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DISCUSSION PAPER SERIES NO. 2023-20

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Adoracion M. Navarro



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Subnational Infrastructure Development and Internal Migration in the Philippines

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PHILIPPINE INSTITUTE FOR DEVELOPMENT STUDIES

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Abstract

Making a comprehensive comparison of subnational levels of infrastructure development in the Philippines is difficult due to the uneven availability of data on infrastructure indicators across geo-political areas. This study shows that this is possible at the regional level by developing a demonstration composite subnational infrastructure development index. Picking indicators based on representativeness in the infrastructure subsectors and on uniform availability of data across regions, the study constructed a regional infrastructure development index. It also presents one useful application of the index, that is, analyzing the link between subnational infrastructure development and internal migration through a Poisson regression. It then uses the *Balik Probinsya Bagong Pag-asa* Program, a program engineering the return migration of low-income Filipino families from cities to the provinces, to illustrate the usefulness of the regression results in conducting an evidence-based policy analysis. The relationships established through econometric regression and the trends in inter-regional migration show that migration is a phenomenon. Filipino migrants vote with their feet based on demographic and economic factors, including the level of infrastructure development in their origin and destination. Engineering the return to destinations that Filipino migrants left in the first place does not guarantee that they will stay there given the determinant demographic and economic factors. The resources spent on such engineering can be used instead for programs that minimize spatial development inequities, such as by improving infrastructure to attract investments and jobs.

Keywords: infrastructure, regional development, internal migration, return migration, *Balik Probinsya Bagong Pag-Asa*, Poisson regression

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Subnational Infrastructure Development and Internal Migration in the Philippines

*Adoracion M. Navarro**

1. Introduction

As data availability for infrastructure indicators is inconsistent across Philippine geo-political areas (provinces, cities, municipalities), making a comprehensive comparison of subnational levels of infrastructure development is difficult. But at the administrative regional level, there are certain indicators reported by various agencies that can be considered representative of various infrastructure subsectors. Picking indicators based on representativeness in the infrastructure subsectors and on uniform availability of data across regions, this study shows how to make cross-regional assessments possible by developing a demonstration composite subnational (regional) infrastructure development index.¹ It also presents one useful application of the index—analyzing the link between subnational infrastructure development and internal migration.

Internal migration is a type of migration that refers to “a relatively permanent change in usual place of residence” between migration-defining boundaries but within national borders (White and Lindstrom 2005, p. 326). As a concept, it excludes changes across national borders; these are considered international migration instead. Infrastructure development influences internal migration through the expansion of economic opportunities and improvements in the capabilities of individuals. This study uses the constructed regional infrastructure development index, along with other demographic and economic determinants, to assess the link between the level of infrastructure development in Philippine regions and the interregional migration flows. Particularly, the assessment used the interregional migration flow data from the 2018 National Migration Survey, the first nationwide migration survey ever made by the Philippine Statistics Authority (PSA).² Given the evidence-based relationships, the study then derives policy implications using the *Balik-Probinsya, Bagong Pag-asa* program³ as an illustration of possible uses of the internal migration determinants estimation technique in policy analysis.

The study is structured into four sections. This section serves as an introduction and presents the objectives. Section 2 discusses the review of literature, the analytical framework, and the research methods. Section 3 explains the results. Section 4 concludes and provides policy implications.

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¹ The infrastructure development index developed in this study is for demonstration purposes only and the PIDS does not intend to create a periodic monitoring system for the index. Government agencies and interested researchers will nevertheless find it useful to replicate the construction of the index as data updates become available and incorporate it in their monitoring practices.

² Conducted in collaboration with the University of the Philippines Population Institute.

³ The choice of the program where policy analysis is applied to is based on the research topic tasking from the PIDS Management Committee.

The general objective of this study is to relate subnational infrastructure development in the Philippine administrative regions to inter-regional migration trends and derive policy implications. Specifically, this study aims to:

- a. process data on subnational infrastructure indicators and demonstrate how an infrastructure development index can be constructed and used for benchmarking across regions;
- b. analyze internal migration trends in the 2018 National Migration Survey (NMS) of the Philippine Statistics Authority;
- c. explore the relationship between infrastructure development and internal migration using the derived subnational infrastructure development indices and the 2018 on internal migration trends; and
- d. derive policy implications, including implications on the current engineered return migration policy (the *Balik Probinsya, Bagong Pag-asa* Program), given the link between internal migration and subnational infrastructure development.

2. Review of related literature, analytical framework, and research methods

The review of related literature focuses on the creation of infrastructure indices and the evolution of migration studies. The choice of the analytical framework for examining the relationship between infrastructure and internal migration follows from the tracking of this evolution. The research methods involve data-driven index construction and econometric regression.

2.1 Review of related literature

Creating an infrastructure index that summarizes the level of infrastructure development of areas has been a staple practice by international organizations like the World Economic Forum (WEF) and the International Institute for Management Development (IMD) World Competitiveness Center. The WEF ranks countries in its periodic Global Competitiveness Report based on an overall competitiveness index. This overall index has twelve pillars, one of which is infrastructure.⁴ Infrastructure as a pillar of competitiveness is itself an index constructed by the WEF from a combination of quantity indicators and quality indicators (i.e., based on perception surveys) on road connectivity, railroads, train services, airport connectivity, airport services, shipping connectivity, and seaport services (WEF 2019).

The IMD World Competitiveness Center, on the other hand, produces the IMD World Competitiveness Yearbook that ranks countries based on four competitiveness factors, with

⁴ The other pillars are institutions, ICT adoption, macroeconomic stability, health, skills, product market, labor market, financial system, market size, business dynamism, and innovation capability.

infrastructure being one of the factors.⁵ Each factor has sub-factors which are weighted equally (regardless of the number of criteria each sub-factor contains) in assessing the factor. The infrastructure factor is a combination of assessment of five sub-factors, namely, basic infrastructure, technological infrastructure, scientific infrastructure, health and environment, and education. The criteria in assessing factors and sub-factors can be hard data or perception survey results (IMD 2022).

This study is the first attempt in the local literature on infrastructure studies to construct a composite infrastructure index for Philippine administrative regions. In contrast with the method by the mentioned international organizations, the index produced under this study does not use perception surveys but hard data on sectors of physical infrastructure. Similar with the practice of these international organizations, the resulting scores in the index can be used to rank the infrastructure-related competitiveness of areas, in this case Philippine administrative regions. Another use is as a variable in determining and testing socio-economic relationships, as is demonstrated in this study by using subnational infrastructure development as determinant of internal migration.

In analyzing migration, introductory frameworks usually start with theories advanced by Stewart (1948) on demographic gravitation, which came to be known as the gravity model of migration, and Lee (1966) on origin and destination factors and intervening obstacles in migration, which came to be known as “push and pull” factors of migration. The basic gravity model of migration has developed based on the idea that as the importance of one location or both locations increases, there will also be an increase in movement between them. Importance is often represented as size, that is, population. Moreover, there is distance decay, meaning, the farther apart the two locations are, the less the movement between them will be given the increase in the cost of migration. Thus, population and distance are the basic determinants of migration. In theorizing based on push and pull factors, the determinants are more numerous, namely, the attributes of the origin area (what pushes people to move away from the area) and the attributes of the destination area (what drives people to move toward the area) as well as obstacles and personal factors influencing the difficulty or ease of moving.

Equation 1 below shows the basic gravity model of migration, with population and distance as the only determinants.

$$M_{ij} = G \frac{P_i^\alpha P_j^\beta}{D_{ij}^\gamma} \quad \text{Equation 1}$$

where M_{ij} refers to the number of residents in area j who at an earlier point in time resided in area i ; $P_i(P_j)$ refers to the population of $i(j)$; D_{ij} is some measure of distance between i and j ; the superscripts are parameters to be estimated; and G is a proportionality constant.

⁵ The other factors are economic performance, government efficiency, and business efficiency.

When this model is transformed into its logarithmic form, as shown in Equation 2, it can be tested empirically using ordinary least squares regression.

$$\ln M_{ij} = \delta + \alpha \ln P_i + \beta \ln P_j - \gamma \ln D_{ij} + \varepsilon_{ij} \quad \text{Equation 2}$$

This basic model with population and distance as determinants of migration have been enriched in some studies by recognizing that a comprehensive analysis of migration often includes pull and push factors that have economic, political, social, historical, and cultural dimensions (e.g., Ramos and Surinach 2013). Migration studies in the gravity modeling tradition have thus evolved into estimating models where various push and pull factors are thrown in to the equation.

But some migration studies (e.g., Flowerdew and Lovett 1988, Congdon 1992) argue that a Poisson regression rather than a log-normal regression like Equation 2 is more appropriate given that migration uses count data. The Poisson regression is a special case of generalized linear model. It involves a dependent variable that is assumed to have a Poisson distribution and logarithmically linked to a linear combination of independent variables.

The Poisson model recognizes that the migration flow variable involves count data (i.e., number of persons with only integer values) and follows a discrete probability distribution, the Poisson distribution. For count variable y_i that has a Poisson distribution, the expected value is

$$E[y_i | \mathbf{x}_i] = e^{(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k)} \quad \text{where } \mathbf{i} = 1, \dots, k \quad \text{Equation 3}$$

where x_i are the determinants and the betas are coefficients.

Its log transformation is

$$\ln(E[y_i | \mathbf{x}_i]) = \beta_0 + \beta_1 x_1 + \dots + \beta_k x_k \quad \text{Equation 4}$$

which can then be estimated using a Poisson regression.

