Economic Inequality, Regional Development, and Internal Migration in Indonesia

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Economic Inequality, Regional Development, and Internal Migration in Indonesia

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Abstract

This study aims to probe the determinants of inter-provincial migration flows in Indonesia and how economic and development changes affect migration patterns. We employ three census periods, 1990, 2000, and 2010. Our study finds that an increase in relative inequality between origin and destination provinces decreases inter-provincial migration and relatively high distance elasticity in Indonesia leads to high migration cost. People are more inclined to migrate due to push factors as opposed to pull factors from the destination region, thus indicating a strong relationship between the level of regional development and the willingness of people to migrate.

Keywords: economic inequality; internal migration flows; regional development

1. Introduction

Indonesia has experienced significant changes in migration trends as the flow and direction of migration shift in response to economic and development changes. In the course of transforming its economy, Indonesia is obliged to wisely distribute its factors of production, such as labor and capital, from areas with excess labor to underdeveloped areas with untapped resources. However, there are challenges associated with the effort to redistribute economic activity in Indonesia due to the lack of access to capital in certain regions. To compensate for this impediment, geographical labor mobility is vital for the creation of a successful economic transition.

Following the country's independence in 1945, two primary trends became stablished in relation to lifetime internal migration in Indonesia. The first was

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characterized by an intense migration flow from Java to Sumatera (Hugo 1982, Tirtosudarmo 2009, Van Lottum & Marks 2012). Overcrowded population in Java and the gap in job opportunities between Java and other regions appeared to serve as the main determinants of the migration in the associated periods (Tirtosudarmo 2009). The most recent internal migration trend has been marked by a dramatic decrease in lifetime migration to Sumatera and a surge in the level of lifetime migration to other regions (i.e. Kalimantan and Papua) as destinations since the end of 2000.

In 2000 and over the course of the following decade, Indonesia benefited from a commodity boom that fueled economic growth in a majority of regions, with outer Java experiencing the greatest benefit (World Bank 2015, Yusuf, Summer, & Rum 2014). Indonesia's GDP per capita grew by an annual rate of 5.4 per cent during the period 2000–2015. Yet, alongside this rapid economic growth, there has also been a rise in economic inequality since the

beginning of 2000, reversing the accomplishment of a declining Gini coefficient during the prior decade. Over the last 15 years, there had been a rapid increase in the Gini coefficient, from 0.30 in 2000 to 0.413 in 2014. Although the vast majority of regions in Indonesia experienced this increasing Gini coefficient, Java persisted in retaining the highest degree of economic inequality (0.401).

Up to now, there has been a paucity of studies examining the effect of inequality on the decision to migrate. The relationship between migration and inequality has been a subject of contention (Connell 1981, Ha et al. 2009, Lipton 1980). To address the question of whether people originating from regions characterized by a more equal degree of economic conditions and better provision of public goods will migrate less, or vice versa, this paper offers new estimates of the determinants of inter-provincial migration flows, specifically for the period 1990–2010. It isolates the effects of socio-economic factors, including economic inequality, disparity of public goods, public expenditure, regional income, and distance between regions. Moreover, the novelty of our paper is its inclusion of panel data on gross migration flows, thus controlling for the determinants of migration by including pairwise fixed effects and the characteristics of both the sending and destination regions.

This paper is organized in four parts, commencing with the theoretical background and empirical studies related to migration. It then proceeds with the data, variable specification, and estimation method. Subsequently, the findings and analysis are presented and, lastly, a conclusion is provided.

2. Literature Review

2.1. Internal migration in Indonesia

Indonesia has a long history of people mobility across its vast area. According to Hugo (1982), Indonesia comprises various ethnic groups that frequently move from their original places to other areas. Following the independence in 1945, there was an intense flow of migration from Java to Sumatera (Hugo 1982, Tirtosudarmo 2009, Van Lottum & Marks 2012). Overcrowding in Java and the gap in job opportunities between Java and other regions were deemed to be the factors inducing migrants to move into the region (Tirtosudarmo 2009). Ever since the early 1950s, Indonesia's central government had actively encouraged migration from Java to the outer islands through a program named transmigration, a continuation of Dutch colonial policy. The concern over population redistribution in Indonesia was perceived as an attempt by the government to meet labor requirements for economic development outside Java, as the government sought to expand forestry, mining, and plantations in other regions. The oil boom of the 1970s altered the objective of transmigration from addressing the issue of uneven population distribution between Java and other islands to improving the regional development of selected energy-rich provinces.

