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## The Impact of Trade Openness to Structural Transformation and Inequality: The Case of Indonesia

by

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Despite achieving sustained growth for the past two decades, Indonesia is still regarded as a moderately high-inequality country. One of the most plausible explanations in the changing pattern of its structural transformation, which could be caused as a result of increasing global integration in Indonesia. Therefore, using panel data regression, this study aims to investigate the impact of trade openness on income inequality in the process of economic transformation in Indonesia, with the scope of national and subnational level. The study found that the impact of trade openness on sectoral share varies across national and region. These results imply that future trade and development policies in Indonesia should take into account more of the regional variation, so that it can mitigate the negative impact on inequality in each sub-national level.

**Key Words:** Trade Openness, Structural Transformation, Inequality, Indonesia, Panel Data Regression

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# 1 Introduction

Indonesia was well known to be one of the star performers in Southeast Asia, where its economy grew rapidly from the 1960s until the 1990s. These three decades of rapid growth resulted in a rapid decline in the poverty rate and raised the living standards of millions of people as inequality remained stable and relatively low (Tadjoeddin and Chowdhury, 2019, p.6). During this period, Indonesia also witnessed a massive structural change in the economy from an agricultural-based economy into a manufacturing and services-driven economy led by labor-intensive manufacturing exports (Aswicahyono et al. 2013, p. 185). The structural transformation and rapid growth catapulted Indonesia into one of the eight “high performing Asian economies” (World Bank, 1993). However, the Asian Financial Crisis hit in 1997-1998, which caused the Indonesian economy to struggle to accelerate its economic growth. Although Indonesia was able to recover and achieve sustained growth after the crisis, inequality sharply increased as shown by the increase of its Gini index, by about ten percentage points from 2000 to 2015, which is one of the largest increases in the Asia Pacific region (Kanbur, Rhee, and Zhuang, 2014). Since then, Indonesia’s Gini index stabilized and declined slightly. However, Indonesia is still regarded as a moderately high-inequality country (Hill, 2021). This has become the focus of attention in the economy as this inequality will cause social problems and hinder the development process.

One of the most plausible explanations in explaining the rising of inequality during this period is the changing pattern of its structural transformation, when Indonesia experienced stalling industrialization and tertiarization (Yusuf & Halim, 2021). However, structural transformation might not be the only factor that caused the rising of inequality as there are more factors that drive the structural change in this period, one of them being international trade. De Silva and Sumarto (2013) stated that the change in the sectoral composition from agriculture towards non-agriculture could be caused by a result of increasing global integration in Indonesia. Therefore, it is predicted that there is an impact of international trade on income inequality in Indonesia through the process of structural transformation.

Although there are numerous studies that examine how international trade can influence structural transformation and inequality, the study that investigates how international trade impacts inequality in the process of structural transformation has been very limited. The study concerning this topic has been conducted by Durongkaveroj (2021) which found that using multi-country panel data analysis, trade openness does have an effect on income inequality. For countries that have a higher degree of trade openness, the impact of manufacturing-led structural transformation on income inequality is more significant. On the other hand, in developing countries, the study found that the movement of workers to services has an inequality-increasing effect and its effect is larger for developing countries that have more open trade regimes.

Trade openness could also affect different levels of development across regions within a country. The ability of a region in capturing the benefits of trade openness depends on its characteristics and critical endowments, such as human capital and resource endowments. Thus, the degree to which trade openness could reduce inequality varies across regions (Rivas, 2007). Indonesia provides an interesting case where trade-led structural transformation impact on inequality is expected to vary in each region. Indonesia has a high regional diversity which means that some regions within Indonesia share structural characteristics with low-income countries where it has dominance of agriculture and/or mining sectors, whilst other parts of Indonesia has dominance of manufacturing and services sector, which are characteristics for the better-off, upper-middle-income developing countries (Yusuf et al., 2021). This in combination with Indonesia's size and its geographical variation, provinces were affected differently by trade liberalization (Kit-katos and Sparrow, 2011). Therefore, investigating how trade openness could affect inequality through structural transformation processes in Indonesia and its region has motivated the analysis performed in this thesis.

## 1.1 Aim and Scope

The aim of this study is to analyze the impact of trade openness on income inequality through the process of structural transformation in Indonesia for the period of 1997 - 2019. To tackle this aim, the following research questions are chosen. The first question is; *What is the impact of trade openness on income inequality in the process of economic transformation in*

*Indonesia?* To answer this research question, panel data regression analysis will be performed to quantify the effect of trade openness on income inequality through the shift of sectoral employment from agriculture to the non-agriculture sector. The non agriculture sector will be classified into three groups, namely the manufacturing sector, service sector, and non-manufacturing (utilities, mining, and construction) sector. As Indonesia has a high regional diversity, the impact of trade openness will also be analyzed in regional context, where the sub-national level (provinces) of Indonesia will be grouped into five major islands groupings, which are Java-Bali, Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia. In investigating how and why the outcome of the results occurred, this study will also attempt to answer the second research question; *What are the underlying factors and their interplay in explaining how trade openness impacts inequality through structural transformation?* To answer this question, the results will be supported by empirical research based on literature reviews and descriptive analysis of Indonesia's and each of its region integration to global trade and sectoral labour conditions.

## 1.2 Outline of the Thesis

This thesis is organized as follows. Chapter 2 presents a literature review where it briefly introduces previous studies related to the relationship between trade openness, structural transformation, and inequality and impact of trade openness to structural transformation – inequality nexus in Indonesia and other countries. Chapter 3 presents a theoretical framework, where in this section the theories concerning how trade openness could affect inequality through structural transformation proxied by the shift in employment share will be explained. Chapter 4 presents the data section, which explains the definitions of the data that was in this thesis and its source. Chapter 5 presents the methodology section, which describes the model that is used for this study. Chapter 6 presents the result and empirical discussion on the impact of trade openness to structural transformation – inequality level, both in national level and sub-national level. Finally, chapter 7 concludes the thesis.



## 2 Literature Review

This chapter will discuss previous studies related to trade openness, and its impact on inequality through structural transformation. In the first section of this chapter, previous findings concerning the relationship between inequality and structural transformation will be explored. The second section of the chapter will discuss the previous works on how trade openness could impact inequality – structural transformation nexus, with a special focus on how this interplay could occur differently in Indonesia national and sub-national level.

### 2.1 Previous Studies on Inequality and Structural Transformation

Reducing inequality has remained a vital agenda for the past decades. Even though since 1975 global inequality in relative terms has decreased, many countries have experienced rising in within-country inequality (Roy and Sinha Roy, 2017). Looking at the pattern of inequality and structural change, Roy and Sinha Roy (2017) found that inequality has been increasing in countries that have undergone structural change. Therefore, the relationship between structural change and inequality is predicted to exist. The association between structural transformation and inequality was described by Kuznets (1955), who predicted an inverted-U shaped relationship between economic development through structural transformation and inequality. In finding evidence supporting the Kuznets hypothesis, numerous studies have been conducted. The results are mixed and inconclusive, where some studies support the existence of the Kuznets curve and others do not. Some of the early studies conducted using multi-country cross-section regression (Kravis, 1960; Paukert, 1973; Ahluwalia 1976) supported the validity of inverted U-shaped relationship between inequality and development. These studies were focused on the cross-section approach partly due to unavailability of time series data on income distribution for most developing countries (Ahluwalia, 1976). However, this approach raises several problems because in examining the dynamic process in Kuznets hypothesis, historical context of the countries needs to be investigated and this approach does not consider income inequality evolution that occurred within a country, which is central to Kuznets hypothesis.

Subsequent studies using more complete datasets for cross-section and panel regression approaches challenged the findings of previous cross-section studies, where they supported the existence of the Kuznets curve (Thornton, 2001; Huang, 2004; Barro, 2008) and others do not (Fields and Jakubson, 1994; Ravallion, 1995; Deininger and Squire, 1998; Huang, Lin, and Yeh, 2012; Theyson and Heller, 2015). Looking at each country, the results are also mixed and inconclusive. There was no particular pattern regarding inequality and growth. For instance, Deininger and Squire (1998) found that Brazil, Mexico, Hungary, Philippines, Trinidad and Tobago followed an inverted U-shaped while Costa Rica, the United States, India, and the United Kingdom do not. These studies have one thing in common; using income per capita to test the hypotheses. However, using per capita income as a proxy for the transition from a low productivity sector to a higher productivity sector is likely to be an incomplete measure. Per capita income is affected by many factors besides the movement of labour out of agriculture and there are no widely accepted theories explaining how such factors affect inequality.

Instead of looking at the association between per capita income and inequality, recent studies have been conducted where they investigated the association between sectoral share employment and inequality. Employment share is considered superior to GDP per capita as labour movement across sectors is at the centre of Kuznets theory, which is an underlying mechanism that would lead to the pattern of an inverted U-shaped. Angeles (2010), in his study using panels of country and country by country regressions, did not give support for the Kuznets hypothesis. He tested the relationship between employment outside agriculture and inequality, and the share of the urban population as an alternative measure. The study concluded that there was no relation between employment outside agriculture and the urban population with inequality, which contradicted Kuznets' theory. However, the study did not differentiate sectors outside agriculture, which lead to the conclusion of the study, as the sector outside agriculture (i.e. manufacturing, service) might have different natures which leads to a different outcome for income distribution. Baymul and Sen (2020) using panel regression of developing and developed countries also focused more on the impact of the shift of workers out of agriculture to inequality in selected countries as the underlying process in line with the Kuznets hypothesis. They disaggregate the non-agricultural sector into manufacturing, non-manufacturing (mining, utilities, and construction) activities, and services as the movement of labour out of agriculture to these sectors might have different implications to inequality. The study finds that the shift of labour to manufacturing decreases income inequality regardless of their stage of transformation. However, the shift of labour into the services sector at the early stage of structural

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transformation will increase inequality and then, at the later stage, reduce inequality, which implied that the inverted U-shaped relationship applies more to service-led structural transformation. The study found that compared to the services sector, the manufacturing sector tends to have lower within-sector inequality because the nature of the manufacturing sector is more labour-intensive. Since manufacturing activities are more inclined to occur in the formal sector, wages are more likely to be compressed by labour regulations and minimum wages. Therefore, manufacturing-led transformation decreases income inequality.

