

SECTOR AND SPATIAL-SPECIFIC MULTIPLIERS IN NUSA TENGGERA ISLANDS' ECONOMY: AN INTER-ISLAND INPUT- OUTPUT ANALYSIS

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ABSTRACT

This paper aimed to provide the results of analysis on total and flow-on multipliers, sector-specific, and spatial-specific multipliers in Nusa Tenggara Islands' economy, mainly for planning and evaluation purposes. These Islands consist of three provinces: Bali, West Nusa Tenggara and East Nusa Tenggara. The model employed was Inter-Island Input-Output Model (IIOM) developed using new hybrid procedures with special attention on Island economy. Data used for model were updated Indonesian data for the year of 2015. The results show that firstly, the important sectors of Nusa Tenggara Island economy could be based on total multipliers and flow-on effects of output, income and employment. Secondly, important economic sectors could be based on sector-specific multipliers effects; multipliers that occurred in own sector and other sectors. Thirdly, important economic sectors could be based on spatial-specific multipliers; multipliers that occurred both in own region and other regions. Fourthly, important economic sectors could be based on spatial distribution of flow-on; flow-on effects that occurred in own region as well as in other regions.

Keywords: Total Multiplier; Flow-on Multipliers; Sector-Specific Multipliers; Spatial-Specific Multipliers

1. INTRODUCTION

Nusa Tenggara Islands or The Lesser Sunda Islands or Kepulauan Sunda Kecil ("Southeastern Islands") is a group of islands in Maritime Southeast Asia, north of Australia. Together with the Greater Sunda Islands to the west they make up the Sunda Islands. The islands are part of a volcanic arc, the Sunda Arc, formed by sub-duction along the Sunda Trench in the Java Sea. The main Lesser Sunda Islands are, from west to east: Bali, Lombok, Sumbawa, Flores, Sumba, Timor, Alor archipelago, Barat Daya Islands, and Tanimbar Islands (Wikipedia, 2016).

Nusa Tenggara Islands comprise many islands, most of which are part of Indonesia and are administered as the provinces of Bali with Denpasar as capital city, West Nusa Tenggara with Mataram as capital city, and East Nusa Tenggara with Kupang as capital city (Anonymous, 2015). The province of Bali includes the island of Bali and a few smaller neighboring islands, notably Nusa Penida, Nusa Lembongan, and Nusa Ceningan. It is located at the westernmost end of the Lesser Sunda Islands, between Java to the west and Lombok to the east. Its capital, Denpasar, is located in the southern part of the island. The island is home to most of Indonesia's Hindu minority. According to the 2010 Census, 83.5 per cent of Bali's population adhered to Balinese Hinduism, followed by 13.4 per cent Muslim, Christianity at 2.5 per cent, and Buddhism 0.5 per cent (Anonymous, 2015).

West Nusa Tenggara (Indonesian: *Nusa Tenggara Barat* – NTB) is a province of Indonesia. It comprises the western portion of the Lesser Sunda Islands, with the exception of Bali which is its own province. Mataram, on Lombok, is the capital and largest city of the province. The province's area is 19,708.79 km². The two largest islands in the province are Lombok in the west and the larger Sumbawa in the east (Anonymous, 2015). East Nusa Tenggara (Indonesian: *Nusa Tenggara Timur* – NTT) is the southernmost province of Indonesia. It is located in the eastern part of the Lesser Sunda Islands and includes West Timor. It has a total area of 48,718.1 km² (Wikipedia, 2016). The provincial capital is Kupang on West Timor. The province consists of more than 500 islands, the three largest being Flores, Sumba, and the western half of Timor (West Timor)

According to Prihawantoro, et al (2013), the main economic activities in Nusa Tenggara Island were Sector-1; Agriculture, livestock and fishery in all provinces, Sector-6: Trade, hotel and restaurant (only in Bali). Bali-Nusa Tenggara contribution to national economy less than 3 per cent (Harian Aktual, December 2015), but Bali position as international tourist destination is very important. According to Tribunenews (2016), Bali's economic growth (10.3%) was far above national economic growth (5.02%).

In macroeconomics, a multiplier is a factor of proportionality that measures how much an endogenous variable changes in response to a change in some exogenous variable (Dornbusch, R., & Stanley, F., 1994; McConnell, C., et. al, 2011; Pindyck, R & Rubinfeld, D., 2012). In monetary microeconomics and banking, the money multiplier measures how much the money supply increases in response to a change in the monetary base (Krugman & Wells 2009; Mankiw, 2008). Multipliers can be calculated to analyze the effects of fiscal policy, or other exogenous changes in spending, on aggregate output. Other types of fiscal multipliers can also be calculated, like multipliers that describe the effects of changing taxes.

Literature on the calculation of Keynesian multipliers traces back to Richard Kahn's description of an employment multiplier for government expenditure during a period of high unemployment. At this early stage, Kahn's calculations recognize the importance of supply constraints and possible increases in the general price level resulting from additional spending in the national economy (Ahiakpor, J.C.W., 2000). Hall (2009) discusses the way that behavioral assumptions about employment and spending affect econometrically estimated Keynesian multipliers.