As the result of the Asian economic crisis in 1997, the transition to democracy was followed by the implementation of decentralization, leading to Indonesia's transmigration programs becoming all but abandoned. The impact of the abandoned transmigration policy was that the country's internal migration flows could not be fully controlled. Therefore, during the period 1997–2005, approximately 130,000 residents were displaced from the transmigration area in Aceh to their origin area of Java (Hedman 2008). The high displacement rate during that time was attributed to the economic crisis and

was further exacerbated by rising conflict, displacement, and violence in several provinces.

In fact, the number of migrants arriving in highly populated areas such as Jakarta had already increased dramatically up to the early 20th century. According to Van Lottum and Marks (2012), this migration was driven mainly by wage differentials between provinces and other specific attractive factors. The direction of the migration flow was indeed contrary to the initial purpose of the Indonesian government's migration policies, namely to endorse the development of regions other than Java. Despite this, however, the trend had since reversed and the rate of migration out of Java rose between 2000 and 2010, with the destination areas shifting to other islands besides Sumatera, such as Kalimantan and Papua. Net migration to Kalimantan rose by 52.2% in 2000 and 35.39% in 2010 compared to the preceding period, while net migration to Papua is consistently positive.

2.2. A migration decision regarding economic and public goods inequality

In order that the response of people towards both push and pull factors of migration can be observed, we focus on the analysis of the effects of rising economic inequality and disparity of public facilities development in the last 20 years. In the context of migration, inequality in the economy and public facilities has inseparable relation with migration flows (Connell 1981, Ha et al. 2009). It has been long debated whether migration causes inequality or vice versa, as confirmed by Adger (1999). In other perspectives, it is contended that regional disparity is one of the determinants of migration (Borjas 1987, Clark, Hatton, & Williamson 2002, Mayda 2005). Various factors affecting internal migration have been widely investigated. For instance, in 2012,

Van Lottum and Marks revealed that Jakarta plays a crucial role in affecting domestic migration flow in terms of being the central destination of migration. It is because strongly centralized development in the capital city induces people to migrate into it. Overseas, Aldashev and Dietz (2012) examine Kazakhstan's internal migration and estimate that poor infrastructure will result in high migration costs, that can be relevant to the conditions of Indonesia. Furthermore, Andrienko and Guriev (2004) confirm that, in Russia, better provision of public goods in one region will induce people to migrate into the region.

The relationship between migration flow and the provision of public goods can be explained intuitively. Tiebout's (1956) model predicts that a region with higher public expenditure and adequate public goods will be more densely populated than other areas. Such circumstances can be explained by in-migration to the area. Gerber (2000) in his study analyses Russian migration and discovers that economic impoverishment creates circumstances in which people expect higher real wages, lower unemployment and higher amenities in the region to which they move. These results remain valid after controlling for public goods provision, including the availability of housing, crime rates, urbanization, and geography, that are also significant and have intuitive signs. Andrienko and Guriev (2004) also confirm that in Russia, a better provision of public goods in a region induces people to migrate to that region. The under-provision of public goods can lead to high migration cost, in turn hampering the migration flow between regions, as confirmed by Aldashev and Dietz (2012).

It is important that a study on the effect of public goods provision in Indonesia is conducted as the majority of the provision of public services currently rests in the hands of local government. Observed from the perspective of public finance, decentralization in Indonesia has comprised two aspects,

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namely decentralization of expenditure and decentralization of revenue collection. Therefore, each region will have a different capacity for both carrying out spending and collecting revenue. Consequently, this leads to a disparity of ability of the local government in providing public services and goods. For example, the difference in road density ratio – defined as the length of road to the total area of the region – is striking. For example, there is 670 km of road per 100 sq km in Jakarta, while there are only 2.2 km of road per 100 sq km in East Kalimantan and 2.7 km of road per 100 sq km in Papua.

The most popular model applied to predict migration flow is the gravity model. The model relates migration to the vector of the function of population between two areas and the distance between them based on the principle that the frequency of movement and interaction between two places are akin to the gravitational attraction between two masses. Although the hypothesis is widely accepted to be empirically consistent, the gravity model has also been criticized for its inability to address the actual causes of migration and other considerations in the decision-making process of migrants (Clark 1986). This weakness can be explained by the fact that the model has a bias in terms of its degree of focus on macro-level forces at the expense of the micro-level reasoning of migrants.