Both the log-normal and Poisson models continue to be used in current migration studies. Moreover, the search for the determinants of migration continues to be conducted in context-specific cases. For instance, Greenwood (2021) surveyed the literature behind determinants of migration and found that economic opportunities have been consistently significant in motivating people to migrate within national borders. Specifically, “among economic opportunity measures, the availability of jobs stands out as the single most consistent variable to which migrants respond” (Greenwood 2021, p. 15). In the Philippines, this pattern also exists, as evidenced in Toya et al. (2004) which finds, among others, that people with higher human capital tend to move from poor to rich regions.

Expansion in economic opportunities such as employment is one channel through which infrastructure development impacts migration. Increased employment opportunities in an area affect not only residents, but also non-residents, some of whom would begin to consider immigrating to the area. Some empirical studies provide evidence that infrastructure can indeed expand internal migration. Xu and Sun (2020) finds that China’s High-Speed-Railway network

increased migration to connected cities, while Cross (2001, p. 111) argues that in South Africa, “infrastructure delivery [is driving] migration processes to a considerable extent.” Using 2010 Nepal population census data, Shilpi et al. (2014) sees the role of public infrastructure behind the country’s migration flows. Guirao et al. (2017) shows that increasing high-speed rail commuting lines influenced the growth of labor migration in Madrid from 2004 to 2015. In evaluating determinants of internal migration, Vakulenko (2016) finds some effects due to transportation.

In the local literature, no such empirical testing of infrastructure as a determinant of internal migration has been made. This study therefore fills this gap in the Philippine studies of migration. At the same time, it introduces policy researchers in the Philippines to the use of the Poisson model in analyzing the determinants of intra-regional flows of migration.

2.1 Analytical framework

In the construction of the regional infrastructure index, this study straightforwardly uses the notion that the overall level of infrastructure development in Philippine regions is evidenced by the level of development of the component sectors of infrastructure such as transport, electricity, water and information and communication technology (ICT) infrastructure.

In analyzing inter-regional migration within the Philippines, this study follows the Poisson modeling framework and postulates that internal migration is influenced by infrastructure development. It assumes that certain demographic and economic characteristics of Philippine regions explain internal migration. It enriches the modeling by considering the constructed infrastructure index as representative of the level of regional infrastructure development that can explain differences in internal migration.

The analytical framework can be represented in the following equation:

$$\ln(E[MIG_{ij}]) = \beta_0 + \sum_{k=1}^m \beta_k x_{kj} + \sum_{l=1}^n \beta_l x_{li} + \sum_{p=1}^q \beta_p x_{pj}$$

where MIG_{ij} is the migration flow from origin region i to destination region j , x_{ij} is the characteristic common to both regions i and j (e.g., distance between them), x_{li} are demographic and economic characteristics of origin region i , and x_{pj} are demographic and economic characteristics of destination region j . The level of infrastructure development is one of the economic characteristics of regions i and j .

2.3 Research methods

2.3.1 Constructing the index

The construction of the regional infrastructure index involves using 2018 data⁶ on the following indicators:

- road density as extent of road connectivity, with data primarily from the Department of Public Works and Highways (DPWH) Atlas and supplemented by data from the Bangsamoro Planning and Development Authority (BPDA)
- road roughness index as indicator of road quality, with data from the DPWH Atlas
- households' access to the internet, cellphone, and computers, with data from the PSA's 2018 Family Income and Expenditure Survey (FIES)
- household electrification rate, with data from the Department of Energy (DOE)
- households' access to piped water supply, with data from 2018 FIES 2018.

The method also involves creating a composite index for road development using equally weighted road density and road roughness indicators. As the access rates for internet, cellphone and computers are reported as separate indicators in the FIES, these are used to create a composite index of ICT access, with equal weighting also on the component indicators. The road development sub-index, ICT access sub-index, household electrification rate, and piped water supply access rate are then weighted equally to create the overall regional infrastructure development index.

2.3.2 Estimating a Poisson regression model of Philippine inter-regional migration flows

Before using the 2018 NMS survey data in the regression, this study analyzes the patterns of 2018 inter-regional migration. In quantitatively examining the relationship between the 2018 inter-regional migration flows and the determinants of migration, this study uses a Poisson regression model. As explained above, the use of the Poisson model emerged in migration studies (e.g., Congdon 1992) as more appropriate (relative to the gravity model of migration) for count data. The actual estimation is carried out in Stata 16 (a statistical software), which has a Poisson regression model option.

⁶ Because this study uses the regional infrastructure index to explain 2018 inter-regional migration flows, which are in turn based on the only available migration survey data (the 2018 NMS data), the infrastructure indicators are gathered for the year 2018 only. Interested entities can replicate the method of constructing the regional infrastructure index using other years.

3. Results of establishing the link between infrastructure and internal migration

3.1 The regional infrastructure index

After surveying the data availability, indicators on road transport, ICT, potable water supply and electricity were selected, effectively covering four infrastructure subsectors. The road transport infrastructure subindex is a composite of equally weighted road density (kilometer [km] of roads per square [sq] km of land) and road roughness index (scale of 1–7, where 7 is the worst) from the DPWH. As the DPWH did not collect data for the Autonomous Region in Muslim Mindanao (ARMM) and its successor, the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), prior to 2021,⁷ this study had to rely on other sources, particularly a report on ARMM figures from the BPDA (2016, 2020), to estimate proxies. Table 1 shows the results of the road transport sub-index estimation per region.

Table 1. Road transport indicators and computed road transport index per region, 2018

Region	Road density (km roads/sq.km. land)	Road roughness index	Road transport development index
NCR	188.39	4.75	66.07
CAR	11.39	5.84	11.31
I	12.86	3.52	28.27
II	6.65	4.54	19.34
III	10.70	3.48	27.98
IV-A	15.34	3.35	30.14
IV-B	7.76	5.30	14.20
V	13.19	3.13	31.14
VI	14.58	5.21	16.66
VII	14.59	4.22	23.73
VIII	11.02	4.08	23.78
IX	9.77	4.39	21.24
X	9.58	4.42	20.97

⁷ The DPWH started including the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) in its DPWH Atlas starting only in 2021.

XI	8.26	4.36	21.05
XII	6.83	4.34	20.81
XIII	7.20	3.73	25.27
ARMM	2.96	5.08	14.50

NCR – National Capital Region; CAR – Cordillera Administrative Region; ARMM – Autonomous Region of Muslim Mindanao.

Note: Road density is measured by the DPWH on a scale of 1 to 7, where 1 means good condition and 7 means bad condition. The road transport development index is computed as the average of both road transport infrastructure indicators, readjusted using the WEF (2019) method in the Global Competitiveness Index estimations, that is, by assigning zero to the lowest possible value and 100 to highest possible value. In the computations in this study, the maximum value taken for road density is the highest data recorded for 2018, while the maximum value taken for road roughness is 7. The higher the value of the constructed road transport index in a region is, the better is the road transport condition in that region.

Sources: DPWH (2021, 2022) for the road density and road roughness index, except for ARMM; BPDA (2016, 2020) for the ARMM road density and road roughness index; author's calculations for the road transport development index.

The ICT infrastructure subindex is a composite of families' internet, cellphone, and computer use (i.e., equally weighted) from the 2018 FIES. Table 2 shows the results of the ICT sub-index estimation per region.

Table 2. ICT access indicators and computed ICT access index per region, 2018

Region	Access to internet (% of households)	Access to cellphone (% of households)	Access to computer (% of households)	Composite ICT access index
NCR	25.80	95.80	32.40	51.33
CAR	12.10	90.80	28.70	43.87
I	9.40	90.00	19.90	39.77
II	4.70	84.70	17.20	35.53
III	17.60	92.10	21.60	43.77
IV-A	18.80	92.70	28.00	46.50
IV-B	3.30	82.90	14.50	33.57
V	6.00	84.50	17.00	35.83
VI	5.50	86.10	17.30	36.30
VII	8.00	85.50	17.90	37.13
VIII	4.70	78.60	13.70	32.33

IX	4.30	81.60	12.00	32.63
X	8.60	84.30	16.20	36.37
XI	6.00	81.10	16.30	34.47
XII	4.30	81.90	13.20	33.13
XIII	5.60	84.30	14.70	34.87
ARMM	0.50	88.50	3.90	30.97

NCR – National Capital Region; CAR – Cordillera Administrative Region; ARMM – Autonomous Region of Muslim Mindanao.

Note: The ICT access index is computed as the equally weighted average of the three access indicators, readjusted using the WEF (2019) method in the Global Competitiveness Index estimations, that is, by assigning zero to the lowest possible value and 100 to highest possible value. The constructed ICT access index can be interpreted as a partial proxy of the level of development of ICT infrastructure in the region. It is partial because a household's ability to access ICT depends also on the income of the household.

Source: PSA (2020) for access to internet, cellphone, and computer; author's calculations for ICT access index.

Table 3 shows the households' access to water supply per region based on the 2018 FIES and the household electrification rate per region based on the DOE administratively gathered and computed data (but with some needed corrections).⁸ Each of these indicators were translated into sub-indices.

