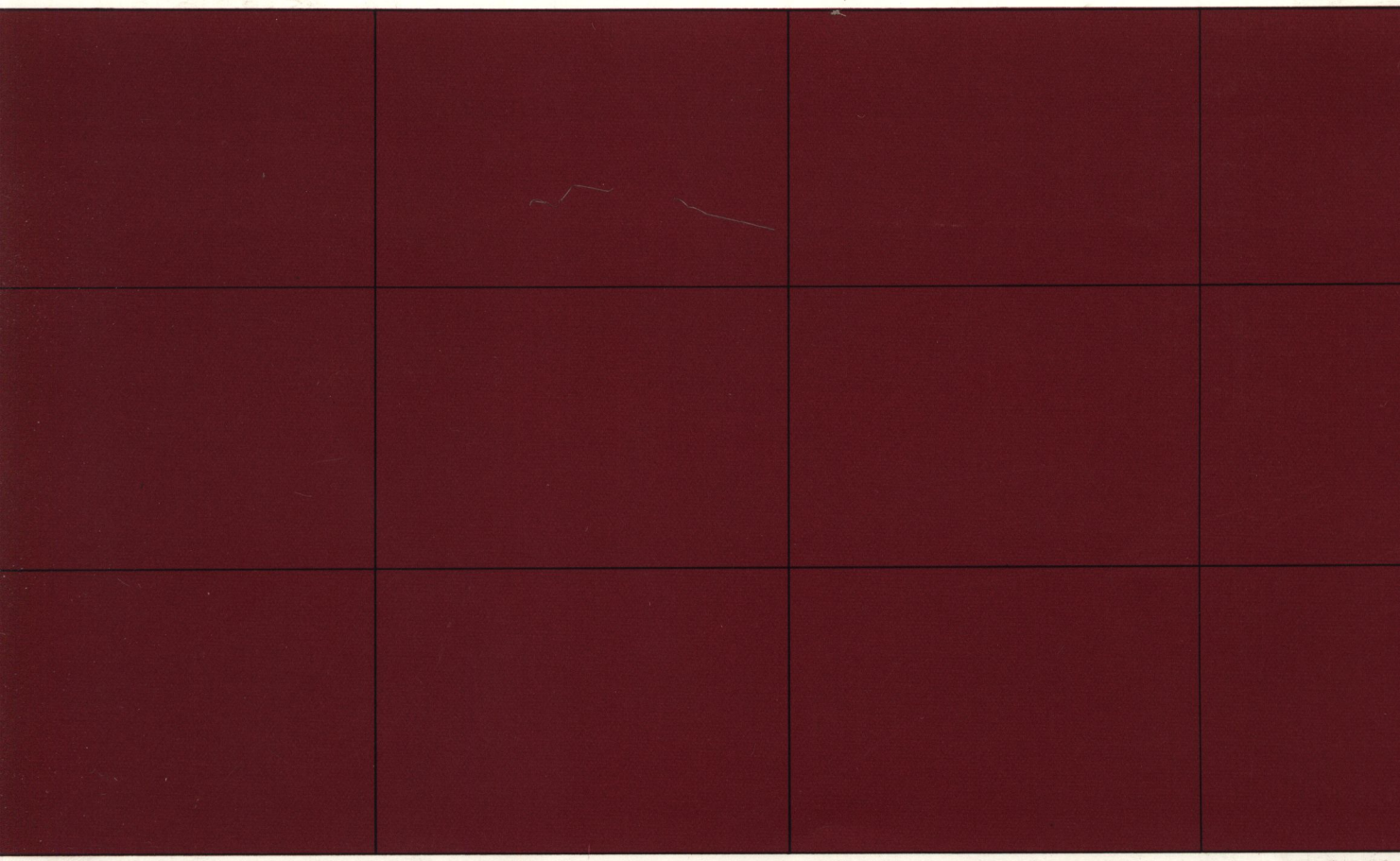
Industrial Structures and Inter-Industry Linkages



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Industrial Structures and Inter-Industry Linkages

By

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INDUSTRIAL STRUCTURES AND INTER-INDUSTRY LINKAGES

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EXECUTIVE SUMMARY

This paper attempts to investigate factors that influence the degree and structure of industrialization in the outer regions and to examine linkages within and between the regional industries and the industries in the Bangkok Metropolitan Region. The major findings are:

1. The degree of industrialization in each province is explained by per capita income, distance from Bangkok, population density, credit-deposit ratio and investment in infrastructure (the cumulative expenditure on road construction and the share of value added from electricity and water supply are used as proxies for the last variable).

2. The regional industries are relatively more competitive in resource-based industries particularly the upstream ones and relatively non-competitive in non-resource-based industries, especially those using inputs with relatively high import content.

3. Small industries in the outer regions are relatively more competitive in labor intensive industries than are their counterparts in the BMR.

4. Lack of locally processed inputs is another factor that inhibits the development of the regional industries. Regional firms whose regional inputs represent less than one third of total inputs employ only about 13 per cent of regional manufacturing employment. In contrast, the regional firms whose regional inputs account for more than two thirds of total inputs employ about 70 per cent of the total regional manufacturing employment. Among the industrial firms the firms using high intensity of regional inputs, most of the employment is in resource-based industries. There are few jobs in non-resource-based industries and there are few industries in this industry group that have a high intensity of regional inputs. Regional industries are on the average get 16 percent of their input from the BMR, 12 per cent from import, and 72 per cent from the outer regions. For regional industries outside the Central region, the shares of input from the BMR and import

drop to 13 per cent and 6 per cent respectively, while the share of regional input increases to 81 per cent.

5. There is a strong linkage between the regional industries and the agricultural sector. The intra-regional linkages among the regional manufacturing industries are relatively weak.

6. Bangkok and export are important markets for regional firms, especially the large ones. Products of the regional industries sold in the Bangkok and export markets generate about 60 per cent of regional manufacturing employment. These two markets also provides regional industries with an opportunity to grow, since the regional market tends to be fragmented by geography so that each local market is too small to absorb the total output of large firms. There is a strong tendency that the proportion of sales to Bangkok and export market to total sales increases with the size of firms. For small firms with fewer than 10 employees, the local market is by far the most important. The regional market absorbs about 97 per cent of the total sales of these firms, and about 85 percent is sold within the province where each firm is located.

We offer the following recommendations:

1. Reduce the average level and the spread in import duty rates.

2. Avoid the use of quantitative restrictions on imports.

3. Strengthen the system of export promotion measures aimed to help small producers, particularly those in the outer regions.

4. Gradually adjust the minimum wage rates in the outer regions towards the market equilibrium level for each locality.

5. Increase the share of the budget devoted to developing the outer regions, especially expanding and improving regional infrastructures. The infrastructural problems in the BMR should be solved by shifting the burden of financing to beneficiaries of the

projects. The potential sources of finance are property taxes (on progressive rate schedules), privatization and user charges.

6. The infrastructural development should emphasize the expansion of the number and the capacity of international airports and seaports and upgrading the interregional transportation networks. Regarding the electricity supply, emphasis should be given to improving accessibility, solving the outage problem and working with the budget constraints of the Provincial Electricity Authority.

CHAPTER 1

REGIONAL STRUCTURE OF THAI INDUSTRY

1.1 INTRODUCTION

Over the past few decades, Thailand's economy has grown rapidly and become more industrialized. In 1987, the share of manufacturing value added in Thailand's GDP stood at 23.9% and per capita income was 23,021 baht. However, the regional structure of the Thai economy is highly unbalanced. As shown in Table 1.1, the Bangkok Metro Region (BMR) captured 78.0% of the country's total manufacturing income, while its population was only 15.8% of the country's total. Its share of the other components of GDP except agriculture was also as high as 48.0%. Thus, its per capita income in 1987 was about 3.1 times the country's average and about 8.6 times that of the Northeast, the poorest region in terms of per capita income.

The share of manufacturing value added in GDP or GRP indicates the degree of industrialization of the country or region. Based on this indicator, it can be seen from Table 1.2 that the degree of industrialization varies widely between the BMR and the provinces. While the share of manufacturing value added in GRP of the BMR was 38.1% in 1987, the share was much lower elsewhere: 6.7% in the North, 4.7% in the South, 7.3% in the Northeast, and 18.2% in the Rural Central Region (defined to include all provinces in the east, west and central plain but exclude the five provinces surrounding Bangkok). Among the 67 provinces outside the BMR, there are 34 provinces whose share of manufacturing value added was less than 5% and 19 provinces whose share was between 5% and 10%. Only 6 out of the remaining 13 provinces had a share above the national average.

The low level of industrialization in the outer regions is accompanied by a low level of per capita income. Income disparity between the BMR and the outer region has also widened over time.[1] In the past, the agricultural sector was Thailand's main source of growth of income and employment. This was achieved primarily by expanding the amount of agricultural land and decreasing forested area. It is now widely recognized that further deforestation would have serious environmental impacts. Therefore this limits the ability of the agricultural sector to expand. In recent years, the manufacturing sector has generated much more new employment than the agricultural sector.[2] However, the industrial base of the outer region is too small to absorb the growing labor force whose employment opportunity in the agricultural sector is also limited. Massive migration into the BMR naturally follows.

If this trend continues it will exacerbate the income disparity problem as well as other problems related to the explosive growth of population in the BMR such as traffic congestion, urban slums and excess demands on public services and utilities, particularly those whose supply cannot be easily increased. Whether regional industrialization is a desirable and viable strategy to avert this trend is a big question to policy makers and development planners. This study is aimed at contributing some facts and discussing their implications as they relate to the debate.

