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The Role of Agriculture in the Structural Transformation of Indonesia

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ABSTRACT

Indonesia has managed to combine high rates of growth, rapid reductions in rural poverty and a significant structural transformation of its economy all at the same time without a big increase in urban manufacturing. Agriculture was a critical part of this transformation through two important channels. First, export-oriented agriculture, particularly palm oil and rubber contributed to rising foreign exchange receipts and helped make compatible rapid growth without balance of payments pressure on the macro economy. Second, through the release of workers from low productivity agriculture to more productive nonagricultural activities, structural change contributed between 25 and 50 percent of the rise in national labor productivity depending on the period. The government also played an important role in agricultural development and productivity growth. Public investments in irrigation in combination with subsidies for fertilizer and improved seeds increased agricultural productivity generating an adequate supply of food for domestic needs with less labor.

Keywords: Indonesia, structural transformation

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Introduction

Indonesia is blessed with a rich, diversified natural resource base. Unlike many other resource rich countries where natural resources often hurt the development of agriculture, export-oriented agriculture in Indonesia has performed well. However, with strong foreign inflows from both agricultural and nonagricultural exports during the commodity boom periods, the economy was pushed toward nontradables, particularly services, which slowed down the contribution of structural change to growth and complicated the long-term process of economic transformation. In this regard, it is important to better understand the role of agriculture in a natural resource rich economy like Indonesia. This is the objective of this paper, which positions the role of the agricultural sector in the long-term process of economywide structural transformation in Indonesia. It provides an overview of the incredible success that Indonesia has had in generating growth and reducing poverty both pre- and post-Asian Financial crisis. It likewise describes trends in agricultural productivity and the sectors' contribution to export growth, particularly in the period after the Asian financial crisis. Increasing agricultural productivity is a win-win strategy for Indonesia as it lowers the cost of food, releases labor to the non-farm sector and increases farmer incomes thus reducing poverty all at the same time. We examine the main factors that increased agricultural productivity and how the agricultural sector supported balanced growth.

Drivers of economic growth

Indonesia was one of the fastest growing economies in the world prior to the 1997 Asian financial crisis. It started the post-world war two period as one of the poorest countries in the world, but between 1971 and 1997 it achieved GDP per capita growth rate of 4.1% per year (Table 1). By 1997, Indonesia had nearly caught up with the four Asian tigers Hong Kong, Singapore, Taiwan and S. Korea to become a middle-income country. However, the Asian financial crisis hit the economy hard, and many observers began to wonder whether the Indonesian growth model, based on exports was sustainable.

It took the better part of five years after Asian financial crisis for Indonesia's economy to regain its footing. When it did, Indonesia's rich natural resource base permitted a balanced expansion particularly during the commodities boom period from 2002-2011. Unlike the other four Asian tigers, the country did not grow by expanding export-oriented manufactures. Instead, oil, coal, and palm oil exports created enough foreign exchange earnings, permitting a rapid expansion of manufacturing imports without the suffocating balance of payments pressure so common in other parts of the developing world. From 2002 to 2016, GDP per capita grew by 4.2 percent per year, while the country avoided some of the financial excesses that drove the global economy into recession in 1999.

Table 1: GDP Growth Rates, 1971-2016 (Constant 2010 US$).

Period	Agriculture	Industry	Manufacturing	Services	GDP	GDP per capita
1971-1997	3.4	7.3	11.2	7.5	6.3	4.1
2002-2016	3.8	4.5	4.6	7.3	5.6	4.2
1971-2016	3.1	5.6	7.8	6.0	5.2	3.4

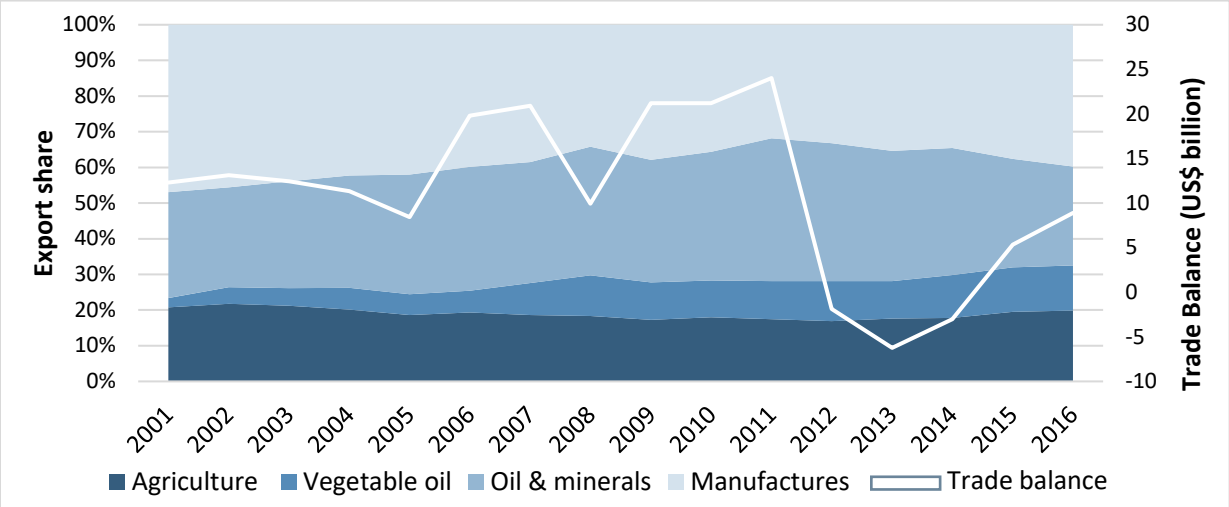
Source: World Development Indicators, World Bank

During the period after Asian financial crisis, exports from the mining sector, dominated by oil and coal, grew rapidly. In the agricultural sector, exports of palm oil increased by more than 16 times bumping up its share in total export value from less than 3 percent to 13 percent over the period (Figure 1). As a result, the overall trade balance recorded a surplus equivalent to 3 percent of GDP in 2011 before

contracting because of the fall in commodity prices, shifting the balance of payments from surplus to deficit in 2012-2014.