Table 3. Access to level 3 water supply service and household electrification rate per region, 2018

Region	Access to Level 3 water supply (% of households)	Electrification (% of households)
NCR	90.70	100.00
CAR	37.90	89.61
I	26.20	97.03
II	17.50	92.38
III	63.30	100.00
IV-A	71.00	100.00
IV-B	30.40	80.85

⁸ The DOE wrongly interpreted the potential household population by using the same census data even for the intercensal years (e.g., 2015 household population for estimating the 2018 household electrification rate). Because the denominator was not moving in some years, the DOE method overestimated the household electrification rate. Thus, this study had to rely on the FIES' 2018 estimate of household population and use it in the denominator for the DOE's estimate of household metered electricity connections.

V	35.40	78.28
VI	27.20	86.22
VII	51.70	91.55
VIII	35.20	83.04
IX	29.10	65.66
X	48.90	85.98
XI	47.50	76.73
XII	31.80	65.44
XIII	41.40	100.00
ARMM	8.40	32.88

Note: Having a level 3 water supply system means piped water supply is being provided to the households.

Sources: PSA (2020); DOE (2022).

The overall infrastructure development index is an equally weighted composite of the four sub-indices. Table 4 shows the final results of constructing the regional infrastructure development index.

Table 4. The computed infrastructure development index per region, 2018

Region	Regional infrastructure development index
NCR	77.03
CAR	45.67
I	47.82
II	41.19
III	58.76
IV-A	61.91
IV-B	39.76
V	45.16
VI	41.59
VII	51.03
VIII	43.59
IX	37.16

X	48.05
XI	44.94
XII	37.80
XIII	50.38
ARMM	21.69

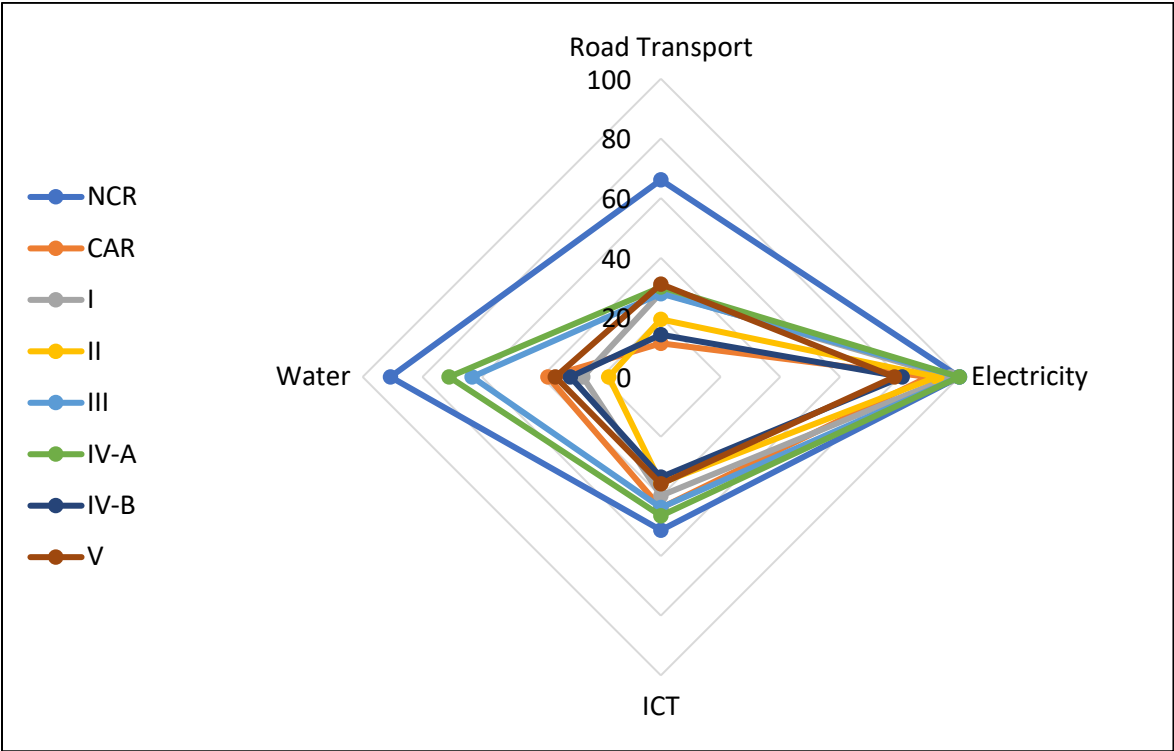
Note: The composite infrastructure development index is the average of the indices for road transport, electricity, ICT, and water supply, with equal weights given to each sub-index.

Source: Author's calculations.

Radar charts can be used to show the overall performance (the area of the radar chart) of a locality in terms of an index as well as in which specific component of the index a locality is not performing well relative to other localities (the specific veins of the radar chart).

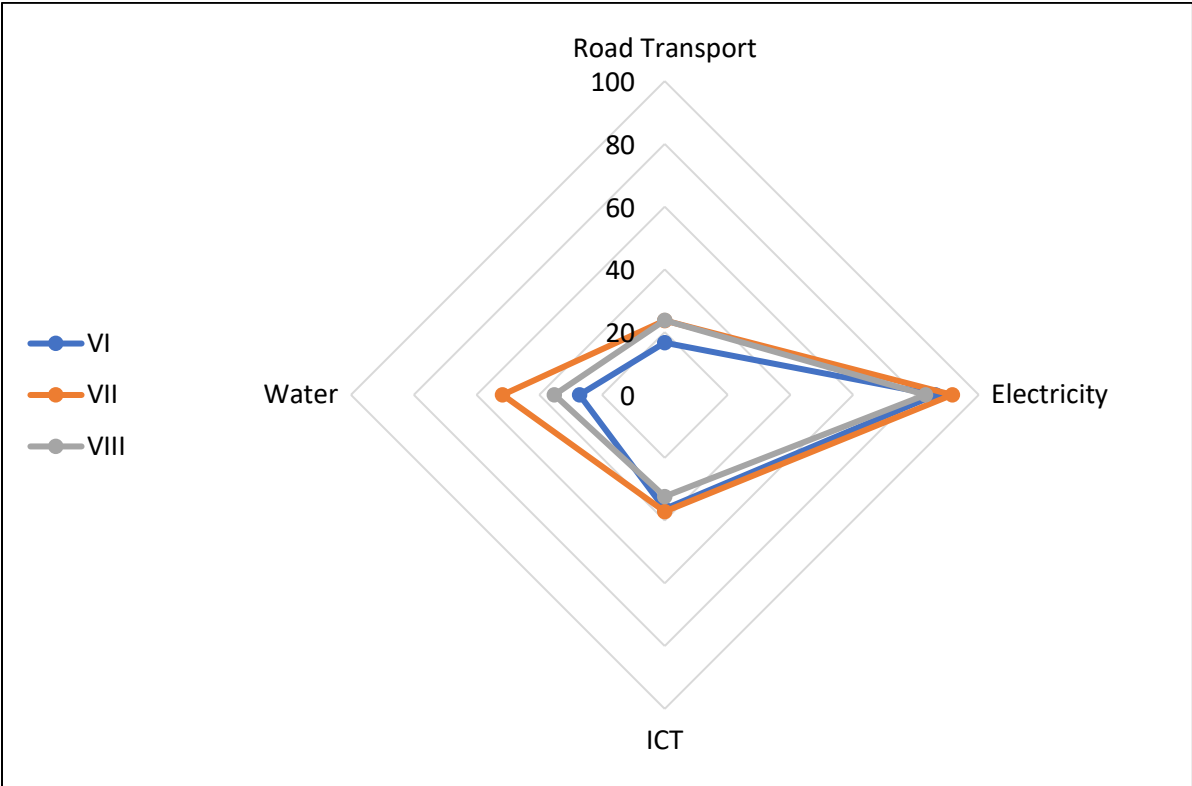
Figures 1 to 3 show the radar charts for the four sub-indices. These are demonstrations of how the regional infrastructure development index can be used to apply benchmarking across regions. The area of the radar chart per region depicts the overall level of infrastructure development; that is, the larger the area, the higher the level of infrastructure development. It is easy to see that the National Capital Region (NCR) had the largest area, while the former ARMM had the smallest. The radar charts can also show inequities simultaneously. For example, Figure 1 shows high inequity across Luzon regions in terms of water access and road transport connectivity. Meanwhile, Figure 3 shows how deficient ARMM was in all metrics relative to the other regions.

