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Macroeconomic Determinants of Internal Migration to West Sumatra

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***Abstract*—This study examines the determinants of migration to the Indonesian province of West Sumatra. Employing a modified gravity model and using data from Statistics Indonesia, this study explores the extent to which macroeconomic variables (GDP per capita, unemployment rate, education attainment) affect migration flows to West Sumatra. The results show that GDP at origin is a significant driver of migration flows, whereas the unemployment rate in West Sumatra is a pull factor for migration. This conflicts with previous studies that report migration to be mainly directed toward more developed regions. Evidence of the impact of GDP on West Sumatra and the unemployment rate in the area of origin is weak. Thus, economic attractiveness is not a major determinant of migration flow to West Sumatra. Other factors that influence migration to West Sumatra are the positive effect of the level of education both in the origin and destination, the size of the population at the origin and destination, and the negative effect of distance.**

Keywords— migration; gravity model; per capita GDP; unemployment rate; West Sumatra

I. INTRODUCTION

As the biggest ethnic in West Sumatra, Minangkabau is one of many ethnics does migration, as known as "merantau." Culture "merantau" in Minangkabau has suspected to be the cause of the small proportion of the working age population in West Sumatra. The 2010–2035 Indonesian population projection showed that up to 2035 the dependency ratio of West Sumatra is still above 50 which is 50.6 so that West Sumatra becomes one of provinces that has not reached demography dividend until 2035 [1]. The high dependency ratio of West Sumatra has suspected due to the high rate of out-migration of productive age population. The young people, who have expected to be the pioneers for the development of West Sumatra, even choose to "merantau", so that their capabilities and potentials had even exploited by the destination. Culture "merantau" feared to be a threat, especially when the development has been centralized in the region.

However, "merantau" has many positive impacts for both the perpetrators themselves, families, and areas that were left indirectly. Nasroen [2] argued, the exodus of Minangkabau people to "merantau" is not detrimental to the Minangkabau community, but contains hope to get sustenance in the country of people who will be brought home.

Therefore, limiting out migration is not an appropriate solution. Another policy strategy was need in gathering the scarcity of young people in West Sumatra. So that, West Sumatra can also reap the demographic dividend period, the moments when the dependency ratio reaches the lowest point that had a positive impact on economic growth [3]. One of the things that can be doing is to see the attractiveness of West Sumatra, because if a region is highly attractive then it not only attracts individuals from other regions to come but also holds individuals in the area moving towards other regions [4].

One way to view the attractiveness of West Sumatra is to examine the determinants of in-migration to the area. There are two reasons: first, the migration decision is related to the ratio of profit and loss between the origin and destination. From an economic point of view, especially for regional economies, migration is often linked to individuals' efforts to maximize satisfaction or utility in an area. Someone will decide to migrate if the utility expectations at the destination are higher than the actual utility at the origin. On the other hand, if the utility expectations at the destination are lower than the actual utility at the origin, then they choose to remain in the area of origin [5].

Second, there has been an increase in net migration to West Sumatra with a large increase in 2015. Net migration is the difference between incoming and outgoing migration. SUPAS (2015) has shown that the trend of in-migration into West Sumatra has increased while out-migration has decreased. In the last 15 years, the number of migrants entering West Sumatra increased from approaching 109,000 in 2000 to 139,000 in 2015. On the contrary, the number of out-migrants decreased by 234,000 to 139,000 [6].

Based on these data, the question becomes: "What are the reasons people migrate to West Sumatra?"

This study will investigate factors that affect in-migration to West Sumatra. Although research on the determinants of migration in Indonesia has been widely conducted, specific studies related to migration into West Sumatra are still very rare. Inter-regional heterogeneity in Indonesia can lead to differences in cases between regions.

This study will focus on the determinants of migration from a macroeconomic point of view. Chotib and Darmawan [7], who estimated the patterns of inter-provincial migration in Indonesia based on the "Economic Interest Index," reveal that population migration generally leads to better economic development.

By knowing the determinants of migration into West Sumatra from the macroeconomic point of view, it is expected that the results will provide input for policy-makers

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related to the potential and attractiveness of West Sumatra's demographic structure.

