

ISEAS Working Paper: Visiting Researchers Series No. 2(2003)

Integration of Indonesian Provinces: Alienated Neighbours?

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ISSN 0219-3582

INTEGRATION OF INDONESIAN PROVINCES: ALIENATED NEIGHBOURS?

Abstract

What are the likely regional impact of an economic disturbance in a certain province? Using a refinement of the regional linkages concepts that have been applied to the EC case, this paper will look at the effects of certain regions on the other regions, thereby providing a new perspective on the issue of economic distance among Indonesian provinces. This paper shows that economic distance among provinces is different from physical distance. Further, the paper shows that there are only weak interactions among various Indonesian islands which has led to the formation of several regional clusters within Indonesia. The paper also draws several policy conclusions regarding regional development in Indonesia.

I. Introduction

Regional development in Indonesia entered a new phase in 1999 when the Indonesian House of Representative (*DPR, Dewan Perwakilan Rakyat*) passed two bills on local governments. The first bill gives more political autonomy to the Indonesian regions, while the second bill changes the central-local governments' financial relationship.

At the heart of both bills, the local economies have been granted greater autonomy in not only politics, but also in economic and financial matters. While these are construed to be positive moves, they are also double-edged swords. The bills put more pressure on local economies to develop their own economies. Part of the pressure is due to budgetary implications: failure to develop local economies leads to lower revenue for the local governments and hence directly affects the local government's ability to serve its constituents. Failure to develop local economies would also make local people suffer, who will in turn bring their sufferings to the polling booths during elections.

However, exactly how these provinces are expected to develop their economies is an unsettled issue. Porter (1990) identifies four determinants of competitiveness. Those factors, briefly summarized, are:

- Quality of production factors,
- Availability and quality of consumer demand,
- Presence of sectoral network of industries, and
- Economic orders (which includes market structure, degree of competition, etc.).

These are wide-ranging requirements and cannot be fully addressed in a single paper. In this paper, our goal is to investigate one aspect of “Porter’s diamond”, that is the sectoral network of industries.

The network of industries is a crucial yet elusive factor in the Indonesian regional development. There are two difficulties that contribute to this situation. The first concerns the availability of data. Studies on sectoral and spatial network necessitate an introduction of data set that is not readily available. What would be ideal, in this case, is an inter-regional input-output data. Yet, these data are available only in some government offices, and are not disseminated widely.

The second difficulty in analyzing spatial network is the unavailability of measures of economic distance. In an economy, economic distance may not necessarily correspond to physical distance (as measured by kilometres, for example). In an archipelago like Indonesia, the differentiation between the two types of distance is even more pronounced. Some provinces interact more with farther provinces than with their next-door neighbours. Clearly, despite small physical distance, the economic distance between any two provincial neighbours can be large.

If we can construct a measure of economic distance, then we would be in place to answer three important questions:

- Given the economic distance, how does the production network among Indonesian provinces look like?
- Given the economic distance and production network, is there a tendency for some provinces to cluster together?
- How many provincial clusters are there in the Indonesian economy?

For each of these questions, there are many important policy implications. The determinants of economic distance are obviously important because the government needs to know whether and to what extent they can speed up the integration among provinces. Similarly, the existence of several clusters of regions directly impinges

upon the government's strategy to alleviate regional income disparity. These are just some of the questions, and the list is far from exhaustive.

The goal of this study, therefore, is to characterize the network of production activities among provinces in the Indonesian economy. In doing so, this study will uncover the hidden economic distance among these provinces, and a tendency for some provinces to cluster together.

The structure of the paper is as follows. This introductory part, which deals with important issues to be addressed in this paper, will be followed by a discussion on methodology and data. We will then take a look at the results of the data analysis, followed by a concluding section that will include some policy recommendations as well.

II. Methodology

Two of the most common and well-known methods to measure linkages among sectors (and regions) is the Chenery-Watanabe (1958) and Rasmussen (1956) / Hirschmann (1958) methods. These methods have often been used in the input-output analysis to identify key sectors in an economy.

Despite their popularity, both methods have several drawbacks. In the case of the Chenery-Watanabe method, for example, only direct linkages are measured. This particular weakness has been remedied by the Rasmussen-Hirschmann method. Using the Leontief inverse in measuring backward and forward linkage, both direct and indirect impact can now be measured.

Despite this improvement, serious problems remain. For example, both methods often identified very small industries as key sectors in an economy. Such a result, of course, is not sound because it implies the promotion of sectors that are not economically important (at least in the short-run).

