidiaries. The subsidiaries are strictly monitored and assessed in line with the supply chain strategies (Inomata 2017). In addition, outsourcing is an option for the firm in case the firm needs a new supplier. Selecting a supplier must be carefully conducted so that the firm can find a better supplier than before.

Economies of scale and specialization have been driving the competitive advantage for multinational companies, which widened the development of GPNs (Javorsek and Camacho 2015). The objective is to maximize the overall value generated (Chopra and Meindl 2016). Maximizing value can be achieved if the total costs are reduced, so the net benefit/profit is at the maximum point.

Integrated transnational manufacturers in capital or technology-intensive industries usually control the production in producer-driven chains (Barrientos et al. 2010). The manufacturer always has a trade-off in choosing the responsiveness or efficiency strat-

egy. Both have strengths and weaknesses; it depends on the objective and structure of the manufacturer.

Banga (2016) states that the net effect of global value chain participation in employment growth in Indian industries has been negative. Higher backward linkage negatively impacts employment growth, while higher forward linkage does not influence employment growth.

The fragmentation in global automotive production increased both within and across the region from 1995 until 2011 (Timmer et al. 2015). In Indonesia, the substantial progress of GPNs leads to superior technology, knowledge, and expertise, precariousness, and the growing informality of outsourced self-employment systems (Wicaksono and Priyadi 2016).

2.2. Labor Productivity

Labor productivity is the firm's ability to generate higher production or value added (Heshmati and Rashidghalam 2018). The annual rate of actual hourly earnings is the same as output per weighted unit of labor and capital combined for the domestic economy (Rees and Jacobs 1961). Productivity between firms might vary depending on capital, energy, or technology—productivity increases when the firm becomes more efficient using the input without additional working hours. Human capital is an essential factor in labor productivity. The effect of education, skills and capital per worker on labor productivity in Iran's food industries is positively significant (Afrooz et al. 2010). Labor quality is determined by human capital, which affects labor productivity. Education and skills are essential in human capital, leading to higher labor productivity Flexible working hours improve labor productivity, while in food services and information communication, there is no relationship between working hours and productivity (Man and Ling 2014). In addition, according to Collewet and Sauermann (2017), increasing working hours makes workers less productive. Theoretically, productivity and working hours correlate; when productivity increases, working hours decrease. It may have a different result.

2.3. Linking Labor Productivity and GVC

Global value chain theory suggests that different value chains create relationships between firms and networks operating under multiple national systems. GVC and employment relations theory has several propositions depending on GVC configuration. The configuration used in this study is relational value chain configuration, where interactions and communication between key firms and suppliers are frequent and central. In proposition 4, relational value chain configuration is classified according to the modest influence of the lead firm, dual leadership and regional institutional influence, high qualification level of the workforce, and high employment stability (Kuruvila and Lakhani 2013). Relational value chain configuration has been implemented by the global automotive industry, where high product complexity is combined with low modifiability. This relation drives the transfer of knowledge between suppliers and large firms.

Linking labor productivity to GVC determines whether GVC participation improves labor productivity. Ideally, an increase in GVC raises labor productivity. According to (Pietrobelli and Rabellotti 2011), engaging in global value chains leads to competitive advantage and increases productivity. Transferring knowledge and technology often become the drivers. Participation in the global value chain and its position is essential. International activities positively impact the firm's productivity (Montalbano et al. 2017). Integration drives the firm to improve its performance. GVC participation and firm-level productivity in Canadian manufacturing show a positive correlation. Becoming part of GVC increases firm productivity, while quitting GVC hurts firm performance (Baldwin and Yan 2014). The firm participating in GVC has a role as an importer and exporter. So, GVC firms have better performance than non-GVC firms.

3. Data and Methodology

The data used in this study are from the World Input–Output Database (WIOD) and Indonesia's Central Agency on Statistics (BPS) from 1995 to 2014. The variables used to

consist of the amount of labor, value added, and the real wage that Indonesia's Central Agency provided on Statistics (BPS) and GVCs, which was calculated by the authors using the Inter-Country Input–Output (ICIO) approach.

Input–output analysis is a quantitative analysis of inter-industry relations to describe the resource allocation in the economy. The data consists of the flows of goods and services inside the economy that underlie the summary statistics, which are measured conventionally by economic activities.

Inter-country input–output is a combination of I-O tables between countries in the world. The input–output table used in this study was provided by the World Input–Output Database (WIOD), which consists of 42 countries and 56 industries. The ICO analysis clarifies the trade flow between countries more than traditional export and import calculations.