The literature on the calculation of I-O multipliers traces back to Leontief's work in 1951, which developed a set of national level multipliers that could be used to estimate the economy-wide effect that an initial change in final demand has on an economy. Isard then applied input-output analysis to a regional economy (Muchdie, 2011). The first attempt to create regional multipliers by adjusting national data with regional data was Moore & Peterson in 1955 for the state of Utah. In a parallel development, Tiebout in 1956 specified a model of regional economic growth that focuses on regional exports. His economic base multipliers are based on a model that separates production sold to consumers from outside the region to production sold to consumers in the region. The magnitude of his multiplier is based on the regional supply chain and local consumer spending (Muchdie, 2011).

In a survey of input-output and economic base multipliers, Richardson notes the difficulty inherent in specifying the local share of spending. He notes the growth of survey-based regional input-output models in the 1960s and 1970s that allowed for more accurate estimation of local spending, though at a large cost in terms of resources (Muchdie, 2011). Beemiller (1990) of the BEA describes the use of primary data to improve the accuracy of regional multipliers. The literature on the use and misuse of regional multipliers and models is extensive. Coughlin & Mandelbaum (1991) provide an accessible introduction to regional I-O multipliers. They note that key limitations of regional I-O multipliers include the accuracy of leakage measures, the emphasis on short-term effects, the absence of supply constraints, and the inability to fully capture interregional feedback effects.

Grady & Muller (1988) argued that regional I-O models that include household spending should not be used and argue that cost-benefit analysis is the most appropriate tool for analyzing the benefits of particular programs. Mills (1993) noted the lack of budget constraints for governments and no role for government debt in regional IO models. As a result, in less than careful hands, regional I-O models can be interpreted to over-estimate the economic benefit of government spending projects. Hughes (2003) discussed the limitations of the application of multipliers and provides a checklist to consider when conducting regional impact studies. Harris (1997) discussed the application of regional multipliers in the context of tourism impact studies, one area where the multipliers are commonly misused. Siegfried, *et al* (2006) discussed the

application of regional multipliers in the context of college and university impact studies, another area where the multipliers are commonly misused.

Input-output analysis, also known as the inter-industry analysis, is the name given to an analytical work conducted by Leontief in the late 1930's. The fundamental purpose of the input-output framework is to analyze the interdependence of industries in an economy through market based transactions. Input-output analysis can provide important and timely information on the interrelationships in a regional economy and the impacts of changes on that economy (Muchdie, 2011).

The notion of multipliers rests upon the difference between the initial effect of an exogenous change (final demand) and the total effects of a change. Direct effects measure the response for a given industry given a change in final demand for that same industry. Indirect effects represent the response by all local industries from a change in final demand for a specific industry. Induced effects represent the response by all local industries caused by increased (decreased) expenditures of new household income and inter-institutional transfers generated (lost) from the direct and indirect effects of the change in final demand for a specific industry. Total effects are the sum of direct, indirect, and induced effects (West & Jensen, 1980; West et al, 1982; 1989).

One of the major uses of input-output information is to assess the effect on an economy of changes in elements that are exogenous to the model of that economy. The capabilities and usefulness of the Leontief inverse matrix which is the source of analytical power of the model are well known. However, the meaning and interpretations are sometimes confusing. West & Jensen in Muchdie (2011) clarified the meaning of some of the components of the multipliers and suggested a multiplier format which is consistent and simpler to interpret but retains the essence of the conventional multipliers.

The objective of this paper is to report the research in developing and applying a model that provides information on multipliers: total, flow-on, sectoral-specific and spatial-specific multipliers that can be used for evaluation and planning economic development in Nusa Tenggara Island. The most significant contribution of this paper is the calculation of sector-specific multipliers that could trace multipliers that occurs in own sector and other sectors as well as the calculation of spatial-specific multipliers; multipliers that occur in own island and other islands.

2. METHOD OF ANALYSIS

An inter-regional input-output model divides a national economy not only into sectors but also regions (Hulu, 1990 and West et.al, 1982; 1989). An industry in the Leontief model is split into as many regional sub-industries as there are regions. The table consists of two types of matrices

representing the two types of economic interdependence. The first are the intra-regional matrices, which are on the main diagonal showing the inter-sectoral transactions which occur within each region. The second are the trade matrices, termed inter-regional matrices, representing inter-industry trade flows between each pair of regions. These matrices show the specific inter-industry linkages between regions, allowing each economic activity to be identified by industry as well as by location.

The inter-regional model can be expressed similar to the equations for the national as well as the single region model. In the general case:

$${}^rX_i = \sum_j \sum_s {}^{rs}X_{ij} + \sum_s {}^{rs}Y_i; (i, j = 1, 2, \dots, n) \text{ and } (r, s = 1, 2, \dots, m) \quad (1)$$

There are $(m \times n)$ equations of this type for each sector in each region showing that the output of each sector is equal to the sales to all intermediate sectors in all regions plus sales to final demand in all regions.