Using sectoral employment share as Baymul and Sen (2020) did, Yusuf, Anglingkusumo, and Summer (2021) found that in Indonesia, the impact of sectoral employment share to inequality also varies between different periods. Using cross-district data for the period of 1992 – 2017, they found that a fall in inequality is associated with structural transformation during periods of industrialization, which is the year 1992 – 1996, and increasing inequality during the period 2000 – 2017, which is the period of tertiarization. The study also found that during the period industrialization, manufacturing sector had an decreasing effect on income inequality while services sector increased inequality. However during the period of tertiarization, manufacturing sector had an increasing effect on income inequality. Services sector in this period was found to still has an increasing effect on inequality, while non-manufacturing sector in both period did not have any effect on inequality. This result provides additional nuances compared to the global results reported by Baymul and Sen (2020).

## 2.1 Previous studies on Trade Openness and Inequality - Structural Transformation Nexus

Kuznets hypothesis assumes that a country is a closed economy. However, with the rapid globalization that has been happening for the past decades, it is important to analyse how international trade impacts inequality through structural transformation. In spite of the importance of international trade, its role has not received a lot of attention in the current literature on structural transformation and inequality (Anderson and Ponnusamy, 2014; Matsuyama, 2009). Incorporating trade openness into the structural transformation-inequality nexus is essential as international trade played a role as a primary driver of economic dynamism among developing countries in the last half-century (Durongkaveroj, 2021). Compared to

closed economies, open economies often have higher economic growth rates (Zahonogo, 2016). In relation to economic growth, Yanikkaya (2003) and Chen and Gupta (2009) state that trade openness can foster economic growth through several channels, such as comparative advantage, technology transfers and knowledge spillover. This statement is supported by Dollar and Kraay (2004), which claim that in developed and developing countries, there is a significant impact of trade openness on economic growth. International trade influences the structural transformation of an economy, as in an open economy, the structure of production is connected with the composition and level of international trade (Syrquin, 1988; Whang, 2017). This process of structural change through international trade is thus expected to affect inequality.

There are numerous studies concerning how international trade affects structural transformation and inequality. In relation to structural transformation, international trade could be one of the main drivers of structural transformation. McMillan and Rodrik (2011) found that in India, China, and some other Asian countries globalization has created more employment opportunities in high-productivity sectors which then boosted structural change. Using South Korea as case study, trade reforms that occurred from the beginning of 1960s has significant effects on structural transformation, especially concerning the movement of employment and share of value added to GDP from agriculture to manufacture sector (Uy, Yi and Zhang, 2013; Betts, Giri and Verma, 2017; Teigner, 2018). Kumi et al. (2017) in examining the relationship between international trade integration and structural transformation in Sub-Saharan also found that trade openness positively drives structural transformation proxied by the shift of value added in agriculture, manufacture, and service sectors. In Indonesia, during the period of 1991 – 2018, Rath and Ridwan (2020) found that economic and trade reforms occurred in the country increased the degree of trade openness which further induced structural changes in the economy. In regards to income inequality, the study that addresses the direct effects of trade openness to income inequality produced different conclusions. Jaumotte et al. (2008) using developed and developing countries as a sample, found that trade openness significantly reduces income inequality while a similar study conducted by Cheong and Wu (2013) using China as a case study found that trade openness increases inequality. The findings in Indonesia have also been mixed. Using time series data from 1978 to 2015, Agusalim and Pohan (2018) found that trade openness does not have any significant effect on income inequality in Indonesia. On the other hand, using provincial panel data set from 2010 - 2015, Kuntoro, Anggraeni, and Widyastutik (2018) found that trade openness reduces income inequality.

There are no clear channels on how trade openness could affect inequality and structural transformation nexus. However, based on previous studies, trade openness can have both positive and negative effects on inequality through the structural transformation process. Trade openness could intensify competition and induce technology transfers which may increase skill intensity and skilled labour while could also lead less-skilled workers in a disadvantage, causing a wage gap which increases inequality (Aizenman, Lee, and Park, 2012; Roy and Sinha Roy, 2017). Trade could also give access to export opportunities and imported intermediates which boost innovation and increase productivity in firms and/or sectors. This raise in productivity cause exporting/importing firms and sectors to pay higher wages which also may lead to wage gap and rising inequality (Bernard et al., 2006; Urata and Narjoko, 2017). Trade openness also could have reducing impact on inequality. Panagariya (2019) found that the shift in development strategy towards export-oriented industrialisation creates higher employment levels, contributing to more equal income distribution, which has been experienced by the newly industrialised economies (NIEs) of East Asia. They managed to achieve high growth without increasing inequality through labour-intensive manufacturing exports. This was possible because, at the early stage of its structural transformation, NIEs countries followed the Lewisian model where they had a surplus of labour and could hire low skilled workers at a fixed wage rate; therefore, the manufacturing wage did not necessarily increase (Durongkaveroj, 2021).

In quantifying how international trade impacts inequality in the process of structural transformation, Durongkaveroj (2021) runs panel data regression using the sample of 48 developed and developing countries with sectoral employment share as a proxy for structural transformation. The study classified the non-agricultural sector into three sectors, which are manufacturing, non-manufacturing, and service. The study found that trade openness does have an effect on income inequality, where in countries that have a higher degree of trade openness, the inequality reducing effect of the movement of workers to manufacturing is larger. On the other hand, in developing countries, the study found that the movement of workers to services has an inequality-increasing effect and its effect is larger for developing countries that have more open trade regimes. However, this approach of using cross-country regression analysis has limitations as each country has different paths of economic development. Therefore, this study aims to supplement previous findings with a more in-depth study using Indonesia as a case country.

In the case of Indonesia, international trade is one of the most important factors that drives rising inequality since the Asian financial crisis. The commodity boom caused the change in the sectoral composition, where the manufacturing sector, the main driver of economic growth before the crisis slowed down while the service sector was catching up to manufacturing (De Silva and Sumarto, 2013). The commodity boom along with increasing external competition from low-cost Chinese manufacturers depressed the growth of labour-intensive manufacturing, which what had been an important source of employment growth in the 1990 (Coxhead 2007). The manufacturing sector since then has been shifting more towards resource-intensive and capital-intensive industries which have a higher gap in its productivity and wage, this increased the inequality in Indonesia (Tadjoeddin and Chowdury, 2019, p.113)

This effect of trade-led structural transformation impact on inequality is also expected to vary across the sub-national level due to its regional diversity. Indonesia has a high regional diversity which means that some regions within Indonesia share structural characteristics with low-income countries where it has dominance of agriculture and/or mining sectors, whilst other parts of Indonesia has dominance of manufacturing and services sector, which are characteristics for the better-off, upper-middle-income developing countries (Yusuf et al., 2021). According to Hill, Resudarmo, and Vidyattama (2008), regions, in this case, provinces in Indonesia can be grouped based on their major concentrations of economic activity and its major islands groupings, which are Java-Bali, Sumatera, Kalimantan, Sulawesi, and Eastern Indonesia. In 2019, the provincial group of Java-Bali Islands contributed the most to Indonesia's GDP, which amounted to 62 percent, followed by Sumatra Island at 21.36 percent, Kalimantan Island at 8.26 percent, and Sulawesi Island at 6.14 percent, while the lowest contribution was given by provinces in Eastern Indonesia which contributed only by 2.24 percent. Their economic structure also varies which is shaped by various underlying factors, such as climate, geographical location, and resource endowments (Aginta and Someya, 2022). In Java-Bali region, economic activities are highly supported by manufacturing sector, where in its share of GDP in manufacturing reached 71,1 percent of total national manufacturing GDP. This region also has better human and physical capital, such as infrastructure. On the other hand, the rest of the regions in Indonesia mainly rely on the primary sector, such as the mining and agriculture sectors.

These differences on economic structure and endowments therefore might affects how trade openness could impact the inequality on each region differently. For example, the increasing in

international trade will induce competition which affects each sector strategies. For the region that is highly industrialised like Java, the sector needs to move into higher value added activities in order to stay competitive. However this might lead to higher inequality as higher value added activities tend to be more capital-intensive. Therefore, this study will contribute to investigating the impact of trade openness on the structural transformation-inequality nexus in Indonesia by looking at the national at the sub-national context. Boosting exports and accelerating industrialization have been one of the main focuses in Indonesia, both in national and sub-national development strategies. Therefore understanding the impacts and interplays between trade openness and structural transformation – inequality nexus will provide insights on whether these strategies might cause growing inequality.

# 3 Theoretical Approach

This chapter will discuss the theoretical foundation that will be used for this thesis. The first section will explore the relationship between structural transformation and inequality, particularly on how the movement of labour out of agriculture can be attributed to increasing inequality. The second section will then discuss how trade openness can impact the relationship between structural transformation and inequality.