1.2 DETERMINANTS OF THE DEGREE OF INDUSTRIALIZATION

The previous section revealed that there is a wide variation in the degree of industrialization among provinces. The share of manufacturing value added in the gross provincial products (MFGGPP) varies from 1.5%

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1. See Suganya Hutaserani and Somchai Jitsuchon, "Thailand's Income Distribution and Poverty Profile and Their Current Situations", TDRI Year-End Conference Paper 1988, pp. 16-21.

2. See Rachain Chintayarangsan "Thailand's Expectation on Reaching NIC Status", in Thailand's National Development: Social and Economic Background, Suchart Prasithrathsuit, Editor, Thai University Research Association, 1989, pp. 117 and 137.

in Nakhon Phanom to 58.8% in Pathum Thani. This section identifies the source of this variation in the degree of industrialization using regression analysis approach. A simple model with a single equation is adopted. The dependent variable is the MFGGPP taken as a proxy for the degree of industrialization in each province. The explanatory variables consist of the following: (see Table 1.3)

1) Gross provincial products per capita (PCAPY)

In cross-country comparison, it is quite well known that across the Kingdom, the share of manufacturing in GDP is closely related to per capita GDP. This relationship is characterized by an inverted U-curve in the graph showing MFGGDP on the vertical axis and per capita GDP on the horizontal axis.[3] This U-curve shows that at low level of GDP per capita: an increase in GDP per capita will be associated with an increase in MFGGDP. In other words, the growth elasticity of manufacturing value added with respect to GDP is greater than unity. After GDP per capita reaches a high enough level, the share of manufacturing in GDP will decline as GDP per capita increases further. This relationship is believed to be influenced by the changing pattern of consumption. At a low level of income, people have to allocate a high fraction of their income to food and other necessities. As their income rises, their share of expenditure on food tends to decrease and a greater share is allocated to industrial goods. After reaching a high enough income level, they will allocate more of the incremental income to services than to goods. Although the relationship between MFGGPP and PCAPY is intrinsically non-linear, this study will estimate the relationship based on linear functional form, since the levels of income per capita in all provinces are relatively low by international standard. Therefore, our data are confined within the range in which the relationship is approximately linear.

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3. See, for example, World Bank, "World Development Report", 1987. pp. 48-54

2) Distance between the province and Bangkok (DISTN)

Since population, national income and manufacturing and service activities are highly concentrated in Bangkok, proximity to Bangkok offers several advantages for industrialization: good access to the large market of Bangkok as well as access to the nationwide distribution system and export market; access to marketing and technological information; supply of inputs produced in and around Bangkok and from import; supply of machinery and equipment; and access to supporting service industries. Another advantage is the close contact with central government agencies -- a crucial factor under the present system of centralized public administration. The MFGGPP is thus hypothesized to be inversely related to the distance from Bangkok.

3) Population density (POPDEN)

Population density was chosen as a proxy for the size of the local market and the degree of industrial agglomeration of the province. Another candidate for the proxy was the province's total population, but this was rejected since correction should be made for the differences among the provinces'areas. The province's population can be changed abruptly by the divisions made in large provinces every few years. The market size may be summarily measured by the total GPP (or by GPP per unit area). We preferred to separate the income effect (based on PCAPY) and the population growth effect (based on POPDEN), since the different income elasticities among products imply that the two effects are different.

Industries tend to locate close to each other to exploit the economies of scope which accrue mainly from the savings in transportation costs and close communication among interrelated industries. A densely populated area tends to have a high concentration of economic activities, and thus a high degree of industrial agglomeration will be incorporated in the effect measured by population density. The MFGGPP should vary directly with POPDEN due to the market size effect and the industrial agglomeration effect.

4) Credit-deposit ratio (CRDEP)

The credit-deposit ratio measures the relative inflow and outflow of the financial resources of the province. The availability of financial resources is a crucial determinant of industrial development. Therefore, a high level of CRDEP should be associated with a high MFGGPP.

5) Infrastructures

Development of industries is greatly dependent the availability and reliability of infrastructural services. A complete measurement of all infrastructures cannot be done in this study, and only two components are incorporated in this analysis. They are:

a) Proportion of electricity and water supply value added in total economic activities.
b) Accumulated expenditure on roads

A few alternative specifications have been attempted in the regression analysis. The results are shown below.

Results of the Regression Analysis under Alternative Specifications

SPECIFICATION 1

MFGGPP = -0.469 + 0.488 PCAPY - 1.93 LDISTN + 1.31 POPDEN
(-0.07) (8.44) (-2.08) (2.00)
+ 0.082 CRDEP + 1.51 ELECT + 4.41 ROAD
(2.58) (2.27) (1.58)
R^2 = 0.79

SPECIFICATION 2

MFGGPP = 0.079 + 0.432 PCAPY - 1.63 LDISTN + 1.67 POPDEN
(0.01) (8.64) (-2.08) (3.01)
+ 0.06 CRDEP + 1.04 ELECT + 5.41 ROAD + 24.9 PTHUM
(2.10) (1.84) (2.29) (5.25)
R^2 = 0.86

SPECIFICATION 3

MFGGPP = -7.85 + 0.440 PCAPY - 0.443 DISTN + 1.93 POPDEN
(2.96) (8.99) (-2.27) (3.64)
+ 0.058 CRDEP + 1.16 ELECT + 5.06 ROAD + 25.2 PTHUM
(2.17) (2.14) (2.15) (5.37)
R^2 = 0.86

SPECIFICATION 4

MFG72 = -9.44 + 1.23 PCAPY2 - 0.291 DISTN + 1.87 POPDEN
(-3.99) (8.55) (-2.17) (4.23)
+ 0.049 CRDEP + 1.39 ELEC72 + 6.38 ROAD + 17.4 PTHUM
(2.07) (3.33) (3.15) (4.15)
R^2 = 0.88

Variable Descriptions

MFGGPP = 1985-87 average share (in percent) of manufacturing value added in GPP of the i^{th} province, based on 1987 prices

MFG72 = 1985-87 average share of manufacturing value added in GPP based on 1972 prices

PCAPY = 1985-87 average GPP per capita of the i^{th} province at current prices (thousand baht/person)

PCAPY2 = 1985-87 average GPP per capita in 1972 prices

LDISTN = natural logarithm of the distance between province i and Bangkok

DISTN = distance between province i and Bangkok (hundred kilometers)

POPDEN = 1985-87 average population density in province i (hundred persons per square kilometer)

CRDEP = 1985-87 average credit-deposit ratio (in percent) in province i

ELECT = 1985-87 average share of electricity and water supply value added in GPP of province i at current prices (billion baht)

ELECT2 = 1985-87 average share of electricity and water supply value added in GPP, at 1972 prices

ROAD = accumulated expenditure on road construction in province i, from 1960 to 1985 (billion baht)

PTHUM = dummy variable equal to 1 for Pathum Thani and 0 for other provinces

The relative impacts that the explanatory variables have on the degree of industrialization may be evaluated by assessing the magnitude of the change in each of these variables required to in produce a one percent change in the share of manufacturing. Under specification 1, an increase of in MFGGPP of 1 percent may be induced either by increasing per capita GPP by 2,050 baht, increasing of population density by 76 persons per sq. km, increasing the credit-deposit ratio by 12 per cent, increasing ELECT by 0.96 per cent, increasing ROAD by 227 million baht or decreasing of LDISTN by 0.52 (= a decrease in distance from Bangkok of 40 percent). All slope coefficients have the expected signs and are statistically significant at the .05 level except for the expenditure on road.

Specification 2 differs from specification 1 by the inclusion of a dummy variable to account for the abnormality of Pathum Thani. The insertion of this variable produces moderate changes in the magnitude of the estimated coefficients. The coefficient ROAD becomes significant while the coefficient of ELECT is slightly lower than the critical value for the .05 significance level.

Specification 3 differs from specification 2 by changing the distance variable from a logarithmic scale to ordinary scale. This change produces minor changes in the estimated coefficients of all other variables. All variables are statistically significant at the 5 percent level.

Specification 4 is obtained by deflating all relevant variables in specification 3 into constant (1972) prices. It results in a slight increase of the coefficient of determination. The income coefficient increases in rough proportion to the price deflator. The coefficients of other deflated variables (ELECT, ROAD) show moderate increases, while the coefficients of the remaining variables (DISTN, POPDEN, CRDEP) show moderate declines.

The statistical results for specification 4 are marginally better than for specification 2 and specification 3. However, the statistical improvement is difficult to rationalize by theoretical consideration. Our investigation analyzes a cross-section of the current economic structures in different provinces. Therefore the current relative price structure should be more relevant than the relative price structure of 1972 (used in equation 4). For the distance variable, the logarithmic scale was found to be superior to the ordinary scale in our preliminary analysis, which involves fewer explanatory variables (e.g., excluding CRDEP, ELECT and ROAD).

The impact of the PTHUM dummy variable demonstrates the influence of certain outliers in our sample. Provinces near Bangkok show greater variation than others. This variation seems to reflect certain drawbacks in our model specifications. Among various possible problems, we suspect that the two most serious ones are the omission of other relevant variables, such as those concerning natural resource endowment and various types of infrastructures, and the complex interrelationship among the variables in the model (i.e. the two-way causality between the dependent variable and some explanatory variables such as PCAPY, and the multicollinearity among the explanatory variables). Despite these problems, the statistical results turn out to be quite satisfactory. The relationship between the share of manufacturing and each explanatory

variable is statistically supported, although only marginally for some variables. The model can potentially be extended into a system of simultaneous equations by endogenizing some of the explanatory variables so as to measure the feedback effect among them and the dependent variable (MFGGPP). For example, it could be hypothesized that POPDEN is influenced by PCAPY and PCAPY is influenced by MFGGPP and other variables such as CRDEP, ELECT and ROAD. The true impact of each explanatory variable is thus speculated to be greater when the feedback effect is incorporated. However, the main purpose of our analysis is to test whether the MFGGPP is influenced by each explanatory variable. Therefore, we adopted the single equation approach for simplicity.