There is also the issue of how to interpret forward linkage measures, since it is based on an implausible and restrictive hypothetical exercise. We will deal with this issue later in the section. See Jones (1976) for further elaborations on this and other criticisms of the traditional linkage methodology.

Strassert (1968) proposed an alternative identification scheme of key sectors (or regions). The scheme starts by asking: “How would output change if a certain sector (region) is removed from an input-output system.” This scheme has generated several progenies that can be subsumed under the “hypothetical extraction” class. An example of this class would include the works of, among others, Cella (1984), Clements (1990), and Sonis *et al.* (1995). The application of the extraction method to the case of multi-country input-output table of the EC economies was conducted by Dietzenbacher *et al.* (1993). A comprehensive summary can be found in Miller and Lahr (2001).

In the regional extraction method, a region is hypothetically extracted from a system and the gross output levels for all regions are measured before and after the extraction. This is done under the assumption that the vector of final demand (or the value-added vector) does not change. We will address two cases (backward and forward linkages) and provide an interpretation of the formulas.

Backward Linkage

To start, let us work within the context of backward linkage. Extension to forward linkage will follow. We start with equation 1:

$$x = (I - A)^{-1} f \quad (1)$$

where:

- x is column vector sized $k \times L$ of gross output (where k is the number of sectors in each region and L is the number of regions in an economy). For our case, k is 9 and L is 27 (including East Timor, which at the time of data construction was still an Indonesian province).
- A is the usual input coefficient square matrix, with dimension 243×243 .
- f is the column vector of final demand, having the same dimension as x .

Following Dietzenbacher *et al.* (1993) scheme, and without loss of generality, we assume the extracted region is located in the upper-left area of A . Call this square matrix A^{11} . Then the structure of A becomes:

$$A = \begin{bmatrix} A^{11} & A^{12} & \dots & A^{1L} \\ A^{21} & \ddots & & \vdots \\ \vdots & & \ddots & \vdots \\ A^{L1} & \dots & \dots & A^{LL} \end{bmatrix} \quad (2)$$

Here \mathbf{A}^{11} contains input coefficients for internal transaction within region 1. On the other hand, \mathbf{A}^{12} contains input coefficients of region 2 that comes from region 1. Note that \mathbf{A}^{12} , like \mathbf{A}^{11} and the other sub-matrices in \mathbf{A} , is a k-by-k matrix where k is the number of sectors in each region.

Since we are interested in the extraction of the first region, we can then represent \mathbf{A} as the following matrix:

$$A = \begin{bmatrix} A^{11} & A^{1R} \\ A^{R1} & A^{RR} \end{bmatrix} \quad (3)$$

where superscript ‘‘R’’ now stands for the rest of the economy, and superscript ‘‘1’’ stands for the extracted region. Here \mathbf{A}^{1R} becomes a k-by-(L-1) matrix. The dimensions of the other matrices \mathbf{A}^{R1} and \mathbf{A}^{RR} follow naturally.

Extraction of region 1 from the rest of the economy implies setting \mathbf{A}^{R1} and \mathbf{A}^{1R} equal to zero. Hence, the changes in output as a result of hypothetically extracting region 1 can be estimated from the following equation (Dietzenbacher *et al.*, 1993):

$$x - \bar{x} = \begin{pmatrix} x^1 - \bar{x}^1 \\ x^R - \bar{x}^R \end{pmatrix} \quad (4a)$$

$$x - \bar{x} = \left\{ \begin{bmatrix} L^{11} & L^{1R} \\ L^{R1} & L^{RR} \end{bmatrix} - \begin{bmatrix} (I - A^{11})^{-1} & 0 \\ 0 & (I - A^{RR})^{-1} \end{bmatrix} \right\} \begin{pmatrix} f^1 \\ f^R \end{pmatrix} \quad (4b)$$

It is instructive to look at elements in the equation. Completing the matrix multiplication, we obtain

$$x^1 - \bar{x}^1 = [L^{11} f^1 - (I - A^{11})^{-1} f^1] + [L^{1R} f^R] \quad (5)$$

This equation clearly states that there are two effects of hypothetically extracting a region. A local and direct impact is represented by the first square bracket on the right hand side of the equation. It is called a local impact because it represents output changes, with the assumption that there is no external impact on the other regions.

The second impact, the indirect impact, is represented by terms in the second bracket. Terms in the second bracket measure output that cannot be produced by region 1 to satisfy some of the final demand coming from the other regions.