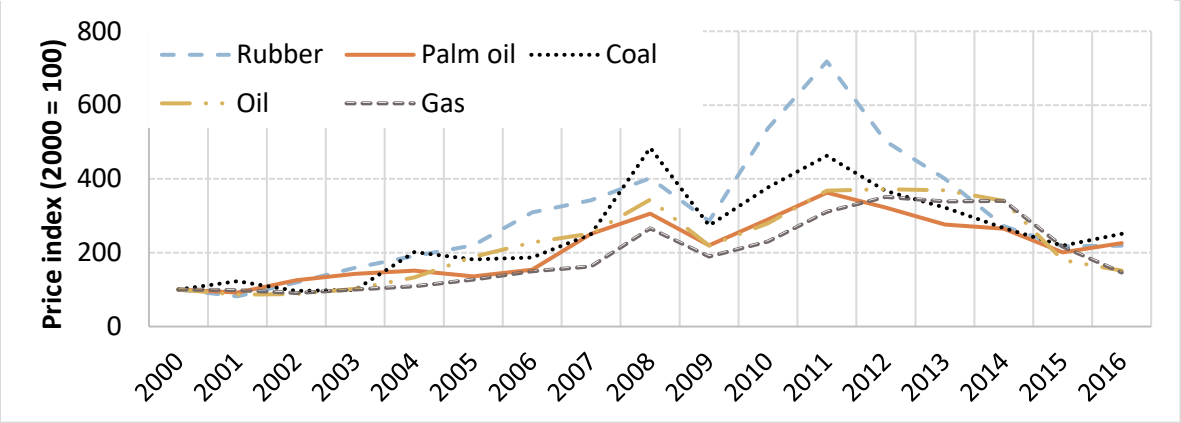
Indonesia's economy is sensitive to the volatility of world prices because of its dependency on commodity exports. The most recent commodities boom quadrupled global prices for Indonesia's major export commodities between 2002 and 2011 (Figure 2). Commodity booms are generally hard on the manufacturing sector growth because they compete for labor and push the wage rate up. Indeed, it was no different for Indonesia with the share of manufacturing exports declining while exports of commodities grew rapidly (Nehru, 2012). The total share of manufacturing in the national economy shrank from about one-third of GDP in the early 2000s to only 20 percent by 2011 (World Bank 2017). This is reflected in a slow-down of growth in manufacturing value-added, falling from 11.2 percent per year in the pre-crisis period to only 4.6 percent per year in 2002-2016 (Table 1). On the other hand, non-tradable services continued to grow rapidly at more than 7 percent both in the pre- and post-crisis periods (Table 1). The share of services in the national economy rose from one-third of GDP in the early 2000s to more than 40 percent in the 2010s, doubling the size of manufacturing in the economy, a phenomenon predicted by the Dutch disease hypothesis.

Figure 1: Export share and trade balance



Source: Export shares from COMTRADE, trade balance from World Development Indicators, World Bank

Figure 2: Selected World Commodity Prices



Source: World Bank Commodities Price Data (The Pink Sheet)

Sectoral Transformation and Increased Labor Productivity

As in other developing countries there was a significant long-term shift of labor out of agriculture and into services and industry in Indonesia coinciding with rural to urban migration. The urban area grew rapidly, and a good deal of that growth, around two-thirds, came from rural migrants. In 1970, 83% of the population was rural whereas in 2016 that number had shrank to 46%. The growth in industry (including manufacturing) and the service sectors was balanced in the late 1980's throughout the 1990s before the Asian financial crisis, driven by the export of manufactures (Wihardja 2017) (Table 2). The agricultural sector released labor to the industrial sector composed of mainly tradable manufacturing as well as mining. Five years after the financial crisis when commodity prices started to increase in the early 2000s, little labor was released from agriculture and the share employed in the sector remained constant. The total workforce grew, but most were absorbed by the nonagricultural economy and, even then, mainly by nontradable services rather than manufacturing. In fact, the 2 percent annual average growth rate in manufacturing employment is lower than the total employment growth rate economywide in 2002-2011 (Table 2).