The regression results yield the following policy implications:

1) Regional industrialization may be achieved by policies aiming to increase regional or rural income, such as allocating greater share of the government budget to the outer regions, correcting the policy bias against agricultural product prices and promoting measures that aim to increase agricultural productivity.

2) The BMR has attracted migration from the outer regions on a massive scale due to better job opportunities and higher wages. Therefore, policies aiming at increasing job opportunity in the outer regions, if successfully implemented, could slow down this trend. As migration into the BMR slows down, population density in the outer provinces would tend to increase compared to the current trend and this would have repercussions tending to accelerate regional industrialization, which in turns would increase the number of job opportunities in the outer regions.

3) The effect of the distance variable on the degree of industrialization of the outer provinces is due to the interaction between the primacy of the BMR and the cost involved in transportation, communication, and other activities that the provincial firms have to conduct with Bangkok. This effect may be reduced by cutting the cost (including time and inconveniences) involved in such activities, or by reducing the primacy of the BMR.

These two objectives require persistent effort over a long period of time and may involve several programs. These programs may aim to improve the regional transportation and communication network, to promote the dispersion of some industries that are presently concentrated in the BMR, or to provide more direct access to international trade in the outer regions by accelerating the development of regional seaports and airports and related services, etc.

4. The effect of the credit-deposit ratio suggests that credit should be made more accessible to regional borrowers. The average credit-deposit ratio over the 1985-87 period in the outer regions is 70.5% while it is 104.3% for Bangkok and 55.9% for the other five provinces in the BMR. The low credit-deposit ratio in the five provinces despite their high degree of industrialization is contradictory to the regression result. A detailed study to explain this apparent paradox may produce useful insights for financial policy. The specific policy recommendations to enhance the availability of credit to regional industries are provided in the sub-project "Finance and Credit in Rural Industrialization".

5. The direct implication from the effect of ELECT and ROAD simply suggests that these infrastructures should be expanded. Another interpretation of this result is to treat ELECT and ROAD as proxies for infrastructures in general. This interpretation may be acceptable on the ground that the development of infrastructures depends more or less on each other.

The importance of infrastructures is strongly supported by a study by Herrin and Pernia on the choice of firm's location in the Philippines[4]. Based on interviews with a sample of 100 firms, 7

4. Herrin, Alejandro N. and Ernesto M. Pernia, "Factors Influencing the Choice of Location: Local and Foreign Firms in the Philippines", Regional Studies, Vol. 21, No. 6.

crucial factors were identified from a preselected set of 34 factors commonly thought to influence location decision. These factors are: (1) suitable land plot; (2) reliable electric power; (3) telephone/telex; (4) easy road access; (5) space for expansion; (6) proximity to to major customers; (7) suitable building. From this set of crucial factors, the infrastructures that should be emphasized are those involving transportation and market accessibility, information/ communication and electric power supply.

1.3 THE ROLE OF NATURAL RESOURCES

The preceding section analyses the relationship between the degree of industrialization and a few explanatory variables. An important factor has been omitted -- namely, the relative abundance of natural resources. The omission is due to several reasons. Firstly, the abundance of natural resources works in two opposing directions. On the one hand, the abundance of natural resources facilitates industrialization by lowering the cost of acquiring raw material inputs. On the other hand, the resource-abundant region tends to earn higher average income allowed by exploitation of its rich natural resources. Consequently, it seems to require higher wages and benefits to attract workers into manufacturing. Thus, the resource-rich region tends to loose its comparative advantage in labor cost. Second, it is not only very difficult to find an accurate yardstick for measuring the abundance of natural resources, but the data required for such measurement is even more difficult to obtain. Third, the effect of natural resources tends to be specific to the types of industries. This suggests that it should be more appropriate to analyze the effect of natural resources after the industries have been disaggregated.

In this section, we will investigate the role of natural resources in regional industrialization by referring to the 180-sector Input-Output Table of Thailand. The manufacturing sector is disaggregated into 93 sectors represented by code numbers 042 to 134. The underlying concept of this section is that, while most factors determining the

location choice of industries seem to favor the establishment of manufacturing plants in Bangkok, natural resources are probably the most influential factor that working in the opposite direction. The influence of natural resources on choice of location varies from one industry to another. We may use the term "resource-based industries" to mean those that are "attracted" to the source of unprocessed raw materials. The attraction stems primarily from minimization of the cost involves in raw material procurement. This force seems to be stronger for industries in which cost of transporting raw materials per unit distance is high as compared to the cost of transporting output to the market. Since an output requires several kinds of inputs, our discussion may be more convenient with an introduction of the concept of a dominant input.

We may define the dominant input for an industry as the input that -- with regard to procurement of raw materials -- exerts the greatest influence on the decision on location choice. For practical purposes, however, we shall modify this definition and base it on an easily measurable variable, that is the input coefficient value. In this paper, the dominant input is identified as the one which constitutes the highest value among all input costs (i.e. that has the highest input coefficient).

Out of the 180 sectors in the I-O Table of Thailand, sectors numbered 001 to 041 cover the agricultural and mining activities. We shall refer them as the "primary sector". Sector numbers 042 to 134 are classified as the manufacturing sector. We shall categorize the latter into 4 groups, namely the domestic upstream resource-based industries (DURBI), the downstream resource-based industries (DRBI), the import-based industries (IBI), and the unclassified industries (UI).

We define DURBIs as those industries whose inputs consist of a relatively high proportion of products from the primary sector. If natural resources have a significant role in regional industrialization, we can expect that there will be high proportion of these industries in the outer regions. The DRBIs are defined as those whose dominant inputs

are the products of DURBIs. The IBIs are defined as those whose inputs are relatively import intensive. Since Bangkok is the main port of entry and the center of distribution of imported goods, we can expect that the IBIs tend to be highly concentrated in Bangkok.

The criteria for determining which of the 93 manufacturing sectors belongs to which of the four categories are as follow:

1) The sector that is to be included in the DURBI group has to satisfy either of the following:

a) Its dominant input is supplied by the primary sector, (i.e. the highest input coefficient belongs to any of the sector with code number between 001 and 041).

b) The sum of input coefficients from the primary sector exceeds 0.20.

In addition, at least 60% of the total inputs of the sector must be supplied domestically.

These criteria are designed to distinguish the relative importance of inputs from the primary sector, as compared to other inputs, in determining the industry's location. The reason for choosing the proportion of input values over the proportion of input weights is due to data availability. An exception is made for the cement industry, which is identified as a DURBI although it does not satisfy the criteria above. This exception arises from the fact that the location of a limestone (or marl) deposit is a decisive factor in determining the plant's location.

2) The sectors identified as DRBIs are those whose dominant inputs belong to the DURBI group. The DRBIs are thus simply the downstream industries of the DURBIs. The intensity of DRBIs in the outer regions depends on how much they are influenced by the location of the dominant input-supplying plants (which are presumed to be predominant in the outer regions) as compared to the attraction of Bangkok. We may expect

that the proportion of these industries in the outer regions will be lower than that of the DURBIs but higher than that of other industries.

3) The IBIs cover any industry whose imported inputs account for at least 40% of its total input cost. These industries are expected to be highly concentrated in Bangkok.

4) All the rest of the 93 (manufacturing) sectors are referred to as UIs.

Table 1.4 shows the basic data employed in the classification procedure as described above as well as the resulting classification. Twenty-three sectors belong to the DURBI group, 10 sectors to the DRBI group, 19 sectors to the IBI group and 41 sectors to the UI group. From the list of industries in each group, we then attempt to compare their relative intensities in regional industries with respect to employment and income generation.

The number of workers in each I-O sector based on the data in the registration file of the Department of Industrial Works (DIW) are shown in Table 1.5. The total number of workers in each sector is split between those in the BMR and those in the outer regions, so that the employment generated by each sector can be compared between the two regions. The ratios of employment in the BMR over total employment by sector is shown in the last column of the table. This ratio might be taken as an indicator of the concentration of each industry in the BMR. The readers should be aware of the limitations of these data. First, the data cover only the firms that registered with the DIW. The number of unregistered firms may be relatively large in some sectors, so that analysis based on such the data could be misleading. Secondly, the actual number of workers in each plant usually deviates from the number reported in the registration, since the actual employment usually varies over time. By the law of large numbers, these errors should cancel out to some extent in the process of aggregation.

The first limitation tends to be a more serious problem, especially for the industries in which informal sectors are prevalent. Examples of important industries in which the employment data are highly questionable are slaughtering and jewelry. The reported number of employment in slaughtering in the outer regions is incredibly low (37 workers). The actual figure should be several thousands considering the fact that there are hundreds of slaughter houses and hundreds of thousand of animals being slaughtered each day. The total number of workers in the jewelry sector is only 4,305 according to the registration file. It is impossible that such a multi-billion baht business will employ such the small number of workers. Based on the recorded value of export of jewelry (24,000 million baht in 1988), a reasonable number for the employment in this sector should be in the order of hundreds of thousands.

To assess the overall reliability of the data we use, it is interesting to note that according to the labor force survey of the NSO, total employment in manufacturing in 1986 was 2,058,800 workers in the dry season and 1,398,800 workers in the rainy season as, compared to 1,004,951 workers of the registered firms.

The overall ratio of employment between unregistered firms and registered firms is thus about one to one. This ratio, however, does not spread evenly among industries. When we compare the employment ratios between the BMR and the outer regions by sector, the data may not represent the actual employment ratios, which include unregistered firms. Significant errors will occur in the cases in which the extent of employment in unregistered firms is overwhelming and there exists a systematic bias that the employment ratios differs between regions for the registered and unregistered firms. As noted earlier, the data on slaughtering and jewelry are highly suspected, and these two sectors are not used in our comparison. Therefore there remain 90 sectors in our study: 21 are in DURBI (rice milling and slaughtering are excluded), 10 are in DRBI, 18 are in IBI (Jewelry is excluded) and 41 are in UI.