Similarly, the changes in output for the rest of the economy can be separated into two terms. The equation is given below, and its interpretation is symmetrical to the earlier case.

$$x^R - \bar{x}^R = [L^{RR} f^R - (I - A^{RR})^{-1} f^R] + [L^{R1} f^1] \quad (6)$$

Forward Linkage

In the initial formulation of Rasmussen (1956) and Hirschman (1958), the measures of both backward and forward linkages were taken from the same input coefficient matrix A. However, the formulation of such linkages was not well received because of its awkward interpretation and peculiar scenario: it measures a change in gross output under the condition that final demand for **all** sectors increases by exactly one unit. Jones (1976) argued that such a scenario is not “very enlightening”.

More recent works on the measurement of forward linkage came about in the form of the Gosh price model (Dietzenbacher, 1993). In this model, instead of using input matrix, we use allocation matrix. The latter measures the proportion of output sector m that goes as input into the production of sector n.

Keeping this in mind, the representation of the hypothetical extraction model in the case of forward linkage becomes:

$$\begin{aligned} (x - \bar{x})' &= \left[(x^1 - \bar{x}^1)', (x^R - \bar{x}^R)' \right] \\ &= \begin{pmatrix} v^1' & v^R' \end{pmatrix} \left\{ \begin{bmatrix} G^{11} & G^{1R} \\ G^{R1} & G^{RR} \end{bmatrix} - \begin{bmatrix} (I - B^{11})^{-1} & 0 \\ 0 & (I - B^{RR})^{-1} \end{bmatrix} \right\} \end{aligned} \quad (7)$$

Although we will not do elaborate here in order to conserve space, it is easy to show, as in the case of backward linkage, that for every hypothetical extraction of a region, there will be a direct and indirect impact, both within and outside the extracted region.

Data

As of to date, the best available data for analyzing interregional interaction remains the Inter-regional Input-Output table (IRIO, for short). Given that the national table (for which the IRIO was based) is published every 5-years, and given that the latest national

table (for the year 2000) has not been published, the latest data we have is from 1995 IRIO table.

Using the 1995 data should not pose a major problem during normal times as the IO table rarely changes much in 5 years. However, for Indonesia, especially in the wake of the crisis, this will remain an empirical issue until we have access to the new updated data.

The original 1995 IRIO is a huge table. There are 27 provinces in the table (including East Timor which was still part of Indonesia at that time). Each provincial economy is further divided into 9 production sectors. The sectors are:

1. Agriculture
2. Mining and Quarrying
3. Manufacturing
4. Electricity, Gas, and Water
5. Construction
6. Trade, Hotel, and Restaurant
7. Transportation and Communication
8. Finance
9. Other services (including government)

Within each province, each of the nine sectors does transactions with other sectors, leading to a 9X9 matrix of inter-industry transactions for each province. What makes the table big is that it is possible for a manufacturing sector in West Java to purchase raw materials and sell output to other provinces. This immediately leads to the large matrix with a size of 243X243 (close to 60,000 cells).

In reality, many elements of the matrix will be zero. For example, Service sector in the province of Papua is very small, and is very unlikely to interact much with other provinces.

III. Empirical Results

In this section we will analyze the results of our calculation. We will first analyze the case of input linkages, followed by an analysis of output linkages. We will also study the results' implications on regional clustering. Finally, we will briefly explain how the clustering of regions derived from this analysis differs from the definition normally used.

Empirical Results: Input Linkages

Table 1 provides the complete results of applying the regional extraction method to the 1995 Indonesian interregional input-output data. Instead of providing the nominal figures, Table 1 represents the percentage impact of extracting a region relative to the region's gross output.

Let us take North Sumatra province as an example (column 2 of Table 1). Extracting North Sumatra from the input-output system will reduce its own gross output (row 1) by 3.76 trillion of Indonesian Rupiah. This is equal to 6.9% of the province's gross output, where North Sumatra's gross output is shown in row 28 of Table 1. Similarly, as shown in the 13th row of column 2, East Java's gross output would be reduced by IDR 1.17 trillion (2.13% of North Sumatra's gross output).

In the above example, East Java bears a large share of the shock as a result of hypothetically extracting North Sumatra from the production system. The shock experienced by East Java is larger than the shock experienced by West Java (1.5% of North Sumatra's gross output).

This provides an important clue, which suggests that the economic distance between North Sumatra and East Java is much closer than that between North Sumatra and West Java. Clearly, physical distance is not the same as economic distance between the provinces. A careful inspection of Table 1 shows similar patterns for the other provinces.

Aggregating these individual economic distances for each province (i.e. taking the row sums of the off-diagonal terms in Table 1) we arrive at row 30 in Table 1. Row 30 represents the backward linkages of a certain province with the rest of the country. In contrast, row 29 in Table 1 represents its own backward inter-provincial feedback. For each province, this number is taken from the appropriate diagonal element of Table 1.