Figure 1. Regional infrastructure development indices in Luzon, 2018



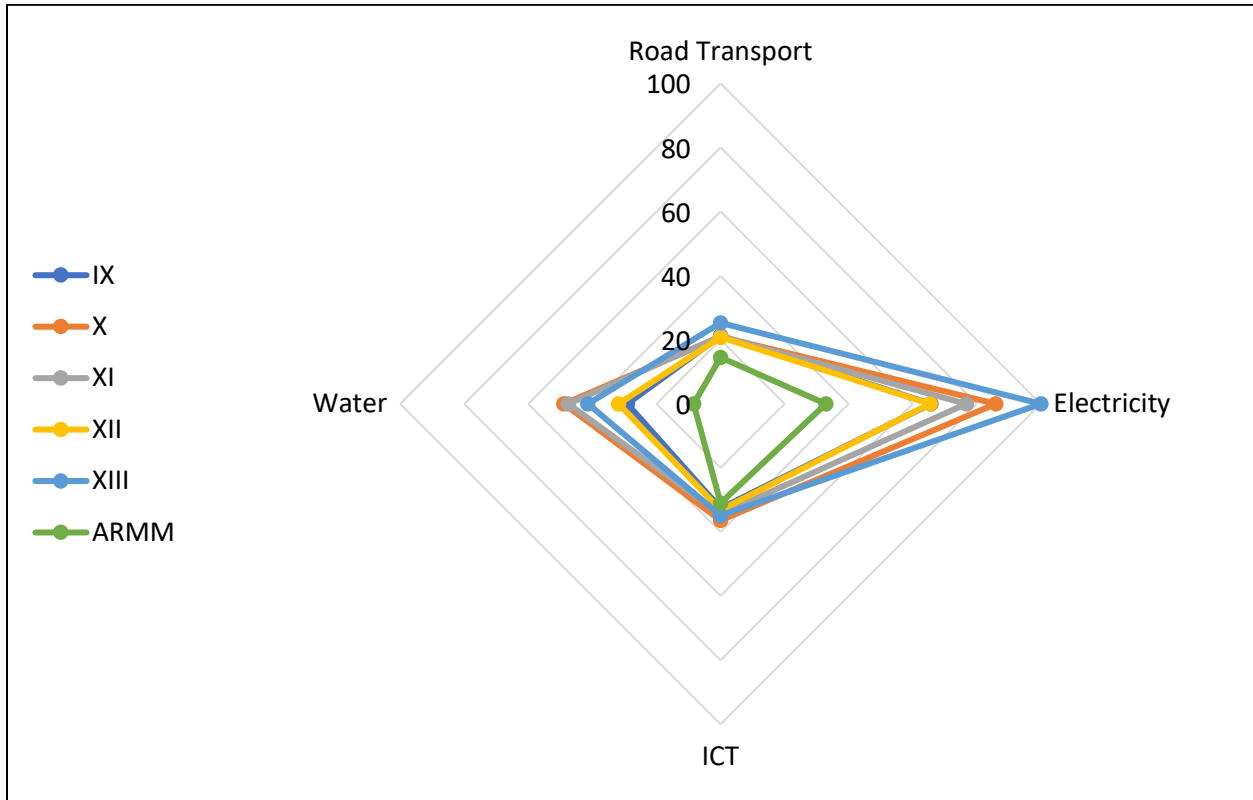
Source: Author’s illustration using the computed indices.

Figure 2. Regional infrastructure development indices in Visayas, 2018



Source: Author’s illustration using the computed indices.

Figure 3. Infrastructure development indices in Mindanao, 2018



Source: Author's illustration using the computed indices.

3.2 Internal migration trends

As the first nationwide survey attempt on the topic of migration, the NMS was designed to estimate migration flows in the Philippines, to examine the characteristics of Philippine migrants, and to identify factors behind internal and international migration in the country. Jointly implemented by the PSA and the University of the Philippines Population Institute (UPPI), the survey collected data from about 45,000 households throughout the country, where individuals aged 15 and above in the selected households were interviewed. The NMS had two questionnaires: one for households in general and another for individuals specifically. The survey had an individual response rate of 89.3 percent, and certain responses were excluded, weighted, or checked to assess the non-response error from the data collection.

The NMS revealed important results on the internal migration experiences of household members in the Philippines. Around 40 percent of Filipinos are lifetime migrants, and most of them have crossed regional boundaries during their moves. Moreover, for most of these Filipinos, their migration moves were not just recent; their migration experience have happened for three months or more, mostly within the Philippines. Within the five years prior to 2018, 15 percent of Filipinos migrated across regional and national borders. This period registered mostly rural-rural migration patterns followed by urban-urban migration flows, with Eastern Visayas gaining the most migrants and the NCR losing the most (PSA and UPPI 2019).

Understanding what causes people to migrate within national borders can be best approached by looking at the decision-making of the individual who considers what is best for himself or herself. If we assume that people view migration options as possibilities for alternative benefits and costs at present and in the future, we can infer that people migrate across boundaries when they can have more net benefits in their destination than in their place of origin. The 2018 NMS actually suggests that this had been the consideration of the internal Filipino migrants.

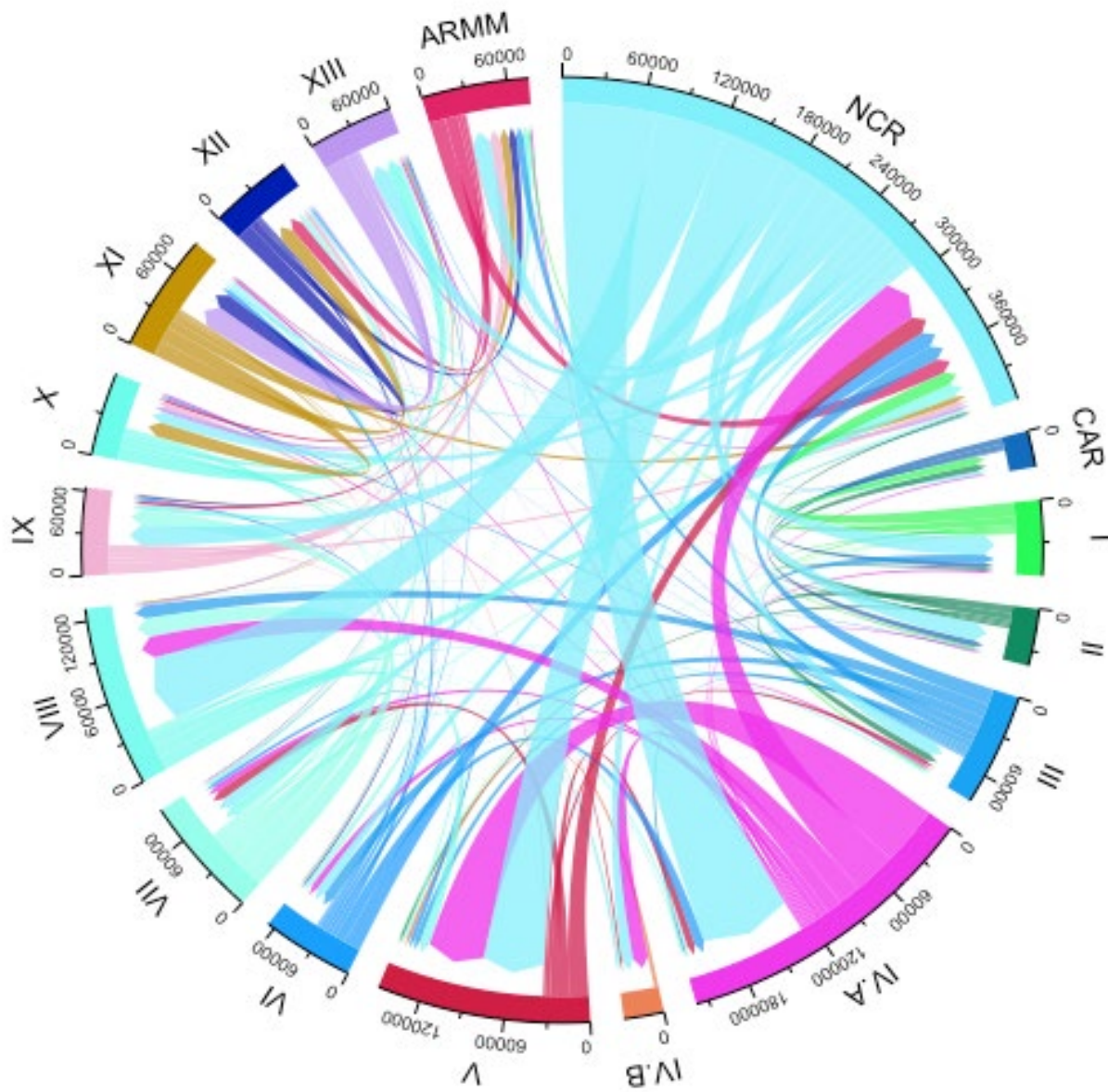
Predominantly, Filipinos cite employment as their migration motive. While leaving to work in other areas, Filipino migrants often leave their children behind under the care of their spouses or their parents. Furthermore, for most of these migrants, migration is both an investment and a necessity: the funds they used to move either come from their personal savings or their family, and prior to moving, one of three migrants expressed that they were having difficulty meeting their basic needs. As the results of the 2018 NMS show, migration in the Philippines is primarily driven by economic opportunities and constraints. Following the logic of the model of push and pull factors in migration, Filipinos consider their relative income streams when considering migration options (PSA and UPPI 2019).

The results found in the 2018 NMS are corroborated by the 2018 report jointly conducted by the United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Development Programme, International Organization for Migration, and United Nations Human Settlement Programme. Similar to the 2018 NMS, the report concluded that a significant number of Filipinos were internal migrants, most of whom moved to CALABARZON. The findings also stated that support from family and friends were important, both to help cover the initial costs of moving to another area and to assist in securing employment in the destination area. Generally, these internal migrants move to urban areas for employment and for further education. Meanwhile, rural migrants move across regional boundaries for marriage and for farming, an economic opportunity (UNESCO et al. 2018).

For the econometric modeling of internal migration using demographic and economic determinants, we extracted the inter-regional migration flows from the 2018 NMS database. First, we examined the details of the 2018 NMS data on period migration flows (past five years or 2013 to 2018), then we excluded the intra-regional migration flows (because these will not be explained by differences in demographic and economic characteristics between the origin region and destination region). We then produced the inter-regional migration flows using the weights estimated by the PSA. Finally, we extracted inter-regional migration flows M_{ij}^{2018} , where i = origin region, and j = destination region. This resulted in 272 regional pairs or $n(n-1)$ unidirectional pairwise comparisons, where n is 17, the number of administrative regions in the country.