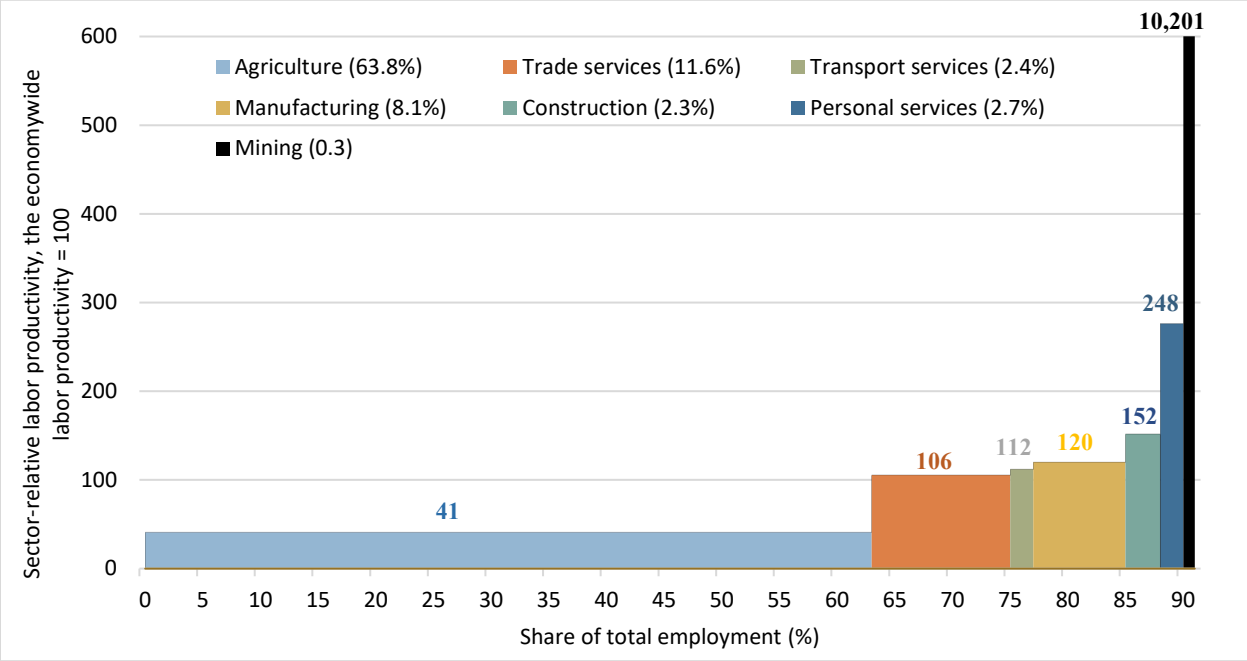
Table 2: Employment growth rate before (1989-97) and after the financial crisis (2002-11)

	Labor growth (%)	
Sector	**1989 -1997**	**2002 – 2011**
Agriculture	-1.5	0.1
Industry	4.4	2.5
Manufacturing	4.1	2.0
Services	3.7	4.9
Total economy	1.3	2.5

Source: Authors' calculation using Groningen Growth and Development Centre (GGDC) data

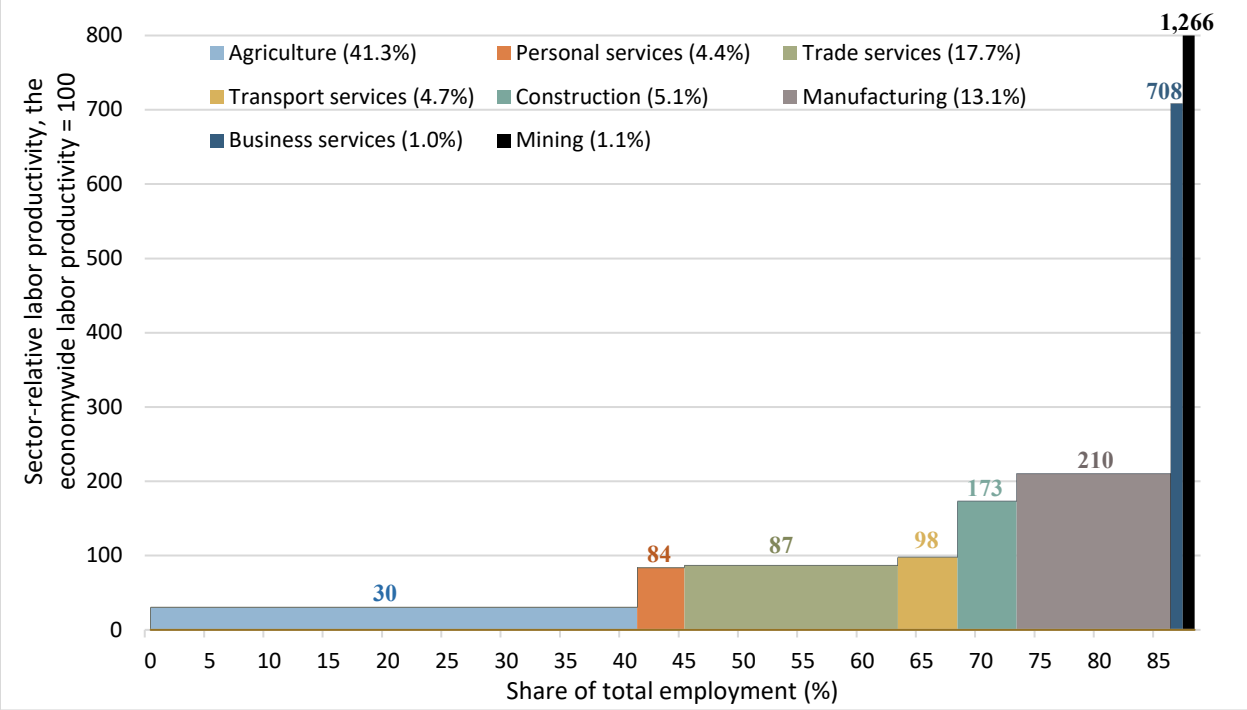
Figure 3 below show changes in employment and relative labor productivity in 1972, 1997 and 2011. Relative labor productivity is calculated as the value added per worker relative to the economy as a whole (where the economy-wide labor productivity equals 100). As shown in Figures 3(a) and 3(b), the share of agricultural labor in total employment falls in the 1991-1997 pre-crisis period, from more than 60 percent in the early 1970s to about 40 percent in the late 1990s. Share of employment increases in most nonagricultural sectors such as trade services, manufacturing, transportation and mining, and all of them have higher labor productivity than agriculture. During the commodity boom period of 2002-2011, this structural transformation continues with the share of employment in agriculture continuing to fall while the nonagricultural sectors increases (Figure 3(c)).