Table 1: Hypothetical Extraction Results: Backward Linkage for Indonesian Provinces (1995)

No	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Aceh	3,503	651	46	472	59	1,796	13	83	199	143	201	6	355	7
2	N. Sumatra	334	3,758	124	455	142	231	10	65	547	444	548	34	1,233	11
3	W. Sumatra	43	182	1,016	77	25	53	2	14	100	260	136	14	160	7
4	Riau	21	1,209	228	6,410	390	256	70	519	1,258	551	304	49	1,465	27
5	Jambi	1	49	38	120	778	130	6	32	96	36	148	4	210	3
6	S. Sumatra	5	182	25	157	327	4,598	31	828	1,143	531	601	20	1,152	62
7	Bengkulu	2	37	25	20	140	157	632	64	97	130	18	1	24	1
8	Lampung	6	33	2	18	14	112	6	1,331	302	287	341	8	370	4
9	DKI Jakarta	208	846	120	900	71	418	30	219	22,894	5,582	5,958	814	7,629	336
10	W. Java	21	492	25	863	44	299	17	214	2,639	17,013	5,802	756	6,583	233
11	C. Java	50	242	23	121	15	99	7	80	1,261	4,727	13,677	800	5,978	573
12	Yogyakarta	1	5	0	4	2	2	1	9	232	241	528	1,360	487	19
13	E. Java	135	1,171	69	624	49	379	18	160	1,968	5,283	8,292	1,274	20,893	734
14	Bali	3	16	5	7	2	10	1	5	126	129	106	16	274	715
15	W. Nusa Tenggara	1	5	1	2	1	3	0	1	32	42	39	5	155	38
16	E. Nusa Tenggara	1	4	1	2	1	2	0	1	54	39	35	5	70	53
17	E. Timor	0	0	0	0	0	0	0	0	0	0	0	0	0	1
18	W. Kalimantan	3	38	3	6	1	8	1	4	352	252	104	15	305	5
19	C. Kalimantan	2	11	3	4	1	7	1	4	168	177	58	12	133	4
20	S. Kalimantan	4	20	5	8	2	11	1	7	113	198	177	19	809	8
21	E. Kalimantan	7	32	6	17	3	19	1	9	1,835	262	675	31	1,594	20
22	N. Sulawesi	3	12	4	9	2	6	1	4	110	55	48	8	108	4
23	C. Sulawesi	2	11	3	2	2	5	1	3	47	50	43	8	112	3
24	S. Sulawesi	3	13	4	18	2	10	1	4	85	75	75	11	399	16
25	SE Sulawesi	1	5	2	1	1	3	0	2	17	25	23	4	114	2
26	Maluku	1	6	2	2	1	3	0	2	59	31	27	4	169	2
27	Papua	2	9	2	4	1	5	0	3	1,216	50	42	6	104	4
	Gross Output	24.39	54.52	16.86	39.02	8.61	30.28	4.85	17.05	172.78	184.80	104.81	12.86	146.78	18.25
	Intra Region	3.50	3.76	1.02	6.41	0.78	4.60	0.63	1.33	22.89	17.01	13.68	1.36	20.89	0.72
	Backward Linkage	0.86	5.28	0.76	3.91	1.30	4.03	0.22	2.34	14.06	19.60	24.33	3.92	29.99	2.18

Table 1: Hypothetical Extraction Results (Cont.)