The pairwise results or the 272 unique internal migration flows are in a table in the Appendix. Note that the presence of zeros indicate zero inter-regional migration for the specific pairing in year 2018. To visualize the inter-regional migration flows, we created a small program for using a circular plot in R (a programming language for statistical computing and graphics), which involved calling *Circos*, a freeware in R. A circular plot is more useful than a table of numbers in appreciating the volume of inter-regional migration flows. Figure 4 below shows this. Note from the figure that the volume of migrants going in and out of the National Capital Region (NCR) are largest, followed by Region IV-A.

Figure 4. Inter-regional migration flows, 2018



Source: Author's interpretation.⁹

⁹ Jethro El L. Camara formulated the small program for this circular plot in R under the guidance of the author.

3.3 Other determinants of migration

The other determinants of migration used in the econometric regression are population density, distance between regional centers, unemployment and gross regional domestic product (GRDP) per capita. Population density is a proxy for the level of urbanization in the region. The distance between regional centers is a proxy for the difficulty and transaction cost in migrating. Unemployment approximates the insufficiency of economic opportunities in the region. GRDP per capita represents the overall economic development in the region. Tables 5 to 7 show the 2018 data on these variables.

Table 5. Population, land area, and population density per region, 2018

Region	Population	Land Area (sq. km.)	Population Density (people per sq. km.)
NCR	13,453,701	619.54	21,716
CAR	1,775,210	19,818.12	90
I	5,178,410	12,964.62	399
II	3,579,715	29,836.88	120
III	11,890,314	21,906.19	543
IV-A	15,418,944	16,576.26	930
IV-B	3,094,357	29,606.25	105
V	6,005,949	18,114.47	332
VI	7,763,898	20,778.29	374
VII	7,745,017	15,872.58	488
VIII	4,619,183	23,234.78	199
IX	3,724,550	16,904.03	220
X	4,892,512	20,458.51	239
XI	5,129,342	20,433.38	251
XII	4,777,419	22,786.08	210
XIII	2,692,072	21,120.56	127
ARMM	4,014,587	36,650.95	110

Note: NCR - National Capital Region; CAR - Cordillera Administrative Region; ARMM - Autonomous Region in Muslim Mindanao. Population density is computed as the number of persons per square kilometer (sq. km.) using the PSA's updated projected 2018 mid-year population based on the 2015 census of population (2019) and land area from the 2013 Land Area Masterlist of Cities and Municipalities (PSA 2021).

Sources: PSA (2019, 2021a)

Table 6. Distances between regional centers (km)

Region	NCR	CAR	I	II	III	IV-A	IV-B	V	VI	VII	VIII	IX	X	XI	XII	XIII
CAR	206.44															
I	235.91	37.23														
II	345.33	180.22	186.76													
III	119.97	100.18	121.66	270.89												
IV-A	47.32	252.87	282.99	384.08	167.1											
IV-B	133.23	339.62	368.32	470.98	249.16	88.18										
V	339.09	497	533.81	542.38	445.56	303.15	278.41									
VI	441.19	644.6	676.26	660.64	560.54	393.87	313.53	273.93								
VII	574.69	769.56	803.68	847.77	694.43	528.15	456.74	317.31	162.2							
VIII	574.74	747.4	783.85	792.06	688.7	532.66	481.34	252.48	267.21	160.66						
IX	799.93	1004.62	1035.67	1105.05	918.27	752.73	669.32	592.42	360.6	279.47	417.76					
X	789.63	986.83	1020.59	1064.81	909.6	742.68	667.29	528.5	356.64	218.03	310.66	151.31				
XI	979	1174.99	1209.08	1247.28	1098.93	932.13	857.07	706.61	545.94	405.43	469.75	254.18	189.77			
XII	995.24	1196.55	1229.23	1282.34	1114.89	947.93	868	748.91	554.6	434.73	528.24	214.21	221	105.31		
XIII	801.03	988.96	1024.27	1048.71	919.77	755.41	688.02	506.33	393.52	233.67	261.93	262.94	111.63	209.81	283.03	
ARMM	919.01	1118.56	1151.78	1200.3	1038.91	871.81	793.73	664.83	480.41	352.63	442.57	168.79	136.34	85.72	85.69	201.17

Note: Distance was measured using the straight flying distance between the regional centers by the calculator found in <https://www.gps-coordinates.net/distance>. The regional centers used are the cities designated by the national government through various issuances as regional government centers, which are as follows: NCR – Manila; CAR – Baguio; Region I – San Fernando, La Union; Region II – Tuguegarao; Region III – Tarlac; Region IV-A – Calamba; Region IV-B – Calapan; Region V – Legazpi, Albay; Region VI – Iloilo; Region VII – Cebu; Region VIII – Tacloban; Region IX – Pagadian; Region X – Cagayan de Oro; Region XI – Davao; Region XII – Koronadal; Region XIII – Butuan; and ARMM – Cotabato.

Source: Author's estimates.

Table 7. Unemployment and GRDP per capita per region, 2018

Region	Unemployment Rate (%)	GRDP per capita (PHP)
NCR	6.59	432,181
CAR	4.11	173,651
I	6.80	113,471
II	3.00	107,568
III	5.77	173,452
IV-A	6.56	175,563
IV-B	4.66	119,813
V	4.89	86,916
VI	5.34	110,783
VII	5.32	152,478
VIII	4.21	96,204
IX	4.13	101,872
X	4.06	167,832
XI	4.30	164,042
XII	3.91	106,737
XIII	4.04	107,932
ARMM	3.73	51,898

Note: PHP - Philippine pesos; NCR - National Capital Region; CAR - Cordillera Administrative Region; ARMM - Autonomous Region in Muslim Mindanao.

Source: PSA (2018, 2019, 2021b).

3.4 Regression results and interpretation

For the Philippine inter-regional migration flows, the specific Poisson regression model that was estimated is

$$\ln(E[MIG_{ij}|x_i]) = \beta_0 + \beta_1 DIST_{ij} + \beta_2 POPDEN_i + \beta_3 POPDEN_j + \beta_4 UNE_i + \beta_5 UNE_j + \beta_6 GRDPCAP_i + \beta_7 GRDPCAP_j + \beta_8 INFRA_i + \beta_9 INFRA_j$$

Equation 5

where the dependent variable MIG_{ij} is the number of migrants from origin region i to destination region j , based on the 2018 National Migration Survey. The independent or explanatory variables also use 2018 data. $DIST_{ij}$ is distance in kilometers between the capital of region i and the capital of region j , $POPDEN_i$ is population density in region i , $POPDEN_j$ is population density in region j , UNE_i is unemployment rate in region i , UNE_j is unemployment rate in region j , $GRDPCAP_i$ is GRDP per capita in region i , $GRDPCAP_j$ is GRDP per capita in region j , $INFRA_i$ is the

infrastructure development index in region i , and $INFRA_j$ is the infrastructure development index in region j .

Running the Poisson regression using STATA version 16.0 produced the following results, which passed statistical significance testing, including the significance of the coefficients.

Table 8. Regression results

MIG_{ij}	Coefficient	SE	z	P> z	95% Confidence Interval	
$DIST_{ij}$	-0.0024533	9.69e-06	-253.25	0.000	-0.0024723	-0.0024343
$POPDEN_i$	-0.0001444	1.75e-06	-82.59	0.000	-0.0001478	-0.000141
$POPDEN_j$	0.0003998	1.52e-06	262.35	0.000	0.0003968	0.0004028
UNE_i	0.3583515	0.0052232	68.61	0.000	0.3481143	0.3685888
UNE_j	-0.2363582	0.0028174	-83.89	0.000	-0.2418803	-0.2308362
$GRDPCAP_i$	0.0000111	1.72e-07	64.91	0.000	0.0000108	0.0000115
$GRDPCAP_j$	-0.000029	1.22e-07	-237.51	0.000	-0.0000292	-0.0000288
$INFRA_i$	0.065002	0.0008763	74.18	0.000	0.0632844	0.0667196
$INFRA_j$	0.0334793	0.0004374	76.55	0.000	0.0326221	0.0343365
Constant	3.460077	0.0239741	144.33	0.000	3.413089	3.507065

Log likelihood = -184894.64

Number of observations = 272

LR $\chi^2(9) = 473339.13$

Prob > $\chi^2 = 0.0000$

Pseudo $R^2 = 0.5614$

Source: Author's calculations.

Each Poisson regression coefficient above is interpreted as follows: it is the expected change, on the log scale, in the outcome MIG_{ij} per unit change in the independent variable, holding the other independent variables constant. Another intuitive result that exponentiates the coefficients can also be derived, as follows.

Table 9. Exponentiated coefficients

Variable	Exponentiated coefficient
$DIST_{ij}$	0.9975497
$POPDEN_i$	0.9998556
$POPDEN_j$	1.0004
UNE_i	1.430969
UNE_j	0.7894978
$GRDPCAP_i$	1.000011
$GRDPCAP_j$	0.999971
$INFRA_i$	1.067161
$INFRA_j$	1.034046
Constant	31.81943

Source: Author's calculations.

The above means that a unit increase in the independent variable is associated with a change in the dependent variable by a factor equivalent to the exponentiated coefficients. Thus, a kilometer increase in the distance between the origin region and destination region, $DIST_{ij}$, is associated with a change in migration flow by a factor of 0.9975497, or a decrease of 0.25 percent; a square meter increase in the population density of origin region i , $POPDEN_i$, is associated with a change in migration flow by a factor of 0.9998556, or a decrease of 0.01 percent; a square meter increase in the population density in destination region j , $POPDEN_j$, is associated with a change in migration flow by a factor of 1.0004, or an increase of 0.04 percent; and so on. The constant is the baseline change in migration flow when all the independent variables are zero.