Employing a modified gravity model and using data from Statistics Indonesia (gross regional domestic product, employment, human development index, the 2010 Indonesia Census, and the 2015 Intercensal Survey), this study examines whether or not economic development is positively associated with migration flows to West Sumatra.

The next section of this article is organized as follows. Section 2 discusses the theory of migration and previous studies that relate to the problems and questions in this study. Section 3 describes the methods and data used and Section 4 presents the results of the empirical estimations. Section V discusses the results and the final section presents the conclusions and implications.

II. Literature Review

Migration is a reaction to economic opportunities in a region, which is one of the main factors that drive interregional migration; in other words, migration leads people to more economically developed areas. The increase in West Sumatra's net migration indicates that this area is becoming attractive as a migration destination. What kind of appeal does West Sumatra have? This study will investigate the determinants of migration into West Sumatra by applying migration theory from a macroeconomic perspective.

A. Previous empirical studies

A number of studies have shown that economic variables are the dominant factors that affect migration. From a macroeconomic perspective, migration occurs from less developed areas to more developed areas [8]. One indicator of the level of economic development is GDP per capita. The higher the GDP per capita at the destination, the higher its attraction as a destination. Wajdi et al. [8] used a modified (extended) basic gravity model and found a positive and significant effect of GDP per capita of the destination, indicating that interregional migration in Indonesia is directed to more developed regions.

However, migration can also be related to GDP per capita at the origin. In his research on the factors affecting migration decisions among provinces in Indonesia, Chotib [5] applied spatial interaction models with logistics functions and concluded that the probability of migration tends to be higher at the high GDP in both the origin and destination. Forte and Portes [9] considered the determinants of international migration to the UK and found GDP per capita in the UK and at the origin are significant drivers of migration flows. Massey [10] argued that the higher the level of economic development in the origin, the more resources and opportunities the prospective migrants have and the higher the migration tendency.

Another determinant of attractiveness to an area is higher wages; that is, an expectation of higher wages at the destination will encourage migration. In regional economics, labor tends to migrate from the region with low employment opportunities and low wages to areas with high employment and high wages [11]. This concurs with a study of factors affecting the out-migration rate of West Sumatra by Julianto and Alfian [12] who concluded that if there is an increase in the real wage ratio variable, then the rate of out-migration of West Sumatra will be higher.

However, the effect of wage differences is not always positive. Chotib and Darmawan [7], who estimated the pattern of inter-provincial migration in Indonesia based on the "Economic Interest Index" with a hybrid model, found the opposite result. Provincial Minimum Wage (UMP) showed negative results, meaning that migrants tend toward regions that actually have lower UMP scores than their home provinces. According to Stark, Oded, and Yitzhaki [13], this can happen because migrants may want to improve their income relative to the local community rather than improving their absolute income. This finding is reinforced by Wajdi [14] who concluded that employment opportunities, although with small wage differences, encourage migrants to migrate rather than large wage differences but few employment opportunities.

When per capita GDP is introduced into the migration equation, the average skill level must be controlled [4]. According to Mayda [15], a higher per capita GDP at destination does not necessarily mean that a migrant would receive that. Higher per capita GDP at destination might be due to higher per capita capital or a higher level of average human capital [4].

Borjas [16] predicted that migration is lower the higher the mean level of education in the destination country and vice versa. This happens if the characteristics of the migrants (skills and experience) are rewarded more than in their original area. However, Levy and Wadycki [17] found that the level of educational attainment in a region has a major impact on migration in Venezuela. Areas that have facilities for higher education (school or university) will attract people seeking such opportunities for higher education. Furthermore, areas with highly educated residents tend to have better social and cultural facilities that will attract better-educated people.