Considerations for correcting this shortcoming include the addition of variables for the socio-economic conditions of the origin and destination, such as income, employment, education, and age structure. In making such corrections, researchers can attempt to explore the relationship between migration and regional economic development, consistent with Ravenstein's (1889) observation that the primary reason that people migrate is to improve their economic well-being. Theoretically, labor migration is similar to the migration of the production factor (Edward 2017). The higher skilled labor demands higher wages due to promising higher productivity. Thus, better-educated labor will have higher propensity to migrate to metropolitan areas, and on the other hand, sending region will lose productive resources and have lower real wages. According to Sjaastad (1962), people tend to migrate should the present value of increased income in the destination region by expecting to obtain a job is greater than that of increased cost of living in the origin area. Furthermore, external migration to the country will raise the productivity of domestic workers, raising higher skilled-employment and earnings of non-immigrant workers in general. However, external migration of labor with similar skills as domestic workers, particularly in low-skilled labor, will result in direct competition for jobs and higher unemployment.

The studies that have employed the gravity model have mostly attempted to explore the relationship between the magnitude of migration and per capita income or the measurement of regional product. On the other hand, studies examining the effect of inequality on migration choice remain scarce. Up to now, the relationship between migration and inequality has remained a subject of contention (Connell 1981, Ha et al. 2009, Lipton 1980). Connell (1981) proposes that human migration is the cause of inequality between regions, with a number of other researchers also asserting that migration is indeed the cause of rising inequality (Adger 1999, Leones & Feldman 1998, Rodriguez 1998). Guriev and Vakulenko (2015) argue that the presence of income inequality in two regions with different levels of prosperity results in different outcomes in terms of migration numbers. The finding shows that the more prosperous the region, the lower the migration outflows. However, in a less prosperous region, an increase in income level is followed by higher emigration. This finding is consistent with the theory of poverty traps, where potential migrants wish to leave poor regions but cannot afford to do so. Furthermore, Hatton and Williamson

(2005) and Williamson (2006) demonstrate a non-linear relationship between income and migration flow, whereby people with a higher probability of migrating are probably in the lower-income quintiles. Other studies have also revealed the effects of inequality on migration patterns, confirming inequality to be one of the primary determinants of migration (Borjas 1987, Clark, Hatton, & Williamson 2002, Mayda 2005).

In his seminal paper, Borjas (1987) predicts that the inequality of individual returns to skill in origin and destination economies influences migration rates, as predicted by his selection model. His seminal work displays that an increase in the relative inequality of the origin country has a non-monotonic or non-linear effect on the migration rate. The impact is estimated to be positive should there is a positive selection, and negative should there is a negative selection. The latter illustrates that migrants moving from a country with a high return to skill to a destination country with a low return to skill are deemed to be negatively selected, as also proved by Ramos (1992) and Borjas (2008).

Supposing that individuals originating from region S, as the original region of the migrants, consider moving to region D, as the destination region of the migrants. The potential migrants are assumed to be risk-neutral. The log earnings distributions in the origin and destination regions are

$$\ln w_j = \mu_j + \varepsilon_j, \quad \text{with} \quad j = S, D \quad (1)$$

where μ_j is the mean of log earnings and ε_j is the individual return (i.e. ability) in region j. An individual migrates ($I = 1$) should earnings at the destination are higher than (or equal to) those in the source region, net of a migration cost (π) in real terms (i.e. $\pi = C/w_0$):

$$\mu_D + \varepsilon_D - \pi \geq \mu_S + \varepsilon_S \quad (2)$$

This condition can be rewritten as

$$P = \Pr[v > -(\mu_D - \mu_S - \pi)] = 1 - \phi(z); \quad (3)$$

where $v = \varepsilon_D - \varepsilon_S$; $z = -(\mu_D - \mu_S - \pi)/\sigma v$; and ϕ follows the standard normal distribution function.

Equation (3) represents the economic component of the migration theory proposed by Sjaastad (1962). Observed from the equation, it can be inferred that there is a negative relationship between migration rate and income in the origin place, a positive correlation with income in the destination place and an inverse relationship with the cost of migrating, that is, the distance between the two areas. An important implication of the aforementioned correlations is that the migration decision is endogenously determined. The following equations demonstrate that an individual will decide to migrate ($I > 0$) based on two different conditions. Equation (4a) illustrates the average income in the origin area while Equation (4b) denotes the average income in the destination area. Following the assumption of normality, the decision to migrate, determined by income distribution in the origin and destination areas, can be expressed as:

$$E(\ln w_0 | I > 0) = \mu_0 + \frac{\sigma_0 \sigma_1}{\sigma_v}(\rho - \frac{\sigma_0}{\sigma_1})\lambda, \quad (4a)$$

$$E(\ln w_1 | I > 0) = \mu_1 + \frac{\sigma_0 \sigma_1}{\sigma_v}(\frac{\sigma_1}{\sigma_0} - \rho)\lambda, \quad (4b)$$