The value-added trade flow within global production networks is often double counted either as intermediate or final goods, which decreases the reliability of standard calculation of trade value (Koopman et al. 2010). Tracing the value-added issue makes accounting for trade value more reliable and accurate. It is essential to capture clear trade flows between countries. Using ICIO analysis, the following matrix must be constructed to determine the involvement in GVC:

$$VBE = \begin{bmatrix} V_{11} & 0 & \cdots & 0 \\ 0 & V_{22} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & V_{GG} \end{bmatrix} \begin{bmatrix} B_{11} & B_{12} & \cdots & B_{1G} \\ B_{21} & B_{22} & \cdots & B_{2G} \\ \vdots & \vdots & \ddots & \vdots \\ B_{G1} & B_{G1} & \cdots & B_{GG} \end{bmatrix} \begin{bmatrix} E_{11} & 0 & \cdots & 0 \\ 0 & E_{22} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & E_{GG} \end{bmatrix} \quad (1)$$

where:

V = Share of value added (value added per output)

B = Leontief Inverse $(I - A)^{-1}$

E = Exports

Matrix VBE shows the decomposition of exports by economy sector-specific value added. In an economic environment characterized, indeed defined, by international production sharing, exports are comprised of commodities for both intermediate and final use.

Then, the VBE matrix is used to measure the GVC position as follows:

$$GVC\_Position_{ijt} = ln\left(1 + \frac{DVX_{ijt}}{E_{ijt}}\right) - ln\left(1 + \frac{FVA_{ijt}}{E_{ijt}}\right) \quad (2)$$

where:

FVA = foreign value added, which is embodied in this country's exports. This corresponds to the backward GVC participation component of the GVC participation index.

DVX = domestic value added of this country, which is embodied in the exports of other countries. This corresponds to the forward GVC participation component of the participation index.

GVC position determines the relative upstream/downstream position of a sector. It can be measured by deriving the sourcing of inputs and output processing. (Wang et al. 2017) suggests that firms in a sector or country can participate in international production sharing in four ways:

(1) Exporting domestic value added in intermediate exports used by other countries as an input for other countries domestically consumed final products.
(2) Exporting domestic value added in intermediate exports used by other countries to produce exports directly or indirectly.
(3) Using other countries' value added to produce its gross exports directly or indirectly.
(4) Using other countries' value added to produce its gross output for domestic use directly or indirectly.

Koopman et al. (2010) only considered points 2 and 3 and excluded most of the production activities covering the source country's domestic value added through interna-

tional production sharing. The following formula shows the domestic value chains (*DVC*), domestic participation in the global value chains:

$$DVC_{ijt} = \frac{\sum V\_D_{ijt}}{\sum V\_A_{ijt}} \tag{3}$$

The equation represents the domestic value added generated from *GVC* production activities. It includes domestic value added in the form of intermediate inputs from the exporting country, which are absorbed directly or indirectly by trading.

4. Results

4.1. GVC Position

GVC position was obtained from Formula (2) with data from the World Input–Output Database and Indonesian automotive industry from 1995 to 2014. Figure 1 shows *GVC position* from 1995 to 2014.

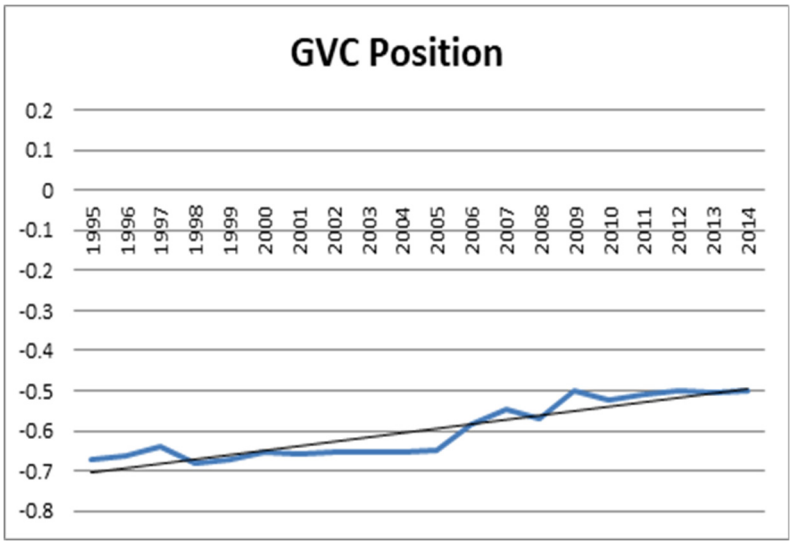

Figure 1. GVC position in the Indonesian automotive industry, 1995−2014. Source: Own calculations based on World Input–Output Database.