Figure 3(a) Relative labor productivity and share of employment across sectors in Indonesia, 1972



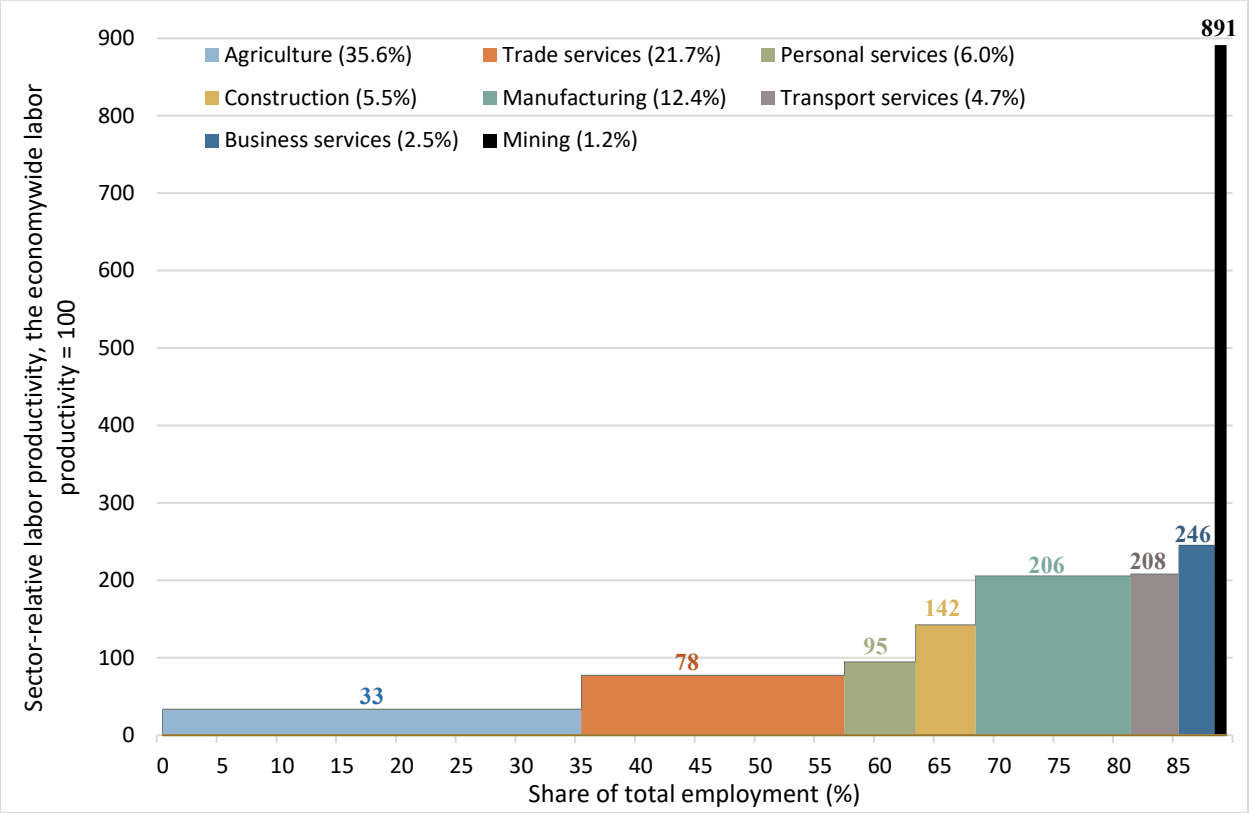
Source: Authors calculations based on the GGDC 10-Sector Database
Note: Numbers in brackets indicate share of employment, numbers above silos indicate relative labor productivity.

Figure 3(b) Relative labor productivity and share of employment across sectors in Indonesia, 1997



Source: Authors calculations based on the GGDC 10-Sector Database
Note: Numbers in brackets indicate share of employment, numbers above silos indicate relative labor productivity.

Figure 3(c) Relative labor productivity and share of employment across sectors in Indonesia, 2011



Source: Authors calculations based on the GGDC 10-Sector Database
Note: Numbers in brackets indicate share of employment, numbers above silos indicate relative labor productivity.

However, two things occurred in this period that are important for understanding the progress of structural transformation in Indonesia. First, de-industrialization occurred prematurely. This can be seen by the declining share of manufacturing employment in this period, falling from 13.1 percent of total employment in 1997 (Figure 3(b)) to 12.4 percent in 2011 (Figure 3(c)). While laborers continued to move out of the least productive sector, agriculture, most of them did not go to the most productive and labor-intensive sectors such as manufacturing. Instead, the trade service sector became the largest nonagricultural sector in terms of employment share, while its relative labor productivity fell from third lowest to the second lowest position, just above agriculture.

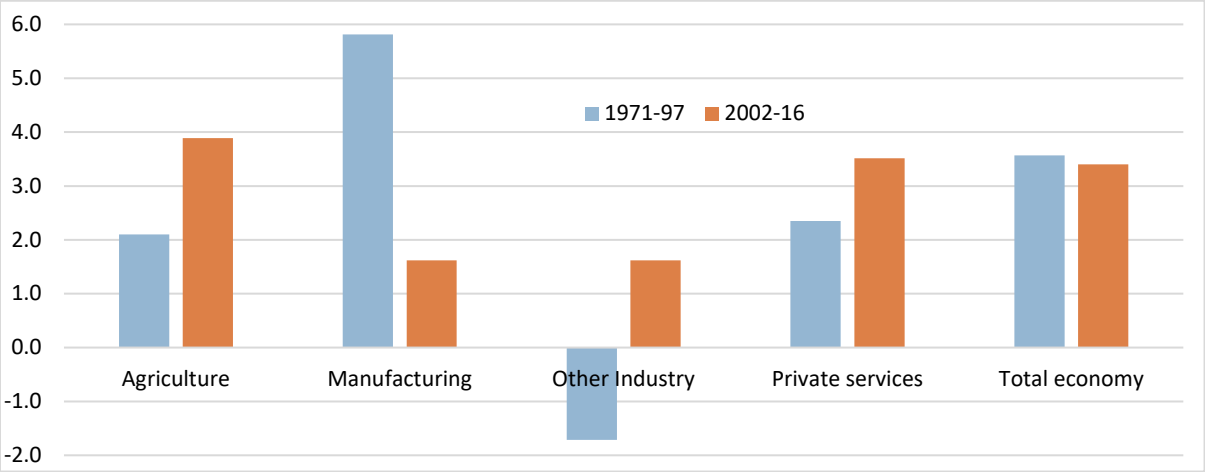
Second, the gap between the most productive sector, mining, and the least productive sector, agriculture, narrowed. Agriculture is still the least productive sector, and trade services, the second least productive sector, still has a labor productivity that is still more than double that of agriculture. Obviously, the dual economic structure still exists in Indonesia even up until now, and structural transformation continues to be a long-term economic development process.