where $\lambda = \phi(z)/P$. Supposing that σ_0 is the income distribution in the origin area and σ_1 is the income distribution in the destination area, there are two possibilities for how economic inequality affects the migration rate between those areas. The first possibility is, considering that income inequality in the origin area is lower than in the destination area ($\sigma_0/\sigma_1 < 1$), an increase in the inequality of the origin area increases out-migration, up to a maximum point. A further increase beyond that point decreases out-migration as a migrant is selected from the high-income group, and the possibility of

earning higher income in the origin area decreases the economic returns on migration. This situation involves the positive selection of migrants from the origin area to the destination area (Borjas 1987). On the other hand, should an increase in relative inequality initially decreases out-migration to a minimum point, with a subsequent shift to the opposite condition, then a case of negative selection arises. Intuitively, an individual will choose to migrate provided that their expected income increases as they move, and the difference in income exceeds the net cost of migration. The model also further explains that should migrants come from a region with higher income (return of skill), they will be negatively selected or it is more likely that the migrants will be people with low skills.

We argued in our theoretical model that the answer depends on the type of selectivity that occurs when people assess net gains from migration. Should migrants treat inequality as the push factor, the increase in relative inequality between two regions will have a non-linear effect on migration flows, resembling U-curve as the inequality increase, and vice versa. Moreover, due to the increasing role of local government in current development, the public facility may become the variable affecting migration. According to the Tiebout model (1956), regions with higher public expenditure and adequate public facilities will be more densely populated than other areas. Such circumstances may be explained by in-migration to the area.

3. Method

The migration data utilized in this study are based on lifetime migration flows collected from population censuses in 1990, 2000, and 2010 conducted by the Central Bureau of Statistics (BPS). The data provide matrixes for the respective benchmark years consisting of 650 migration flows between provinces in Indonesia in 1990 and 2000 and 1050 flows in 2010. The difference in the number of observations is caused by the different number of provinces between the years of observation. In 1990 and 2000, only 26 provinces were included owing to the unavailability of data for several variables in the newly expanded provinces. However, in 2010, we use the full data from 33 provinces.

Our model is adapted from the widely used gravity model (Aldashev & Dietz 2012, Phan & Coxhead 2010, Van Lottum & Marks 2012) in the form of a double-log equation. Considering the characteristics of the available data, this study employed ordinary least squares for cross-sectional analysis for each observation period. To explore the relationship between migration flows and the factors that determine migration, we conducted the estimation using the following model for each year:

$$
\begin{aligned}
\log(\text{mig}_{sr}^t) = {} & \alpha_0^t + \alpha_1^t(\text{relgini}) + \alpha_2^t(\text{relginisq}) \\
& + \sum_{i=3}^{5} \alpha_n \log(X_{ns}^t) + \sum_{i=6}^{8} \alpha_n \log(X_{nd}^t) \\
& + \sum_{i=9}^{11} \alpha_n \log(Y_{ns}^t) + \sum_{i=11}^{12} \alpha_n \log(Y_{nd}^t) \\
& + \alpha_{13}\text{Dist} + \varepsilon_i^t
\end{aligned}
$$

$$(5)$$

Furthermore, this study aims to analyze the determinants of migration during the period 1990–2010 using panel data analysis. To conduct the latter, we made some adjustments to create balanced panel data by aggregating the available data to generate

a similar number of provinces in the base year of 1990.

$$
\begin{aligned}
\log(\mathrm{mig}_{sd}^t) = {} & \alpha_0^t + \alpha_1^t(\mathrm{relgini}) + \alpha_2^t(\mathrm{relginisq}) \\
& + \sum_{i=3}^{5} \alpha_n \log(\mathrm{X}_{ns}^t) + \sum_{i=6}^{8} \alpha_n \log(\mathrm{X}_{nd}^t) \\
& + \sum_{i=9}^{11} \alpha_n \log(\mathrm{Y}_{ns}^t) + \sum_{i=11}^{12} \alpha_n \log(\mathrm{Y}_{nd}^t) \\
& + \alpha_{13}\mathrm{Dist} + \varepsilon_{sdt}^t
\end{aligned}
$$

$$(6)$$

The migration flow from the sending provinces (s) to destination provinces (d) for the period is the dependent variable of the model represented in Equation (6). The relative inequality ($\mathrm{relgini}$) between provinces is represented by the Gini coefficient ratio between the sending and destination provinces. The squared value of relative inequality also includes an examination of whether the response of society to the changes in economic inequality is linear or otherwise.