The spatial input coefficients are derived in the same way as the direct input coefficients in the national or the single-region model. For region s , the spatial input coefficients are expressed as:

$${}^{rs}a_{ij} = {}^{rs}X_{ij} / {}^sX_j \quad (2)$$

Substituting (2) into (1):

$${}^rX_i = \sum_j \sum_s {}^{rs}a_{ij} {}^sX_j + \sum_s {}^{rs}Y_i; (i, j = 1, 2, \dots, n) \text{ and } (r, s = 1, 2, \dots, m) \quad (3)$$

Since equations (1) to (3) refer to general case, it is more convenient to refer specifically to each of the intra-regional and the inter-regional matrices:

$${}^rX_i = \sum_j {}^{rr}X_{ij} + \sum_j {}^{rs}X_{ij} + {}^rY_i; (i, j = 1, 2, \dots, n) \quad (4)$$

and

$${}^sX_i = \sum_j {}^{sr}X_{ij} + \sum_j {}^{ss}X_{ij} + {}^sY_i; (i, j = 1, 2, \dots, n) \quad (5)$$

From (4) and (5), it is possible to determine regionally defined input coefficients, according to the relevant intra-regional and inter-regional trade matrices:

$${}^{rr}a_{ij} = {}^{rr}X_{ij} / {}^rX_j \quad (6)$$

$${}^{rs}a_{ij} = {}^{rs}X_{ij} / {}^sX_j \quad (7)$$

$${}^{sr}a_{ij} = {}^{sr}X_{ij} / {}^rX_j \quad (8)$$

$${}^{ss}a_{ij} = {}^{ss}X_{ij} / {}^sX_j \quad (9)$$

Equations (6) and (9) present the familiar intra-regional direct input coefficients, while equations (7 and (8 represent inter-regional trade coefficients. Equations (6) to (9) can be substituted into equation (4) and (5) resulting the traditional input-output equations:

$${}^rX_i = \sum_j {}^{rr}a_{ij} {}^rX_j + \sum_j {}^{rs}a_{ij} {}^sX_j + {}^rY_i ; (i, j = 1,2,\dots,n) \tag{10}$$

and

$${}^sX_i = \sum_j {}^{sr}a_{ij} {}^rX_j + \sum_j {}^{ss}a_{ij} {}^sX_j + {}^sY_i ; (i, j = 1,2,\dots,n) \tag{11}$$

The equations outlined above can be extended in parallel to the national or single region input-output system. In matrix terms they can be expressed as:

$${}^r x = {}^{rr}A {}^r x + {}^r y \text{ or } {}^r x = (I - {}^{rr}A)^{-1} {}^r y \tag{12}$$

and

$${}^s x = {}^{ss}A {}^s x + {}^s y \text{ or } {}^s x = (I - {}^{ss}A)^{-1} {}^s y \tag{13}$$

where $(I - {}^{rr}A)^{-1}$ and $(I - {}^{ss}A)^{-1}$ are the inverse of the open inter-regional model. In general term, equation (12) and (13) can be written as:

$$x = Ax + y \text{ or } x = (I - A)^{-1} y \tag{14}$$

Since the regional input coefficients of equations (6) to (9) or the A matrix in equation (13) contains both technical and trade characteristics, Hartwick (1971) separated these input coefficients (${}^{rs}a_{ij}$) into trade coefficients (${}^{rst}_{ij}$) and technical coefficients (${}^s a_{ij}$). This separation is essentially the same as one that has been done for the single region model. Equation (13) can then be rewritten as:

$$x = T(Ax + y) \text{ or } x = (I - TA)^{-1} y \tag{15}$$

Method employed for constructing Indonesian Inter-regional Input-Output model was hybrid method that specified for studying Island economy of Indonesia. In this model, the regions were disaggregated into 5 regions, namely 5 big-group of Island, namely SUM for Sumatera Island, JAV for Java Island, KAL for Kalimantan Island, NUS for Nusa Tenggara Island and OTH for Other Island which includes Sulawesi, Maluku and Papua Islands. Meanwhile, economic activities were disaggregated into 9 economic sectors, namely: Sec-1 for Agriculture, livestock and fishery, Sec-2 for Mining and quarrying, Sec-3 for Manufacturing, Sec-4 for Electricity, water and gas, Sec-5 for Construction, Sec-6 for Trade, hotels and restaurants, Sec-7 for Transportation and communication, Sec-8 for Banking and other finance, and Sec-9: Other services.