According to Table 1.5, the ratio of manufacturing employment in Bangkok over that of the whole country is about 0.70. Among the four industrial groups, there are two groups of I-O sectors in which this ratio is lower than the overall average (0.33 for DURBI and 0.64 for DRBI), and two groups in which it is higher than the overall average (0.90 for IBI and 0.80 for UI).

At the I-O disaggregated level, it is quite striking to note that almost every sector in the DURBI group has a ratio below the overall average of 0.70. This finding strongly confirms our expectation that natural resources have a significant role in attracting the resource-based industries to the outer regions. The attraction is stronger for the upstream industries than for the downstream industries. Five out of ten sectors in the DRBI group have a ratio higher than 0.70, while only one out of twenty-one in the DURBI group exceed 0.70.

The renegade in the DURBI group is nonferrous metals (sector 107). This sector produces nuisances because of improper aggregation. It consists of domestic resource-based industries (notably tin and zinc smelting) as well as import-based industries (aluminum, copper, etc.). The major tin and zinc smelting plants are located in the outer regions, while most import-based nonferrous metal plants are located in the BMR as one would expect. The sector is classified as DURBI because tin and zinc dominate the sector's input composition. However, the import-based metals dominate the employment data, thus showing a high concentration of employment in the BMR. Furthermore, the output of this sector is the dominant input of sectors 120, 121 and 134. According to our criteria, these sectors should have been classified as DRBIs. They are classified as UIs instead since the inputs to these sectors from the import-based sub-sector are more significant than those from the domestic resource-based subsectors.

For the IBI group, there are only two sectors out of the total of nineteen in which the employment ratio is lower than 0.70. This finding also confirms our expectation that import-based industries tend to be highly concentrated in the BMR. The two exceptions are sector 093

(petroleum refinery) and sector 118 (agricultural machinery). the petroleum refinery is a large scale industry that requires extensive land area. A suitable location for a refinery is usually in an open, rural area. Most agricultural machinery plants are small scale, but their customers are rural farmers. There is a significant advantage in locating these plants near their customers, so there is a high proportion of employment in this industry in the outer regions.

In order to confirm statistically that the employment ratios between the BMR and the outer regions in the four groups of industries do not differ from each other by chance, a contingency table analysis was applied to the data as shown in Table 1.6. The result of the test strongly support this hypothesis; the test score is as high as 228,096 as compared to the χ^2 value of 7.815 at the .05 significant level.

An index of relative competitiveness (IRC) of the outer regions in each industry i has been constructed by comparing the relative employment of firms in the outer regions and the BMR. Let

N_r = total manufacturing employment in the outer regions
N = total manufacturing employment in the whole country
N_{ri} = total employment in industry i in the outer regions
N_i = total employment in industry i in the whole country

$$IRC_i = \frac{N_{ri}/N_i}{N_r/N} - 1$$

The outer regions are regarded as being relatively competitive in industries in which this index (IRC) is positive and relatively uncompetitive in industries in which this index is negative. The IRC for each industry and group of industries is shown in Table 1.6; it can be quickly seen that the outer regions are more competitive in the DURBI group and uncompetitive in most industries in the IBI and the UI groups. A direct implication of this finding is that natural resources are a very important factor in determining the comparative advantage of the outer regions. Manufacturing employment in the outer regions may be

stimulated indirectly by promotion of resource-based industries. However, there are major constraints to the growth opportunity of these industries on both the demand and the supply sides. On the demand side, the growth opportunity is limited by the low income elasticity of resource-based products, especially food. On the supply side, it is constrained by the depletion of natural resources. Forested land has been contracted at an alarming rate, from 53 per cent of the country's total area in 1961 to 29 per cent in 1985.[5] The prospect for agricultural expansion is thus limited. Fishery in Thailand's exclusive economic zone has exceeded the maximum sustainable yield, and effort per amount of catch has been increasing.[6] Mineral resources can be regarded as having a secondary role in the Thai economy. The contribution of the mining sector to GDP has been less than 3% every year for the last two decades. Employment in this sector in 1988 was only 28,525 persons (less than 0.1 per cent of the population).[7]

The promotion of regional industries should consist of policies aiming to promote the industries in which the outer regions have comparative advantage as well as to improve the competitiveness of the outer regions in other industries. The former objective can be achieved by correcting the distortion in the product market (e.g. the anti-export policy). The later objective may involve correcting the distortion in the factor market and direct promotional measures. Distortion in the factor market is due to such measures as minimum wage regulation and interest rate ceiling. Direct promotional measures will be dealt with in the final chapter.

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5. TDRI, "Thailand Natural Resource Profile", Year-End Conference Paper 1986, pp. 140.

6. Suthat Setboonsarng and Prasong Werakarnjanapongs, "Forestry and Land Use Policy," TDRI Year-End Conference Paper, 1988, pp. 5.

7. Paitoon Wiboonchutikula, Rachain Chintayarangsan and Nattapong Thongpakle, "Trade in Manufactured Goods and Mineral Products", TDRI Year-End Conference Paper, 1989, pp. 126, 136.

1.4 LABOR INTENSITY AND RELATIVE COMPETITIVENESS

The previous section shows that the outer regions are relatively more competitive in the domestic resource-based industries. In this section, we shall investigate whether they are relatively more competitive in labor intensive industries as well.

In a study on migration patterns, it was reported that between 1965 and 1970, the net migration from the outer regions to the BMR amounted to 176,648 persons.[8] Between 1975 and 1980, it increased to 289,576 persons. The increase of the net migration is quite striking for the 5 provinces surrounding Bangkok, where it was about 12-fold, from 7,655 to 95,883 persons. The latter period coincided with the rapid expansion of industrial jobs in these provinces. The net out-migration was the highest and increased rapidly in the Northeast: 87,014 persons in the former period and 208,617 persons in the latter period. One wonders why in such a low-income region in which out-migration has been extremely high, the minimum wage rate is kept very close to the BMR. Obviously, the minimum wage makes it harder for the low-income region to exploit its comparative advantage in labor-intensive industries.

Suchart employed a regression analysis to explain the causes of migration.[9] The unemployment rate was selected as one of the explanatory variables. In all of the four equations in which the dependent variables are in-migration between 1965 and 1970, out-migration in the same period, in-migration in the 1975-80 period and out-migration in the same period, the direction of the effect of the unemployment rate is as expected. A high unemployment rate induces more out-migration and less in-migration. However, the effect is statistically insignificant in every equation at the 0.05 level.

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8. Suchart Prasitratasin, "Changing Pattern of Urbanization and Migration", National Institute of Development Administration, 1987, pp. 23 (in Thai).

9. Suchart, op.cit., pp. 36-39.

One reason for the insignificant relationship is that the relationship is automatically weakened by the reduction of unemployment due to out-migration and the increase of unemployment due to in-migration.

Our analysis will be focused on the relationship between the labor capital ratio and the index of relative competitiveness. The labor-capital ratio is obtained by taking the ratio between the number of employees and the amount of registered capital in each I-O sector. The data is based on the DIW registration file. The relationship between the IRC and the L-K ratio is measured by the Spearman's rank correlation coefficient.

Before performing this analysis, let us look at the pattern of variation of the labor-capital ratio among industries and between the BMA and the outer regions as shown in Table 1.8. Between groups of industries, the IBI shows the lowest labor capital-ratio, followed by the DURBI. The DRBI and the UI are relatively labor intensive. The average labor-capital ratio in the outer regions is higher than that in the BMR in the two labor intensive groups. (UI and DRBI) while it is lower in the outer regions than in the BMR in the more capital intensive groups (IBI and DURBI). The greatest difference is in the IBI group where the labor-capital ratio in the BMR is almost three times that in the outer regions. The major sectors that are responsible for this outcome are pulp, radio, television and communication equipment, spinning, oil refinery and iron and steel. These sectors register extremely large amount of capital and highly capital intensive in the outer regions.

In the previous section, the DURBI and the IBI are the polar groups in which the sources of material inputs have great influence on their relative competitiveness. These two sectors are excluded in the present analysis in order to reduce this effect.

If the minimum wage regulation is effectively implemented, the comparative advantage due to wage differential will probably be insignificant. It is generally believed that this regulation is more effective among large firms than small firms. Therefore the actual wage

differential between regions in small firms should better represent the situation in which wages are freely determined by the market force.

From the above considerations, the analysis will proceed as follows: The labor-capital ratios for each industry group (by I-O classification) in the UI and the IBI are computed for large firms and small firms separately. Large firms are defined as those whose registered capital exceeds 10 million baht. The IRC of the firms in the outer regions in each industry group is also computed separately for large firms and small firms. The rank correlation between the labor-capital ratio and the IRC is then analyzed in each case. In the case of small firms, the rank correlation coefficient is equal to 0.2675, which is statistically significant at the one-tail significance test level of 0.05 ($\rho_{.05(50)} = 0.2326$). This result confirms that the relative competitiveness of small firms in the outer regions increases with the labor intensity. In other words, these regions tend to have a comparative advantage in labor intensive industries.

For large firms, the rank correlation coefficient turns out to be -0.0013, which is statistically insignificant. The large firms in the outer regions do not have a comparative advantage in labor intensive industries as small firms do. If it can be taken for granted that the wage differential between the BMR and the outer regions for small firms is greater than for large firms and that the latter are more effectively controlled by the minimum wage regulation, then it is clear that this regulation destroys the comparative advantage of the large regional firms in labor intensive industries. The distortion created by the minimum wage regulation is thus an impediment to the industrialization of the outer regions.