As shown in Table 8 above, the coefficient for $DIST_{ij}$ is negative, and the magnitude of the effect is a 0.25 percent increase in migration flow as distance increases by 1 km (while holding other variables constant). That distance has a negative effect on migration is to be expected because distance poses difficulty and additional cost (e.g., transportation cost) for potential migrants.

Focusing more on the signs of the coefficients and less on their magnitudes, we can derive some interesting interpretations of the relationship between migration and the other explanatory variables. The coefficient of $POPDEN_i$ is negative, which is intuitive as population density is a proxy for the level of urbanization. As urbanization in the origin region increases, the attendant availability of modern living in urban areas dampens the tendency for its residents to out-migrate. The coefficient of $POPDEN_j$ is positive, meaning that as population density or the level of urbanization in the destination region increases, it becomes attractive to migrants.

The coefficient of $GRDPCAP_i$ is positive, which is acceptable if we deem that higher per capita income facilitates migration out of region i ; the coefficient of $GRDPCAP_j$ is negative, which is counterintuitive because high per capita incomes in destination regions are supposed to be attractive to migrants. Examining the actual data shows that this is likely due to the presence of highly skewed distribution for GRDP per capita, where the NCR per capita income is a high multiple of the per capita income in other regions (e.g., NCR per capita income was 8.33 times the ARMM per capita income in 2018), and the fact that the NCR experienced net outmigration in 2018. However, removing NCR as an outlier results in fewer observations for all variables because of its pairing with 15 other regions. Since it is only in the GRDP per capita where the NCR is an extreme outlier, it is retained in the regression, but with the caveat that the interested researcher in iterations of this (i.e., using results of the PSA's future nationwide migration surveys) should retest the relationship between GRDP per capita and migration.

The results for unemployment are as expected. The coefficient of UNE_i is positive, indicating that high unemployment in a region gives potential migrants an additional economic incentive to leave and look for jobs elsewhere. The coefficient of UNE_j is negative, meaning that as unemployment in the destination region increases, it becomes less attractive as a migration destination.

The results for the infrastructure variables are interesting. Both $INFRA_i$ and $INFRA_j$ coefficients have positive signs, meaning, positive effects on migration. As the level of infrastructure development in origin region i increases, migration outflow from region i is facilitated; as the level

of infrastructure development in destination region j increases, region j becomes more attractive as a migration destination.

3.5 Relating the results to an engineered return migration policy

The usefulness of the findings above to policy analysis can be demonstrated by relating it to the *Balik-Probinsya, Bagong Pag-asa* Program (dubbed “BP²” program by the implementing agencies). This program was designed to “reverse migration to the NCR and other congested metropolises” (Executive Order 114, s. 2020, par. 8) through direct assistance for relocating beneficiary migrants and programs on livelihood, housing, and social welfare once the beneficiaries reach their destination provinces. Based on the Implementing Guidelines of EO 114, the target beneficiaries are low-income families that opt to avail of the program “due to, but not limited to, the following circumstances: (a) voluntary decision to return to the provinces; (b) loss of job or other sources of income; (c) unsafe current dwelling places; or (d) exposure to health and safety risks and other environmental hazards” (*Balik-Probinsya, Bagong Pag-asa* Council 2020, Section 3.3).

Issued during the height of the Coronavirus Disease 2019 (COVID-19) pandemic and not yet recalled as of this writing, EO 114 s. 2020 mandates various government agencies, through a whole-of-government approach, to collectively assist beneficiaries in relocating to the provinces. The EO also mandates the implementing government agencies to use their regular budget in their assigned activities. The medium- to long-term plan is to transfer the responsibility of relocating beneficiaries to local government units. The program is, in effect, an engineered return migration policy. But should this kind of engineering the Philippines’ internal migration be pursued in the first place? Is it sustainable?

As of June 27, 2022, the National Housing Authority (NHA) as program secretariat reported a total of 7,152 principal beneficiaries (either household head or individual if the relocating beneficiary is a single person) or a total of 24,499 individual beneficiaries (see Table 10). The beneficiaries received varying levels of support including direct transportation service, transportation allowance, livelihood assistance, family emergency assistance, subsistence allowance, education assistance, and housing support.

Table 10. BP² Program Beneficiaries as of June 27, 2022

	<u>2020</u>		<u>2021</u>		<u>2022 (as of June 27, 2022)</u>		<u>Total, 2020-2022</u>	
	Principal Beneficiaries	Individual Beneficiaries	Principal Beneficiaries	Individual Beneficiaries	Principal Beneficiaries	Individual Beneficiaries	Principal Beneficiaries	Individual Beneficiaries
NHA Dispatch Operations	82	101	124	454	84	333	290	888
DSWD Dispatch Operations					115	457	115	457
Returned on their own:								
With issued Certificates of Eligibility (COEs)			2,533	7,939	1,848	6,296	4,381	14,235
With pending COEs					2,366	8,919	2,366	8,919
Total beneficiaries	82	101	2,657	8,393	4,413	16,005	7,152	24,499

Note: The principal beneficiary is either the household head if a whole family is relocating or an individual if a single person is relocating.

“NHA dispatch operations” and “DSWD dispatch operations” refer to the transport-related assistance from the NHA and the DSWD, respectively, in relocating beneficiaries to the provinces.

“Returned on their own” refers to eligible BP2 beneficiaries’ shouldering on their own their transport cost in relocating to the province.

“With pending COEs” are those tagged as eligible but has not been issued certificates of eligibility as of June 27, 2022.

Source: NHA's December 13, 2022 reply letter to PIDS with subject "Validated Figures of Balik Probinsya, Bagong Pag-Asa (BP2) Program Beneficiaries".

In terms of number of beneficiaries assisted, the DSWD is the largest contributor to the program. It reported that from May 6, 2020 to October 31, 2022, it had served 6,659 families or 17,342 individuals as part of its contribution to the BP² program.¹⁰ In terms of funding support, however, it is not clear how much were contributed by the implementing agencies as the monitoring system is not set up to enable a systematic tracking of spending specifically for BP² only. For example, in the Department of Agriculture (DA)'s Adaptation and Mitigation Initiative in Agriculture (AMIA) Village approach, which is a technology transfer and upskilling program for developing climate-resilient livelihoods, the DA only has aggregated data (or combined reporting of assistance to existing residents and BP² beneficiaries) from its AMIA villages.¹¹ Moreover, the COA on June 30, 2023 flagged certain parts of the spending for the BP² program when it released its 2022 audit of the NHA operations. Particularly, it deemed certain BP² expenses "excessive", flagged the huge PHP82 million spending on infrastructure projects, and questioned the plans for the idle satellite offices, multipurpose centers, other structures and land improvements, and equipment (COA 2023).

The data in Table 10 suggest that many BP² program beneficiaries did not need government transport support in relocating to the provinces as most of them (94.51%) returned on their own. This suggests that families or individuals wanting to relocate to the provinces are to some extent capable of doing so without government intervention. The data on net migration in the 2018 NMS also suggests that even before the COVID-19 pandemic and without the BP² program, a pattern of return migration had already been happening. Particularly, the 2018 NMS recorded negative net in-migration in the NCR, Region III, Region IV-A, Region VI, and Region VII (see Table 11).

Table 11. In-migration and out-migration per region in 2018

Region	In-migration	Out-migration	Net in-migration
NCR	121,784	292,484	-170,700
CAR	15,927	10,043	5,884
I	30,175	23,711	6,464
II	23,522	17,256	6,266
III	25,245	55,103	-29,858
IV-A	90,419	128,450	-38,031
IV-B	25,146	3,156	21,990
V	116,186	33,799	82,387
VI	28,566	36,587	-8,021

¹⁰ DSWD's December 1, 2022 reply letter to PIDS with subject "Request for Balik Probinsya, Bagong Pag-Asa (BP2) Program Accomplishment".

¹¹ DA's discussion during the November 24, 2022 Balik-Probinsya, Bagong Pag-asa Program Short Term Interventions Cluster Third General Meeting

Region	In-migration	Out-migration	Net in-migration
VII	36,460	50,005	-13,545
VIII	96,679	32,163	64,516
IX	40,534	22,035	18,499
X	34,796	24,752	10,044
XI	45,106	39,232	5,874
XII	36,301	22,625	13,676
XIII	32,346	27,960	4,386
ARMM	47,875	27,707	20,168

Note: A negative net in-migration, or positive net out-migration, means more people moved out than in during the period.

Source: PSA and UPPI (2019).

Moreover, the National Spatial Strategy under the Philippine Development Plan 2017-2022 also exhorted government agencies and local government units to pursue programs and projects on regional development that would decongest cities. It is possible that the relevant national and local public investment programs, such as road projects that aim to connect the missing links between growth centers and rural areas, that supposedly include the objectives of the National Spatial Strategy had influenced the return migration.

Overall, the results of the econometric regression in the previous section and the data on aggregate negative net in-migration in certain regions indicate that return migration, and migration in general, is a phenomenon. It is a phenomenon that cannot be forced, although it can be enhanced by influencing the determinants of migration, such as by designing infrastructure investments in a way that reduces inequities across regions. Continuing the BP² program will therefore not be sustainable as it is attempting to force a result that has determining factors more complex than transport, livelihood, and housing assistance. In addition, the BP² program monitoring procedure does not lend itself easily to tracking the expenses for accountability purposes¹² and the program design does not have a results-based monitoring and evaluation (i.e., there is no way of monitoring that the BP² beneficiaries will not go back to the cities).