One reason for the rapid development of the nonagricultural sector, though less productive, is the development of the rural nonfarm economy. While many members of farm households moved out of agriculture, they either continued to stay in rural areas earning non-farm income or entered the informal trade sector in urban areas with relatively low productivity compared to other nonagricultural jobs.

The Performance of Agriculture

Development economists have long recognized the central role of agricultural productivity growth in raising welfare and reducing poverty. Prior to the Asian Financial Crisis, the labor productivity of manufacturing and private services was higher than agriculture. Following the crisis, and coinciding with the commodity price boom, Indonesian agriculture labor productivity grew faster than the nonagricultural sector and even faster than the economy as a whole (Figure 4). This is consistent with a recent study by Huerta and Garcia-Cicco (2016), who found that the industrial sector's total factor productivity (TFP) was negatively affected by commodity price shocks, while the TFP of service sectors in Chile tended to increase.

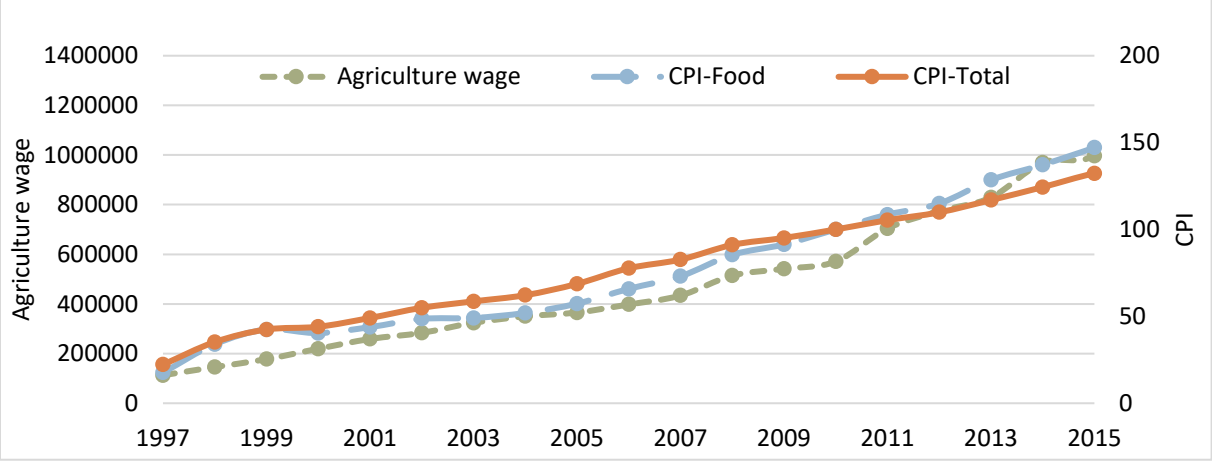
Figure 4: Labor productivity annual growth rate in the two periods: 1971-1997 vs. 2002-2016 (%)



Source: Authors' calculation using Groningen Growth and Development Centre (GGDC) estimates

The total food supply per capita increased between 1990 and 2015. Per capita cereal production increased from about 200 kilograms in 2002 to more than 250 kilograms a decade later while vegetable and fruit yields increased annually at 2.1 and 4.5 percent respectively. These gains were achieved while the agricultural sector released labor to industry and services and held down the urban cost of living until 2009. After that, food prices rose slightly faster than the overall price index.

Figure 5. Agriculture wages and consumer price indexes

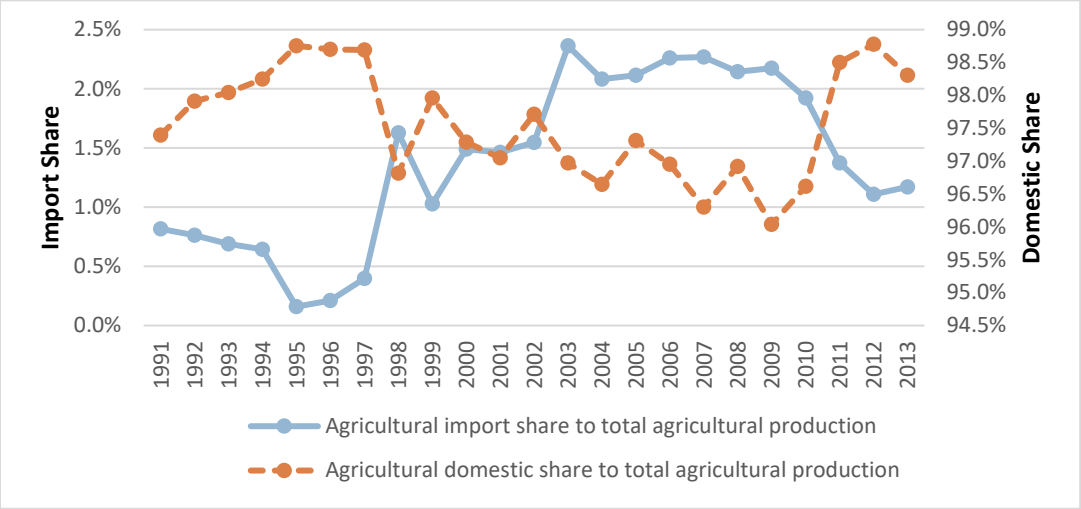


Source: WDI and BPS

The government's decision to use exports receipts to import food during the commodity price boom due to the appreciation of the real exchange rate should have disadvantaged the agricultural sector