Table 1.1
Gross Regional Product (GRP) at Current Market Prices: 1987

Industrial Origin	Whole Kingdom	North East	North	South	Rural Central	Greater Bangkok
(Unit: Million Baht)						
Agriculture	198284.0	48538.9	41849.6	43261.2	45419.5	19214.8
Manufacturing	295512.0	11295.0	9228.4	5794.8	38635.3	230558.6
Others	740234.1	95533.3	87204.9	73415.1	128689.6	355391.3
Gross Regional Product	1234030.1	155367.1	138283.0	122471.0	212744.3	605164.7
Per Capita GRP.(Baht)	23021.0	8343.0	13185.0	17506.0	23525.9	71566.0
Population(1,000 persons)	53605.0	18622.0	10488.0	6996.0	9043.0	8456.0
(Unit: Percent of Kingdom)						
Agriculture	100.00	24.48	21.11	21.82	22.91	9.69
Manufacturing	100.00	3.82	3.12	1.96	13.07	78.02
Others	100.00	12.91	11.78	9.92	17.38	48.01
Gross Regional Product	100.00	12.59	11.21	9.92	17.24	49.04
Population	100.00	34.74	19.57	13.05	16.87	15.77

Source: NESDB

Table 1.2
Share of Manufacturing Value Added in Gross Provincial Product: 1987

Percent

Greater Bangkok	38.1	Rural Central	18.2	North	6.7	Northeast	7.3	South	4.7
Bangkok	35.7	Chon Buri	39.1	Uttaradit	15.2	Khon Kaen	15.7	Phuket	13.2
Pathum Thani	58.8	Saraburi	29.2	Tak	12.3	Surin	13.1	Surat Thani	6.6
Samut Prakan	56.8	Ayutthaya	20.5	Nakhon Sawan	10.7	Nong Khai	10.5	Yala	5.6
Samut Sakhon	32.8	Rayong	14.9	Chiang Mai	10.0	Nakhon Ratchasima	8.8	Nakhon Si Thammarat	5.5
Nonthaburi	25.5	Ratchaburi	14.8	Kam Phaeng Phet	8.7	Buri Ram	8.2	Narathiwat	4.8
Nakhon Pathom	20.5	Prachuap Khiri Khan	12.5	Lampang	4.6	Mukdahan	7.6	Ranong	4.6
		Kanchanaburi	12.4	Mae Hong Son	4.3	Ubon Ratchathani	7.0	Songkhla	4.3
		Trat	9.0	Phayao	4.2	Chaiyaphum	6.7	Phangnga	3.5
		Singburi	8.6	Phitsanulok	3.9	Udon Thani	5.3	Pattani	3.2
		Chanthaburi	8.2	Phetchabun	3.9	Kalasin	3.5	Phatthalung	3.0
		Samut Songkhram	8.0	Phrae	3.5	Roi Et	2.7	Krabi	2.8
		Prachinburi	7.9	Phichit	3.4	Sakon Nakhon	2.5	Trang	2.7
		Phetchaburi	6.6	Sukotthai	3.2	Maha Sarakham	2.3	Satun	2.5
		Suphan Buri	6.0	Chiang Rai	2.7	Yasothon	2.2	Chumphon	2.2
		Chachoengsao	5.6	Nan	2.6	Si Sa Ket	1.8		
		Chai Nat	4.7	Lamphun	2.4	Loei	1.7		
		Lop Buri	4.1	Uthai Thani	2.1				
		Ang Thong	2.8						
		Nakhon Nayok	1.6						

Source: NESDB

Table 1.3
Data Used in the Regression Analysis

Province	1/ Avg 85-7 Nominal MFG/GPP	3/ Investm'T In Road (M Baht)	1/ Avg 85-7 Per Capita Income	1/ Avg 85-7 Elect & Water	4/ Distance (Km.) 1985	2/ Avg 85-7 Cr-Dep Ratio	1/4/ Population Density (Per Sq.Km)
Ang Thong	3.46	272.8	12167.0	2.81	105	58.49	274.0
Ayuthaya	20.77	527.0	13625.7	4.03	76	57.40	250.5
Bangkok	35.12	1448.6	72067.0	2.24	0	104.33	3721.5
Buri Ram	8.22	546.0	7165.7	1.09	410	75.93	127.3
Chachoengsao	5.33	421.1	29272.7	3.74	82	45.12	95.7
Chai Nat	5.33	334.8	15670.0	1.01	194	69.55	134.6
Chaiyaphum	6.84	401.2	8046.7	1.52	342	80.95	75.0
Chanthaburi	7.30	291.6	15478.0	2.74	245	39.42	59.9
Chiang Mai	9.96	856.6	16619.7	2.47	696	101.64	63.3
Chiang Rai	4.03	851.1	10730.7	1.18	785	98.47	83.5
Chon Buri	41.59	483.3	59280.0	1.60	81	78.62	180.8
Chumphon	3.44	335.5	20375.3	1.39	463	63.14	62.9
Kalasin	3.98	445.2	7219.7	1.73	519	67.53	119.8
Kam Phaeng Phet	8.29	469.0	16643.7	1.13	358	101.35	72.3
Kanchanaburi	12.31	756.4	29152.7	1.87	128	142.50	31.7
Khon Kaen	15.08	863.3	10610.7	2.32	449	100.56	145.0
Krabi	3.13	198.4	18614.3	2.84	814	94.61	58.1
Lampang	4.70	792.1	14793.3	4.70	599	63.39	58.3
Lamphun	2.85	355.7	10800.3	1.42	670	63.81	87.6
Loei	2.12	657.0	10359.3	1.07	520	82.47	45.2
Lop Buri	4.12	525.9	12751.0	2.60	153	65.07	110.4
Mae Hong Son	4.77	299.0	13581.3	0.69	924	72.02	12.1
Maha Sarakham	4.51	458.1	6501.0	1.28	475	84.15	161.0
Mukdahan	6.78	113.0	8181.7	1.06	642	110.08	61.7
Nakhon Nayok	2.19	145.1	11770.0	2.32	107	52.95	97.1
Nakhon Pathom	19.88	579.3	17661.0	4.93	56	54.79	273.0
Nakhon Phanom	1.91	143.5	7162.0	1.33	740	40.23	107.8
Nakhon Ratchasima	8.64	960.9	10398.0	2.65	259	84.75	108.2
Nakhon Sawan	11.09	665.8	13500.0	1.51	240	59.51	107.9
Nakhon Si Thammarat	6.39	949.3	10870.7	1.83	780	58.17	143.1
Nan	3.43	793.7	8978.7	1.21	668	85.96	36.1
Narathiwat	4.73	319.5	12832.7	1.34	1149	59.67	117.4
Nong Khai	8.70	355.0	9582.3	1.07	615	46.37	105.2
Nonthaburi	23.81	415.1	17430.7	7.76	20	35.81	798.1
Pathum Thani	58.58	381.9	53021.0	5.61	46	83.20	247.7
Pattani	2.96	194.8	11423.3	1.68	1055	52.25	264.9
Phachuap Khiri Khan	13.43	231.6	24708.3	1.74	281	82.56	62.6
Phangnga	3.36	498.2	32690.3	0.72	788	52.46	49.5
Phatthalung	3.51	237.4	11156.3	1.21	840	56.44	132.5
Phayao	5.30	234.2	8615.7	1.36	691	113.08	75.4
Phetchabun	4.22	767.4	10217.0	1.11	346	67.40	70.9
Phetchaburi	8.18	368.2	16719.7	3.04	123	55.20	65.1
Phichit	4.94	297.9	9983.3	1.53	344	55.16	120.3
Phitsanulok	4.87	528.4	11879.3	1.84	377	69.01	67.9
Phrae	3.69	499.3	9311.3	1.83	551	67.00	72.3
Phuket	16.79	90.8	35300.0	3.04	862	87.54	287.3
Prachinburi	7.59	547.4	10382.7	1.87	135	68.15	63.8

Table 1.3 (Continued)

Province	1/ Avg 85-7 Nominal MFG/GPP	3/ Investm'T In Road (M Baht)	1/ Avg 85-7 Per Capita Income	1/ Avg 85-7 Elect & Water	4/ Distance (Km.) 1985	2/ Avg 85-7 Cr-Dep Ratio	1/4/ Population Density (Per Sq.Km)
Ranong	5.41	303.6	39438.0	1.53	568	37.30	31.6
Ratchaburi	14.09	480.9	18295.0	3.94	100	52.71	130.7
Rayong	13.00	286.9	35567.0	3.07	179	76.64	114.4
Roi Et	4.01	592.3	6690.7	1.59	512	96.17	140.3
Sakon Nakhon	4.14	553.1	7178.3	1.43	647	77.71	93.0
Samut Prakan	55.47	611.9	73948.3	6.23	29	52.75	653.7
Samut Sakhon	29.43	236.6	36076.0	6.67	36	52.87	353.5
Samut Songkhram	6.15	168.1	14258.0	2.19	72	46.22	482.4
Saraburi	27.77	299.8	36482.0	5.40	107	61.15	135.2
Satun	2.48	145.0	20813.7	1.02	973	86.73	82.7
Si Sa Ket	2.72	493.1	6441.3	0.98	571	83.59	138.2
Singburi	10.23	282.7	15185.0	1.89	142	64.50	255.7
Songkhla	4.48	425.7	18902.0	2.47	950	89.87	141.6
Sukotthai	3.52	367.6	11458.3	1.21	427	92.43	85.6
Suphan Buri	6.14	423.1	12853.7	1.57	100	48.47	144.3
Surat Thani	6.51	1037.3	19699.7	1.74	644	63.39	55.2
Surin	11.66	598.1	7302.3	1.29	457	84.09	147.2
Tak	13.26	831.1	17837.0	3.44	426	54.08	19.4
Trang	2.76	178.3	15337.0	1.73	828	47.58	100.8
Trat	7.90	297.8	20985.0	2.13	315	33.14	57.0
Ubon Ratchathani	7.52	677.3	7283.0	1.64	629	63.21	93.4
Udon Thani	6.36	635.8	7915.3	2.10	564	66.62	108.2
Uthai Thani	3.75	219.2	13751.0	0.82	219	51.86	42.1
Uttaradit	14.53	442.4	13243.3	2.95	491	95.35	56.0
Yala	5.43	258.9	16514.3	2.13	1084	57.01	72.5
Yasothon	3.07	149.1	6643.7	1.27	531	65.90	118.9