## 3.1 Structural Transformation and Inequality

The concept of inequality can be described as “how benefit of economy is distributed among people or region” (Ray, 1998) while Ravallion (2003) stated that “inequality is about the disparities in levels of living”. The discourse on inequality often makes a distinction between inequality of outcomes (as measured by income, wealth, or expenditure) and inequality of opportunities—attributed to differences in circumstances beyond the individual’s control, such as gender, ethnicity, location of birth, or family background. Inequality of outcomes arises from a combination of differences in opportunities and individual’s efforts and talent. Income inequality as one of the most widely cited measure of inequality of outcomes refers to the unequal distribution of income within a population. As the distribution becomes less equal, income inequality increases. Income inequality is typically measured by the market (gross) and net (after tax and transfers from social insurance programs) Gini, and by tracking changes in the income shares of the population (Norris et al., 2015). Income inequality has become crucial to paid attention to as higher and continuous level of income inequality will create social cost that will negatively affects economic growth (Berg and Ostry, 2018; Roy and Sinha Roy, 2017) while a more equitable income distribution encourages the investment in human capital, which in turn boosts economic growth (Berg and Ostry 2011). There are several factors that caused income inequality. The nature of labour market, institutions, level of education, growth in technology, gender and also personal factors play important role in causing income differences (Leung, 2015; Jaumotte et al., 2013; Frederiksen and Poulsen, 2010; Calderon and Chong,



2009; Card and Dinardo, 2002). However, one of the most significant causes of inequality is structural change, as the structure of economies production patterns affects the share of labour and level of wage (UNDP, 2020).

Structural change in the narrow term refers to changes in the structure of economy, while in a broader sense, it refers to changes in society, political, cultural, societal, and other factors (Aizenman, Lee and Park 2012). Despite the fact that structural change has many definitions, the most common one refers to long-term and continual changes in the sectoral composition of economic systems (Anand and Kanbur, 1993). It also can be described as the movement of labour force from lower productivity activities (traditional sector or agriculture), to higher productivity activities (modern sector such as manufacturing and other related activities). Structural transformation has long been perceived as an important feature of rapid and sustained growth. However, it has been historically linked to rising income inequality in Kuznets hypothesis.

The idea behind the association of inequality and structural change follows the seminal paper of Kuznets (1955). Kuznets (1955) posits that there is an inverted-U relationship between development and inequality through structural change, or the changes in the structure of production. According to him, the two main aspects of structural transformation are the declining share of agriculture in total output, and the migration of labour from low-income agriculture to high-income industries. He predicted that at the early stages of structural transformation, inequality may increase until the certain level and will decrease beyond that certain level. As described by Anand and Kanbur (1993), during the process of structural transformation, the behavior of inequality can be explained by breaking down income inequality in the economy into between- and within-sector inequality as illustrated by Figure 1. Between-sector inequality occurs when workers shift from lower mean income sector to higher mean income sector, while within-sector inequality occurs when workers shift from sector with low within-sector inequality (low variance of income) to sector with higher within-sector inequality (higher variance of income). Between-sector inequality has a hump shaped curve form because Kuznets (1955) assumed that the non-agriculture sector always has higher per capita income. The between-sector component of inequality rises when workers move from agriculture to non-agriculture, and then drops with an increase in the share of workers in non-agriculture. The reason for this is that at the early stages of structural transformation, only a small share of workers is receiving a higher wage in non-agriculture sector. As the proportion

of workers moving to the non-agricultural sector increases, the between-sector component of inequality decreases. Kuznets also assumed that within agriculture sector, the income is more equitably distributed and this makes within-sector inequality to have a positive slope because in the process of structural transformation, the weight of non-agricultural sector which has more unequal distribution in total inequality keeps increasing. Therefore, total inequality will depend on the interplay between within-sector inequality and between-sector inequality.

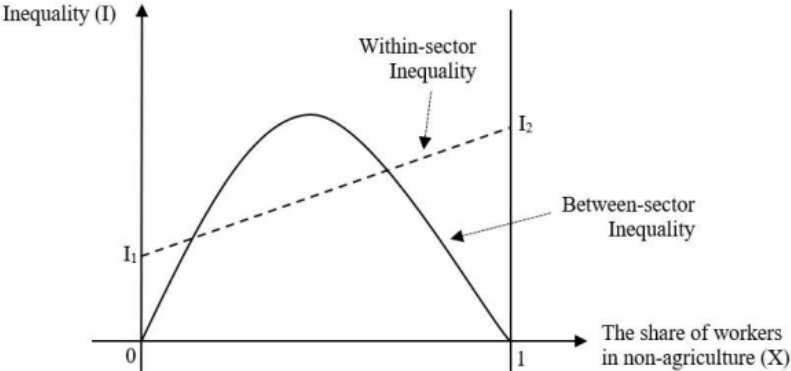


Figure 3.1 The Kuznets Process (Anand and Kanbur, 1993)

### 3.2 Trade Openness and Structural Transformation - Inequality Nexus

Economic openness or trade openness illustrates the higher share of trade and reduced barriers of conducting trade between countries, which expected to benefit all countries involved (Darmawan, 2020). Higher integration in international trade could shape structural transformation of an economy as international trade facilitate specialization, which then affects the composition of sectoral employment and value added (Alessandria, Johnson, and Yi, 2021). Thus, this process is expected to affect inequality. This thesis will adapt Durongkaveroj (2021) framework where it investigate trade openness impacts on structural transformation - total inequality nexus by looking at the changes in within- and between-sector inequality. Durongkaveroj (2021) assumes that an economy consists of agriculture, manufacturing, and services, and that agriculture has lower mean income than manufacturing and services. However in this study, non-manufacturing sector will be added as it has important role in

Indonesia’s economy. The channel on how trade openness affects these can be shown by Figure 3.2.

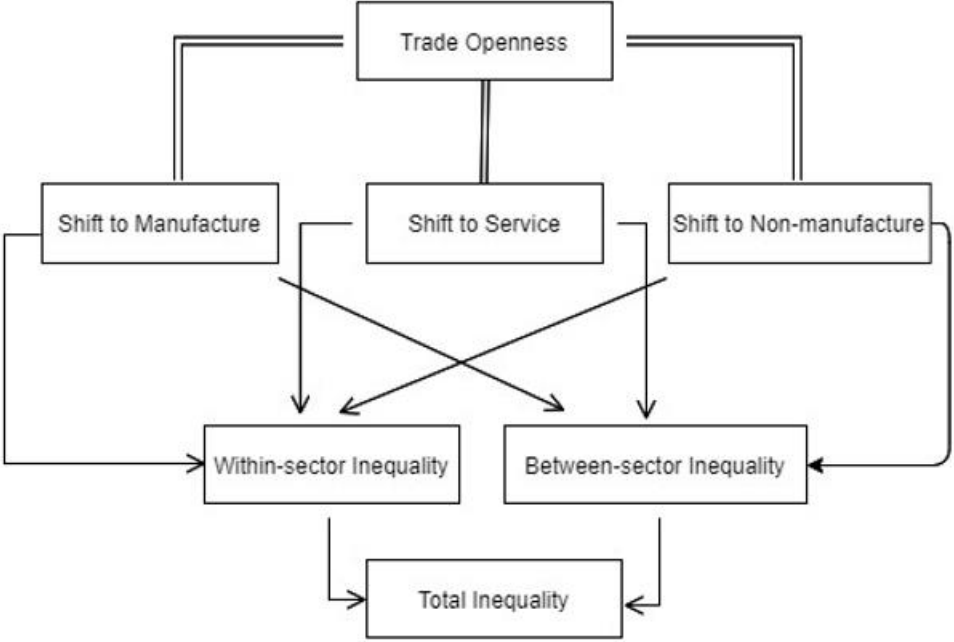


Figure 3.2. Trade Openness Impacts on Structural Transformation-Inequality Nexus (Durongkaveroj, 2021)

Trade Openness could positively and negatively affect within-sector inequality depended on the type of sector. Durongkaveroj (2021) assumes that manufacturing sector has lower within-sector inequality because labor regulations, such as minimum wages, tend to compress wages in this sector. Engaging in global trade in manufacture helps firms to gain bigger market and better efficiency in the production process which will raise also the demand for more employment in manufacture. The benefits of this trade are more likely to be equally distributed among workers with the role of labour union and other labour market regulations. This might also narrow the differences in wage among manufacturing workers. Therefore, when labour shifts to manufacture, within-sector inequality is expected to decrease. However, higher trade in services might lead to higher within-sector inequality because the effect of international trade tends to be limited to few services activities, such as telecommunications, finance, and transport. Higher trade in non-manufacturing sector is also expected to has higher within-sector inequality, especially in resource rich region where the global trade demand tends to be concentrated in mining activities.

In terms of the effect of trade openness to between-sector inequality, openness to trade will accelerate the process of population shift towards non-agricultural sector. With the assumption that agriculture has lower mean income, therefore it is predicted that countries with more open trade regimes will have higher between income inequality. Therefore, how the shift of labour towards non-agriculture sector affects total inequality will depends on the interaction between the within-sector inequality and between-sector inequality.

## 4 Data

This study uses Indonesian provincial panel data set for a total of 34 provinces in Indonesia, covering the period from 1997 to 2019, which was constructed from various publications by Indonesian National Bureau of Statistics or *Badan Pusat Statistik* (BPS) and realized local government budget reports by the Ministry of Finance. The data sources and definitions for each variable is listed in table 4.1 below. It is important to note that there are some missing variables as the sub-national boundaries have frequently changed as shown by the number of provinces that changed over time. In 2001, Banten, Bangka Belitung, North Maluku, and Gorontalo became new provinces which were separated from West Java, South Sumatra, Maluku, and North Sulawesi, respectively. In 2004, West Papua and West Sulawesi became a new province separated from Papua/Irian Jaya and South Sulawesi, respectively, in 2004, and the newest province formed is North Kalimantan, which was separated from the province of East Kalimantan in 2012. However, the results still hold when another regression using 26 provinces is conducted, even though the magnitude of the coefficients is different.