No	Name	15	16	17	18	19	20	21	22	23	24	25	26	27
1	Aceh	1	1	0	6	2	6	10	0	0	2	0	1	1
2	N. Sumatra	7	2	0	8	5	7	32	1	1	4	1	3	2
3	W. Sumatra	3	1	0	4	4	5	33	4	1	3	1	1	2
4	Riau	5	8	1	205	83	250	95	5	3	79	3	49	8
5	Jambi	1	0	0	6	4	2	5	1	0	2	0	1	1
6	S. Sumatra	4	2	0	6	3	9	69	1	1	4	1	3	2
7	Bengkulu	0	0	0	0	0	0	2	0	0	0	0	0	0
8	Lampung	1	1	0	3	1	2	10	0	0	8	0	1	1
9	DKI Jakarta	143	29	13	215	82	262	912	60	121	242	57	145	129
10	W. Java	73	12	3	89	56	80	426	8	8	111	16	15	13
11	C. Java	131	86	27	37	37	41	198	26	22	77	15	75	56
12	Yogyakarta	5	1	0	1	1	1	5	0	0	1	0	1	1
13	E. Java	389	128	22	237	294	143	765	69	54	168	42	136	114
14	Bali	23	10	1	5	7	9	24	4	3	10	3	3	6
15	W. Nusa Tenggara	594	292	13	1	2	2	6	1	1	2	1	1	2
16	E. Nusa Tenggara	220	509	43	1	2	2	5	1	1	2	1	1	2
17	E. Timor	0	4	6	0	0	0	0	0	0	0	0	0	0
18	W. Kalimantan	2	2	0	1,466	187	61	299	3	2	7	2	2	4
19	C. Kalimantan	2	1	0	438	1,468	319	320	3	2	7	2	2	3
20	S. Kalimantan	3	3	1	130	72	1,961	595	5	3	22	4	3	6
21	E. Kalimantan	7	91	14	895	399	1,327	6,850	43	7	315	15	7	12
22	N. Sulawesi	1	1	0	7	6	12	211	632	41	53	3	3	4
23	C. Sulawesi	1	1	0	12	5	14	103	77	711	146	12	145	24
24	S. Sulawesi	5	4	1	9	8	12	151	10	27	1,093	213	12	60
25	SE Sulawesi	1	1	0	1	2	2	7	3	11	69	279	14	3
26	Maluku	1	3	0	3	3	4	52	515	3	323	150	1,918	698
27	Papua	1	3	1	14	9	22	404	8	3	85	4	59	1,899
	Gross Output	6,993	5,798	2,388	14,433	9,491	13,618	41,855	9,039	6,625	20,832	4,602	8,230	14,169
	Intra Region	594	509	6	1,466	1,468	1,961	6,850	632	711	1,093	279	1,918	1,899
	Backward Linkage	1,029	687	142	2,335	1,268	2,595	4,739	848	316	1,742	546	682	1,152

To get some sense of the number, please note that in the case of Aceh, the ratio between row 30 and row 29 is lower than one (0.24). Similarly, low ratios can be found on Bengkulu (0.34), Maluku (0.35), Papua (0.61), and Central Sulawesi (0.44). It is an open question as to what these low ratios suggest although these provinces are mainly producers of primary products, and are relatively less sophisticated in terms of economic infrastructures.

Empirical Results: Input-Based Regional Clusters

Given the size of Table 1, we have decided to also present a more compact version in Table 2.¹ To achieve Table 2, we aggregate provinces into several “super-provinces.” This aggregation scheme was also presented for example in Sonis *et al.* (1997). Nazara *et al.* (2001). Here, the exception is that we have included Bali as part of the Java block.

The aggregation scheme is as follows:

- Sumatra includes Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, and Lampung.
- Java includes Jakarta, West Java, Central Java, East Java, Yogyakarta, and Bali.
- Kalimantan includes West Kalimantan, Central Kalimantan, South Kalimantan, and East Kalimantan.
- Sulawesi includes North Sulawesi, Central Sulawesi, South Sulawesi, and Southeast Sulawesi
- The Rest of Indonesia includes Maluku, Papua, West and East Nusa Tenggara, and East Timor.

Hence in Table 2 we separate the effects of a regional extraction into its own direct impact (column 1), and the induced impact on other “super provinces” (the other columns). In calculating Table 2, we also normalize the data such that the sum of each row is equal to 100%. In other words, Table 2 presents the distribution of an impact of provincial extraction among various “super regions.”

Table 2: Inter-island Aggregation of Backward Linkage for Indonesian Provinces (1995)