Sources: 1/ NESDB
2/ Bank of Thailand
3/ TDRI
4/ Statistical Yearbook Thailand

Table 1.4
Classification of Industries into Four Major Groups Based on 1982 I-O Table

Sector		Dominant Input		Sum of Input Coefficients of Primary Sector	Import Ratio	Category
Code	Name	Code	Coefficient			
42	Slaughtering	19	0.328	0.757	0.0032	DURBI
43	Canning and Preservation of Meat	42	0.495	0.004	0.0043	DRBI
44	Dairy Products	44	0.378	0.029	0.1324	UI
45	Canning,Preservation of Fruits, Vegetables	8	0.276	0.404	0.1009	DURBI
46	Canning, Preservation of Sea Foods	28	0.507	0.522	0.0443	DURBI
47	Coconut and Palm Oil	11	0.291	0.500	0.0114	DURBI
48	Animal, Vegetable Oil and By Products	6	0.312	0.316	0.0187	DURBI
49	Rice Milling	1	0.749	0.749	0.0024	DURBI
50	Tapioca Milling	4	0.798	0.798	0.0005	DURBI
51	Grinding of Maize	2	0.591	0.591	0.0157	DURBI
52	Flour and Other Grain Milling	3	0.452	0.502	0.4255	DURBI
53	Bakery Products	52	0.347	0.028	0.0227	DRBI
54	Noodles and Similar Products	49	0.499	0.039	0.0210	DRBI
55	Sugar	9	0.671	0.672	0.0034	DURBI
56	Confectionery	52	0.203	0.056	0.0671	DRBI
57	Ice	135	0.277	0.004	0.2058	UI
58	Monosodium Glutamate	55	0.245	0.000	0.1863	DRBI
59	Coffe and Tea (Processing)	15	0.603	0.603	0.0211	DURBI
60	Other Food Products	6	0.196	0.495	0.0372	DURBI
61	Animmal feed	28	0.166	0.278	0.1132	DURBI
62	Distilling and Spirits Blending	49	0.112	0.006	0.0666	UI
63	Breweries	63	0.105	0.020	0.3795	UI
64	Soft Drinks	64	0.166	0.009	0.1955	UI
65	Tobacco Processing	14	0.640	0.640	0.0006	DURBI
66	Tobacco Products	65	0.205	0.000	0.4516	IBI
67	Spinning	86	0.192	0.203	0.4125	IBI
68	Weaving	67	0.537	0.000	0.0598	UI
69	Textile Bleaching and Finishing	93	0.265	0.000	0.3031	UI
70	Made-Up Textile Goods	68	0.290	0.062	0.0869	UI
71	Knitting	67	0.408	0.000	0.0722	UI
72	Wearing Apparel	68	0.551	0.000	0.1031	UI
73	Carpets and Rugs	71	0.236	0.000	0.0126	UI
74	Jute Mill Products	12	0.344	0.344	0.1536	DURBI
75	Tanneries and Leather Finishing	42	0.607	0.079	0.0373	DRBI
76	Leather Products	75	0.196	0.005	0.1319	UI
77	Footwear, Except of Rubber	68	0.237	0.000	0.0944	UI
78	Saw Mills	25	0.404	0.406	0.0962	DURBI
79	Wood and Cork Products	78	0.376	0.095	0.1834	DRBI
80	Wooden Furniture and Fixtures	78	0.477	0.010	0.1441	DRBI
81	Pulp, Paper and Paperboard	81	0.341	0.006	0.5600	IBI
82	Paper and Paperboard Products	81	0.556	0.000	0.5601	IBI
83	Printing and Publishing	81	0.304	0.000	0.5406	IBI
84	Basic Industrial Chemicals	84	0.260	0.082	0.3849	UI
85	Fertilizer and Pesticides	85	0.359	0.016	0.5772	IBI
86	Synthesic Resin, Plastic, etc.	86	0.096	0.000	0.1509	UI
87	Paints, Varnishes, and Lacquers	84	0.338	0.000	0.5830	IBI

Table 1.4 (Continued)

Sector		Dominant Input		Sum of Input Coefficients	Import	Category
Code	Name	Code	Coefficient	of Primary Sector	Ratio	
88	Drugs and Medicines	84	0.109	0.037	0.3473	UI
89	Soap and cleaning Preparations	92	0.216	0.000	0.4535	UI
90	Cosmetics	180	0.112	0.023	0.1750	UI
91	Matches	84	0.107	0.028	0.1849	UI
92	Other Chemical Products	84	0.330	0.102	0.4055	IBI
93	Petrolium Refineries	31	0.759	0.759	0.8883	IBI
94	Other Petroleum Products	93	0.285	0.005	0.0679	UI
95	Rubber Sheet and Block Rubber	16	0.731	0.732	0.0277	DURBI
96	Tyres and Tubes	68	0.200	0.000	0.3168	UI
97	Other Rubber Products	95	0.537	0.000	0.1030	DRBI
98	Plastic Ware	86	0.310	0.000	0.5531	IBI
99	Ceramic and Earthen Ware	40	0.107	0.130	0.0659	DURBI
100	Glass and Glass Products	84	0.160	0.090	0.1864	UI
101	Structural Clay Products	40	0.138	0.246	0.0850	DURBI
102	Cement	93	0.364	0.074	0.0865	DURBI
103	Concrete and Cement Products	102	0.286	0.258	0.0495	DURBI
104	Other Non-Metalic Products	102	0.310	0.312	0.2492	DURBI
105	Iron and Steel	105	0.546	0.021	0.4020	IBI
106	Secondary Stell Products	105	0.306	0.004	0.2483	UI
107	Non-Ferreous Metal	33	0.581	0.594	0.0849	DURBI
108	Cutlery and Hand Tools	106	0.380	0.001	0.3926	UI
109	Metal Furniture and Fixtures	106	0.371	0.000	0.3007	UI
110	Structural Metal Products	106	0.358	0.000	0.3761	UI
111	Other Fabricated Metal Products	106	0.376	0.000	0.4821	IBI
112	Engines and Turbines	112	0.238	0.000	0.2807	UI
113	Agricultural Machinery	112	0.167	0.000	0.2932	UI
114	Wood and MetalWorking Machine	106	0.180	0.000	0.1967	UI
115	Special Industrial Machinery	106	0.162	0.000	0.4562	IBI
116	Office and Household Machinery	116	0.130	0.000	0.3237	UI
117	Electrical Machinery	117	0.180	0.000	0.2461	UI
118	Radio, Television, etc.	118	0.365	0.000	0.4783	IBI
119	Household Electrical Appliances	119	0.185	0.000	0.3039	UI
120	Insulated Wire and Cable	107	0.306	0.000	0.1843	UI
121	Electric Accumulators	107	0.156	0.002	0.3604	UI
122	Other Electrical Apparatus	122	0.326	0.000	0.5460	IBI
123	Ship Building and Repairing	123	0.223	0.000	0.2925	UI
124	Railroad Equipment	124	0.204	0.000	0.2236	UI
125	Motor Vehicles	125	0.222	0.000	0.4386	IBI
126	Motorcycles and Bicycles	126	0.203	0.000	0.2401	UI
127	Repair of Motor Vehicles	106	0.109	0.000	0.2781	UI
128	Aircraft	128	0.311	0.000	0.2378	UI
129	Scientific Equipment	129	0.323	0.000	0.2772	UI
130	Photographic and Optical Goods	130	0.399	0.000	0.6288	IBI
131	Watches and Clocks	131	0.545	0.000	0.5774	IBI
132	Jewellry and Related Articles	132	0.238	0.035	0.4990	IBI
133	Recreational Equipment	95	0.173	0.116	0.0808	DRBI
134	Other Manufactured Goods	107	0.213	0.076	0.1011	UI

Source: Input-Output Table of Thailand, 1982.