particularly agricultural exports. However, the agricultural sector performed well despite multiple challenges coming from a commodity boom effect that could have brought productivity and output down (Figure 6). During the commodity boom period imported food increased as a share of the total, but the divergence between imports and domestic production is not that large. Between 2002 to 2011, the share of domestic agricultural production decreased by less than two percent, while the share of agricultural imports increased by only one percent.

Figure 6. Domestic agricultural production and imports as a share of total



Source: FAOSTAT

Interpreting the contribution of agriculture to rising national labor productivity

Agriculture has performed exceedingly well in recent years as exhibited by labor productivity growth that was faster than productivity in industry and services since 2002, especially when the economy was challenged by commodity price volatility. To examine the composition of this productivity growth we follow McMillan and Rodrik (2011) and decompose productivity into two components: within sector productivity changes and structural change through the movement of labor between sectors. Formally, we can write the decomposition as follows:

$$\Delta Y_t = \underbrace{\sum_{i=n} \theta_{i,t-k}\, \Delta Y_{i,t}}_{\text{Within}} + \underbrace{\sum_{i=n} y_{i,t-k}\, \Delta \theta_{i,t}}_{\text{Structural change}}$$

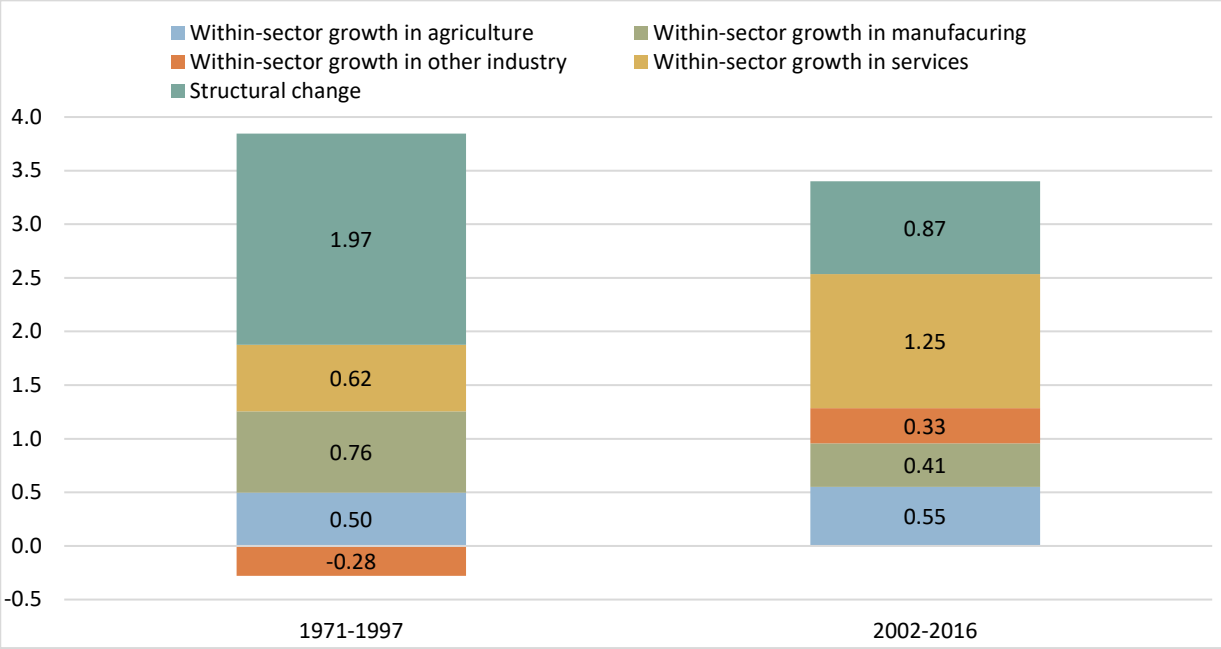
$Y = economywide\ productivity;\ \ y = sectoral\ productivity;\ \ \theta = employment\ share$
$i = sector;\ \ t = year$

The first term in the equation is the summation of increases in labor productivity within sectors given the employment structure in the base period. The second component of the equation is changes in employment share weighted by the base period's labor productivity for the corresponding sectors.

In Figure 7, the height of each bar represents the economywide labor productivity annual growth rate, which was 3.6 percent in 1971-1997 and 3.4 percent in 2002-2016. While the average annual growth rates of economy-wide labor productivity are similar in the two periods, the contribution to the growth

differs between the two periods. In the pre-crisis period, structural change played a much more important role in economywide labor productivity, representing more than 50 percent of growth. This rapid structural change occurs when there is a large gap between low productivity agriculture where most workers are employed and high productivity nonagricultural sectors. Rapid structural change allows these developing countries to enjoy a higher labor productivity growth rate by moving labor out of agriculture to the nonagricultural sector. However, as workers migrate from agriculture to the nonagricultural sectors, productivity growth within sectors becomes more important for sustainable growth. The contribution from structural change falls to about 25 percent in 2002-2016 when there was less movement between sectors overall and much less movement out of agriculture (Table 2, above). Moreover, because services become the largest sector over time, productivity growth within services will play more important role for the economywide productivity growth. As shown in Figure 7, approximately 37.5 percent of economywide productivity growth can be explained by productivity growth within services in 2002-2016.