In order to calculate the effect of public goods provision, we employed a vector of public expenditure (X) comprising regional expenditure for public goods as Public Expenditure, the number of tertiary education institutions to approximate Public Higher Education (PHE) institutions, and the length of the road network for every 100 square kilometers of the area in the respective region. We gathered data on regional expenditure for public goods from the capital expenditures of local government held by the Ministry of Finance. Meanwhile, the data on the number of tertiary education institutions were collected from the Central Bureau of Statistics' Village Potential Data (PODES) and the data on the length of roads were obtained from the database of the Ministry of Public Works .

The control variables (Y) comprise provincial-level mean wage and gross domestic regional product of the sending and destination regions, obtained from the Central Bureau of Statistics. To consider price-level differences between years, we deflated the mean of incomes by the gross domestic regional product (GDRP) deflator. This allows us to control for region-specific inflation rates in the observation year, sufficient for regression models with fixed effects. In terms of the distance between provinces, we utilized the distance between the capital cities of provinces in kilometers.

4. Result and Analysis

This study applies a two-step empirical approach to the model of migration flow, namely, an estimation of 1) the determinants of annual migration flow and 2) the determinants of long-term migration flow.

Table 1 shows the linear-squared estimation of Equation (5) for each year. Only the results of the main variables are presented, with the estimation results for the control variables excluded. In columns 1, 3 and 5, we run the specification assuming there is no non-monotonic relationship between relative inequality and migration flow. Meanwhile, in columns 2, 4 and 6, we added the square of relative inequality to test for the non-monotonic relationship between inequality and migration.

The result of the linear model in 1990 and 2000 shows that in nearly all observation years, relative inequality is negatively correlated with migration flows, thus following a negative selection. It shows that people are unwilling to migrate should there is a widening of inequality between the origin and destination region. Intuitively, people choose to migrate between regions that feature indistinguishable inequality since they expect that the economic conditions and job opportunities will be similar to those found in their place of origin.

A non-monotonic relationship between inequality and migration flow is discovered in the test. The

Table 1: Estimation Results of the Gravity Model of Migration for Each Year

Dependent variable: log of gross migration rate from (s) to (d) region for the relevant period

	1	2	3	4	5	6
	Linear 1990	1990	Linear 2000	2000	Linear 2010	2010
Relative Inequality	-1.438***	-7.156*	-1.018***	-15.97***	-1.124***	0.986
	(0.386)	(3.637)	(0.294)	(2.672)	(0.239)	(2.373)
Square of Relative Inequality		2.751		7.108***		-1.015
		(1.741)		(1.263)		(1.136)
Public Expenditure Sending Province	0.0294	0.0401	0.472***	0.508***	-0.412***	-0.407***
	(0.0672)	(0.067)	(0.136)	(0.133)	(0.0799)	(0.0801)
Public Expenditure Destination Prov.	0.254***	0.261***	0.355**	0.372**	0.181**	0.185**
	(0.067)	(0.0668)	(0.136)	(0.133)	(0.0601)	(0.0603)
Road Density Sending Province	0.211***	0.196***	0.440***	0.430***	0.183***	0.184***
	(0.0532)	(0.0547)	(0.0445)	(0.0435)	(0.0369)	(0.0369)
Road Density Destination Prov.	-0.209***	-0.225***	-0.0474	-0.0766	-0.0791*	-0.0769*
	(0.0538)	(0.0545)	(0.0443)	(0.0436)	(0.0382)	(0.0383)
Public Higher Education Sending Province	0.507***	0.523***	1.111***	1.099***	1.186***	1.181***
	(0.118)	(0.117)	(0.0745)	(0.0728)	(0.0600)	(0.0603)
Public Higher Education Destination Prov.	0.382***	0.397***	-0.0688	-0.0749	0.062	0.058
	(0.115)	(0.117)	(0.0744)	(0.0727)	(0.0606)	(0.0608)
Constant	-7.378*	-3.769	-17.70***	0.768	-26.40***	-27.15***
	(2.949)	(3.756)	(5.111)	(5.974)	(4.428)	(4.509)
Observations	650	650	650	650	650	1,056
Adjusted R-square	0.693	0.694	0.734	0.746	0.767	0.767

Note: Robust standard errors are in parentheses.
Variables included in the model but not reported in the table are distance between sending and destination provinces, real mean wage in sending and destination provinces, and gross domestic regional product in sending and destination provinces.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

negative coefficients in the years 1990 and 2000 might indicate a U-shaped relationship. The effect of inequality on out-migration is negative in more equal origin provinces and positive in less equal origin provinces. In other words, migrants choose to remain in their region for as long as better income distribution exists. Meanwhile, in a less equal origin province, people tend to move to another region.