Table 1.5

Employment of Registered Firms by I-O Classification

IO	Name	Greater Bangkok	Provin-cial	Whole Kingdom	Bangkok /Kingdom
		Number of Workers			
	DURBI				

45	Canning, Preservation of Fruits, Vegetables	7102	10991	18093	0.3925
46	Canning and Preservation of Sea Foods	12653	12283	24936	0.5074
47,48	Animal, Vegetable Oil and by Products	3416	1566	4982	0.6857
50,51,52	Grinding of Maize and Other Grain Milling	934	26674	27608	0.0338
55	Sugar	655	23541	24196	0.0271
59	Coffee and Tea (Processing)	251	284	535	0.4692
60	Other Food Products	2162	7923	10085	0.2144
61	Animal Feed	5267	4413	9680	0.5441
65	Tobacco Processing	3064	4172	7236	0.4234
74	Jute Mill Products	8557	15997	24554	0.3485
78	Saw Mills	11186	21547	32733	0.3417
95	Rubber Sheet and Block Rubber	3457	11268	14725	0.2348
99	Ceramic and Earthen Ware	5184	7598	12782	0.4056
101	Structure Clay Products	848	6292	7140	0.1188
102	Cement	158	4177	4335	0.0364
103	Concrete and Cement Products	12482	7854	20336	0.6138
104	Other Non-metallic Products	2022	1397	3419	0.5914
107	Non-ferrous Metal	5091	1116	6207	0.8202
	Total	84489	169093	253582	0.3332
	DRBI				

43	Canning and Preservation of Meat	1432	1100	2532	0.5656
53	Bakery Product	4674	1635	6309	0.7408
54	Noodles and Similar Products	4676	3815	8491	0.5507
56	Confectionery	2752	515	3267	0.8424
58	Monosodium Glutamate	3286	2014	5300	0.6200
75	Tanneries and Leather Finishing	1523	27	1550	0.9826
79	Wood and Cork Products	10190	5874	16064	0.6343
80	Wooden Furniture and Fixtures	17145	13505	30650	0.5594
97	Other Rubber Products	5706	767	6473	0.8815
133	Recreational Equipment	683	26	709	0.9633
	Total	52067	29278	81345	0.6401

Table 1.5 (Continued)

IO	Name	Number of Workers: Greater Bangkok	Provincial	Whole Kingdom	Bangkok /Kingdom
	IBI				

66	Tobacco Products	3425	40	3465	0.9885
67	Spinning	26575	4077	30652	0.8670
81	Pulp, Paper and Paperboard	5230	1712	6942	0.7534
82	Paper and Paperboard Products	6834	175	7009	0.9750
83	Printing and Publishing	20522	1925	22447	0.9142
85	Fertilizer and Pesticides	907	347	1254	0.7233
87	Paints, Varnishes and Lacquers	2067	406	2473	0.8358
92	Other Chemical Products	2281	718	2999	0.7606
93	Petroleum Refineries	594	676	1270	0.4677
98	Plastic Ware	25261	642	25903	0.9752
105	Iron and Steel	11114	2001	13115	0.8474
111	Others Fabricated Metal Products	51125	1253	52378	0.9761
115	Special Industrial Machinery	2848	520	3368	0.8456
118	Radio, Television, etc.	3627	2999	6626	0.5474
122	Other Electrical Apparatus	5416	60	5476	0.9890
125	Motor Vehicles	26312	4739	31051	0.8474
130	Photographic and Optical Goods	699	6	705	0.9915
131	Watches and Clocks	3293	10	3303	0.9970
	Total	198130	22306	220436	0.8988
	UI				
	--				
44	Dairy Products	3716	950	4666	0.7964
57	Ice	2036	6095	8131	0.2504
62	Distilling and Spirits Blending	6587	3667	10254	0.6424
63	Breweries	3311	6	3317	0.9982
64	Soft Drinks	9034	1494	10528	0.8581
68	Weaving	64723	4537	69260	0.9345
69	Textile Bleaching and Finishing	8508	292	8800	0.9668
70	Made-up Textile Goods	2601	2597	5198	0.5004
71	Knitting	16745	251	16996	0.9852
72	Wearing Apparel	86997	1673	88670	0.9811
73	Carpets and Rugs	1654	1152	2806	0.5895

Table 1.5 (Continued)

Number of Workers

IO	Name	Greater Bangkok	Provin-cial	Whole Kingdom	Bangkok /Kingdom
UI					
76	Leather Products	7517	0	7517	1.0000
77	Footwear, Except of Rubber	7806	1560	9366	0.8334
84	Basic Industrial Chemicals	3220	620	3840	0.8385
86	Synthetic Resins, Plastic, etc.	6209	230	6439	0.9643
88	Drugs and Medicines	13533	1217	14750	0.9175
89	Soap and Cleaning Preparations	2161	108	2269	0.9524
90	Cosmetics	2663	54	2717	0.9801
91	Matches	983	709	1692	0.5810
94	Other Petroleum Products	903	1237	2140	0.4220
96	Tyers and Tubes	6246	1246	7492	0.8337
100	Glass and Glass Products	8390	5	8395	0.9994
108	Cutlery and Hand Tools	1199	132	1331	0.9008
109	Metal Furniture and Fixtures	4559	442	5001	0.9116
110	Structural Metal Products	12419	2478	14897	0.8337
112	Engines and Turbines	8048	10776	18824	0.4275
113	Agricultural Machinery	3018	3558	6576	0.4589
114	Wood and Metal Working Machine	3052	71	3123	0.9773
116	Office and Household Machinery	16757	2182	18939	0.8848
117	Electrical Machinery	9331	585	9916	0.9410
119	Household Electrical Appliances	1244	0	1244	1.0000
120	Insulated Wire and Cable	2605	0	2605	1.0000
121	Electric Accumulators	5718	75	5793	0.9871
123	Ship Building and Repairing	2529	2417	4946	0.5113
124	Railroad Equipment	2936	0	2936	1.0000
126	Motorcycles and Bicycles	12116	570	12686	0.9551
127	Repair of Motor Vehicles	16080	7716	23796	0.6757
128	Aircraft	1710	0	1710	1.0000
129	Scientific Equipment	1341	7	1348	0.9948
134	Other Manufactured Goods	11090	1785	12875	0.8614
999	N.E.C	10176	33772	43948	0.2315
	Total	391471	96266	487737	0.8026
	Grand Total	726157	316943	1043100	0.6962

Source: Provincial Factory Directories (PFD), Ministry of Industry.

Table 1.6
Contingency Table Analysis of Employment Distribution Between Regions by Industry Groups

Number of Employees

Region	DURBI	DRBI	IBI	UI	Total
Greater Bangkok					
- Observed	84,489	52,067	198,130	391,471	726,157
- Expected	176,532	56,629	153,457	339,540	
Outer Regions					
- Observed	169,093	29,278	22,306	96,266	316,943
- Expected	77,050	24,716	66,979	148,197	
Total	253,582	81,345	220,436	487,737	1,043,100

Notes: $\chi^2 = 228,096$
$\chi^2.05(3) = 7.815$

Source: Table 1.5

Table 1.7
Index of Relative Competitiveness
of the Outer Regions by Industry

IO	Name	Index
	DURBI	

45	Canning, Preservation of Fruits, Vegetables	0.9993
46	Canning and Preservation of Sea Foods	0.6211
47,48	Animal, Vegetable Oil and by Products	0.0345
50,51,52	Grinding of Maize and Other Grain Milling	2.1798
55	Sugar	2.2020
59	Coffee and Tea (Processing)	0.7471
60	Other Food Products	1.5856
61	Animal Feed	0.5004
65	Tobacco Processing	0.8975
74	Jute Mill Products	1.1442
78	Saw Mills	1.1664
95	Rubber Sheet and Block Rubber	1.5185
99	Ceramic and Earthen Ware	0.9563
101	Structure Clay Products	1.9002
102	Cement	2.1712
103	Concrete and Cement Products	0.2711
104	Other Non-metallic Products	0.3448
107	Non-ferrous Metal	-0.4083
	Total	1.1946
	DRBI	

43	Canning and Preservation of Meat	0.4298
53	Bakery Products	-0.1471
54	Noodles and Similar Products	0.4787
56	Confectionery	-0.4812
58	Monosodium Glutamate	0.2506
75	Tanneries and Leather Finishing	-0.9427
79	Wood and Cork Products	0.2034
80	Wooden Furniture and Fixtures	0.4501
97	Other Rubber Products	-0.6100
133	Recreational Equipment	-0.8793
	Total	0.1846

Table 1.7 (Continued)

IO	Name	Index
	IBI	

66	Tobacco Products	-0.9620
67	Spinning	-0.5622
81	Pulp, Paper and Paperboard	-0.1884
82	Paper and Paperboard Products	-0.9178
83	Printing and Publishing	-0.7178
85	Fertilizer and Pesticides	-0.0893
87	Paints, Varnishes and Lacquers	-0.4597
92	Other Chemical Products	-0.2121
93	Petroleum Refineries	0.7518
98	Plastic Ware	-0.9184
105	Iron and Steel	-0.4979
111	Others Fabricated Metal Products	-0.9213
115	Special Industrial Machinery	-0.4919
118	Radio, Television, etc.	0.4896
122	Other Electrical Apparatus	-0.9639
125	Motor Vehicles	-0.4977
130	Photographic and Optical Goods	-0.9720
131	Watches and Clocks	-0.9900
	Total	-0.6670
	UI	
	--	
44	Dairy Products	-0.3299
57	Ice	1.4670
62	Distilling and Spirits Blending	0.1770
63	Breweries	-0.9940
64	Soft Drinks	-0.5330
68	Weaving	-0.7844
69	Textile Bleaching and Finishing	-0.8908
70	Made-up Textile Goods	0.6443
71	Knitting	-0.9514
72	Wearing Apparel	-0.9379
73	Carpets and Rugs	0.3512

Table 1.7 (Continued)

IO	Name	Index
UI		
76	Leather Products	-1.0000
77	Footwear, Except of Rubber	-0.4518
84	Basic Industrial Chemicals	-0.4686
86	Synthetic Resins, Plastic, etc.	-0.8824
88	Drugs and Medicines	-0.7285
89	Soap and Cleaning Preparations	-0.8433
90	Cosmetics	-0.9346
91	Matches	0.3791
94	Other Petroleum Products	0.9024
96	Tyers and Tubes	-0.4527
100	Glass and Glass Products	-0.9980
108	Cutlery and Hand Tools	-0.6736
109	Metal Furniture and Fixtures	-0.7091
110	Structural Metal Products	-0.4525
112	Engines and Turbines	0.8840
113	Agricultural Machinery	0.7807
114	Wood and Metal Working Machine	-0.9252
116	Office and Household Machinery	-0.6208
117	Electrical Machinery	-0.8058
119	Household Electrical Appliances	-1.0000
120	Insulated Wire and Cable	-1.0000
121	Electric Accumulators	-0.9574
123	Ship Building and Repairing	0.6083
124	Railroad Equipment	-1.0000
126	Motorcycles and Bicycles	-0.8521
127	Repair of Motor Vehicles	0.0672
128	Aircraft	-1.0000
129	Scientific Equipment	-0.9829
134	Other Manufactured Goods	-0.5437
999	N.E.C	1.5291
	Total	-0.3504
	Grand Total	0.0000