No	Name	Own	Suma- tra	Java	Kali- mantan	Sula- wesi	Rest of Indonesia
1	Aceh	80.3	9.4	9.6	0.4	0.2	0.1
2	N. Sumatra	41.6	25.9	30.7	1.1	0.5	0.2
3	W. Sumatra	57.1	27.5	13.5	0.9	0.7	0.4
4	Riau	62.1	12.8	24.4	0.3	0.3	0.1
5	Jambi	37.5	52.9	8.8	0.4	0.3	0.1
6	S. Sumatra	53.3	31.7	14.0	0.5	0.3	0.2
7	Bengkulu	74.5	16.1	8.6	0.4	0.3	0.1
8	Lampung	36.3	43.7	18.7	0.7	0.4	0.2
9	DKI Jakarta	62.0	10.1	16.9	6.7	0.7	3.7
10	W. Java	46.5	6.5	43.6	2.4	0.6	0.4
11	C. Java	36.0	6.0	54.4	2.7	0.5	0.4
12	Yogyakarta	25.7	2.6	69.3	1.5	0.6	0.4
13	E. Java	41.1	9.8	41.2	5.6	1.4	1.0
14	Bali	24.7	4.2	65.5	1.3	0.8	3.4
15	W. Nusa Tenggara	36.6	1.3	47.0	0.9	0.5	13.7
16	E. Nusa Tenggara	42.6	1.1	22.3	8.1	0.7	25.3
17	E. Timor	4.3	1.2	43.9	10.5	1.2	39.0
18	W. Kalimantan	38.6	6.3	15.4	38.5	0.8	0.5
19	C. Kalimantan	53.6	3.7	17.4	24.0	0.7	0.5
20	S. Kalimantan	43.0	6.2	11.8	37.5	0.9	0.7
21	E. Kalimantan	59.1	2.2	20.1	10.5	4.1	4.0
22	N. Sulawesi	42.7	0.8	11.4	3.6	6.1	35.5
23	C. Sulawesi	69.2	0.7	20.3	1.4	7.7	0.7
24	S. Sulawesi	38.6	3.6	21.5	12.4	9.4	14.5
25	SE Sulawesi	33.9	0.8	16.2	2.8	27.5	18.9
26	Maluku	73.8	2.3	14.4	0.5	6.7	2.3
27	Papua	62.2	0.5	10.5	0.8	3.0	23.0

Source: Table 1

To take an example, 42% of the backward impact of extracting North Sumatra will be felt on the province itself (in terms of loss of gross output). Other provinces in Sumatra will suffer losses equal to 26% of North Sumatra's gross output. The entire Java province (including Bali) will suffer loss equal to 30.7% of North Sumatra's gross output.

In terms of backward linkage, Table 2 clearly shows that the majority of the effects (75%) of a provincial extraction are limited to the province itself and other provinces within the same island.

Information from Table 2 can be sorted to show which provinces will have the highest induced impact.² At the top of the list are provinces such as Yogyakarta, Central Java, East Java, South Kalimantan, and West Kalimantan. However, due to their large size, only the Central and East Java provinces have much economic significance. In any case, we interpret these economies as relying more on supplied inputs obtained from other provinces.

At the opposite end of the range are provinces such as Aceh, Papua, Bengkulu, North Sulawesi, and Bengkulu. In most cases, these are suppliers of primary products. Economically speaking, we interpret these economies as relying less on supplied inputs from other provinces.

Empirical Results: Forward Linkages

To conserve space, the main result (which is the forward linkage equivalent of Table 1) is presented in the Appendix. At a general level, the distinction between economic distance and physical distance can still be made. Taking the North Sumatra example again, North Sumatra's impact can still be felt the most in East Java compared to any other provinces.

As in the case of backward linkage, we can separate the extraction impact into the effect on the extracted province, versus the impact on the other provinces. The first effect is called the forward inter-provincial feedback, while the latter is called forward linkage.

Again, the ratio between interregional feedback and the forward linkage also serves as a useful indicator of how much a province depends on other regions to purchase its products. The bigger the ratio, the larger is the linkage with other regions. In the Indonesia case, Bali stands out as a province that relies less on other provinces, which really befits its status as a tourist center.^{3 4}

Table 3 presents the forward linkage equivalent of Table 2, where (instead of looking at the data on a province by province basis) we look at an impact of a province against islands. In this table, the provincial linkage changes dramatically. To start, note that in the case of backward linkage that we discussed previously in table 2, the majority of the induced impact is felt on the island where a province is located. Hence

extraction of Aceh will, first and foremost, impact Aceh itself (80% of the impact). Some of the extra-provincial impact will be felt on other Sumatra provinces (9.4%) and the Java provinces (9.6%).

Table 3: Inter-island Aggregation of Forward Linkage for Indonesian Provinces (1995)