The GIRIOT (Generation Inter-Regional Input-Output Tables) procedures proposed and developed by Muchdie (1998) and have been applied using Indonesian data for the year 1990 (Muchdie, 1998; 2011). The GIRIOT procedure consists of three stages, seven phases and twenty four steps. Stage I: Estimation of Regional Technical Coefficients, consists of two phases, namely Phase 1: Derivation of National Technical Coefficients and Phase 2: Adjustment for Regional Technology. Stage II: Estimation of Regional Input Coefficients, consists of two phases, namely Phase 3: Estimation of Intra-regional Input Coefficients, and Phase 4: Estimation of Inter-regional Input Coefficients, and Stage III: Derivation Transaction Tables, consists of three phases, namely Phase 5: Derivation of Initial Transaction Tables, Phase 6: Sectoral Aggregation, and Phase 7: Derivation of Final Transaction Tables. These procedures have been revisited, evaluated and up-dated by Indonesian data 2015.

One of the major uses of input-output information is to assess the effect on an economy of changes in elements that are exogenous to the model of that economy. The capabilities and usefulness of the Leontief inverse matrix which is the source of analytical power of the model are well known. However, the meaning and interpretations are sometimes confusing. West and Jensen (1980) clarified the meaning of some of the components of the multipliers and suggested a multiplier format which is consistent and simpler to interpret but retains the essence of the conventional multipliers.

Table 1: Component Effects of Output, Income and Employment Multipliers

Effects	Output	Income	Employment
Initial	1	h_j	e_j
First-round	$\sum a_{ij}$	$\sum a_{ij} h_i$	$\sum a_{ij} e_i$
Industrial-support	$\sum b_{ij} - 1 - \sum a_{ij}$	$\sum b_{ij} h_i - h_i - \sum a_{ij} h_i$	$\sum b_{ij} e_i - e_i - \sum a_{ij} e_i$
Consumption-induced	$\sum (b^{*ij} - b_{ij})$	$\sum (b^{*ij} h_i - b_{ij} h_i)$	$\sum (b^{*ij} e_i - b_{ij} e_i)$
Total	$\sum b^{*ij}$	$\sum b^{*ij} h_i$	$\sum b^{*ij} e_i$
Flow-on	$\sum b^{*ij} - 1$	$\sum b^{*ij} h_i - h_j$	$\sum b^{*ij} e_i - e_j$

Source: West, *et al* (1982; 1989).

Note: h_j is household income coefficient, e_j is employment output ratio, a_{ij} is direct input coefficients, b_{ij} is the element of open inverse of Leontief matrix, and b^{*ij} is the element of closed inverse Leontief matrix.

As a measurement of response to an economic stimulus, a multiplier expresses a cause and effect line of causality. In input-output analysis the stimulus is a change (increase or decrease) in sales to final demand. Similar to those in the single-region model, in the inter-regional model West *et.al*, (1982; 1989) defined the major categories of response as: initial, first-round, industrial-

support, consumption-induced, total and flow-on effects. Formulas of such effects are provided in Table 1.

Table 2: Inter-regional Sector-Specific and Region-Specific Multipliers

	Output	Income	Employment
Sector-Specific	$\sum {}^{rs}b^{*}_{ij}; r = 1,..m$	$\sum {}^{rs}b^{*}_{ij} {}^sh_i; r = 1,..m$	$\sum {}^{rs}b^{*}_{ij} {}^se_i; r = 1,..m$
Region-Specific	$\sum {}^{rs}b^{*}_{ij}; i = 1,..n$	$\sum {}^{rs}b^{*}_{ij} {}^sh_i; i = 1,..n$	$\sum {}^{rs}b^{*}_{ij} {}^se_i; i = 1,..n$

Source: DiPasquale & Polenske (1980).

Note : *r* and *s* are the *m* origin and destination regions, *i* and *j* are the *n* producing and purchasing sectors, ${}^{rs}b^{*}_{ij}$ is the element of closed inverse of Leontief matrix, *m* is the number of regions and *n* is the number of sectors.

DiPasquale & Polenske (1980) specify four types of multipliers, in which two of them are relevant in the context of the inter-regional input-output model; sector-specific and region-specific multipliers. Table 2 provides formula for the calculation of both sector-specific and region-specific multipliers for output, income and employment.

The inter-regional sector-specific multiplier expresses the inputs required from the whole economy to satisfy a unit expansion of a named sector’s exogenously determined final demand. The inter-regional region-specific multiplier quantifies the inputs required from all sectors in a specified region to satisfy the unit demand expansion in a given region.

Formula provided in Table 1 and Table 2 were used to calculate total and flow-on multipliers, sector-specific multipliers and spatial-specific multipliers.

3. RESULTS AND DISCUSSIONS

3.1. Total and Flow-on Effects

Table 3 and Figure 1 present total output, income and employment multipliers and flow-on effects in Nusa Tenggara Island. In term of output, the highest total multiplier was NUS-3 (Manufacturing in Nusa Tenggara Island), 2.837. It means that an increase of final demand of the sector by 1.000 would increase total output by 2.837 including the initial increase of 1.000. It was followed by NUS-4 (Electricity, water and gas in Nusa Tenggara Island), 2.819 meaning that an increase of final demand of that sector by 1.000 would increase total output by 2.819 including the initial increase of 1.000. The flow-on effect was 1.819. The lowest total multipliers was in NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Island), 1.620. An increase of final demand of that sector by 1.000 units would increase total output by 1.620 including the initial increase of 1.000.