Figure 7. Average annual labor productivity growth rate pre- and post-financial crisis



Source: Authors' calculation using the combination of GGDC data (for 1971-1997) and country data (for 2002-2016)

It should also be pointed out that agriculture plays an important role in economywide productivity growth in both periods. While agricultural productivity is the lowest compared to all other sectors, because it employs many people, it can play an important role for economywide labor productivity when labor moves out of agriculture and agricultural productivity continues to grow. Between 1971 and 1997, the annualized productivity growth within agricultural sector explains 0.50 percentage points of economywide labor productivity growth rate, or 14 percent of the total in this period. In the second period 2002-2016, the annualized productivity growth within agriculture explains 0.55 percentage points of economy-wide labor productivity growth, equivalent to 16.2 percent of the total. Thus, it is important to recognize that agriculture continues to be a dynamic contributor to rising productivity in the country as a whole.

Government Programs that raised productivity in agriculture

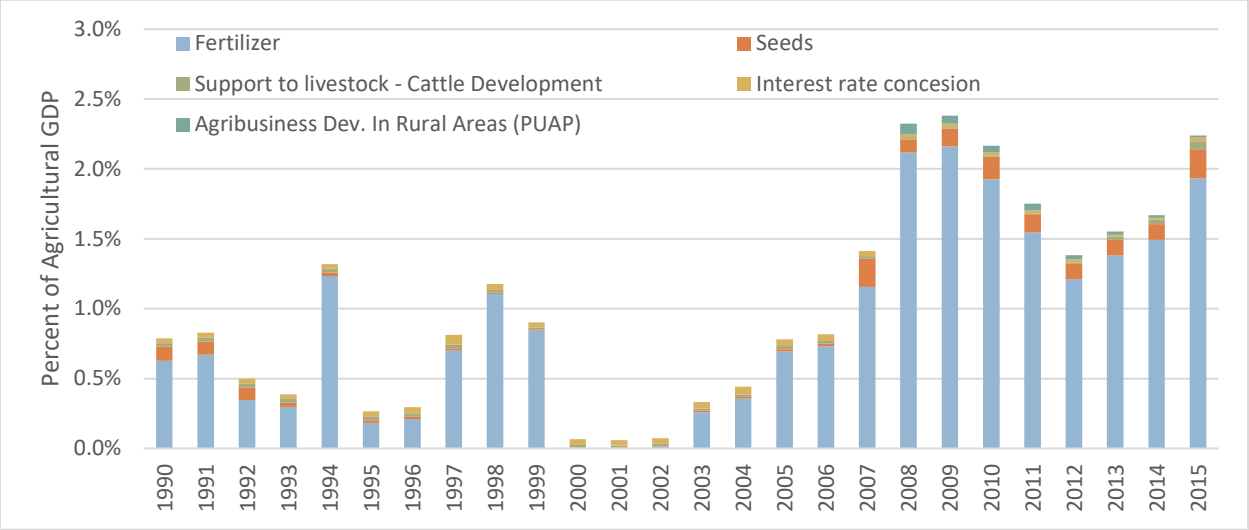
Since the 1960's, support to the agriculture sector has been crucial in reducing the country's reliance on food imports by increasing crop intensification, including rice, through input subsidies for fertilizer, pesticides, and irrigation. Farmers were also given easy credit terms and were assisted to implement new rice hybrid technologies that marked the Green Revolution. These programs and supports have contributed to the rapid increase of agriculture productivity in Indonesia.

In the years preceding the 1997/1998 crisis there was an increase in agriculture support and a shift in the types of policies and programs. While most agriculture policies and programs in the 1980's were targeted towards on-farm productivity enhancement, policies post-1998 focused on price incentives, credit markets, and the use of natural resources (Timmer, 2004; Erwidodo and Stringer, 2009). Due to Indonesia's agreement with the IMF and its membership in WTO, the country also followed a series of trade liberalizations by relaxing measures to protect commodities such as rice and sugar (Thomas and Orden, 2003) and lessening the authority of Indonesia's Food Logistics Agency (BULOG) which formerly was the most powerful rice state regulator.

Estimates from the OECD Indicators of Agricultural Supports suggest that direct supports to farmers have been increasing in last decade, at the cost of consumers. These supports have been in the form of both prices that producers receive for their products and subsidies for inputs that farmers buy in their production process. Among Indonesia's main commodities, poultry, rice, and sugar are the three most supported commodities despite several trade reforms taken after the 1997/1998 crisis. In fact, the amount of support to rice, the most important staple for Indonesian households, increased considerably over the years which may explain the ability of Indonesia to feed its population while maintaining reasonable prices in the last twenty-five years. More general supports that create a conducive environment for primary agricultural development including agricultural research, knowledge and extension, inspection and control, development and maintenance of infrastructure, marketing, and cost of public stockholding have remained stagnant over the last 25 years.

In addition to supporting agriculture production, the GOI also supported agriculture inputs. Instead of putting more investment into research and development or creating a conducive environment to support farming activities, fertilizer subsidies have become the focus of Indonesian agriculture policy taking a significant amount of the government budget (Figure 8). This intervention could potentially harm long-term agriculture development, given how market manipulation impedes the optimal allocation of resources and eventually slows down the structural transformation process. Furthermore, a recent study has found mistargeting issues in fertilizer subsidy distribution and that on average small-holder farmers actually use more fertilizer per hectare than what is recommended diminishing crop yields (Osorio et al., 2011).