In 1990 and 2000, the effect of income distribution on migration rate following negative selection can be attributed to the declining in economic inequality in a particular period. The average province-level Gini coefficient in 1990 is only 0.29, falling to 0.27 in 2000 in the aftermath of the 1998 economic crisis. Moreover, the prosperity level of society also increases in 2000 relative to 1990 as the average province-level real wage is more than quadrupled. Additionally, we expect that the non-monotonic relationship between migration rate and relative inequality is driven by long-distance provincial migration

rather than migration to nearby regions. This is because the costs of migration are likely to increase with distance. Considering the geographical characteristics of Indonesia that comprises many islands, it can be assumed that migrants will be required to take more expensive means of transportation.

Declining inequality and increasing social prosperity are accompanied by an increase in net migration rates in a majority of the provinces in 1990 and 2000. The greatest increase in net migration is experienced by the less unequal provinces. These provinces are comprised of West Java, North Sumatera, Riau, and Southeast Sulawesi. Meanwhile, the provinces that suffer from relatively high economic inequality experience a decreasing net migration rate, despite an increasing real wage rate in the respective provinces.

We discovered that the correlation between relative inequality and migration in 2010 differs from that in the preceding periods, even though the difference

is statistically insignificant. This might be attributed to the rising inequality in all provinces during the period 2000–2010. The average Gini coefficient of all provinces of Indonesia rises by one-third to 0.36 in 2000–2010. West Nusa Tenggara is the province that experiences the highest increase in economic inequality, leading to its greatest reduction in net migration rates during the respective period.

The contrasting relationship between relative inequality and migration, thus exposes two distinct periods in the history of Indonesian economic inequality. Initially, declining economic inequality discourages people from migrating to other provinces, while the opposite induces people to migrate out of their province of origin. Therefore, we argued that economic inequality acts as a push factor for internal migration in Indonesia.

Inequality might be analogous to push factors because as income distribution in a society deteriorates, people have more incentive to seek out areas that offer higher incomes and have equal income distribution. This is because people tend to underestimate the probability of ending up within the lowest percentile of income distribution in the destination province. In addition, the degree of income distribution might reflect the risks of migration. The greater the economic inequality, the greater the likelihood of earning a lower than average real wage in the destination region relative to the cost of migration. However, the role of inequality in intensifying the risk of migration requires further examination, since it is outside the scope of this study. Guriev and Vakulenko (2015) state that migrants exhibit aversion behavior with regard to inequality, as they are more likely to be poor; as a result, they prefer to migrate to more equal regions.

Furthermore, the implementation of decentralization might have affected internal migration patterns through the provision of public goods by local governments. Decentralization enables local govern-

ments to independently conduct actions that are necessary to foster regional development, including the establishment of public goods. Therefore, it is expected that local governments will compete for the provision of public goods and that people will have increased options with regard to moving to regions that can fulfil their demand for public goods.

To capture the effects of public goods provision on internal migration in Indonesia, three variables are selected: public expenditure, tertiary education institutions and road density. Public expenditure is used to represent the efforts taken by local governments to provide local public goods. Public expenditure is selected, with fixed spending for administrative purposes excluded, thereby providing a better depiction of the amount of spending allocated to public goods. In 1990, only public expenditure in the destination region affects the migration rate and acts as a pull factor. In the following decade, public goods in both the destination and origin regions have a significant effect on migration, with both showing a positive correlation. Meanwhile, in 2010, the direction changes, with a negative correlation between public spending in origin region and migration rates. Moreover, the sign of the relationship is consistent with the Tiebout (1956) hypothesis.

Another indicator for measuring the relationship between public goods and migration is the length of the road network for every square-kilometer area of the provinces (road density). A longer road density in an area increases people's mobility and further increases the out-migration rate from the origin province. In 1990, a 1% increase in road density in the origin province is shown to lead to a 0.21% increase in the out-migration rate. The value of the coefficient slightly increases in 2000 prior to declining in 2010. Tiebout's model predicts that an increase in road density leads to an increase in population density in a region as people prefer a region with a greater level of public goods. However, the estimation result implies the opposite—that people will still

migrate even when there is an increasing provision of public goods in their regions.

Public Higher Education (PHE) institutions are utilized to consider the growing trend of people striving to increase their expected income through enrollment in tertiary education. Owing to the disparity that exists between the quantity and quality of PHE institutions in Indonesia, in theory, people are willing to migrate for the sake of education. The results show that PHE institutions significantly affect the migration rate in all years, except for the case of PHE institutions in the destination province for 2000 and 2010. However, the sign of this variable shows a positive relationship with migration, contrary to the Tiebout hypothesis. This indicates that PHE institutions act as a push factor for migration, thereby implying that an increase in the number of PHE institutions in the origin province will lead to a corresponding increase in out-migration from the province.