Based on Figure 1, GVC position in the Indonesian automotive industry has a positive trend line. GVC position shows whether the industry is categorized as upstream (more than 0) or downstream (less than 0). The GVC position from 1995 until 2014 was around −0.7 to −0.5 (less than 0). Indonesia's automotive industry is categorized as a downstream industry or one with high imports of intermediate goods. As the GVC position increases, domestic value added to Indonesia's automotive industry increases. The reason is that domestic demand dominates the automotive market, which improves domestic investment and drives local suppliers to grow. Despite that, government policy about local contents has made the manufacturer use intermediate goods from locally and abroad at a certain level.

4.2. Domestic Value Chain

Domestic value chain (DVC) was obtained from Formula (3) with data from the World Input–Output Database and Indonesian automotive industry from 1995 to 2014. Figure 2 shows domestic value chains (DVC) in the Indonesian automotive industry, from 1995 to 2014.

Based on Figure 2, the international production sharing from domestic has a positive trend. The domestic value chains increase from 4% to 33%. Increasing domestic value added is caused by the transfer of knowledge and technology from multinational companies, especially Japanese manufacturers. It improves the ability to generate higher value-added and intermediate export goods.

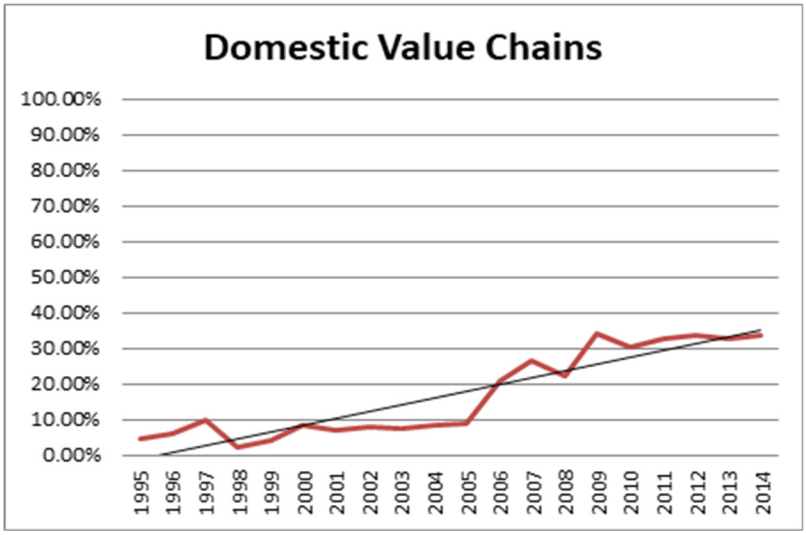

Figure 2. Domestic value chains in the Indonesian automotive industry, 1995–2014. Source: Own calculations based on World Input–Output Database.

The ratio of a forward linkage to a backward linkage in Indonesia's automotive industry can be shown in Table 1. The results show that the net gains in the automotive industry are less than 1, which is harmful. Even though the net gains are far enough from 1, the net gains still improve over the years. Both forward linkage and backward linkage fluctuated. Forward linkage tends to increase, and backward linkage tends to decrease.

Table 1. Ratio of forward to backward linkage for the Indonesian automotive industry.

Year	Forward Linkage	Backward Linkage	Net Gains
1995	5.46	13,992.76	0.00039
1996	9.89	11,954.65	0.00083
1997	18.12	9799.42	0.00185
1998	4.91	20,700.50	0.00024
1999	4.39	13,372.52	0.00033
2000	3.84	8036.83	0.00048
2001	4.12	8891.17	0.00046
2002	4.59	10,134.46	0.00045
2003	3.54	9694.10	0.00036
2004	6.86	14,933.71	0.00046
2005	9.42	15,511.73	0.00061
2006	18.38	7887.50	0.00233
2007	39.63	10,734.70	0.00369
2008	54.86	10,350.57	0.00530
2009	47.81	4586.10	0.01043
2010	53.27	6223.50	0.00856
2011	77.63	7767.29	0.00999
2012	122.40	8933.05	0.01370
2013	122.72	9090.61	0.01350
2014	140.53	9210.10	0.01526

Source: Own calculations based on World Input–Output Database.