So far, the empirical evidence of a positive role at origin and negative role at destination of education is not robust and appears to depend on whether international or internal migration flows are analyzed. In line with Hatton and Williamson [18] who found a negative impact of the ratio of average years of education on migration to the US, Mayda [15] found that when average schooling level is controlled, the average skill level of the population at the destination are negatively affected by emigration. However, when physical capital endowments per worker were added into the regression, the physical and human capital coefficients were not statistically significant. Piras [4] analyzed push and pull factors of internal migration in Italy and found that human capital had no role at the destination, whereas in the area of origin it worked as a holding factor. Within this framework, Piras assumed that if a region is highly attractive because of its role as a population center—and, thus, holds a high level of human capital— not only does it attract individuals from other regions (positive role of human capital at destination) but it also deters individuals from moving to other regions (negative role of human capital at origin).

B. Theories of migration decision-making

Lee's Theory of Migration

In his article "A Theory of Migration," Lee [19] exposed that the volume of migration in a region develops according to the level of regional diversity. Lee described four factors that cause people to make the decision to migrate, namely, factors in the origin, factors in the destination, obstacles that hamper, and personal factors.

In the origin and destination areas, there is a positive factor (+) that provides a value advantage if residing in the area. This factor can keep people from leaving their area and attract people to move to the area, and includes schools, job

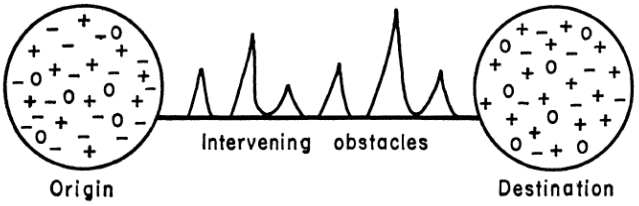

Figure 1. Origin and destination factors, and intervening obtacles in migration

Source: Lee (1966) [19]

opportunities, or a good climate. In both areas, there are also factors that provide a negative value (factor −) that makes a person want to move away from the place. The cumulative difference between the two factors at both sites is likely to cause migration flows. In addition, there are also factors that do not affect the population to migrate (factor 0). Furthermore, between the two sites there will always be barriers that may hinder the migration that some people can overcome and for others not, such as distance, transportation facilities and costs, topography of the territory, migration laws, taxes, or the number of people that will participate in migrating. Factors that are not less important are the personal/individual factors because a positive or negative assessment of an area depends on the individual who assesses the positive and negative aspects of a region and determines whether to move or not.

The large number of immigrants to settle in an area is influenced by the magnitude of the pull factor of the area for migrants as well as the driving factors that cause people to migrate out of their region, better known as "push and pull theory" (Lee, 1966) [19]. Examples of push factors in the area of origin that encourage people to migrate, such as a limited number of employment opportunities and types, inadequate educational facilities, infrastructure, and housing facilities, and adverse environmental conditions. Factors at destination areas that attract migrants are better income opportunities, higher educational opportunities, complete social facilities, and large city activities such as entertainment venues that attract people from other regions.

C. Todaro's Model of Migration

From migrant decision-making factors in migration as Lee (1966) [19] points out, economic factors are the most commonly used motives for migration [20]. Todaro's migration model assumes that migration is an economic phenomenon where there is a difference in expected income rather than actual income between the origin and destination. Todaro and Smith [21] generally assumed that the migration process occurs because actual and potential laborers compare their expected earnings over time in the destination (the difference between the yield and the cost of migrating) to the average income that is generally obtainable in the area of origin. Migrants as decision-makers consider the various vacancy opportunities available in two areas and choose one that maximizes the expected gains of migration. This expected gain is measured in two ways, first, the difference in real income between employment in the origin and destination and, second, the probability that a new migrant may find employment in urban areas. In the traditional economic model analysis, it is implicitly assumed to be a state of full or near-full employment in the destination area, so that the decision to migrate is solely aimed at finding the highest wage rate, another factor being considered constant. However, the analysis is less realistic in the context of economic and institutional frameworks in developing countries where the number of jobseekers is generally greater than the number of available jobs [22].

In summary, Todaro's migration model has four assumptions [5]:

- Migration is stimulated primarily by rational economic considerations of relative costs and benefits, both financially and psychologically.
- The decision to migrate depends on the actual/expected level of income, which is influenced by the actual level of difference and the probability of obtaining employment in urban areas (destinations).
- This probability is inversely proportional to the unemployment rate in the destination area.
- The rate of migration that exceeds the growth rate of employment in the destination area is made possible by the positive difference from continues expected income. Higher unemployment rates in more modern urban areas are the result of an imbalance of interregional economic opportunities that occurs in most developing countries.