No	Name	Own	Suma- tra	Java	Kali- mantan	Sula- wesi	Rest of Indonesia
1	Aceh	17.14	66.15	16.10	0.47	0.06	0.07
2	N. Sumatra	57.85	14.44	27.05	0.49	0.06	0.12
3	W. Sumatra	39.63	22.56	34.85	2.13	0.47	0.36
4	Riau	35.34	25.48	31.33	6.34	0.84	0.67
5	Jambi	57.41	19.94	21.57	0.80	0.14	0.13
6	S. Sumatra	46.10	16.99	35.84	0.89	0.08	0.11
7	Bengkulu	20.86	49.48	29.27	0.29	0.05	0.05
8	Lampung	56.40	5.90	36.94	0.42	0.23	0.11
9	DKI Jakarta	30.22	8.11	54.94	4.15	1.34	1.25
10	W. Java	53.66	4.84	39.36	1.53	0.33	0.27
11	C. Java	62.46	1.73	33.69	0.83	0.36	0.92
12	Yogyakarta	65.39	0.55	33.66	0.17	0.05	0.17
13	E. Java	47.64	6.02	40.55	3.21	0.75	1.83
14	Bali	75.02	1.60	20.05	1.36	0.60	1.37
15	W. Nusa Tenggara	57.86	0.88	19.84	0.67	0.33	20.42
16	E. Nusa Tenggara	51.42	1.01	21.66	0.81	0.33	24.77
17	E. Timor	96.25	0.11	1.21	0.10	0.05	2.28
18	W. Kalimantan	56.62	1.77	26.50	14.44	0.41	0.27
19	C. Kalimantan	40.30	1.27	19.96	37.70	0.47	0.30
20	S. Kalimantan	52.80	1.41	28.16	16.58	0.70	0.35
21	E. Kalimantan	36.85	0.88	37.04	21.14	3.02	1.08
22	N. Sulawesi	49.94	2.92	22.88	15.17	8.36	0.73
23	C. Sulawesi	30.58	2.41	18.95	9.73	19.35	18.98
24	S. Sulawesi	53.37	2.13	22.58	6.40	12.07	3.46
25	SE Sulawesi	64.67	1.64	19.99	1.34	9.71	2.65
26	Maluku	31.91	0.67	10.87	2.22	32.83	21.50
27	Papua	28.54	1.08	47.16	16.71	3.60	2.91

Source: Table Appendix

In the forward linkage case, see Table 3, an extraction of a Sumatra province will have a larger induced impact on Java. To see this, note that in the first eight rows of Table 3 which reports numbers for provinces in Sumatra, the content of column 3 (impact on Java) is mostly larger than the content of column 2 (impact on other Sumatra provinces). The exceptions are Aceh and Bengkulu.

Similarly, we note that all provinces in Kalimantan and Sulawesi have a higher induced effect with Java compared with other provinces in their respective islands. These results suggest that in terms of production structure, most roads lead to Java. Economically speaking these results shows that the rest of Indonesia depends more on Java provinces (which includes Bali) as the buyer for their products.

In general, we can say that all provinces imparted larger induced forward effects to Java than to any other islands. The major exceptions are few: Aceh, Bengkulu, East Timor, Central Kalimantan, and Maluku. These latter provinces clearly show a greater affinity toward regions other than Java.⁵

In terms of the ranking of forward linkage, Maluku is the province that relies most heavily on other provinces to purchase its output. Also at the top of the list are Aceh, Central Kalimantan, East Java, East Kalimantan, and Riau.

Notes on Regional Groupings

In addition to providing rankings of backward linkages, Table 2 and 3 also clearly shows some interesting observations. Putting West Nusa Tenggara as part of ROI block (Rest of Indonesia) block was clearly inappropriate. Row 15 and column 3 (in Table 2) shows that the West Nusa Tenggara should clearly be part of the Java block. The same argument goes for the East Kalimantan province and (although less relevant now) East Timor. The result suggests that greater Java will include Java provinces, Bali, West Nusa Tenggara, and also East Kalimantan.

On the same ground, we can similarly argue that North Sulawesi is more closely in tune with the Rest of Indonesia (to be exact: with Maluku and Papua), as opposed to the Sulawesi block.

Although very preliminary, this result suggests that one cannot casually analyze Indonesian provinces based on an Island-based grouping. More importantly, we also

have to be very careful when drawing policy implications that are island based. Among others, such provincial groupings depend on the goal of analysis. The case of Lampung should make this very clear.

Located on the southern tip of Sumatra and separated with Java by the narrow Sunda strait, various studies have regarded Lampung as an extension of Java. Looking at Table 2 and 3, it is clear that Lampung is better linked with Java in the case of forward linkage (i.e. Lampung is more dependent on Java to purchase its output). However, when it comes to supply of inputs (backward linkage), Lampung should be treated more as part of Sumatra.

IV. Conclusion and Policy Implications

Our analysis has yielded several conclusions along with policy implications for Indonesian regional development.

First, we have been able to generate a measure of economic distance among provinces. Arguably crude, such a measure is nevertheless useful in gauging spatial impact of local disturbances on national economy. Taking Aceh as an example, our measure clearly shows that the impact of a war in Aceh is likely to be localized within the province itself. Some of the negative impact on the surrounding regions (especially South Sumatra) can be minimized if the Indonesian government secures the oil and gas fields in Aceh.