The net gains show the contribution of a country or industry to provide input for other countries. Being involved in global value chains still benefits Indonesia's automotive industry, even if the net gain is negative. The automotive industry is not export-oriented. Due to its limitations, Indonesia's automotive industry might still be in this current condition (the majority import intermediate goods). However, looking at the trends, the development in the automotive industry is excellent; it is still possible to have positive net gains but slowly.

4.3. Labor Productivity

Labor productivity describes the firm's ability to produce something. It can be determined by value added or output. Several factors influence labor productivity, such as education, age, and training. Labor skills usually affect labor productivity directly, which is determined by education or training. It classified labor into different classes, low-skilled labor, medium-skilled labor, and high-skilled labor. In this study, labor productivity is determined by output per production worker. Figure 3 shows the labor productivity in the Indonesian automotive industry from 1995 to 2014.

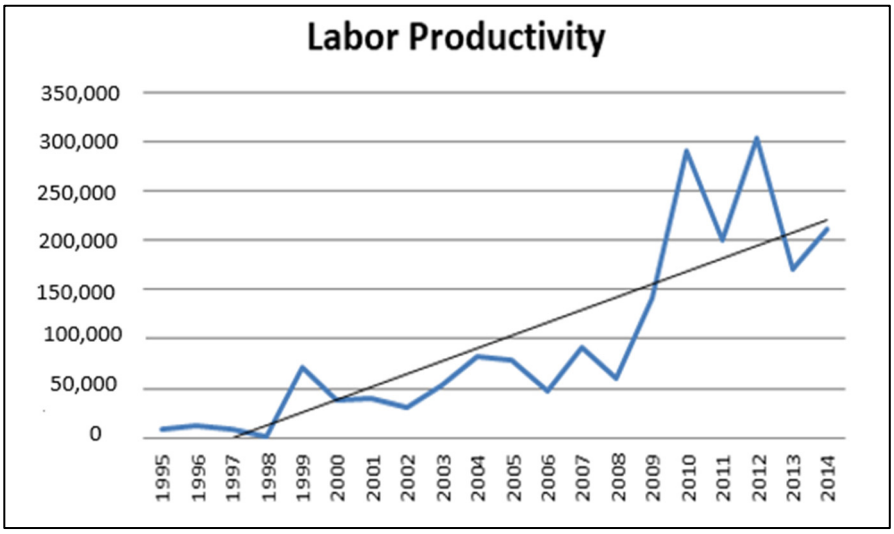

Figure 3. Labor productivity in the Indonesian automotive industry, 1995–2014.Source: Own calculations based on BPS and World Input–Output Database.

Despite fluctuation from 1995 to 2014, labor productivity in Indonesia's automotive industry has a positive trend (see Figure 3). The lowest productivity occurred in 1998 because of the crisis effect, while the most significant productivity gap occurred in 2010. Human capital is one of the critical factors that affect labor productivity. Educated and skilled workers lead to higher productivity because they can use their knowledge and skills to be more productive. However, skilled workers tend to work more effectively and efficiently than unskilled workers.

Real wages in the Indonesian automotive industry fluctuated; the ups and downs occurred six times from 1995 to 2014. It can be seen in Figure 4. In 1998, the real wage in the automotive industry was meagre, which was affected by the financial crisis. In addition, the trend line shows a positive trend. It reflects labor productivity. Both have a positive trend and have a relatively similar trend line. Consistent with a macroeconomic theory, real wage growth is in line with labor productivity in the long run. So, increasing the real wage leads to an increase in labor productivity.

Figure 4. Real wage in the Indonesian automotive industry, 1995–2014. Source: Own calculations based on BPS.

Figure 5 compares labor productivity and real wages in natural logarithm form. Both labor productivity and real wages have the same trend. As real wages increase, labor productivity increases, which is consistent with neoclassical theory. Improving real wages affects labor productivity.