Table 3: Total and Flow-on Effects: Output, Income and Employment

SECTOR	Output			Income			Employment		
	Initial	Flow-on	Total	Initial	Flow-on	Total	Initial	Flow-on	Total
NUS-1	1.000	0.620	1.620	0.187	0.124	0.311	0.981	0.260	1.241
NUS-2	1.000	1.145	2.145	0.349	0.234	0.583	1.923	0.393	2.316
NUS-3	1.000	1.837	2.837	0.114	0.328	0.442	0.386	0.784	1.170
NUS-4	1.000	1.819	2.819	0.091	0.305	0.396	0.422	0.494	0.916
NUS-5	1.000	1.531	2.531	0.165	0.290	0.455	0.422	0.465	0.887
NUS-6	1.000	1.011	2.011	0.158	0.198	0.356	0.232	0.441	0.673
NUS-7	1.000	1.262	2.262	0.182	0.292	0.474	0.422	0.484	0.906
NUS-8	1.000	0.885	1.885	0.243	0.185	0.428	0.422	0.316	0.738
NUS-9	1.000	1.520	2.520	0.485	0.314	0.799	0.307	0.596	0.903

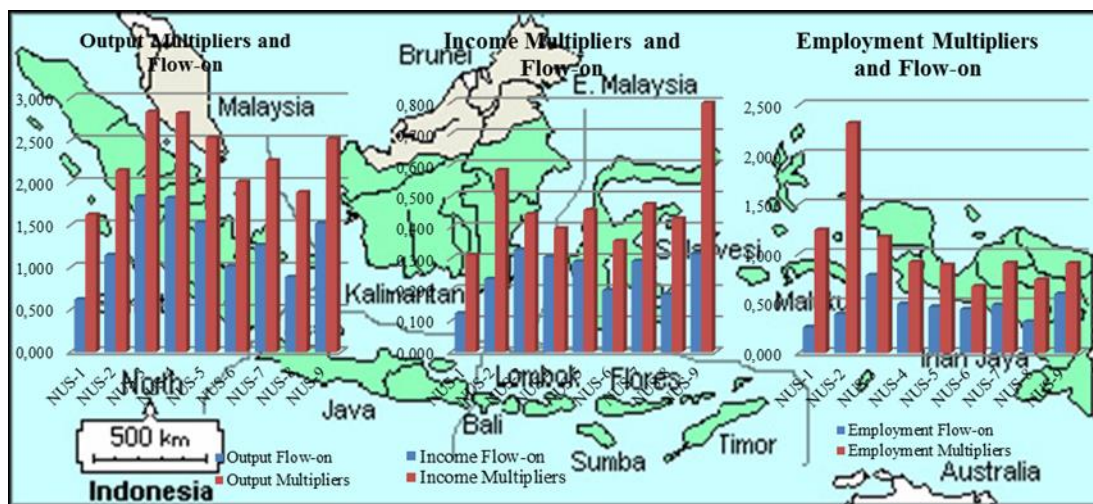


Figure 1: Total Multipliers and Flow-on Effects: Output, Income and Employment

Income flow-on effects were the difference between total income multipliers and initial income effects from the increase of final demand in that sector. It is the summation of direct, indirect and induced effects of an economic activity. For instance, in NUS-3 (Manufacturing in Nusa Tenggara Island), the increase of final demand by 1.000 would have initial income effects by 0.114, resulting total income of 0.442. The income flow-on effect of NUS-3 (Manufacturing in Nusa Tenggara Island) was 0.328. The highest income flow-on effect was in NUS-3 (Manufacturing in Nusa Tenggara Island) 0.328, followed by NUS-9 (Other services in Nusa Tenggara Island) 0.314. The lowest income flow-on effect was in, NUS-1 (Agriculture, livestock and fishery), 0.124. In this case ranking based on total income multipliers were different than those based on flow-on effect as there were differences in initial effects.

In term of employment, the highest total employment multiplier was in NUS-2 (Mining and quarrying in Nusa Tenggara Island), 2.316. It was then followed by NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Island) with total income multipliers of 1.241. The lowest total employment multiplier was in NUS-6 (Trade, hotel and restaurant) with total income multipliers of 0.673. Employment flow-on effects were the difference between total employment multipliers and initial employment effects from the increase of final demand in that sector. It is the summation of direct, indirect and induced effects on employment from an economic activity. The highest employment flow-on was in NUS-3 (Manufacturing in Nusa Tenggara Island), 0.596 and followed by NUS-9 (Other services in Nusa Tenggara Island), 0.260. The lowest income flow-on effect was in, again, NUS-1 (Agriculture, livestock and fishery).