*Table 4.1. Variable and Definition*

Variable	Definition	Data Source
<b><i>IN</i></b>	Income inequality, measured by Gini coefficient by province	Badan Pusat Statistik (BPS)
<b><i>MANU</i></b>	Share of employment in manufacturing (% of total employment) by province	Badan Pusat Statistik (BPS)
<b><i>SER</i></b>	Share of employment in services (% of total employment) by province	Badan Pusat Statistik (BPS)
<b><i>NMANU</i></b>	Share of employment in non-manufacturing (% of total employment) by province	Badan Pusat Statistik (BPS)
<b><i>OPN</i></b>	Trade openness, measured by trade to GRDP ratio	Badan Pusat Statistik (BPS)

<b><i>GRDPC</i></b>	Gross Regional Domestic Product per capita (log form)	Badan Pusat Statistik (BPS)
<b><i>GXinfra</i></b>	Share of infrastructure expenditure to government expenditure by province (% of total GRDP)	Ministry of Finance
<b><i>SCHOOL</i></b>	Mean years of schooling by province	Badan Pusat Statistik (BPS)

# 5 Methodology

## 5.1 Model Specification

In investigating the impact of trade-led structural transformation on income inequality in Indonesia, this thesis uses panel data regression with the model specified below. This model is based and adapted from the previous studies (Baymul & Sen, 2020; Durongkaveroj, 2021).

$$\begin{aligned} IN_{it} = & a + \beta_1 MANU_{it} + \beta_2 MANU_{it}^2 + \beta_3 NMANU_{it} + \beta_4 SER_{it} + \beta_5 SER_{it}^2 \\ & + \beta_6 OPN_{it} + \beta_7 (MANU_{it} \times OPN_{it}) + \beta_8 (NMANU_{it} \times OPN_{it}) \\ & + \beta_9 (SER_{it} \times OPN_{it}) + \beta_{10} (MANU_{it}^2 \times OPN_{it}) \\ & + \beta_{11} (NMANU_{it}^2 \times OPN_{it}) + \beta_{12} GRDPC_{it} \\ & + \beta_{13} GXinfra_{it} + \beta_{14} SCHOOL_{it} + \mu_i + v_t + \varepsilon_{it} \end{aligned}$$

For dependent variable, gini coefficient by province (*IN*) is used as a proxy for income inequality. The subscripts of *i* and *t* refer to province and year.  $\mu_i$  is used to capture the province fixed effects, while the year fixed effects are captured by  $v_t$ . To investigate the structural transformation, the non-agricultural sector is classified into three sectors: manufacturing (*MANU*), services (*SER*), and non-manufacturing (*NMANU*) which consists of utilities, mining, and construction industries. The quadratic term is used to determine whether there is non-linear relationship (Kuznets hypothesis) between inequality and sectoral employment share. Trade to GRDP ratio is used as a proxy for trade openness (*OPN*), which is the sum of exports and imports as a share of provincial GDP or Gross Regional Domestic Product (GRDP). To test whether income inequality is affected by trade openness through the process of structural transformation, interaction term between trade openness and sectoral employment share variables and their quadratic terms is used.

For control variables, provincial gross regional domestic product per capita (*GRDPC*) is used because in the case of Indonesia, the increase in GRDP per capita would lead to a more balance wealth distribution, raise the quality of life, which could reduce

inequality (Aginta, Soraya, and Santoso, 2018). The share of infrastructure expenditure to total government expenditure (*GXinfra*) is also included as a control variable since public spending might have a significant effect on growth and inequality. In the case of Indonesia, public investment in infrastructure has a significant role in reducing inequality (Dartanto, Yuan, and Sofiyandi, 2017). Province's mean year of schooling (*SCHOOL*) is also included as a control variable as a proxy for human capital quality, which plays a vital role in structural change (Martins, 2019). In Indonesia's case, an increase in the mean year of schooling increases the number of skilled labor force, which could increase inequality (Dartanto, Yuan, and Sofiyandi, 2017). On the other hand, higher levels of human capital as the results of educational expansion would also allow people to get better and higher paying jobs which could also reduce income inequality (Lee and Lee, 2014).

The summary of explanatory variables and its expected sign of regression coefficient are listed in table 5.1 below.

*Table 5.1. Variables and Expected Sign of Regression*

Variables	Expected Sign
<i>MANU</i>	-
<i>SER</i>	+
<i>NMANU</i>	+
<i>OPN</i>	-/+
<i>MANU x OPN</i>	-
<i>SER x OPN</i>	+
<i>NMANU x OPN</i>	+
<i>GRDPC</i>	-/+
<i>GXinfra</i>	-
<i>SCHOOL</i>	-/+



## 5.2 Estimation Method

Hausman test was performed to decide which estimator is the best for the model. The result shows that the error term is correlated with explanatory variables, favoring the Fixed Effects (FE) estimator over the random effects (RE) estimator. The FE estimator controls for time-invariant province characteristics that may impact both dependent and independent variables. Normality test is conducted using Jarque-Bera test, with the result shows that the probability is more than 0,05, which shows that the residues are normally distributed. Furthermore, heteroscedasticity-consistent robust standard error is used to address the concern about heteroscedasticity. Correlation analysis is conducted to check for correlation among variables. The results show that there is no correlation between the variables as all of the coefficients are lower than 0.8, which is perceived as a benchmark for highly significant correlation, therefore, none of the variables will be omitted from the model to avoid omitted variable bias. For sub-national level analysis, the provinces will be divided by groups based on major concentrations of economic activity and its major islands groupings, which are Java-Bali, Sumatera, Kalimantan, Sulawesi, and Easter Islands. The list of the provinces is listed on the Appendix 2.

## 6 Empirical Analysis

### 6.1 Results

The summary of regression results are presented in Table 6.1. Column 1 presents the regression for national level consisting of all 34 provinces. The result shows that for national level, manufacturing employment share coefficient is positive and statistically significant, which indicates that an increase of one percentage point in manufacturing employment share is associated with an increase of a 0,88 percentage point in the Gini coefficient. The coefficient on the squared manufacturing variable is positive and statistically significant at the 1 % level. This suggests that there is no U-shaped relationship between manufacturing employment share and inequality. The coefficient in non-manufacturing and service employment share is positive but not statistically significant. Both the squared variables of non-manufacturing and service sector are not significant which suggest that there is also no U-shaped relationship between service and non-manufacturing employment share with inequality. As this thesis aim is to check whether trade openness could affect income inequality through the change in sectoral employment share, interaction terms between trade openness and sectoral employment share is therefore included. The coefficient on the interaction term between the share of workers in manufacturing and the trade openness is positive and statistically significant at 5 % level while the coefficient on the interaction term of non-manufacturing and service employment share is not statistically significant even at the 10% level. This indicates that the inequality-increasing effect of manufacturing employment share is larger for provinces with a higher trade openness.

Table 6.1 Summary of Regression Results

	National	Sumatera	Java - Bali	Kalimantan	Sulawesi	Eastern INA
Manufacturing	0.879*** (0.216)	1.455** (0.548)	1.236** (0.442)	1.626** (0.503)	0.722 (0.887)	-1.581 (1.083)
Manufacturing <sup>2</sup>	4.346*** (0.699)	-3.105 (2.038)	-2.144 (2.557)	2.846 (2.384)	-5.866 (9.575)	4.459 (6.696)
Non-manufacturing	0.207 (0.254)	0.686 (0.504)	0.994 (1.016)	0.674 (0.449)	1.921* (0.854)	1.027 (1.354)
Non-manufacturing <sup>2</sup>	-0.237 (0.496)	-1.042 (1.412)	-0.713 (0.855)	-1.255 (0.693)	-0.0574 (-1.137)	-9.017 (12.40)
Service	0.163 (0.231)	0.833*** (0.254)	0.430** (0.174)	-0.00432 (0.255)	0.603 (0.401)	-0.455 (0.337)
Service <sup>2</sup>	0.0827 (0.271)	-0.986** (0.315)	-0.264 (0.479)	0.0426 (0.243)	-0.336 (0.495)	0.848 (0.528)
Mean years of schooling	-0.000529 (0.00667)	0.0116** (0.00367)	-0.00948* (0.00467)	0.0182 (0.0116)	0.0417** (0.0108)	-0.000626 (0.00793)
Log of GDP per capita	0.0077** (0.00250)	0.0103*** (0.00219)	-0.00458 (0.00455)	0.00313 (0.00208)	0.00273 (0.00609)	0.00455 (0.00488)
Infrastructure expenditure	-0.00220 (0.0109)	0.000492 (0.0117)	0.00636 (0.0128)	-0.00242 (0.00333)	-0.0189 (0.0221)	-0.00745 (0.0237)
Trade Openness (TO)	-0.0344* (0.0189)	-0.152** (0.0530)	0.173 (0.411)	0.00884 (0.0803)	-0.178 (0.114)	0.0305 (0.175)
Manufacturing x TO	0.852** (0.362)	1.444* (0.649)	1.586* (0.758)	0.497 (0.160)	3.267 (2.308)	5.660 (5.192)
Service x TO	0.00995 (0.105)	0.948* (0.486)	0.344* (0.151)	0.214 (0.246)	0.134 (0.898)	-1.063 (1.187)
Non-manufacturing x TO	0.234 (0.274)	0.704 (0.424)	0.722 (1.339)	0.322* (0.126)	-1.249 (0.705)	4.923 (3.275)

Robust standard error in parentheses

\*\*\*p<0.01, \*\*p<0.05, p\* <0.1

In national level, trade openness itself has a negative impact on income inequality. However, two of control variables (local government expenditure on infrastructure and years of schooling) have no significant effect on income inequality, while GDP per capita has a positive effect on inequality.