D. Gravity Model

The theory of gravity in migration was initiated by Ravenstein [23] through the concept of "migration law." The rationale for the gravity model for spatial interaction phenomena is based on Sir Isaac Newton's expression of gravity shown in Eq. (1):

$$F_g = G \times \frac{m_1 m_2}{d_{12}^2} . \quad (1)$$

The force of gravity F_g is directly proportional to the product of two masses and inversely proportional to the square of their distance apart, and multiplied by the gravitational constant *G*.

When applied to migration, the tensile strength between the two regions measured by changes for migration between the two. Systematically, the gravity model formulation is as follows:

$$M_{ij} = k \times \frac{P_i P_i}{d_{ij}^{\beta}} \quad (2)$$

where M_{ij} is the estimated migratory current from origin *i* to destination *j* and *k* is the constant number/travel number of the population. P_i is a resident of region *i*, P_j is a resident of region *j*, and *d* is *distance deterrence*.

Haynes and Fortheringham [24] modified the model to be:

$$M_{ij} = k \times \frac{P_i^{\lambda} P_i^{\alpha}}{d_{ij}^{\beta}} \quad (3)$$

or

$$M_{ij} = k.\ P_i^{\lambda} P_i^{\alpha} d_{ij}^{\beta} \quad (4)$$

where $\beta < 0$.

This gravity model has the characteristic of distance as a key factor. Distance, in fact, is usually used as an approach to measuring and capturing psychic costs that cannot actually be measured but affects the flow of migration [25].

The gravity model can be transformed to logarithmic form, where the equation changes to the form of a linear log regression equation [26]:

$$Ln\,M_{ij} = a_0 + \lambda Log(P_i) + \alpha Log(P_j) - \beta Log(d_{ij}) \quad (5)$$

where a0 = log (*k*) and λ and α are parameters of *Pi* and *Pj*, respectively. The a0 parameter is transformed back to its original form where $k = 10^{a0}$.

Using this method, the value of the parameter estimation can be searched to form the regression equation and determine the parameter. Estimation of the above model parameters can use Ordinary Least Square (OLS) method by first converting the above equation into natural logarithm form.

In the development from its model considered less accommodating various factors that affect the flow of migration. This has prompted many researchers to modify their interests and data conditions. In the theory introduced by Lowry [27] in Etzo [25], migration is influenced by the unemployment rates, wage rates, and labor force in the origin and destination areas, and the distance between the origin and destination areas.

The basic gravity model was also developed by Bodvarsson and Van den Berg [28] and Greenwood [29] (in Wajdi et al. [8]). Because there are so many potential determinants of migration flows, estimating the basic formulas of this gravity model will usually produce omitted variable bias. To solve this problem, the authors introduced other variables into the basic gravity model (Wajdi et al., 2017) [8]. The extended form of the gravity model is known as the "modified gravity model." The general representation of the modified gravity model as proposed by Greenwood [29] contains real per capita income or GDP at origin *i*, per capita real income or GDP in destination *j*, vectors of explanatory variables describing different origin characteristics (push factors), and vectors of explanatory variables that describe the different characteristics of the destination (pull factor).

III. Research Methodology

In accordance with the objectives and background presented above, we analyze the decision to migrate using the gravity model. This model is widely used in regional planning because it can help regional planners estimate an area's attractiveness compared with other locations [30]. This study explores the extent to which macroeconomic variables (per capita GDP, unemployment rate, education attainment) affect migration flows to West Sumatra.