This finding indicates the potential presence of the effect of externalities on PHE institutions—known as the network effect—that generates a positive relationship with migration. As PHE institutions serve as a channel of information, an increasing number of PHE institutions means a greater level of information available for people in the origin province to decide whether they should migrate. Access to higher education facilitates and the flow of information on job opportunities in other provinces, thus acting as a bridge towards increasing income. Therefore, better access to tertiary education leads to an increased rate of migration from a province.

As for control variables, two provinces that are located far apart have a lower migration rate compared to adjacent provinces, that we concluded from the negative sign of distance elasticity ranging from 1.26 to 1.58. The distance elasticity in Indonesia is far greater than in various other countries, including Kazakhstan (-1.36) (Aldashev & Dietz 2012), Vietnam (-1.1) (Phan & Coxhead 2010), and Russia (-0.99) (Andrienko & Guriev 2004). The negative correlation between distance and migration rate indicates that people prefer migrating to a neighboring as opposed to a distant region due to the high cost of migration in Indonesia. The relatively high cost of migration in Indonesia might be attributed to various factors. First, the country's geographical conditions render it difficult to move between provinces and islands. Second, the poor condition of the country's infrastructure/public goods is deemed to be the biggest contributor to the high cost of migration (Aldashev & Dietz 2012). Low connectivity or access to another area hampers migration because the high cost of migration is borne by migrants, and there is imperfect information about job availability in distant regions (Aldashev & Dietz 2012).

In addition, GDRP significantly affects the migration rate. Interestingly, there is a positive correlation between GDRP and the migration rate, meaning that an increase in GDRP acts as a push factor encouraging people to migrate from their province. Phan and Coxhead (2010) argue that as a region becomes more prosperous, people are more able to afford the cost of migration, thereby generating a corresponding increase in the out-migration rate. The authors confirmed that the liquidity constraint effect has a greater influence than the push effect.

The second model of Equation 6 (Table 2) attempts to explain the determinants of migration in Indonesia over the last 20 years. In column 1, we run the fixed-effect specification for individual regions (for both i and j), assuming a linear relationship between inequality and migration. In column 2, we re-run the fixed-effect specification with the square of relative inequality. Controlling for the fixed effects of sending and destination provinces, the estimation results are almost similar to the findings of Equation 5. It is discovered that the correlation is negative and follows a U-shaped curve. This implies that the

migration rate fits a negative selection model, as predicted by the previous studies.

Based on the coefficients of relative inequality and squared of relative inequality, we calculated a quadratic relationship with a minimum point of 0.9. Hence, despite rising inequality, the out-migration rate from the origin province will continue to decrease. Such condition will persist until the inequality in the origin province is 90% of the magnitude of the inequality in the destination province. Subsequently, increasing inequality will lead to an increase in the migration rate. However, this correlation is statistically insignificant.

The insignificant relationship between inequality and migration rate can be attributed to the effect of the fixed-effect estimation. The use of fixed-effect estimation removes the problem of unobserved heterogeneity or time-invariant variables from the estimation process, as the fixed-effect estimation excludes distance variables from the estimation, thereby resulting in the loss of useful information. Therefore, this study applied an econometric method that enables the estimation of time-invariant variables while also maintaining the assumption of the fixed-effect estimation. This is known as the Hausman–Taylor method (Hausman & Taylor 1981).

Observed from the results of the Hausman–Taylor method presented in column 3, it can be inferred that there is a statistically significant negative non-monotonic relationship between relative inequality and the migration rate in 1990–2010. Despite an increase in inequality, the out-migration rate from the origin province continues to decrease to a minimum point of 1.02, or when inequality in the origin and destination provinces is nearly identical. When inequality in the origin province is 2% higher than in the destination province, then the out-migration rate starts to increase as the inequality in the origin province increases.

Following the utilization of the Hausman–Taylor es-

timation, it is discovered that income in the origin province is negatively correlated with the out-migration rate. An increase in the real wage of the sending province prevents the flow of out-migration, while an increase in the real wage in the destination province has no effect on the migration rate. Intuitively, this finding emphasizes the fact that only real earned income—not expected income—is relevant in the decision to migrate. This finding relates to the risk behavior of migrants, stating that income in the destination region might be insignificant in relation to the uncertainty-related conditions of inequality in the respective region.

Observed from the second model, public goods and public expenditure indeed affect internal migration in Indonesia. In addition, the results obtained from the second model are similar to those in the first model. PHE institutions and road density in the origin province have a greater effect on the migration rate than in the destination province. Over the last 20 years, improved access to higher education has provided the necessary information for individuals to determine whether or not migration to another area will benefit them. Moreover, higher education acts as a push factor for migration. Consequently, the increasing road density of the past 20 years has eased the migration process. We argue that this phenomenon, along with the surge of inter-provincial transportation facilities, may be responsible for reducing the cost of migration.