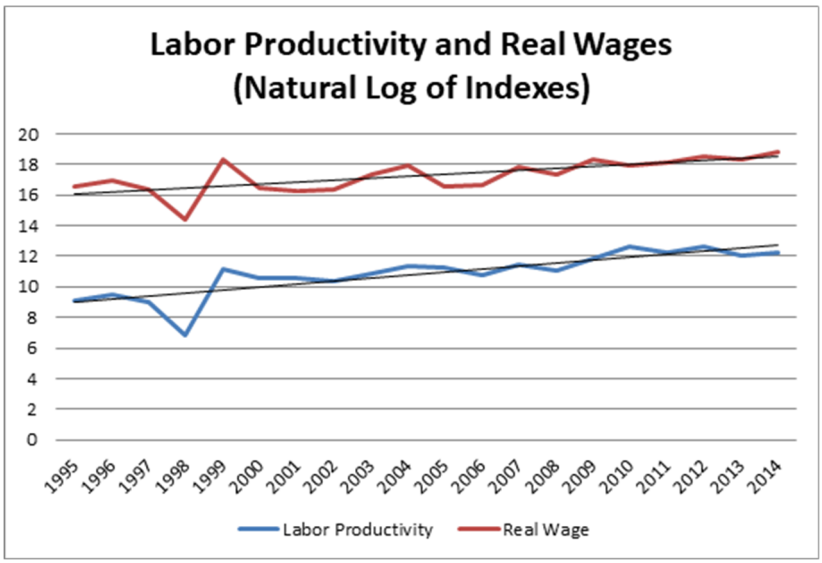

Figure 5. Comparison of labor productivity and real wages in Indonesia's automotive industry, 1995–2014. Source: Own calculations based on BPS.

Real wages in Indonesia's automotive industry reflect labor productivity. Both have a positive and similar trend, whereby as real wages increase, so does labor productivity. Efficiency wage theory suggests that the firm may pay labor higher than market clearing and increase real wages to improve labor productivity. As real wages increase, labor tends to work harder, so productivity increases. In Indonesia's automotive industry, real wages reflect labor productivity. They are increasing real wage labor productivity.

Table 2 shows the difference between DVC, GVC position, net gains, and labor productivity. In 1995 and 2014, the changes in DVC and GVC positions were not significant but improved, and changes in net gains and productivity were relatively significant. The GVC position increased by 0.17 from 1995 to 2014, which means the position of Indonesia's automotive industry is higher than before. Even in the downstream industry, the position

increases slowly, representing the industry's improvement. The higher level of GVC position will increase the capability of the industry to provide intermediate goods. In global production networks, the manufacturer of a country enjoys gains from the partnership if it can move from the downstream to the upstream industry. Indonesia's automotive industry is on the right way to achieving that, even slowly but surely.

Table 2. Difference between DVC, GVC position, net gains, and labor productivity in the Indonesian automotive industry from 1995 to 2014.

Year	DVC	GVC Position	Net Gains	Labor Productivity
1995	4.51%	−0.66991	0.00039	8583.69
2014	33.51%	−0.49970	0.01526	210,643.02
Difference	28.98%	0.17021	0.01487	202,059.33

Source: Own calculations based on BPS.

The DVC has changed from 4.51% to 33.51%. Over the years, Indonesia's automotive industry improved the domestic value of intermediate goods and reduced the foreign value added to intermediate goods. Increasing domestic value added is driven by the transfer of knowledge and technology from leading firms. It reflects that Indonesia's automotive industry is progressive in absorbing technological progress. Furthermore, the domestic performance in Indonesia's automotive industry leads to GVC integration. In addition, increasing domestic value added is driven by leading firms' knowledge and technology transfer. It reflects that Indonesia's automotive industry is progressive in absorbing technological progress.

Incredibly, net gains increased by 0.01487 for the period from 1995 to 2014, which is 38 times higher than before. Even though the net gains were lower than 1, they grew significantly. In 1995, the net gain was 0.00039, while in 2014, the net gain was 0.01526. The increasing net gain is influenced by domestic value added. It has been driven by the improvement in the transfer of knowledge and technology.

Labor productivity improved between 1995 and 2014. In 1995, labor productivity was 8583; in 2014, labor productivity was 210.643, which increased to almost 24 times higher than before. As labor productivity increases, real wages increase, and working hours decrease. Thus, the Indonesian automotive industry experiences decent work for productive work and decent hours.

The difference between DVC, GVC position, net gains, and labor productivity between 1995 and 2014 is positive, which means labor productivity is in line with global value chain integration; thus, the Indonesian automotive industry was progressive in absorbing knowledge and technology from international production sharing.