A. Research method

This is a quantitative study that uses secondary data. The data were collected from various official data of Statistic Indonesia (BPS) such as the 2015 Intercensal Population Survey (also kown as SUPAS), 2010 per capita GDP, 2010 unemployment rate, 2010 human development index 2010, and the 2010 Indonesia Census, with an analysis unit of all districts/municipalities in Indonesia (total of 478). Because the observed migration flows are the flow of incoming migration from 478 districts/municipality in Indonesia to the 19 districts/municipalities in West Sumatra, the total unit of observation is as much: (497 − 19) x 19 = 9,082 units. SUPAS 2015 data are used to observe the migration flows while other supporting data use 2010 data in because the migration in this study is a risen migration, i.e., those who moved across provincial boundaries within the last five years before enumeration, whereas 2010 is considered a base year in making a decision to migrate. Other data sources include http website://jarakantarkota.com for information about the distance between areas in Indonesia.

B. Data analysis

This study used recent migration flows to measure to flow of migration. The advantage of using recent migration rather than lifetime migration is that it reflects the dynamics of the population more accurately. The explanatory variables used in the study are shown in Table I.

To see the extent to which macroeconomic variables influence migration flows, this study uses per capita GDP, the unemployment rate, and education attainment. The use of wage variables follows Chotib and Darmawan [7] who estimated the patterns of inter-provincial migration in Indonesia based on the "Economic Interest Index," which cannot be done in this study because the minimum wage in each region of West Sumatra is the same; thus, there is no diversity of the data on wage variables, which causes autocorrelation.

In contrast to Wajdi et al. [8], who calculated the geographic distance based on the kilometers between origin *i* and destination *j*, this study uses the distance from origin *i* to destination *j* that already considers physical obstacles, e.g., rivers or highways, so it can describe the distance more accurately.

With considerations of the weaknesses of the basic gravity model and many other factors influencing the migration flows as described in the previous section, this study uses the modified gravity model of Wadji et al. (2017) [8] as follows:

$$\ln(M_{ij}) = \beta_0 + \beta_1 \ln(P_i) + \beta_2 \ln(P_j) + \beta_3 \ln(GDP_i) + \beta_4 \ln(GDP_j) + \beta_5 \ln(U_i) + \beta_6 \ln(U_j) + \beta_7 \ln(Educ_i) + \beta_8 \ln(Educ_j) + \beta_9 \ln(D_{ij}) + e_{ij} \quad (6)$$

TABLE I. SUMMARY OF DATA SOURCES FOR EXPANATORY VARIABLES

Explanatory Variable	Data Source
Size of population at origin (P_i) Size of population at destination (P_j)	Author's calculation based on 2010 census
Gross domestic regional product per capita at origin ($GDRP_i$) Gross domestic regional product per capita at destination ($GDRP_j$)	Author's calculation based on BPS publications
Unemployment rate at origin (U_i) Unemployment rate at destination (U_j)	Author's calculation based on 2010 Labor Force Survey (Sakernas, 2010)
Mean years school at origin (*Educi*) Mean years school at destination (*Educj*)	Author's calculation based on BPS publications
Distance between origin and destination (D_{ij})	Author's calculation (see text for details)

Mij represents gross migration flow between the region (regency/municipality) in Indonesia from origin i (regency/municipality outside West Sumatra) to destination j (regency/municipality within West Sumatra). Pi and Pj denote, respectively, the populations at origin i and destination j, and Dij is the geographical distance between origin i and destination j. In accordance with the general principles of the basic gravity model, it was estimated that β_1 and β_2 would have positive signs while β_9 would have a negative sign. Because migrants are attracted to destinations that are more developed compared with their origin, the proxy for regional economic development in this study is the real per capita gross domestic product (GDP), where the variables are expected to have a negative effect at the origin ($\beta_3 < 0$) and a positive effect at the destination ($\beta_4 > 0$). The unemployment rate variable was used where the coefficient for the unemployment rate at origin was expected to have a positive effect on out-migration ($\beta_5 > 0$) and a negative effect on in-migration to that region ($\beta_6 < 0$). The level of education (mean years school), used to represent a person's motivation to migrate to West Sumatra, was expected to have a negative effect at the origin ($\beta_7 < 0$) and a positive effect at the destination ($\beta_8 > 0$).