However, when grouping the provinces based on several regions, the regression yields different results. For provinces in Sumatera, the coefficient of employment share in service is positive and statistically significant at 1 % level, which means that an increase of one percentage point in service employment share is associated with an increase of a 0,83 percentage point in the Gini coefficient. The result shows that the U-shaped relationship between service employment share and inequality in provinces in Sumatera is exist, which can be shown by the statistically significant and negative coefficient on the squared service variable. The coefficient of employment share in manufacturing is positive and statistically significant at 5 % level, which means that an increase of one percentage point in manufacturing employment share is associated with an increase of a 1,45 percentage point in the Gini coefficient. In Sumatera region, trade openness itself also has a negative impact on income inequality

The coefficient on the interaction term between the share of workers both in manufacturing and service and the trade openness is positive and statistically significant at 10 % level while the coefficient on the interaction term of non-manufacturing employment share is not statistically significant even at the 10% level. This indicates that the inequality-increasing effect of manufacturing and service employment share is larger for provinces in Sumatera with higher degree of trade openness. For control variables, the result also shows that mean years of schooling has a positive effect on inequality.

For provinces in the Java-Bali group, the coefficient of employment share in manufacturing is positive and statistically significant at 5 % level, which means that an increase of one percentage point in manufacturing employment share is associated with an increase of a 1,23 percentage point in the Gini coefficient. The coefficient on the interaction term between the share of workers in manufacturing and the trade openness is positive and statistically significant at 10 % level while the coefficient on the interaction term of non-manufacturing and service employment share is not statistically significant even at the 10% level. This indicates that the inequality-increasing effect of manufacturing and service employment share is larger for provinces in Java-Bali with higher degree of trade openness. For control variables, the result also shows that mean years of schooling has a negative effect on income inequality.

For provinces in Kalimantan, the coefficient of employment share in manufacturing is positive and statistically significant at 5 % level, which means that an increase of one percentage point in manufacturing employment share is associated with an increase of a 1,62 percentage point in the Gini coefficient. Out of all interaction terms, only the coefficient on the interaction term

between the share of workers in non-manufacturing and the trade openness that is negative and statistically significant at 10 % level. This indicates that inequality-decreasing effect of non-manufacturing employment share is larger for provinces in Kalimantan with higher degree of trade openness

For provinces in Sulawesi, the coefficient of employment share in non-manufacturing is positive and statistically significant at 10 % level, which means that an increase of one percentage point in non-manufacturing employment share is associated with an increase of a 1,91 percentage point in the Gini coefficient. However, all the interaction terms are not statistically significant. In Sulawesi, mean years of schooling also has a positive coefficient and statistically significant, which means that education increases inequality in Sulawesi provinces. While for provinces in Eastern Region, all of the variables are not statistically significant.

## 6.2 Discussion

In this section, the regression results will be discussed with a focus on the underlying factors and interplays that could explain the results. The discussion will be divided on different sub-sections that will begin with national level analysis (Indonesia) and sub-national level which will be divided by regions. At the end of this chapter, a conclusion regarding the findings will also be discussed.

### 6.2.1 Indonesia

The results found in this thesis indicate that in Indonesia, the shift of labour to the manufacturing sector has an increasing effect on inequality. This finding aligned with a previous study (Yusuf, Anglingkusumo, and Summer, 2021), which found that since the Asian financial crisis, the manufacturing sector had an increasing effect on income inequality. During the pre-crisis or the 'New Order' era led by Soeharto, the manufacturing sector was the driver of growth in Indonesia. However, this trend changed, and the service sector has been catching up to manufacturing (ILO, 2018).

This slowdown in manufacturing growth was also accompanied by a disconnection between wage and labour productivity growth in the manufacturing sector during the post-Soeharto era, which affected income distribution. Labour productivity in the manufacturing sector continued to rise while its real wage stagnated. This thus contributed to the rising in income inequality (Tadjoeddin and Chowdhury, 2019, p. 26). The inequality increasing effect of manufacturing can be related to the phenomenon of jobless growth in the sector after the crisis, which was caused by the changing characteristics of the labour market (Aswicahyono et al., 2011). Jobless growth refers to the decreased ability of the manufacturing sector to absorb labour surplus from the agriculture sector, or in other words, when the manufacturing sector becomes less labour absorbing (Aswicahyono et al. 2013, p.218). This period contrasted with the period before the crisis when manufacturing jobs grew rapidly.

One of the possible explanations for the slow growth of manufacturing employment is that since the crisis, the manufacturing sector experienced an increase in the capital-labour ratio, which indicates that the sector increased its intensification of capital used as Indonesia began

to recover from the crisis. Since the Asian financial crisis, Aswicahyono et al. (2011) also showed that the composition of jobs within manufacturing had been changing away from labour-intensive industries such as footwear and garments. However, other factors could also possibly affect jobless growth, such as the commercial environment and other reasons which affect employers willingness in manufacturing sector to hire labour (Aswicahyono et al. 2013, p.217).

In relation to trade openness, the result indicates that in provinces with higher degree of trade openness, the shift of labour to manufacture caused by international trade has a larger increasing-inequality effect compared to provinces with lower degree of trade openness. Several factors might explain how this could happen. Indonesia's higher trade openness after the crisis was mainly driven by resource-exporting sectors, where Indonesia's energy and natural resource exports have experienced strong and sustained growth from global demand. The reason for this was because of the resource boom that occurred during the first decade of the twenty-first century, when commodity prices rose across the globe mostly due to China's exceptionally strong resource-intensive growth (Wihardja, 2016)

The rapid growth of export in labour-intensive manufacturing output that Indonesia enjoyed before the crisis declined significantly as the commodity boom caused substantial real exchange rate appreciation, rendering Indonesian exports less competitive. Furthermore, manufacturing industries in Indonesia has also been negatively impacted by the external competition, such as competition from low-cost Chinese manufacturers. This thus further depressed the growth of labour-intensive manufacturing, which what had been an important source of employment growth in the 1990 (Coxhead 2007). The export of labor-intensive manufacturing products have also declined (Allen, 2016). In 2008–2010, for example, they accounted for a relatively small share of total exports, as can be gleaned from the 9% share from textiles, footwear, and accessories, Indonesia's major labor-intensive exports. This contrasts with one third of all exports coming from oil and gas, and from mineral products during the same period (Allen, 2016). Compared to labour-intensive industries, this resource-intensive industries have higher gap in its productivity and wage (Tadjoeddin and Chowdury, 2019, p.113). This could led to higher within-sector inequality in manufacturing. Therefore, this changing pattern in manufacturing export towards capital-intensive could explain why trade openness could exacerbate inequality in manufacturing-led transformation in manufacturing in Indonesia.

The result also shows that the control variables (mean years of schooling, infrastructure expenditure, and GDP per capita) do not have any significant effect on inequality. This might occur because years of schooling as a proxy for human capital quality also has its limitation as it cannot depict the quality of education, which is the main problem in the phenomenon of skill mismatch in Indonesia, which hampers the higher skilled job to absorb labour. Indonesia has been experiencing skill mismatches between labour demand and supply. Even though mean years of schooling and enrollment rates have significantly increased, from the employers perspective, educated labour is having skill shortages which shows that there is a problem of skill mismatch that are unresponsive with market demands (Ginting, Manning, and Taniguchi, 2018, p. 46). Infrastructure expenditure also does not have any significant effect on income inequality, possibly due to its limitation in capturing the quality of infrastructure as better quality of infrastructure could reduce inequality (Chatterjee & Turnovsky, 2012).

### 6.2.1 Sumatera

The result shows that in Sumatera, the structural transformation towards manufacturing and service sector has an increasing effect on inequality. Kuznets type of U-shaped relationship also exists in services sector, which means that the movement of labour to the services sector in the long run will lead to decreasing inequality. However, non-manufacturing sectors do not have any significant effect on income inequality. The shift of labour towards non-agriculture in Sumatera provinces has mainly been shifting towards the service sector. In 1997, the share of employment in agriculture was 55 percent and it decreased to 40 percent in 2019. On the other hand, its share of employment in services has increased from about 33 percent in 1997 to 45 percent in 2019. Sumatera provinces have also undergone structural changes towards manufacturing and non-manufacturing sector even though there were only small movement of labour to those sectors. In 1997 the share of employment in manufacturing sector and non-manufacturing sector was 7 percent and 4 percent respectively, while in 2019 the employment share of both sectors were slightly increased to 8,6 percent for manufacturing and 6,8 percent for non-manufacturing.

Looking into each sub-sectors in service (Figure 4.3), in 1997 – 2019, majority of workers in Sumatra provinces work in trade, hotels, and restaurants (50 percent), while around 35 percent of total share of employment in services work in public administration, education, health, and



other services. The rest of total employment work in transportation and warehousing, information and communication, financial and insurance services, and business services. These subsectors productivity varies, with financial and business services have the highest productivity, around six times higher than the productivity in wholesale and retail trade. This difference in productivity thus might explained the inequality within the sector. In total, inequality in service is also higher than agriculture which caused the between-sector inequality increased when labour move from agriculture to service. These then might explained why the shift of labour towards service sector led to the rise in total inequality in Sumatera provinces.