5. Discussion

Upstream or downstream stages of the global production process depend on the industry's capability. More vital institutions and relative skill abundance are correlated with a propensity to export in the downstream industry (Antras et al. 2012). Even though Indonesia's automotive industry is categorized as the downstream industry, the value of the GVC position increases, which means that the propensity to export in this industry has been improved. Humphrey (2003) found that developing countries can increase the possibility of integration into GVCs of global automotive production by opening up the domestic market. Automotive manufacturers have a responsive strategy in a supply chain that focuses on quality and response to time. The level of responsiveness in automotive manufacturers is somewhat responsive. The downstream industry is near the end-consumer and the supply chain stages. According to Sturgeon et al. (2008), the government will usually prohibit locating the assembly close to the consumer. So, the specialized supplier and assembly are clustered in the near location. Meanwhile, in Indonesia, the government has supported the automotive industry.

The benefit that can be gained for low–middle income countries come from technology upgrading and spillovers. It should be noted that the benefit for the domestic economy will be achieved if the country or industry has the sufficient absorptive capacity (Kummritz 2015). The success of international production networks or global value chains can be represented by technological progress or upgrading the industry's capacity. Indonesia's automotive industry is experiencing upgrading capacity, represented by increasing domestic value added. They are transferring knowledge and technology caused by multinational companies involved in global value chains. Beverelli et al. (2019) suggest that the domestic value chain is a stepping stone for global value chain integration. In addition, the switching cost is higher than the fragmentation cost. High switching costs may occur because the industry must switch the foreign supplier with a local supplier. The fragmentation cost is the cost that a company pays to source intermediate goods externally rather than in-house.

Technological progress is essential to improve productivity, especially for capital-intensive industries. Blalock and Veloso (2007) found that firms in Indonesia that rely more on imports have higher productivity than others. Imports have become the driver of international transfer technology. Despite that, multinational companies can absorb transfer technology rather than domestic companies, which have production activities domestically only. The capability of the manufacturer is essential for technology transfer effectiveness. It determines the way the manufacturer absorbs the technology. Several factors affect technology transfer effectiveness. Knowledge management and technological capabilities are the key factors in technology transfer effectiveness (Jafari et al. 2014).

Productivity gains are associated with forwarding linkages for domestic firms which source intermediate goods from foreign-owned firms (Newman et al. 2015). Sourcing intermediate goods from international trade minimize costs for the manufacturer or firm. The firm may choose the best intermediate goods at the best price around the world. So, productivity gains for the firm occur.

The global value chain drives international knowledge sourcing. Firms that engage in international knowledge-sourcing strategies record higher productivity growth. Combining external and local technology acquisition improves firm performance (Belderbos et al. 2013). So, the most significant impact occurs if the firms combine external and local technology. Global value chains lead to a more significant share of value-added, transfer knowledge, and capture geographically dispersed economic activity (Yeung and Coe 2014). Criscuolo and Timmis (2017) found that participating in global value chains stimulates productivity growth through various channels. It includes a specialization, access to imported intermediate goods, knowledge spillovers, and competitive effects of foreign competition.

The expansion of the automotive industry has been accompanied by productivity improvement (Okamoto and Sjöholm 2000). In the 1990s, productivity in the automotive industry was very low. However, over the years, productivity has increased. It has been driven by the transfer of knowledge and technology from MNCs.

Real wages reflect labor productivity. Meanwhile, the structural characteristics may affect real wage growth. Increases in real wages often exceed productivity gains. Determinants of real wages affect real wage growth rather than labor productivity, such as skills and human capital (Mihaljek and Saxena 2010). Training and education are associated with higher wages and productivity (Turcotte and Rennison 2004). Real wages are associated with the change in unemployment and labor productivity. Faster real wage growth may lead to inequalities between the marginal productivity of labor and real wages. It is caused by low labor productivity growth. So, the economy's money is higher than the number of products produced. (Rusinova et al. 2015). Improvement in labor productivity may be due to increased human factors' high quality, efficiency, and capital intensity (Heshmati and Rashidghalam 2018).

6. Conclusions

Labor productivity improves domestic value chains in Indonesia's automotive industry. It leads to global value chain integration. So, labor productivity is in line with global value

chain integration. The benefit of being involved in global value chains improves the capability of the Indonesian automotive industry. Furthermore, improving the industry's capability leads to a higher global value chain position in which a higher value is added for the industry and economy.

There are some remaining problems in this study that need further research. The more profound analysis of productivity and the compensation gap as the consequence of involvement in global value chains is an interesting issue. Furthermore, measuring the fragmentation and switching costs between domestic value chains and global integration in Indonesia's automotive industry remains questionable.

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