3.2. Sector-Specific Multipliers

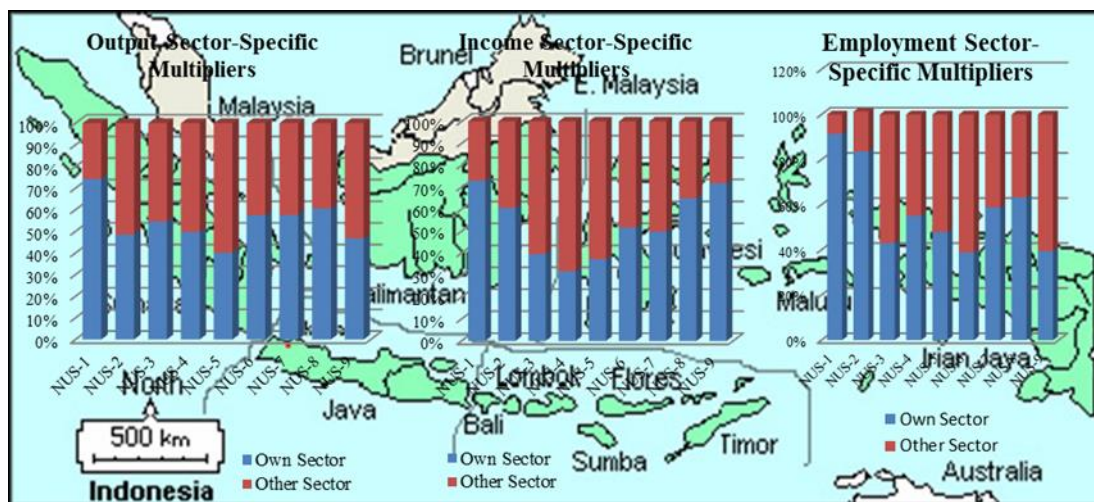


Figure 2: Sector-Specific Multipliers: Output, Income and Employment

Figure 2 provides sector-specific multipliers for output, income and employment in Nusa Tenggara Island economy. In term of output, there were 5 sectors that less than 50 per cent of multipliers occurred in own sectors; it means that more than 50 per cent of multipliers occurred in other sector, namely NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara), NUS-3 (Manufacturing in Nusa Tenggara Island) NUS-6 (Trade, hotel and restaurant in Nusa Tenggara Island), NUS-7 (Transportation and communication in Nusa Tenggara Island) and NUS-8 (Banking and other finance in Nusa Tenggara Island). Meanwhile, other 4 sectors with more than 50 per cent multipliers occurred in own sector; in other words that there were 5 sectors with less than 50 per cent multipliers occurred in other sector. These sectors were: NUS-2 (Mining and

quarrying in Nusa Tenggara Island), NUS-4 (Electricity, Water and Gas), NUS-5(Construction in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands).

In term of income, there were 4 sectors that more than 50 per cent of multipliers occurred in own sectors; it means that less than 50 per cent of multipliers occurred in other sectors, namely NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-2 (Mining and Quarrying in Nusa Tenggara Islands), NUS-8 (Bank and other finance in Nusa Tenggara Islands) and NUS-9 (Other services in Nusa Tenggara Islands). Meanwhile, other 5 sectors with less than 50 per cent multipliers occurred in own sector; in other words that there were 5 sectors with more than 50 per cent of multipliers occurred in other sectors. These sectors were: NUS-3 (Manufacturing in Nusa Tenggara Islands), NUS-4 (Electricity, Water and Gas in Nusa Tenggara Islands), NUS-5 (Construction in Nusa Tenggara Islands), NUS-6 (Trade, hotel and restaurant) and NUS-7 (Transportation and communication in Nusa Tenggara Islands).

In term of employment, there were 5 sectors that more than 50 per cent of multipliers occurred in own sectors; it means that less than 50 per cent of multipliers occurred in other sectors, namely NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-2 (Mining and Quarrying in Nusa Tenggara Islands), NUS-4 (Electricity, Water and Gas in Nusa Tenggara Islands), NUS-7 (Transportation and communication in Nusa Tenggara Islands) and NUS-8 (Banking and other finance in Nusa Tenggara Islands). Meanwhile, other 4 sectors with less than 50 per cent multipliers occurred in own sector; in other words that there were 4 sectors with more than 50 per cent of multipliers occurred in other sectors. These sectors were: NUS-3 (Manufacturing in Nusa Tenggara Islands), NUS-5 (Construction in Nusa Tenggara Islands), NUS-6 (Trade, hotel and restaurant), and NUS-9 (Other services in Nusa Tenggara Islands).

3.3. Spatial-Specific Multipliers

Figure 3 provides spatial-specific multipliers of output, income and employment multipliers in Nusa Tenggara Islands' economy. In term of output, all sectors had more than 50 per cent of multipliers occurred in own region, in Nusa Tenggara Islands. All sectors had less than 50 per cent of multipliers occurred in other regions; other Islands. For income, all sectors had more than 50 per cent of multipliers occurred in own region; in Nusa Tenggara Islands, except NUS-4 (Electricity, Water and Gas in Nusa Tenggara Islands). All sectors had less than 50 per cent of multipliers occurred in other regions; other Islands, except for NUS-4. In term of employment, all sectors had more than 50 per cent of multipliers occurred in own region; Nusa Tenggara Islands. Again, all sectors had less than 50 per cent of multipliers occurred in other regions; other Islands.