The type of *balik-probinsya* that is more sustainable and requires less resources is as a social welfare service option for homeless individuals roaming the streets, which was implemented by the DSWD in 2003 onwards (DSWD 2003) and redesigned under the DSWD's *Oplan Pag-Abot* (DSWD 2023). It is not a return migration policy. Instead, it recognizes that the options for street dwellers need to be expanded beyond sheltering them in residential care facilities being run by government and private charity organizations. It requires less resources given that the target

¹² There is periodic reporting per agency in every inter-agency meeting, but some government agencies in their reports use principal beneficiaries and individual beneficiaries interchangeably, making it difficult to assess the cost effectiveness of the BP² program in terms unit cost of spending or government spending per beneficiary. Other government agencies also commingle their accounting for BP² beneficiaries with the accounting for existing beneficiaries of their regular programs that are deemed part of the assistance to BP² beneficiaries.

beneficiaries are expected to be smaller. This kind of government intervention recognizes that the aim of public spending is to protect the homeless from the risks of living in the streets and not to engineer a large-scale return migration from urban to rural areas. It does not treat migration as a problem; rather, it focuses on the true problem—homelessness.

4. Conclusion and policy implications

This study shows that despite the uneven availability of infrastructure indicators at the subnational level, a subnational infrastructure development index for benchmarking across regions can be constructed. Given the available data, the constructed regional infrastructure development index is a composite of road transport connectivity and quality indicators and access indicators related to ICT, electricity and potable water supply. This study also demonstrates that aside from the use of the index in benchmarking and cross-regional comparisons, it can also be used to analyze policies such as the policy on engineered return migration called *Balik Probinsya, Bagong Pag-Asa* program.

The relationships established through econometric regression using the regional infrastructure development index and other determinants show that migration is a phenomenon. Migrants vote with their feet and choose destinations with demographic (e.g., urbanization) and economic (e.g., transaction cost, infrastructure, employment, and economic output) characteristics that fit their needs. Engineering the return to destinations that Filipino migrants voted out in the first place does not guarantee that they will stay there given these demographic and economic factors. The resources spent on such engineering can be used instead for programs that minimize inequities in the economic characteristics of geographic areas (such as by improving infrastructure to attract investments and jobs). This is expected to be more sustainable.

That infrastructure development has a positive influence on migration, as shown in the regression results, reinforces the notion that migration should not be viewed as a problem. It is a phenomenon that cannot be forced and can even create human resource-related opportunities in the destination areas. Although there are attendant problems to congestion in cities due to the inadequate management of areas where migrants converge (e.g., informal settlements), these can be more effectively solved using means other than an engineered return migration scheme.

As a populist policy, return migration programs will still likely be attractive to Philippine politician policymakers in the future. Politicians will have much to gain as name recall takes effect when benefits are doled out to program beneficiaries. Going forward, it will help policymakers in executing agencies to assess the continuation of the *Balik Probinsya, Bagong Pag-Asa* program and any future engineered return migration policy by viewing migration as a phenomenon and a response to changes in the economic characteristics of geographic areas.

Future research in the area of migration is also encouraged. This study can be replicated when data availability has improved, for example, after the deficiencies in the infrastructure indicators data have been addressed, and when another round of the National Migration Survey has been conducted. Because migration increases congestion in cities, migration-induced congestion is also a research topic that policy researchers can explore in the future.

Appendix - Inter-regional migration flows in the Philippines, 2018

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
Cordillera Administrative Region	National Capital Region	0
I - Ilocos Region	National Capital Region	0
II - Cagayan Valley	National Capital Region	0
III - Central Luzon	National Capital Region	0
IVA - CALABARZON	National Capital Region	12432
MIMAROPA Region	National Capital Region	0
V - Bicol	National Capital Region	0
VI - Western Visayas	National Capital Region	0
VII - Central Visayas	National Capital Region	0
VIII - Eastern Visayas	National Capital Region	280
IX - Zamboanga Peninsula	National Capital Region	0
X - Northern Mindanao	National Capital Region	0
XI - Davao	National Capital Region	0
XII - SOCCSKSARGEN	National Capital Region	0
XIII - Caraga	National Capital Region	0
ARMM	National Capital Region	0
National Capital Region	Cordillera Administrative Region	182
I - Ilocos Region	Cordillera Administrative Region	326
II - Cagayan Valley	Cordillera Administrative Region	2226
III - Central Luzon	Cordillera Administrative Region	0
IVA - CALABARZON	Cordillera Administrative Region	212
MIMAROPA Region	Cordillera Administrative Region	0
V - Bicol	Cordillera Administrative Region	0
VI - Western Visayas	Cordillera Administrative Region	215
VII - Central Visayas	Cordillera Administrative Region	0
VIII - Eastern Visayas	Cordillera Administrative Region	0
IX - Zamboanga Peninsula	Cordillera Administrative Region	0
X - Northern Mindanao	Cordillera Administrative Region	0
XI - Davao	Cordillera Administrative Region	0
XII - SOCCSKSARGEN	Cordillera Administrative Region	0
XIII - Caraga	Cordillera Administrative Region	0
ARMM	Cordillera Administrative Region	0
National Capital Region	I - Ilocos Region	5077
Cordillera Administrative Region	I - Ilocos Region	2706
II - Cagayan Valley	I - Ilocos Region	0

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
III - Central Luzon	I - Ilocos Region	0
IVA - CALABARZON	I - Ilocos Region	1210
MIMAROPA Region	I - Ilocos Region	0
V - Bicol	I - Ilocos Region	0
VI - Western Visayas	I - Ilocos Region	0
VII - Central Visayas	I - Ilocos Region	0
VIII - Eastern Visayas	I - Ilocos Region	0
IX - Zamboanga Peninsula	I - Ilocos Region	0
X - Northern Mindanao	I - Ilocos Region	0
XI - Davao	I - Ilocos Region	0
XII - SOCCSKSARGEN	I - Ilocos Region	0
XIII - Caraga	I - Ilocos Region	0
ARMM	I - Ilocos Region	0
National Capital Region	II - Cagayan Valley	3566
Cordillera Administrative Region	II - Cagayan Valley	1475
I - Ilocos Region	II - Cagayan Valley	731
III - Central Luzon	II - Cagayan Valley	0
IVA - CALABARZON	II - Cagayan Valley	0
MIMAROPA Region	II - Cagayan Valley	0
V - Bicol	II - Cagayan Valley	0
VI - Western Visayas	II - Cagayan Valley	0
VII - Central Visayas	II - Cagayan Valley	0
VIII - Eastern Visayas	II - Cagayan Valley	0
IX - Zamboanga Peninsula	II - Cagayan Valley	0
X - Northern Mindanao	II - Cagayan Valley	0
XI - Davao	II - Cagayan Valley	0
XII - SOCCSKSARGEN	II - Cagayan Valley	0
XIII - Caraga	II - Cagayan Valley	0
ARMM	II - Cagayan Valley	0
National Capital Region	III - Central Luzon	0
Cordillera Administrative Region	III - Central Luzon	0
I - Ilocos Region	III - Central Luzon	0
II - Cagayan Valley	III - Central Luzon	0
IVA - CALABARZON	III - Central Luzon	0
MIMAROPA Region	III - Central Luzon	0
V - Bicol	III - Central Luzon	0
VI - Western Visayas	III - Central Luzon	0
VII - Central Visayas	III - Central Luzon	0
VIII - Eastern Visayas	III - Central Luzon	0

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
IX - Zamboanga Peninsula	III - Central Luzon	0
X - Northern Mindanao	III - Central Luzon	0
XI - Davao	III - Central Luzon	0
XII - SOCCSKSARGEN	III - Central Luzon	0
XIII - Caraga	III - Central Luzon	0
ARMM	III - Central Luzon	0
National Capital Region	IVA - CALABARZON	0
Cordillera Administrative Region	IVA - CALABARZON	0
I - Ilocos Region	IVA - CALABARZON	0
II - Cagayan Valley	IVA - CALABARZON	0
III - Central Luzon	IVA - CALABARZON	0
MIMAROPA Region	IVA - CALABARZON	0
V - Bicol	IVA - CALABARZON	0
VI - Western Visayas	IVA - CALABARZON	0
VII - Central Visayas	IVA - CALABARZON	0
VIII - Eastern Visayas	IVA - CALABARZON	0
IX - Zamboanga Peninsula	IVA - CALABARZON	0
X - Northern Mindanao	IVA - CALABARZON	0
XI - Davao	IVA - CALABARZON	0
XII - SOCCSKSARGEN	IVA - CALABARZON	0
XIII - Caraga	IVA - CALABARZON	0
ARMM	IVA - CALABARZON	0
National Capital Region	MIMAROPA Region	5077
Cordillera Administrative Region	MIMAROPA Region	0
I - Ilocos Region	MIMAROPA Region	0
II - Cagayan Valley	MIMAROPA Region	0
III - Central Luzon	MIMAROPA Region	0
IVA - CALABARZON	MIMAROPA Region	5071
V - Bicol	MIMAROPA Region	0
VI - Western Visayas	MIMAROPA Region	0
VII - Central Visayas	MIMAROPA Region	0
VIII - Eastern Visayas	MIMAROPA Region	0
IX - Zamboanga Peninsula	MIMAROPA Region	0
X - Northern Mindanao	MIMAROPA Region	0
XI - Davao	MIMAROPA Region	0
XII - SOCCSKSARGEN	MIMAROPA Region	0
XIII - Caraga	MIMAROPA Region	0
ARMM	MIMAROPA Region	0
National Capital Region	V - Bicol	24548