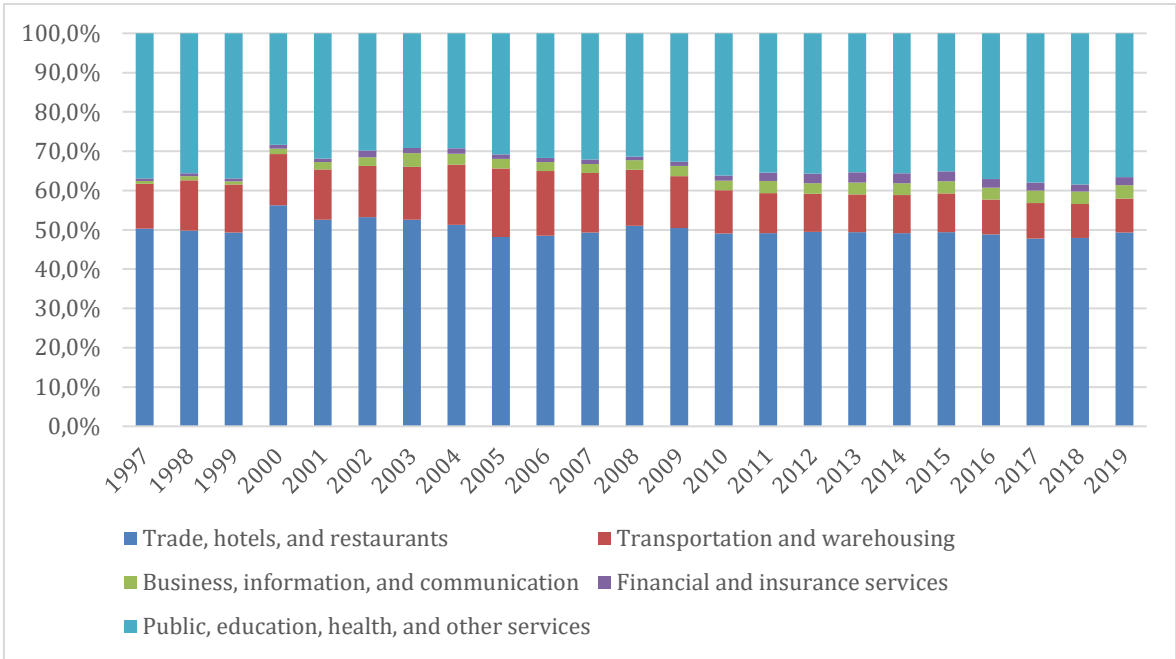


Figure 6.2. The structure of employment share in services sector of Provinces in Sumatera, 1997 to 2019

Source: Badan Pusat Statistik, 2021

Manufacturing sector also found to has an increasing effect in inequality. From 1997 until 2019, all provinces in Sumatera have experienced an increase on total employment in manufacturing. With several provinces, such as North Sumatera, Riau, Riau islands, West Sumatera, South Sumatera, and Lampung experienced significant increased on their total employment in manufacturing. Provinces in Sumatera has a wide-range of manufacturing sub-sector, with South Sumatera, West Sumatera, North Sumatera, Riau, and Riau Islands have mostly capital-intensive sub-sectors, while Bangka Belitung Islands, Bengkulu, Jambi, Aceh and Lampung have mostly labour-intensive sub-sectors (Bahar and Yuniasih, 2019). Bahar and Yuniasih (2019) also find that in Sumatera provinces, the real wage in capital-intensive industries is

higher compared to the labour-intensive industries. This difference in real wage therefore could contribute to higher within-sector inequality in manufacturing. In terms of between-sector inequality, manufacturing sector productivity in Sumatera provinces is higher compared to agriculture sector productivity, which then might have caused the shift of labour to manufacturing, increasing the between-sector inequality. This interplay thus is expected to increase total inequality.

The result also indicates that in provinces with a higher degree of trade openness, the shift of labour to manufacturing and services sectors caused by international trade has a larger increasing-inequality effect compared to provinces with a lower degree of trade openness. Riau islands could be one of the examples on how trade openness could have a larger increasing inequality effect through structural transformation. Riau islands is the province with the highest trade openness, where three of its districts (Batam, Bintan, and Karimun) are special economic zones (SEZ), where it designs to attract foreign investment and promote international trade. This SEZ plays a big role in Riau Islands economy, which enables the province to achieve a high rate of economic growth (Negara and Hutchinson, 2018). The SEZ also helped the province to be more integrated with global production networks as the proportion of firms engaged in global trade activities, such as exporting and importing is high which then contributed to the province's high level of export and import intensity (Negara and Hutchinson, 2018). Negara and Hutchinson (2018) also found that this integration with global trade has a positive impact on firms' productivity and competitiveness, as firms which use imported inputs, more export oriented, or foreign-owned have higher productivity. This also aligns with a study conducted by Amiti and Davis (2011) which stated that better access to foreign participation is crucial for firms' competitiveness. The number of exporting and importing firms in Riau Islands have also generally increased (Negara and Hutchinson, 2018). Takii and Narjoko (2013) also find that in Indonesia, firms involved with international trade and/or with foreign ownership pay higher wages to their skilled workers and employ more skilled workers compared with local and domestic-oriented plants. Therefore, this will lead to increasing income inequality.

In relation to the service sector, trade openness could influence the changing in labour structure in the service sector. In Indonesia, many service jobs are created through exports and imports, either directly or indirectly, with three sub-sectors dominating the share of employment created through international trade, which consists of: transport, travel and 'other' business services (Manning and Aswicahyono, 2012). In the case of Riau islands, the special economic zones

also helped to create more employment in service sector, with the highest increase in service jobs is related to trade, transportation and warehousing, and tourism (Hermawan, 2022). The labour productivity between these subsectors in Riau islands is also varies, with transportation and warehousing has the highest productivity. This difference in productivity then is expected to drive inequality. Therefore, trade openness could have increasing effect on total inequality through the structural change in service sector.

### 6.2.2 Java-Bali

For provinces in the Java-Bali group, the structural transformation towards manufacturing sector has an increasing effect on income inequality. Java-Bali is the most populous region in Indonesia, with its contribution to national GDP account for around 60 percent. Most of the provinces in this group are also among the most industrialised in Indonesia, where the economic activities in this region are mainly supported by manufacturing industries. For example, in Banten and West Java, the contribution of manufacturing sector to their GRDP reached 44 percent. In total, from 2010 until 2019, the average share of manufacturing contribution to national GDP from Banten, West Java, East Java and Central Java is 36 percent. As the location of many major manufacturing firms, the region has corresponding physical capital, including infrastructure, as well as better human capital with highly-educated workers (Aginta and Someya, 2022).

Even though the shift of labour towards non-agriculture has mainly been shifting towards the service sector, Java-Bali region have also undergone structural changes towards manufacturing and non-manufacturing sector even though there were only small movement of labour to those sectors. In 1997 the share of employment in manufacturing sector was 14,8 percent, while in 2019 its employment slightly increased to 18 percent. However, all provinces in this region experienced disjoint in their real wage and productivity which led to growing inequality, where manufacturing sector has one of the highest earnings inequality (Tadjoeddin and Chowdbury, 2019, p. 114).

The result also indicates that manufacturing-led and services-led structural transformation also has higher inequality increasing effect in province with higher degree of trade openness. West Java could be one example how trade openness could lead to higher inequality. West is one of provinces with high degree of trade openness, where more than 60 percent of Indonesia's

manufacturing industries are located in West Java. West Java was also one of the provinces that experienced larger increase in inequality compared to national average during 2000 – 2015. West Java manufacturing export growth is driven by the product of capital-intensive industries, such as electronic products, automotive, and chemical industries where their exports value contributed up to 45 percent of its total exports in 2019. Thus, international trade could lead to higher within-sector inequality in West Java manufacturing as it drives the region to produce more capital-intensive industries products. In terms of services sector, the spillover effect of international trade to services sector is expected to occur in this region, by providing jobs associated with export and import activities. Higher engagement in international trade in Java – Bali region has a positive impact on service sector employment, as it increased the opportunities for service jobs, such as tourism related jobs, transportation, construction, communication, and finance (ADB, 2020). Considering the variation of each sub-sector labour productivity, this shift of labour towards services is expected to lead to higher inequality.

### 6.2.2 Kalimantan

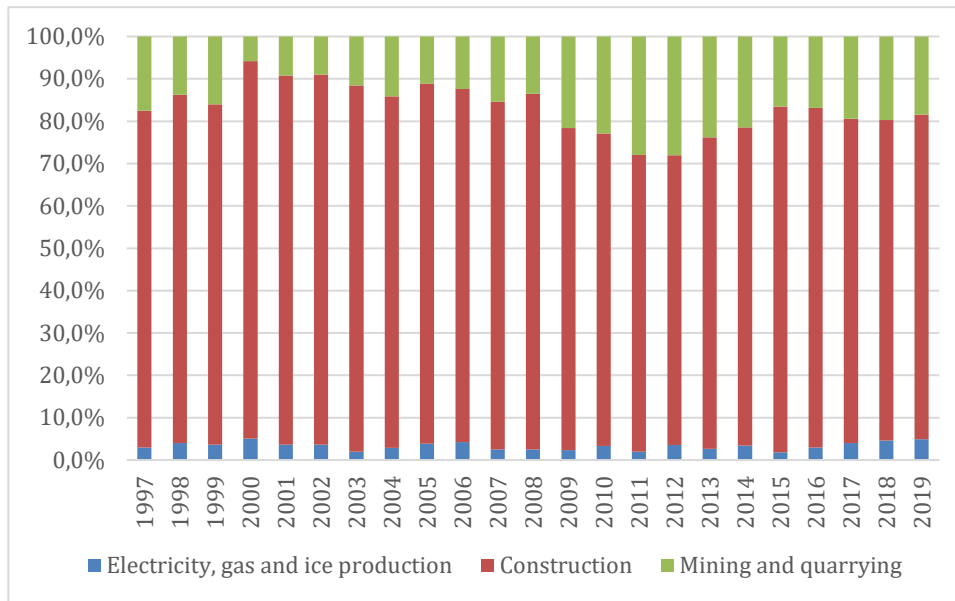
In Kalimantan, the result shows that manufacturing sector has an increasing effect on inequality. Even though the effect of non-manufacturing sector itself in general is not significant, the result also shows that in provinces with higher degree of trade openness, non-manufacturing has an increasing-inequality effect. The economic structure in Kalimantan provinces varies, with mining sector plays an important role in resource-rich province provincial economy, such North Kalimantan, East Kalimantan, and South Kalimantan, with its contribution reached more than 20 percent in 2018. On the other hand, Central Kalimantan and West Kalimantan relies mainly on agriculture sector, with its contribution also reached more than 20 percent. Manufacturing sector also plays important role in Kalimantan provinces (except North Kalimantan) where its sectoral share to GDRP accounted to more than 15 percent. However, the overlapping between provinces with manufacturing and those with natural resources indicates that most of the activities of industries in these provinces are resource-based manufacturing (Tadjoeddin and Chowdury, 2019, p. 150). These industries are relatively capital intensive and also mainly conducted by larger firms (ADB, 2019). Tadjoeddin and Chowdury (2019) also find that in larger firms, wage is tend to be higher. Therefore, these factors could explain why manufacturing in Kalimantan region has an increasing effect on inequality.