Second, looking at the broad picture of provincial interaction, we note that there are weak spatial diffusions among Indonesian provinces. Events in Kalimantan, for example, would have only minor impacts on off-Java provinces outside Kalimantan.

This can be seen as a blessing or a curse. The Aceh war, for example, shows that Aceh's weak regional links clearly has less impact at the national level. On the other hand, weak integration also poses a problem as well. Development of the regions would need several growth poles, for which the financing would be difficult for the cash-strapped Indonesian government.

Third, our analysis shows that in most islands, shocks within a particular province will mostly impact Java provinces and other neighbouring provinces within the island. As can be seen from various graphs in the previous sections, there are some

clusters of regions. This, however, implies that efforts to reduce spatial economic disparities must begin with several provinces. We will have more to say about this later. One cannot just wait for the spatial diffusion to take place since a strong diffusion process does not exist.

Fourth, as is usual in regional studies, the type of economic activities and choice of location matters. For very obvious reasons, this research does not contribute much to the analysis of export activities of primary products such as mining and agriculture. These products are simply endowed to only certain provinces.

However, when it comes to the production process of manufacturing and other tertiary products such as financial services, production network matters, our analysis shows that Java and Sumatra provinces (due to their relatively tight integration) are the only viable locations now.

Fifth, with regards to Sumatra, we can still see some problematic areas. The first is in Aceh, where the problem seems to go beyond simple economics. Given its long and continuous history of wars (dating back to the Dutch colonial period), Aceh is a mixture of economics, politics, and social aspects.

Putting Aceh aside, the weak point in Sumatra is currently the Bengkulu and Jambi provinces. Located in the middle part of Sumatra, Bengkulu and Jambi become, the hinterland of the hinterland (if you view Sumatra as the hinterland of Java). Given their strategic location, there is a need for a special effort to bring these two provinces out of their relative backwardness.

In terms of linkage, we note that Bengkulu links with Jambi and South Sumatra. In turn, Jambi links with Riau and South Sumatra. Hence, a solution to the Bengkulu and Jambi problems involves two simultaneous steps. The first step would include a recognition and development of key sectors in both provinces. The second step would be to try and strengthen the linkages between these two provinces with South Sumatra (or Riau).

Sixth, outside Java and Sumatra, we are left with the question of how many blocks of provinces there are. Off the bat, we note that regional integration is also possible for Kalimantan. Such development would, however, most likely clash with environmental concerns.

Outside Kalimantan, our research shows that the picture of regional integration in the rest of Indonesia is unclear. We note the lack of cohesiveness with the island of Sulawesi, where the northern part does not gel well with the southern part. North Sulawesi is clearly linked more to Maluku rather than with South Sulawesi.

Hence, contrary to the general perception, we can alternatively view Sulawesi, Maluku and Papua as a single block and try to formulate development policies based on this grouping.

The odd province out would be East Nusa Tenggara. If Bali and West Nusa Tenggara can be clearly associated with the Java block, then the linkage between East Nusa Tenggara and its economic affiliation is rather unclear. Unless this is resolved soon, it will be difficult to envision a strong economy in this part of Indonesia.

Future Research

Our attempt to measure economic distances among regions has yielded several interesting results and policy conclusions. However, more needs to be done.

First, there is the issues of key sectors in each province. This is an interesting and important issue both in terms of policy perspective as well as commercial perspective.

Second, similar research using data sets from different periods need to be also conducted, and comparison should be made with our results in this paper. This is important to see the stability of our results, and hence it would have important ramifications on future policies (i.e. it would be useless to conduct a policy if our result is not robust). Intuitively speaking, our results look robust as it matched with the general perception.

Finally, as we go deeper into each province, we can also be more specific about the strength and weaknesses of each region. In terms of the “competitive advantage” as coined by Porter (1991), what we have discussed in this research falls into the network factor. Other important issues for an economy include the quality of production factors, quality of consumers, and the market structure (such as regulations). These issues should be included in future studies.

NOTES

1. Note that the concept of economic distance that was applied in a province versus province context is now applied in terms of province versus island context. I wish to thank a seminar participant at ISEAS for raising this issue.
2. Induced impact is the row sum of columns 2, 3, 4, 5, and 6. Column 1 refers to its own intra-province feedback.
3. Bali, as shown in the table on backward linkages, still depends on others for raw materials.
4. The other notable region is East Timor (which has since 1999) separated from Indonesia. This region purchased many things from the rest of Indonesia, but sold very few things to the rest of Indonesia.
5. Borderline cases include West and East Nusa Tenggara.

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