Another finding suggests that local public expenditure acts as a push factor and increased public spending will become an incentive for people to remain in their origin province. This illustrates that residents respond to regional physical development. They will opt to not migrate for as long as they perceive the prospect of an increase in their well-being in the future. Such a notion demonstrates that the greater role of local governments in developing their own public goods has indeed affected the way Indonesians value the benefits and costs of migration.

Table 2: Estimation Results of the Gravity Model of Migration for All Years

Dependent variable: log of gross migration rate from (s) to (d) region

	1 Linear Fixed Effect	2 Fixed Effect	3 Linear Hausman– Taylor	4 Hausman–Taylor
Relative Inequality	0.288	-1.52	0.0553	-2.053*
	(0.150)	(0.904)	(0.139)	(1.025)
Square of Relative Inequality		0.861*	.	1.005*
		(0.427)	.	(0.484)
Public Expenditure	-0.115***	-0.117***	-0.163***	-0.165***
Sending Province	(0.0180)	(0.0188)	(0.0165)	(0.0166)
Public Expenditure	0.0308	0.0316	0.0196	0.0205
Destination Prov.	(0.0181)	(0.0188)	(0.0166)	(0.0166)
Road Density	0.303***	0.294***	0.350***	0.345***
Sending Province	(0.0680)	(0.0635)	(0.0411)	(0.0411)
Road Density	-0.0400	-0.0469	-0.0131	-0.0175
Destination Prov.	(0.0679)	(0.0562)	(0.0411)	(0.0411)
Public Higher Education	0.139***	0.139***	0.243***	0.243***
Sending Province	(0.0297)	(0.0365)	(0.0273)	(0.0273)
Public Higher Education	-0.00796	-0.00896	-0.00409	-0.00565
Destination Prov.	(0.0297)	(0.0299)	(0.0273)	(0.0273)
Constant	0.619	1.737	11.92***	13.29***
	(0.982)	(1.147)	(1.094)	(1.277)
Year Dummy	Y	Y	Y	Y
Fixed Variable (province)	Y	Y	Y	Y
Observations	1,950	1,950	1,950	1,950
R-square	0.47	0.468	.	.

Note: Robust standard errors are in parentheses.

Variables included in the model but not reported in the table are distance between sending and destination provinces, real mean wage in sending and destination provinces, and gross domestic regional product in sending and destination provinces.

$* p<0.05, ** p<0.01, *** p<0.001$

5. Conclusion

As the consequence of Asian financial crisis, Indonesia experienced a decline in economic inequality from the late 1990s until 2000. However, this trend was reversed in the following decade in line with the commodity boom. In response to such changing economic conditions, migration flows in Indonesia seem to accompany changes in economic inequality. This study confirmed the substantial contribution of rising economic inequality to the change in Indonesia's inter-provincial migration patterns. The estimation model indicates that economic inequality has become one of the push factors for migration in Indonesia.

As the degree of economic inequality in a region worsens, people are inclined to migrate out of that region. Assuming that the degree of economic inequality in the origin region is lower relative to that in the destination region, the migration flow will continue to fall despite the increasing trend of inequality in the origin region. The latter will continue until a minimum condition is attained, at which point the degree of economic inequality in the origin area is commensurate with the degree of economic inequality in the destination regions.

The provision of public goods is another factor affecting migration in Indonesia; however, this study confirmed that the Tiebout hypothesis is inapplicable in Indonesia. Two types of the public goods are examined in this study: tertiary education institutions and roads. Moreover, the amount of spending on public goods is included in the analysis, resulting in three findings. First, the establishment of tertiary education leads to a higher migration flows owing to the network effect. Tertiary education institutions play the role of information provider, and thus, their establishment might provide sufficient information

for the decision to migrate. Second, the length of the road network in the destination province is positively correlated with migration flows. In other words, an increasing road density in the origin province will facilitate the migration of residents out of that region as transportation becomes easier. However, an increasing level of public spending will deter people from migrating to other regions. We argued that there is a strong relationship between the level of regional development and people's willingness to migrate, that tends to flow from regions with low development level to those with higher development level.

There are two limitations of our analysis that can be improved in future studies. First, an alternative measurement of inequality, such as the Theil index, may prove to be more effective for illustrating income inequality due to its ability to display the inequalities between and within provinces to better explain the development of inequality among provinces. Second, we did not treat for any possible endogeneity concerns in our model and suggest the utilization of the instrumental variable method to produce a better estimation.

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