This research estimates the coefficient of the gravity model by using Poisson regression. As with Wajdi et al. [8], problems with using OLS models have also been found in this study. First, the bias in the estimate results from the logarithmic forms; thus, it needs to be converted to logarithmic values before estimating in the OLS regression. Second, the model fails to meet the OLS normality assumption. Third, there is unequal variance in the error terms. Fourth, the result is unstable due to zero flows. To overcome these four problems, Wajdi et al. [8] proposed using a Poisson regression. According to Beine, Bertoli, and Moraga [31], due to the difficulty of finding valid and informative instruments in the gravity model of migration, instrumentation in the gravity model of migration needs to be conducted in a Poisson regression framework such as the possibility of Poisson pseudo-maximum likelihood (PPML).

However, the Poisson regression method is used to produce over-dispersed estimators. Therefore, to overcome the problem of over-dispersion in the data, we used negative binomial regression analysis. One way to overcome the over-dispersion is to use the maximum likelihood that requires an assumption for θ_i to follow the gamma distribution so that its output event will have a negative binomial distribution. This method will produce good estimates for $\sigma 2$ as well as parameters that affect λ. This method has been applied to STATA through the binomial regression negative procedure [22].

IV. RESULTS

The first step in data processing is to observe the distribution of data to determine the appropriate estimation method for the data distribution model. The normality test results are based on the Shapiro–Wilk statistical values in Table II and the Q–Q output plot in Figure 2, which confirmed the decision to reject H_o (*p*-value < alpha), meaning that the migration flows are not normally distributed.

Furthermore, as described previously, the Poisson regression method applied during processing with STATA shows that the migration flows data indicate the presence of over-dispersion symptoms in which the variance value is greater than the mean value. In the case of this study, the ratio between deviance and *df* is 54.82. The Poisson regression model that is formed will be feasible to use if the value of the ratio is about one. Small ratio values indicate the occurrence of under-dispersion while a ratio value much greater than one indicates an over-dispersion. The magnitude of the ratio indicates that the Poisson regression model is not suitable for use with these data as there was an over-dispersion in the data of migration flows to West Sumatra by 2015.

Therefore, a negative binomial regression analysis is used to overcome the over-dispersion problem. The result of the negative binomial regression for the modified gravity model is shown in Table III.

After the negative binomial regression, independent variables that significantly influence the rise in migration to West Sumatra in 2015 are the number of residents at origin, the number of residents at destination, the GDP at origin, the unemployment rate at destination, the average length of school at origin, the average length of school at destination, and distance.

The parameter estimates only show the direction and significance of the explanatory variable but do not suggest the magnitude of the different effects. To facilitate the interpretation of each parameter in the above equation, we consult the value of the Incident Rate Ratio (IRR). Table III presents the marginal effects of changes in explanatory variables by using the IRR output.

Distance: If the distance between origin and destination is increased by one kilometer, then the average of migration flow will decrease by 0.9994 times, *ceteris paribus*.

GDP per capita at origin: If there is an increment of GDP per capita value of 1,000 rupiah at origin, then average

migration flows will increase by 1.000008 times, *ceteris paribus.*

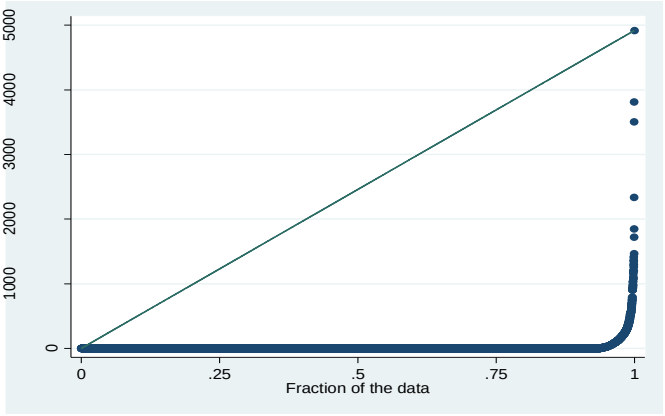

Fig. 2. Q-Q plot for normal data

Source: Author's calculation

TABLE II. SHAPIRO–WILK W-TEST FOR NORMAL DATA

Variable	Obs	W	V	z	Prob>z
Migration Flows	9082	0.38811	2803.026	21.196	0.000

Source: Author's calculation

Population at origin: If the number of people at origin increases by 1 person, then the average of migration flows will increase by 1.000001 times, *ceteris paribus*.