Kalimantan is also one of Indonesia's foreign exchange earners with East Kalimantan has the highest degree of trade openness. This province could be one of example on how trade openness could contribute to increasing inequality through the economy structural transformation towards non-manufacturing sector. East Kalimantan economy mainly driven by mining sector and its high degree of trade openness could be attributed to the period of commodity boom, which helped East Kalimantan provinces to increase their export by exporting commodities (Adriansyah et al, 2020). However, mining in East Kalimantan is the sector who has the largest inequality (Hartono and Irawan, 2008). Therefore, this could explain why the high degree of trade openness in East Kalimantan could lead to higher inequality through non-manufacturing sector.

### 6.2.2 Sulawesi

Sulawesi contribution to national GDP only accounted for around 6 percent in 2019. The shift of labour towards non-agriculture in Sulawesi provinces has mainly been shifting towards the service sector, with its share of employment increased from 37 percent in 1997 to 46,7 percent in 2019. Sulawesi provinces also have undergone structural change towards manufacturing and non-manufacturing sector, with its share of employment increased slightly from 6,9 percent and 3,7 percent in 1997 to 8,7 percent and 8 percent in 2019, respectively.

The result indicates that the shift of labour to non-manufacturing sector was the only factor that increase inequality in Sulawesi. Looking at the share of employment in non-manufacturing sub-sector, in 2019, 76,7 percent of total employment in non-manufacturing in Sulawesi work in construction sector while 18,4 percent work in mining and quarrying, and 4,9 percent work in electricity, gas and ice production. This difference in total employment might led to higher within-sector inequality in non-manufacturing, because the productivity of each subsector varies, where mining has the highest productivity, around five times of the productivity of construction. In total, non-manufacturing sector in Sulawesi also has higher productivity compared to agriculture. Thus, these might attributed to the increase in total inequality in Sulawesi provinces.



*Figure 6.3 The structure of employment share in non-manufacturing sector of Provinces in Sulawesi, 1997 to 2019*

Source: Badan Pusat Statistik, 2021

## 6.2.2 Eastern Indonesia

Eastern Indonesia provinces can be categorized as the poorest regions, with its contribution to national GDP only accounted for around 3 percent in 2019. This region also has greater communication and infrastructure deficits than other regions in Indonesia (Tadjoeddin and Chowdhury, 2019, p.112). The development in Eastern Indonesia region has always been challenging, because of its low socio-economic indicators, especially Papua with its geographically challenging and sparsely populated region (Manning and Rumbiak 1989).

Agriculture is still the main sector in Eastern Indonesia provinces, with its share of employment accounted for 47 percent in 2019. In terms of share of employment, the structural transformation in this region mainly has been moving towards service sector, with its share in 1997 accounted for 26,5 percent and increased significantly to 39,15 percent in 2019. The share of employment in manufacturing and non manufacturing sector had been decreasing, with its share were 8,6 percent and 4 percent in 1997 to 7,5 percent and 6,3 percent in 2019, respectively. Compared to other region such as industrialised provinces of Java, some of the provinces in this region,

such as North Maluku and East Nusa Tenggara have not yet undergone the process of industrialization (Adriansyah et al., 2020).

The result shows that the shift of labour out of non-agriculture sector (manufacturing, non-manufacturing, and service) and the interaction terms between the shift of labour out of non-agriculture sector with trade openness do not have any significant effect on income inequality in Eastern Indonesia provinces. One of the possible explanations for these is that in Eastern Indonesia, there are many other factors that could impacted inequality. Some of the eastern regions are conflict-prone, and this might affected the insignificance of structural transformation in Eastern Indonesia. For example, in Maluku, the sectoral employment shift towards manufacturing sector has been slow, with the violent conflict seems to play a significant role where there was a huge drop in the manufacturing employment of Maluku in 2005 (Rao & Vidyattama 2017). Corruption is also one of the factor which could hamper the province ability to tackle inequality. In example, despite a lot of efforts in building infrastructure and accelerate the development of its economy, autonomy funds are suspected to be corrupted by few elites in West Papua (Adonis, 2021).

To sum up, in national level, trade openness has an inequality-increasing effect through manufacturing-led structural transformation. The reason for this was because of the resource boom and increasing international competition which depressed the growth of labour-intensive manufacturing, which what had been an important source of employment growth before the crisis. The commodity boom also further induced the emergence of resource-intensive industries, which have higher gap in its productivity and wage. However, looking at sub-national level, trade openness impact on structural transformation-inequality nexus varies. In Sumatera, one example of province with the highest trade openness (Riau Islands) is discussed to understand the factors behind the result. Higher engagement of global trade helps integrate the region with global production networks, which contributed to the province's high level of export and import intensity. This also increased the number of exporting and importing firms in Riau Islands, where it pays higher wages to their skilled workers and employ more skilled workers compared with local and domestic-oriented plants, which could increase inequality in total. In relation to service sector, higher engagement to global trade helped Riau Islands to create more employment in service sector, with the highest increase in service jobs is related to trade, transportation and warehousing, and tourism, which has difference level in productivity. This difference in productivity then is expected to drive inequality. In Java-Bali region, West

Java is discussed in explaining how trade openness could have inequality increasing impact on manufacturing-led structural transformation. Export growth in this province is mainly driven by the product of capital-intensive industries. This can lead to higher within-sector inequality in West Java manufacturing as it drives the region to produce more capital-intensive industries products.

In Kalimantan region, East Kalimantan is discussed as one of example on how trade openness could contribute to increasing inequality through the economy structural transformation towards non-manufacturing sector. Commodity boom helped East Kalimantan economy by increasing their commodities export. However, mining sector in East Kalimantan is the sector which has the largest inequality, and relatively more capital intensive which could lead to higher inequality. In Sulawesi and Eastern Indonesia, trade openness seems to have no discernible effect on income inequality through structural transformation. This might occurred because of other unobserved factors which could have significant impact on inequality, such as social conflicts and corruption.



## 7 Conclusion

This thesis concludes that at the national level, trade openness has an inequality-increasing effect through manufacturing-led structural transformation. However, its impact varies on the sub-national level. In Sumatera, trade openness has an inequality-increasing effect through manufacturing-led and services-led structural transformation, while in Java-Bali region, trade openness has an inequality-increasing effect through manufacturing-led structural transformation. In Kalimantan region, trade openness has an inequality-increasing effect through the structural transformation towards non-manufacturing sector, while in Sulawesi and Eastern Indonesia region, trade openness does not have any significant effect to income inequality – structural transformation nexus.

To perform this study, the thesis performs panel data regression on national and sub-national level, based on major economic activities and major islands grouping, which are Java-Bali, Sumatera, Kalimantan, Sulawesi, and Eastern Region with the period of 1997 – 2019. This thesis also further attempted to explain the underlying factors and the interplay in explaining how trade openness impacts inequality through structural transformation, in terms of national and sub-national level. In national level, To sum up, in national level, trade openness has an inequality-increasing effect through manufacturing-led structural transformation. The reason for this was because of the resource boom and increasing international competition which depressed the growth of labour-intensive manufacturing, which what had been an important source of employment growth before the crisis. The commodity boom also further induced the emergence of resource-intensive industries, which have higher gap in its productivity and wage.

However, looking at sub-national level, trade openness impact on structural transformation-inequality nexus varies. In Java-Bali and Sumatera regions, commodity boom also affected the changing pattern of the manufacture exports, which shifted towards more capital-intensive industries that affected within-sector inequality in manufacture due to its differences in productivity. As manufacturing sector has higher productivity compared to agriculture sector, the shift of labour towards manufacturing therefore also increases between-sector inequality which could increase total inequality.

In Java-Bali and Sumatra regions, trade openness also has an inequality increasing impact through services-led structural transformation. Higher engagement in international trade helped the regions to create more export and import related services jobs, such as trade, transportation and warehousing, communication, construction and tourism.

In Kalimantan region, trade openness has an increasing inequality effect through the economy structural transformation towards non-manufacturing sector where in increased their commodities export. However, mining sector in the region is the sector which has the largest inequality, and relatively more capital intensive which could lead to higher inequality. On the other hand, unobserved factors could have impacted inequality in Sulawesi and Eastern Indonesia, which might influenced the insignificance of trade openness to income inequality – structural transformation nexus.

Based on the findings, future trade and development policies in Indonesia could be focused more on regional impact, with taken into account each of the regional variation, so that it can mitigate the negative impact on inequality in each sub-national level. This study has several limitations. Using trade to GDP ratio as a proxy for trade openness has its limitation as the changes in the ratio could also be driven by changes in GDP. Future studies can also explore more about the different structural transformation path of each province and region, using longer data, as this can provide better understanding of the impact of trade openness to structural transformation – inequality nexus. For example, for the highly industrialised and higher income region, trade liberalization might affected income inequality differently compared to the poor region which rely on low productivity activities. Local government roles in this case could also be further explored, because since decentralization, local government has larger influence in determining provincial economy.