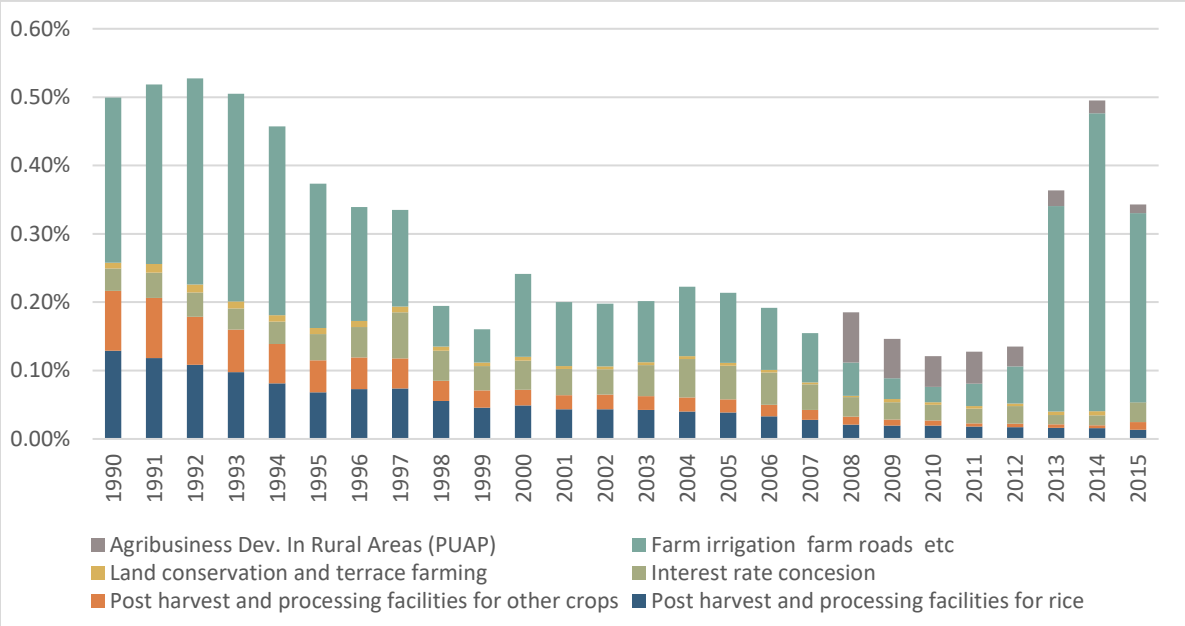
Figure 8. Share of Payments on Variable Input Use (PIV) to Agriculture GDP (1990-2015)



Source: Author's calculation based on OECD Producer and Consumer Support Estimates database

Supports for fixed capital have also been common ever since the Suharto era when irrigation was the main capital investment. Water management was decentralized with the establishment of Indonesian Government Act No. 7/2004 on Water Resources and the Government Regulation in 2006 shifting the responsibility for irrigation to district governments. As a result, the federal budget allocation for irrigation dropped in 2006 and the bulk of the irrigation activity shifted from irrigation infrastructure towards improved water management, community participation, and human resource development. More recently, changes in the administration under Joko Widodo has put a greater emphasize on infrastructure with plans to develop 1 million hectares of new irrigation area and to rehabilitate three million hectares of irrigation area as strategies to achieve food security. The government has also committed to build water reservoirs and other supporting agricultural infrastructure. Consequently, expenditures on irrigation and road construction skyrocketed in the last few years (Figure 9).

Figure 9. Share of Payments on Fixed capital formation (PIF) to Agriculture GDP (1990-2015)



Source: Author's calculation based on OECD Producer and Consumer Support Estimates database

While the focus of agriculture policies pre-1998 was on crop intensification through seed-fertilizer technologies and price subsidies, recent agriculture issues have blended with land ownership disputes and land shortage. Jokowi's administration therefore aimed to solve the issues by creating new paddy fields. Agricultural land extension became a major program with the Ministry of Agriculture reportedly creating new paddy fields of more than 130,000 hectares by 2016 which were consistent with the goal of achieving food self-sufficiency (Jakarta Post, 2017).

Government support to agriculture has intensified in the last ten years reaching about 3 percent of agriculture GDP in 2015. This support mainly benefits farmers by providing them with input subsidies and price incentives on certain commodity outputs. Some strategic commodities like rice and maize have received support from the government, which explains some of the reasons for high yield growth. However, in the same time frame we also found long-term investment on agriculture infrastructure, research and development as well as capital formation has been low and stagnant. This unequal budget allocation raises questions on how sustainable growth in the agriculture sector will be in the next decades to support the structural transformation process.

Conclusions

Indonesia has managed to combine high rates of growth, rapid reductions in rural poverty and a significant structural transformation of its economy all at the same time without a big increase in urban manufacturing. Agriculture was a critical part of this transformation. It did two things for Indonesia. First, export-oriented agriculture, particularly palm oil and rubber contributed to rising foreign exchange receipts and helped make compatible rapid growth without balance of payments pressure on the macro economy. Second, agriculture released workers to alternative, higher productivity nonagricultural activities, and did this while maintaining the supply of basic food commodities in the country. The shrinkage of the agricultural labor force helped to drive up the agricultural wage which in turn helps to explain the significant reduction in rural poverty. Government investments in irrigation and extension services plus input subsidies for fertilizer and seeds helped make it possible for agriculture to produce an adequate supply of food to domestic needs and exports for foreign exchange earning while less labor was employed in the agricultural sector and more jobs with higher education and better pay were created in the nonagricultural sector.

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