TABLE III. BINOMIAL NEGATIVE RESULT OF THE MODIFIED GRAVITY MODEL

Explanatory Variable	Coefficient	Std. Error	*t*-value
Constant	−3.379853***	1.05225	−3.21
Size of population at origin (P_i)	1.33E-06***	2.45E-07	5.43
Size of population at destination (P_j)	3.45E-06***	6.32E-07	5.47
Gross domestic regional product per capita at origin ($GDRP_i$)	8.40E-06***	2.76E-06	3.04
Gross domestic regional product per capita at destination ($GDRP_j$)	−4.09E-05	3.20E-05	−1.28
Unemployment rate at origin (U_i)	4.29E-03	3.57E-02	0.12
Unemployment rate at destination (U_j)	−1.06E-01***	3.96E-02	−2.67
Mean years school at origin ($Educ_i$)	3.68E-01***	8.89E-02	4.14
Mean years school at destination ($Educ_j$)	3.33E-01***	1.59E-01	2.1
Distance between origin and destination (D_{ij})	−5.56E-04***	4.06E-05	−13.69

***) Significant at 1%; **) Significant at 5%; *) Significant at 10%

Source: Author's calculation

TABLE IV. INCIDENT RATE RATIO (IRR) ESTIMATION RESULTS

Explanatory Variable	Coefficient	Std. Error	*t*-value
Size of population at origin (P_i)	1.000001***	2.45E-07	5.43
Size of population at destination (P_j)	1.000003***	6.32E-07	5.47
Gross domestic regional product per capita at origin ($GDRP_i$)	1.000008***	2.76E-06	3.04
Gross domestic regional product per capita at destination ($GDRP_j$)	0.9999591	3.20E-05	−1.28
Unemployment rate at origin (U_i)	1.004296	3.57E-02	0.12
Unemployment rate at destination (U_j)	0.8996821***	3.96E-02	−2.67
Mean years school at origin ($Educ_i$)	1.445087***	8.89E-02	4.14
Mean years school at destination ($Educ_j$)	1.395142***	1.59E-01	2.1
Distance between origin and destination (D_{ij})	90.9994441***	4.06E-05	−13.69

***) Significant at 1%; **) Significant at 5%; *) Significant at 10%

Source: Author's calculation

Population at destination: If the number of people at destination increases by 1 person, then the average of migration flows will increase by 1.000003 times, *ceteris paribus*.

MYS at origin: If there is an average increase in mean years school in the area of origin for 1 year, then the average of migration flows will increase by 1,445 times, *ceteris paribus.*

MYS at destination: If there is an average increase in mean years school in the destination area for 1 year, then the average migration flow will increase by 1,395 times, *ceteris paribus*.

Unemployment rate at destination: If there is a decrease in the unemployment rate in the destination area, then the average migration flows will increase by 0.899 times, *ceteris paribus.*

V. DISCUSSION

In this section, we will discuss the results of the estimated gravity model of migration flows into West Sumatra. As shown in Tables 3 and 4, almost all the variables are statistically significant.

The results are in line with the basic gravity method, which predicts that migration flows are directly proportional to the population and negatively proportional to distance. As expected, the coefficient of the size of the population at origin showed a positive and statistically significant sign. The positive sign of this coefficient indicated that there was more migration between larger areas in terms of population due to a greater capacity to send migrants [8]. The population coefficient in the destination area also showed a positive and

statistically significant sign. In a study regarding the internal determinants of migration in Indonesia in 1930–2000, Van Lottum and Marks [32] found that population effects are increasingly important at the destination. A region rich in human resources would be an attractive location for manufacturing or service-related industries [7]. The positive effects of population size in both areas were in line with the study of Wajdi et al. [8] who found the same effect of population size both in origin and destination.

In line with the results of other studies, the effect of negative distances and very significant. This means that the greater the distance between the area of origin and the destination the fewer the number of migrants who migrate to the area and vice versa. The addition of one kilometer of distance will decrease the average of migration flow events by one time.