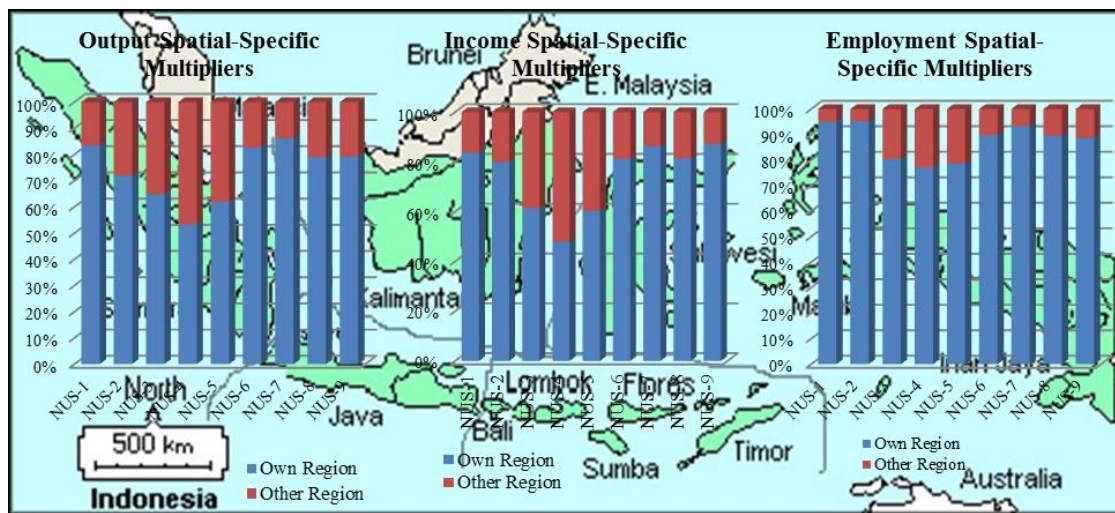


Figure 3: Spatial-Specific Multipliers: Output, Income and Employment

3.4. Spatial Distribution of Flow-on Effects

Figure 4 presents spatial distribution of flow-on effects in Nusa Tenggara Islands' economy. In term of output, 5 sectors had flow-on effects that more than 50 per cent of flow-on occurred in own region, namely: NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-6 (Trade, hotel and restaurant in Nusa Tenggara Islands), NUS-7 (Transportation and communication in Nusa Tenggara Islands), NUS-8 (Banking and other finance in Nusa Tenggara Islands) and NUS-9 (Other services in Nusa Tenggara Islands). Meanwhile, 4 other sectors had flow-on effect that less than 50 per cent occurred in own region, meaning that more than 50 per cents of flow-on effect occurred in other region, namely: NUS-2 (Mining and quarrying in Nusa Tenggara Islands), NUS-3(Manufacturing in Nusa Tenggara Islands), NUS-4 (Electricity, water and gas in Nusa Tenggara Islands) and NUS-5 (Construction in Nusa Tenggara Islands).