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
Cordillera Administrative Region	V - Bicol	0
I - Ilocos Region	V - Bicol	0
II - Cagayan Valley	V - Bicol	0
III - Central Luzon	V - Bicol	1562
IVA - CALABARZON	V - Bicol	22247
MIMAROPA Region	V - Bicol	1812
VI - Western Visayas	V - Bicol	0
VII - Central Visayas	V - Bicol	0
VIII - Eastern Visayas	V - Bicol	0
IX - Zamboanga Peninsula	V - Bicol	0
X - Northern Mindanao	V - Bicol	0
XI - Davao	V - Bicol	0
XII - SOCCSKSARGEN	V - Bicol	0
XIII - Caraga	V - Bicol	0
ARMM	V - Bicol	0
National Capital Region	VI - Western Visayas	1428
Cordillera Administrative Region	VI - Western Visayas	0
I - Ilocos Region	VI - Western Visayas	0
II - Cagayan Valley	VI - Western Visayas	0
III - Central Luzon	VI - Western Visayas	0
IVA - CALABARZON	VI - Western Visayas	951
MIMAROPA Region	VI - Western Visayas	0
V - Bicol	VI - Western Visayas	0
VII - Central Visayas	VI - Western Visayas	2121
VIII - Eastern Visayas	VI - Western Visayas	0
IX - Zamboanga Peninsula	VI - Western Visayas	0
X - Northern Mindanao	VI - Western Visayas	0
XI - Davao	VI - Western Visayas	0
XII - SOCCSKSARGEN	VI - Western Visayas	0
XIII - Caraga	VI - Western Visayas	0
ARMM	VI - Western Visayas	0
National Capital Region	VII - Central Visayas	2261
Cordillera Administrative Region	VII - Central Visayas	0
I - Ilocos Region	VII - Central Visayas	0
II - Cagayan Valley	VII - Central Visayas	0
III - Central Luzon	VII - Central Visayas	0
IVA - CALABARZON	VII - Central Visayas	2342
MIMAROPA Region	VII - Central Visayas	2022
V - Bicol	VII - Central Visayas	0

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
VI - Western Visayas	VII - Central Visayas	0
VIII - Eastern Visayas	VII - Central Visayas	2945
IX - Zamboanga Peninsula	VII - Central Visayas	0
X - Northern Mindanao	VII - Central Visayas	0
XI - Davao	VII - Central Visayas	0
XII - SOCCSKSARGEN	VII - Central Visayas	124
XIII - Caraga	VII - Central Visayas	0
ARMM	VII - Central Visayas	0
National Capital Region	VIII - Eastern Visayas	14811
Cordillera Administrative Region	VIII - Eastern Visayas	0
I - Ilocos Region	VIII - Eastern Visayas	0
II - Cagayan Valley	VIII - Eastern Visayas	0
III - Central Luzon	VIII - Eastern Visayas	8036
IVA - CALABARZON	VIII - Eastern Visayas	5369
MIMAROPA Region	VIII - Eastern Visayas	0
V - Bicol	VIII - Eastern Visayas	0
VI - Western Visayas	VIII - Eastern Visayas	0
VII - Central Visayas	VIII - Eastern Visayas	1912
IX - Zamboanga Peninsula	VIII - Eastern Visayas	0
X - Northern Mindanao	VIII - Eastern Visayas	0
XI - Davao	VIII - Eastern Visayas	0
XII - SOCCSKSARGEN	VIII - Eastern Visayas	0
XIII - Caraga	VIII - Eastern Visayas	0
ARMM	VIII - Eastern Visayas	0
National Capital Region	IX - Zamboanga Peninsula	6169
Cordillera Administrative Region	IX - Zamboanga Peninsula	0
I - Ilocos Region	IX - Zamboanga Peninsula	0
II - Cagayan Valley	IX - Zamboanga Peninsula	0
III - Central Luzon	IX - Zamboanga Peninsula	202
IVA - CALABARZON	IX - Zamboanga Peninsula	0
MIMAROPA Region	IX - Zamboanga Peninsula	0
V - Bicol	IX - Zamboanga Peninsula	0
VI - Western Visayas	IX - Zamboanga Peninsula	2518
VII - Central Visayas	IX - Zamboanga Peninsula	2842
VIII - Eastern Visayas	IX - Zamboanga Peninsula	0
X - Northern Mindanao	IX - Zamboanga Peninsula	1523
XI - Davao	IX - Zamboanga Peninsula	0
XII - SOCCSKSARGEN	IX - Zamboanga Peninsula	0
XIII - Caraga	IX - Zamboanga Peninsula	0

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
ARMM	IX - Zamboanga Peninsula	0
National Capital Region	X - Northern Mindanao	3705
Cordillera Administrative Region	X - Northern Mindanao	0
I - Ilocos Region	X - Northern Mindanao	0
II - Cagayan Valley	X - Northern Mindanao	0
III - Central Luzon	X - Northern Mindanao	2057
IVA - CALABARZON	X - Northern Mindanao	0
MIMAROPA Region	X - Northern Mindanao	0
V - Bicol	X - Northern Mindanao	0
VI - Western Visayas	X - Northern Mindanao	0
VII - Central Visayas	X - Northern Mindanao	0
VIII - Eastern Visayas	X - Northern Mindanao	0
IX - Zamboanga Peninsula	X - Northern Mindanao	990
XI - Davao	X - Northern Mindanao	0
XII - SOCCSKSARGEN	X - Northern Mindanao	0
XIII - Caraga	X - Northern Mindanao	0
ARMM	X - Northern Mindanao	0
National Capital Region	XI - Davao	3521
Cordillera Administrative Region	XI - Davao	0
I - Ilocos Region	XI - Davao	0
II - Cagayan Valley	XI - Davao	0
III - Central Luzon	XI - Davao	613
IVA - CALABARZON	XI - Davao	0
MIMAROPA Region	XI - Davao	0
V - Bicol	XI - Davao	626
VI - Western Visayas	XI - Davao	3629
VII - Central Visayas	XI - Davao	1231
VIII - Eastern Visayas	XI - Davao	0
IX - Zamboanga Peninsula	XI - Davao	0
X - Northern Mindanao	XI - Davao	0
XII - SOCCSKSARGEN	XI - Davao	1774
XIII - Caraga	XI - Davao	1241
ARMM	XI - Davao	0
National Capital Region	XII - SOCCSKSARGEN	0
Cordillera Administrative Region	XII - SOCCSKSARGEN	0
I - Ilocos Region	XII - SOCCSKSARGEN	0
II - Cagayan Valley	XII - SOCCSKSARGEN	0
III - Central Luzon	XII - SOCCSKSARGEN	0
IVA - CALABARZON	XII - SOCCSKSARGEN	0

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
MIMAROPA Region	XII - SOCCSKSARGEN	0
V - Bicol	XII - SOCCSKSARGEN	0
VI - Western Visayas	XII - SOCCSKSARGEN	0
VII - Central Visayas	XII - SOCCSKSARGEN	2736
VIII - Eastern Visayas	XII - SOCCSKSARGEN	0
IX - Zamboanga Peninsula	XII - SOCCSKSARGEN	0
X - Northern Mindanao	XII - SOCCSKSARGEN	846
XI - Davao	XII - SOCCSKSARGEN	0
XIII - Caraga	XII - SOCCSKSARGEN	638
ARMM	XII - SOCCSKSARGEN	0
National Capital Region	XIII - Caraga	2811
Cordillera Administrative Region	XIII - Caraga	0
I - Ilocos Region	XIII - Caraga	0
II - Cagayan Valley	XIII - Caraga	0
III - Central Luzon	XIII - Caraga	0
IVA - CALABARZON	XIII - Caraga	0
MIMAROPA Region	XIII - Caraga	0
V - Bicol	XIII - Caraga	0
VI - Western Visayas	XIII - Caraga	0
VII - Central Visayas	XIII - Caraga	0
VIII - Eastern Visayas	XIII - Caraga	0
IX - Zamboanga Peninsula	XIII - Caraga	0
X - Northern Mindanao	XIII - Caraga	3176
XI - Davao	XIII - Caraga	0
XII - SOCCSKSARGEN	XIII - Caraga	0
ARMM	XIII - Caraga	0
National Capital Region	ARMM	3802
Cordillera Administrative Region	ARMM	0
I - Ilocos Region	ARMM	1745
II - Cagayan Valley	ARMM	0
III - Central Luzon	ARMM	0
IVA - CALABARZON	ARMM	0
MIMAROPA Region	ARMM	0
V - Bicol	ARMM	0
VI - Western Visayas	ARMM	0
VII - Central Visayas	ARMM	0
VIII - Eastern Visayas	ARMM	0
IX - Zamboanga Peninsula	ARMM	1492
X - Northern Mindanao	ARMM	6605

<i>Origin Region i</i>	<i>Destination Region j</i>	<i>Migration, M_{ij}</i>
XI - Davao	ARMM	3331
XII - SOCCSKSARGEN	ARMM	2608
XIII - Caraga	ARMM	0

Source: PSA and UPPI (2019).

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