As a driving factor, evidence for the impact of unemployment rate at origin is rather weak. Although the coefficient was positive, which indicates that the higher unemployment rates at destination lead to an increase in migration flows, the coefficients were not statistically significant; for example, a 1% decrease in the unemployment rate in West Sumatra will increase the average migration flows by 0.9 times. Meanwhile, the coefficient for the unemployment rate at destination was negative and statistically significant. This finding is in line with the studies of Piras [4] and Darmawan and Chotib [7] that migration leads to lower areas of unemployment.

The negative impact of GDP per capita at destination and the positive impact at origin refute previous findings that indicate that the lack of economic development at origin triggers migration to more developed areas. This indicates that migration to West Sumatra is not driven by economic conditions in the area of origin and economic development in West Sumatra. The effect of GDP at origin conforms to Massey's [10] argument that migration may also be positively related to the level of economic development in the country of origin. However, due to the negative sign and statistical insignificance of the GDP coefficient at the destination, these findings cannot conclude that there is economic attractiveness for migration in terms of GDP in West Sumatra. The study found that the increment of GDP per capita of 1,000 rupiah at origin will increase average migration flows to West Sumatra by 1.000008 times.

The coefficient of estimation for education at destination positive and statistically significant as expected. This result fits the theoretical expectation that people are interested in migrating to areas with a high level of education. An increase of the mean years school in West Sumatra for one year will increase the average migration flow by 1.39 times. The results of research by Geis et al. [33] found that areas with higher levels of education have a positive effect on incoming migration flows. The higher education of a region shows higher human capital and better educational opportunities that can attract migrants into the area. However, unlike expected, the coefficient at origin was also marked positive and significant. These results indicate that migrants who come to West Sumatra are not influenced by the level of education in West Sumatra being better than in their area, where an average increase in mean years school in the area of origin for one year actually increases migration flows to West Sumatra 1.45 times. Levy et al. (1974) revealed that regions with highly educated residents tend to have better social and cultural facilities that will attract better-educated people. Highly educated migrants generally have a higher tendency to migrate from their home areas and are better equipped to adjust the situation in the destination area.

VI. CONCLUSION

This study aimed to identify the determinants of migration to West Sumatra. Employing a modified gravity model using macroeconomic variables (GDP per capita, unemployment rate and education attainment), this study will see the appeal of West Sumatra in attracting incoming migration.

In line with the basic gravity model, this research found positive effects of population both in origin and destination and negative effects of distance. The impact of macro-economic indicators on the volume of migration flows into West Sumatra showed that the coefficient of GDP per capita of West Sumatra was negative and insignificant while the per capita GDP at origin was positive and significant. Another proxy for economic development, the unemployment rate at destination, showed a negative and significant sign; however, the effects at origin, even though the coefficient was positive, were not significant. Adding a wages variable may be able to complete the analysis because considerations for migration, apart from being affected by employment, are also affected by wage differences.

However, the minimum wages among the regencies/ municipalities in West Sumatra are the same, which caused collinearity; thus, this study could not calculate the influence of wages. The coefficient of education was positive and significant for both the origin and destination. To estimate the coefficient of education, both in the origin and destination showed a positive and significant sign.

The results of this study indicate that from an economic perspective, the unemployment rate in West Sumatra is a factor that attracts migrants, whereas the evidence for per capita GDP influences is weak. The economic attractiveness of West Sumatra in influencing the flow of in-migration does not appear to be strong. This finding was expected to provide input to the West Sumatra government to seek other strategies to meet the shortage of "productive age" population. There was still a large out-migration flow compared with in-migration to West Sumatra, in addition to cultural wander may also be due to utilities in West Sumatra still not better than other regions.

Because there are so many potential determinants of migration flows, adding more variables might enrich the analysis of the determinants of migration into West Sumatra. In this study, the determinants of migration decisions were only viewed from the macroeconomic perspective, whereas migration decisions are also caused by individual-level microeconomic factors prior to migrating. Therefore, it is necessary to conduct similar research using individual variables so that it can be known both at the macro- and microeconomic levels what factors influence a person's decision to migrate to West Sumatra.

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