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# Appendix A – Region Grouping

Table 1. List of Provinces

<b>Sumatera</b>	<b>Java-Bali</b>	<b>Kalimantan</b>	<b>Sulawesi</b>	<b>Eastern Indonesia</b>
Aceh	Jakarta	North Kalimantan	North Sulawesi	East Nusa Tenggara
North Sumatera	Banten	West Kalimantan	Central Sulawesi	West Nusa Tenggara
West Sumatera	West Java	East Kalimantan	South Sulawesi	Maluku
South Sumatera	Central Java	South Kalimantan	Southeast Sulawesi	North Maluku
Riau	East Java	Central Kalimantan	West Sulawesi	Papua
Jambi	DI Yogyakarta		Gorontalo	West Papua
Bengkulu	Bali			
Lampung				
Bangka Belitung Islands				
Riau Islands				

# Appendix B – Diagnostic Tests and Regression Results

## Hausmann test result

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
	(b) fe	(B) re		
Manu	.132747	.2282554	-.0955084	.0315936
Nmanu	.9680485	.8578668	.1101817	.0153621
Serv	.1187784	.0151364	.1036419	.0206306
school	.000043	.0000588	-.0000158	3.31e-06
Infras	-.0030849	.0080191	-.011104	.
capita	.001444	.0027969	-.0013528	.
TO	.0186815	.0245801	-.0058986	.
manuopn	-.0817139	-.1197312	.0380174	.
Servopn	.0255513	.0295249	-.0039736	.
Nmanuopn	-.1109988	-.1134527	.0024539	.

b = Consistent under H0 and Ha; obtained from `xtreg`.  
 B = Inconsistent under Ha, efficient under H0; obtained from `xtreg`.

Test of H0: Difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(9) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 59.59 \end{aligned}$$

Prob > chi2 = 0.0000

(V\_b-V\_B is not positive definite)

## Skewness Kurtosis test result

Variable	Obs	Pr(skewness)	Pr(kurtosis)	Joint test	
				Adj chi2(2)	Prob>chi2
resid	705	0.0000	0.0009	39.65	0.0000

## Correlation test result

	Gini	Manu	Nmanu	Serv	school	Infras	capita	TO	manuopn	Servopn	Nmanuopn
Gini	1,000										
Manu	0,1165	1,0000									
Nmanu	0,2319	0,3378	1,0000								
Serv	0,2141	0,2306	0,7413	1,0000							
school	0,1819	0,0796	0,3752	0,3026	1,0000						
Infras	0,2255	0,0652	0,2051	0,1018	0,3141	1,0000					
capita	0,1272	0,0133	0,0833	0,0425	0,0279	0,1990	1,0000				
TO	0,1299	0,2708	0,1062	0,1620	0,1675	0,0661	0,1176	1,0000			
manuopn	0,1013	0,4576	0,1542	0,1770	0,1843	0,0874	0,1156	0,7391	1,0000		
Servopn	0,2102	0,2024	0,1855	0,3117	0,2611	0,1043	0,0745	0,7261	0,6045	1,0000	
Nmanuopn	0,1901	0,1535	0,2525	0,1411	0,2916	0,1196	0,0718	0,7561	0,6548	0,6926	1,000

### Regression test result, 34 provinces

VARIABLES	National (1)	Sumatera (2)	Java - Bali (3)	Kalimantan (4)	Sulawesi (5)	Eastern INA (6)
Manu	0.879*** (0.216)	1.455** (0.548)	1.236** (0.442)	1.626** (0.503)	0.722 (0.887)	-1.581 -1.083
Manu2	4.346*** (0.699)	-3.105 -2.038	-2.144 -2.557	2.846 -2.384	-5.866 -9.575	4.459 -6.696
Nmanu	0.207 (0.254)	0.686 (0.504)	0.994 -1.016	0.674 (0.449)	1.921* (0.854)	1.027 -1.354
Nmanu2	-0.237 (0.496)	-1.042 -1.412	-0.713 (0.855)	-1.255 (0.693)	-0.0574 -1.137	-9.017 (12.40)
Serv	0.163 (0.231)	0.833*** (0.254)	0.430** (0.174)	-0.00432 (0.255)	0.603 (0.401)	-0.455 (0.337)
Serv2	0.0827 (0.271)	-0.986** (0.315)	-0.264 (0.479)	0.0426 (0.243)	-0.336 (0.495)	0.848 (0.528)
edu	- 0.000529 (0.00667)	0.0116** (0.00367)	- 0.00948* (0.00467)	0.0182 (0.0116)	0.0417** (0.0108)	-0.000626 (0.00793)
capita	0.00137 (0.00250)	0.0003 (0.00219)	-0.00458 (0.00455)	0.00313 (0.00208)	0.00273 (0.00609)	0.00455 (0.00488)
Infras	-0.00220 (0.0109)	0.000492 (0.0117)	0.00636 (0.0128)	-0.00242 (0.00333)	-0.0189 (0.0221)	-0.00745 (0.0237)
TO	-0.0344* (0.0189)	-0.152** (0.0530)	0.173 (0.411)	0.00884 (0.0803)	-0.178 (0.114)	0.0305 (0.175)
manuopn	0.852** (0.362)	1.444* (0.649)	1.586* (0.758)	0.497 (0.160)	3.267 -2.308	5.660 -5.192
Servopn	0.00995 (0.105)	0.948* (0.486)	0.344 -2.181	0.214 (0.246)	0.134 (0.898)	-1.063 -1.187
Nmanuopn	0.234 (0.274)	0.704 (0.424)	0.722 -1.339	0.322* (0.126)	-1.249 (0.705)	4.923 -3.275
manu2opn	3.837*** -1.128	0.172 -2.220	11.29 -7.550	-0.405 -1.595	-1.03 -1.350	-5.81 (4.74)
serv2opn	-0.0325 (0.151)	-1.514* (0.700)	-0.276 -1.800	-0.282 (0.207)	-0.142 -1.467	-0.0579 -1.563
nmanu2opn	-0.825 -1.110	-1.166 -1.384	-2.855 -4.826	0.347 (0.744)	6.702 -4.898	-2.322 (34.28)
Constant	0.223*** (0.0480)	0.318*** (0.0447)	-0.0901* (0.0340)	0.213* (0.0975)	0.270*** (0.0347)	0.380*** (0.0641)
Observations	705	217	156	99	122	111
R-squared	0.473	0.599	0.707	0.744	0.702	0.416
Number of provinces	34	10	7	5	6	6

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### Regression test result, 27 provinces

VARIABLES	National (1)	Sumatera (2)	Java - Bali (3)	Kalimantan (4)	Sulawesi (5)	Eastern INA (6)
Manu	0.422** (0.176)	1.615** (0.585)	0.825*** (0.173)	1.247*** (0.144)	-0.138 (1.298)	-1.673 (1.629)
Manu2	2.020*** (0.564)	-1.153 (4.025)	-2.361 (1.683)	0.542 (0.702)	-1.495 (8.051)	4.983 (10.39)
Nmanu	1.833*** (0.348)	0.344 (0.786)	1.921 (1.018)	1.172 (0.827)	0.531 (0.963)	1.012 (1.071)
Nmanu2	-5.209** (2.196)	1.770 (5.800)	-4.755 (5.035)	-3.582 (2.876)	4.887 (11.43)	-3.673 (11.87)
Serv	-0.112 (0.138)	0.405* (0.194)	0.509* (0.198)	-0.527 (0.259)	1.389** (0.271)	-0.582 (0.410)
Serv2	0.289* (0.151)	-0.374* (0.196)	0.0481 (0.161)	0.819 (0.475)	-0.941 (0.614)	0.968 (0.769)
edu	0.00322 (0.0052)	8.99e-05** (2.84e-05)	-0.00606* (0.00273)	6.72e-05 (6.98e-05)	0.000127** (3.54e-05)	0.00106 (0.00116)
capita	0.000897 (0.00240)	0.0016 (0.00321)	-0.00517 (0.00418)	0.00162 (0.00381)	0.00474 (0.00537)	0.00435 (0.00826)
Infras	0.00139 (0.0111)	-0.00485 (0.0125)	0.00785 (0.0132)	0.00419 (0.00964)	0.0326* (0.0128)	0.00676 (0.0162)
TO	-0.00579*** (0.00203)	-0.0159** (0.00556)	0.00212 (0.00122)	0.00187 (0.00674)	-0.0045 (0.00259)	0.00429 (0.00557)
manuopn	0.302* (0.163)	1.508* (0.679)	3.075*** (0.616)	0.341 (0.174)	3.436 (1.905)	10.34 (7.721)
Servopn	-0.0265 (0.0755)	0.0683 (0.127)	0.794 (0.978)	0.227 (0.142)	-1.488 (0.800)	-1.396 (0.841)
Nmanuopn	0.0464 (0.414)	0.912 (0.645)	-1.744 (5.912)	0.848*** (0.0534)	2.613 (1.333)	4.538 (3.027)
manu2opn	1.418** (0.581)	8.502* (4.331)	12.36 (10.16)	0.793 (0.544)	-18.02 (11.81)	-64.23 (80.81)
serv2opn	0.0277 (0.137)	-0.204 (0.161)	-0.610 (0.891)	-0.424 (0.290)	2.774 (2.051)	1.323 (1.838)
nmanu2opn	-2.077 (3.272)	-5.995 (4.217)	19.16 (39.46)	2.448 (1.558)	-27.07 (18.72)	-52.10 (53.39)
Constant	0.263*** (0.0251)	0.111*** (0.0277)	0.139 (0.0818)	0.374*** (0.0312)	0.0453 (0.0214)	0.422** (0.108)
Observations	600	198	137	91	91	98
R-squared	0.538	0.625	0.746	0.706	0.825	0.460
Number of province	27	9	6	4	4	5

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1