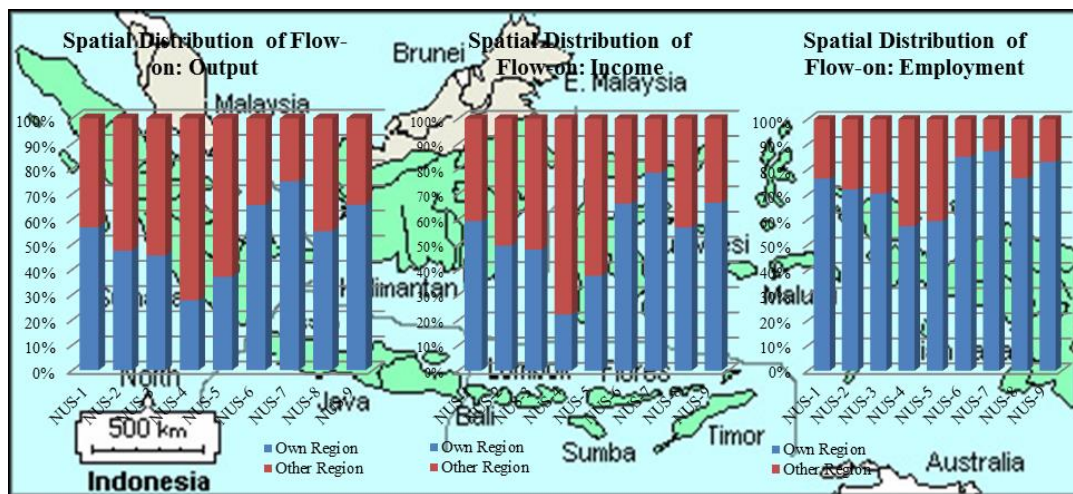


Figure 4: Spatial Distribution of Flow-on Effects: Output, Income and Employment

In term of income, 6 sectors had flow-on effects that more than 50 per cent of flow-on occurred in own region, namely: NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-2 (Mining and quarrying in Nusa Tenggara Islands), NUS-6 (Trade, hotel and restaurant in Nusa Tenggara Islands), NUS-7 (Transportation and communication in Nusa Tenggara Islands), NUS-8 (Banking and other finance in Nusa Tenggara Islands) and NUS-9 (Other services in Nusa Tenggara Islands). Meanwhile, 3 other sectors had flow-on effect that less than 50 per cent occurred in own region, meaning that more than 50 per cents of flow-on effect occurred in other region, namely: NUS-3(Manufacturing in Nusa Tenggara Islands), NUS-4 (Electricity, water and gas in Nusa Tenggara Islands) and NUS-5 (Construction in Nusa Tenggara Islands).

In term of employment, all sector had employment flow-on that occurred in own region more than 50 per cent. All sectors had the flow-on effects that occurred in other regions were less than 50 per cent.

4. CONCLUSION

The conclusions could be drawn were: firstly, the important sectors of Nusa Tenggara Islands' economy could be based on total multipliers of output, income and employment. Based on total output multipliers, three important sectors in Java Islands economy were NUS-3 (Manufacturing in Nusa Tenggara Islands), NUS-4 (Electricity, water and gas in Nusa Tenggara Islands), and NUS-5 (Construction in Nusa Tenggara Islands). Based on total income multipliers, three important sectors in Java Islands economy were NUS-2 (Mining and quarrying in Nusa Tenggara Islands), NUS-3 (Manufacturing in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands). Based on total employment multipliers, three important sectors in Nusa

Tenggara Islands economy were NUS-1 (Agriculture, livestock, forestry and fishery), NUS-2 (Mining and quarrying in Nusa Tenggara Islands), and NUS-3 (Manufacturing in Nusa Tenggara Islands). Based on output flow-on effects, three important sectors in Nusa Tenggara Islands economy were NUS-3 (Manufacturing in Nusa Tenggara Islands), NUS-4 (Electricity, water and gas in Nusa Tenggara Islands), and NUS-5 (Construction in Nusa Tenggara Islands). Based on income flow-on effects, three important sectors in Nusa Tenggara Islands economy were NUS-3 (Manufacturing in Nusa Tenggara Islands), NUS-4 (Electricity, water and gas in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands). Based on employment flow-on effects, three important sectors were NUS-3 (Manufacturing in Nusa Tenggara Islands), NUS-4 (Electricity, water and gas in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands).

Secondly, important economic sectors could be based on sector-specific multipliers effects. It could be based on the highest multipliers that occurred in own sectors. Based on output sector-specific multipliers that occurred in own sector, three important sectors were: NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-8 (Banking and other finance in Nusa Tenggara Islands), NUS-7 (Transportation and communication in Nusa Tenggara Islands). Based on income sector-specific multipliers that occurred in own sectors, three important sectors were NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-8 (Banking and other finance in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands). Based on employment sector-specific multipliers that occurred in own sector, three important sectors were NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS--2 (Mining and quarrying in Nusa Tenggara Islands), and NUS-8 (Banking and other fiancé in Nusa Tenggara Islands).

Thirdly, important economic sectors could be based on spatial-specific multipliers. It could be based on the highest multipliers that occurred in own regions; in Java Islands. Based on output spatial-specific multipliers that occurred in own region, three important sectors were: NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-6 (Trade, hotel and restaurant in Nusa Tenggara Islands), and NUS-7 (Transportation and communication in Nusa Tenggara Islands). Based on income sector-specific multipliers that occurred in own region, three important sectors were: NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-7 (Transportation and communication in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands). Based on employment spatial-specific multipliers that occurred in own region, three important sectors were NUS-1 (Agriculture, livestock and fishery in Nusa Tenggara Islands), NUS-2 (Mining and quarrying in Nusa Tenggara Islands), and NUS-7 (Transportation and communication in Nusa Tenggara Islands).

Fourthly, important economic sectors could be based on spatial distribution of flow-on. It could be based on the highest flow-on that occurred in own regions; in Nusa Tenggara Islands. Based on output spatial distribution of flow-on that occurred in own region, three important sectors were: NUS-6 (Trade, hotel and restaurant in Nusa Tenggara Islands), NUS-7 (Transportation and communication in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands). Based on income spatial distribution of low-on that occurred in own region, three important sectors were: NUS-7 (Transportation and communication in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands). Based on employment spatial distribution of flow-on that occurred in own region, three important sectors were NUS-7 (Transportation and communication in Nusa Tenggara Islands), and NUS-9 (Other services in Nusa Tenggara Islands).

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