Source: Table 1.5

Table 1.8
Total Registered Capital and Employment in Bangkok Firms and Regional Firms

Sector	Greater Bangkok Firms				Provincial Firms			
	Number of Firms	Number of Workers	Capital (Million Baht)	* Ratio	Number of Firms	Number of Workers	Capital (Million Baht)	* Ratio
DURBI GROUP								
45 Frozen Pineapple	107	7041	719.14	9.7909	86	10983	1823.48	6.0231
46 Canning & Preserving of Fish	187	12651	1769.04	7.1513	210	12221	1550.10	7.8840
47 Coconut Oil	72	3356	1820.03	1.8439	94	1535	579.47	2.6490
50 Flour & Mild Products	62	878	616.21	1.4248	2911	25821	4319.64	5.9776
55 Sugar	22	655	278.44	2.3524	140	23541	15148.51	1.5540
59 Coffee Processing	44	251	275.83	0.9100	33	284	13.33	21.2985
60 Other Food Products	181	2154	1200.82	1.7938	171	7899	1443.50	5.4721
61 Fish Meal	104	5267	1121.02	4.6984	198	4404	1609.86	2.7356
65 Tobacco Processing	1	3604	7500.17	0.4805	10	4172	792.44	5.2648
74 Jute Mill Products	53	8382	2461.23	3.4056	17	15997	1482.29	10.7921
78 Saw Mills	501	10779	1763.89	6.1109	716	21020	2403.50	8.7456
95 Rubber Sheet & Block Rubber	86	3457	391.84	8.8224	127	10888	1370.85	7.9425
99 Ceramic and Earthen Wares	62	5165	1490.62	3.4650	185	7566	5067.02	1.4932
101 Structural Clay Products	17	848	199.60	4.2485	459	6262	560.35	11.1751
102 Cement	14	158	14.52	10.8853	105	4265	10889.41	0.3917
103 Concrete & Cement Products	288	12408	1997.09	6.2130	691	7757	1168.88	6.6363
104 Other Non-Metallic Products	29	2022	303.65	6.6590	15	1394	966.85	1.4418
107 Non-Ferrous Metal	320	5065	1690.09	2.9969	22	1116	3770.77	0.2960
Total	2150	84141	25613.23	3.2851	6190	167125	54960.25	3.0408
DRBI GROUP								
43 Canning & Preservation of Meat	77	1419	346.87	4.0908	142	1093	61.48	17.7786
53 Bakery Products	219	4654	761.27	6.1135	220	1635	171.61	9.5273
54 Noodles & Similar Products	217	4642	504.94	9.1932	536	3801	469.67	8.0930
56 Confectionery	94	2748	543.95	5.0519	21	518	39.23	13.2041
58 Monosodium Glutamate	108	3032	690.83	4.3889	158	2000	239.51	8.3505
75 Tanneries & Leather Finishing	144	1523	254.68	5.9801	2	27	10.02	2.6946
79 Wood & Cork Products	441	10128	516.15	19.6222	396	5872	363.97	16.1334
80 Wooden Furniture & Fixtures	1283	16791	1790.48	9.3779	907	13388	1853.12	7.2246
97 Other Rubber Products	212	5684	572.36	9.9308	15	785	133.29	5.8894
133 Recreational & Athletic Equipment	51	683	56.86	12.0111	3	26	2.24	11.6020
Total	2846	51304	6038.40	8.4963	2400	29145	3344.13	8.7153

Table 1.8 (Continued)

Sector	Greater Bangkok Firms				Provincial Firms			
	Number of Firms	Number of Workers	Capital (Million Baht)	* Ratio	Number of Firms	Number of Workers	Capital (Million Baht)	* Ratio
IBI GROUP								
66 Tobacco Products	8	3425	8792.58	0.3895	1	40	1.65	24.2424
67 Spinning	106	26489	5017.86	5.2789	17	4077	1684.69	2.4200
81 Pulp	32	5230	1370.07	3.8173	9	1701	8374.56	0.2031
82 Paper & Paperboard Products	360	6808	2957.38	2.3020	21	175	133.98	1.3062
83 Printing & Publishing	1500	20265	4346.12	4.6628	323	1925	275.58	6.9852
85 Fertilizers	44	907	276.76	3.2772	18	347	85.42	4.0623
87 Paints	128	2042	447.19	4.5663	14	406	44.61	9.1021
92 Other Chemical Products	168	2273	939.05	2.4205	35	716	555.56	1.2888
93 Petroleum Refineries	1	594	576.00	1.0313	3	676	1494.30	0.4524
98 Plastic Wares	1573	24895	4522.74	5.5044	40	619	68.27	9.0672
105 Iron & Steel	169	11106	3531.43	3.1449	19	2001	1560.02	1.2827
111 Other Fabricated Metal Products	3921	50793	12408.05	4.0936	137	1219	102.97	11.8381
115 Special Industrial Machinery	264	2812	247.47	11.3628	38	482	222.77	2.1637
118 Radio, Television & Communication	88	3627	913.94	3.9685	7	2999	3312.41	0.9054
122 Other Electrical Apparatus	215	5371	661.97	8.1136	1	60	2.89	20.7469
125 Motor Vehicles	1031	26071	11690.93	2.2300	590	4769	297.71	16.0192
130 Photographic & Optical Goods	20	699	227.65	3.0705	1	6	0.33	17.9641
131 Watches & Clocks	43	3293	351.46	9.3695	1	10	0.94	10.5932
Total	9671	196700	59278.66	3.3182	1275	22228	18218.66	1.2201
UI GROUP								
44 Milk	87	3716	2147.73	1.7302	130	934	661.62	1.4117
57 Ice	177	1996	878.50	2.2721	576	6043	2594.11	2.3295
62 Distilling and Spirits Blending	10	6587	2886.40	2.2821	18	3667	3199.31	1.1462
63 Breweries	2	3311	1151.21	2.8761				
64 Soft Drinks & Carbonated Water	71	8797	2194.93	4.0079	76	1504	353.90	4.2498
68 Weaving	453	64535	14942.99	4.3187	50	4537	1614.28	2.8105
69 Textile Bleaching and Finishing	182	8320	1401.82	5.9351	19	292	31.22	9.3518
70 Made-up Textile Goods	105	2591	516.87	5.0128	15	2597	444.56	5.8418
71 Knitting	379	16730	2031.70	8.2345	7	251	53.89	4.6576
72 Wearing Apparel	1539	85458	5403.06	15.8166	31	1673	87.48	19.1252
73 Carpets and Rugs	11	1654	161.10	10.2666	4	1152	82.70	13.9299

Table 1.8 (Continued)

Sector	Greater Bangkok Firms				Provincial Firms			
	Number of Firms	Number of Workers	Capital (Million Baht)	* Ratio	Number of Firms	Number of Workers	Capital (Million Baht)	* Ratio
UI GROUP								
76 Leather Products	182	7497	718.91	10.4283				
77 Footwear, Except of Rubber	258	7798	667.37	11.6847	3	1560	183.44	8.5041
84 Basic Industrial Chemicals	78	3189	2261.30	1.4103	5	620	646.46	0.9591
86 Synthetic Resins	16	6209	5594.51	1.1098	2	230	710.80	0.3236
88 Drugs and Medicines	279	13504	4538.26	2.9756	41	1172	66.63	17.5897
89 Soap and Cleaning Preparations	53	2161	3268.09	0.6612	2	108	116.60	0.9262
90 Cosmetics	94	2617	434.61	6.0215	2	54	23.51	2.2971
91 Matches	15	983	89.28	11.0097	5	709	32.04	22.1279
94 Other Petroleum Products	20	903	458.78	1.9683	5	1237	425.80	2.9051
96 Tyers and Tubes	115	6246	4608.64	1.3553	344	1232	184.58	6.6745
100 Glass and Glass Products	47	8336	5753.02	1.4490	1	5	0.14	35.7143
108 Cutlery and Hand Tools	85	1199	208.72	5.7447	26	132	8.35	15.8004
109 Metal Furniture and Fixtures	315	4559	399.32	11.4170	47	438	35.42	12.3672
110 Structural Metal Products	1157	12309	1835.98	6.7043	483	2534	189.24	13.3901
112 Engines and Turbines	869	7898	2645.27	2.9857	2118	10748	1234.93	8.7033
113 Agricultural Machinery	268	3006	345.10	8.7106	537	3521	374.68	9.3973
114 Wood and Metal Working Machine	336	2994	318.76	9.3927	10	51	4.79	10.6405
116 Office and Household Machinery	764	16625	2350.89	7.0718	103	2180	915.53	2.3811
117 Electrical Machinery	404	9175	1220.57	7.5170	129	585	44.79	13.0605
119 Household Electrical Appliances	31	1237	212.74	5.8147				
120 Insulated Wire and Cable	43	2605	1472.80	1.7687				
121 Electric Accumulators	51	5553	567.23	9.7897	18	75	12.19	6.1515
123 Ship Building and Repairing	171	2493	262.73	9.4890	143	2384	150.01	15.8925
124 Railroad Equipment	2	2936	1005.53	2.9199	1	5	0.26	18.9394
126 Motorcycles and Bicycles	263	12081	1908.63	6.3297	191	577	93.94	6.1420
127 Repair of Motor Vehicles	1434	15798	1728.92	9.1375	1520	7666	857.02	8.9449
128 Aircraft	1	1710	2900.00	0.5897				
129 Scientific Equipment	52	1329	162.37	8.1852	2	7	0.90	7.8038
134 Other Manufactured Goods	419	11087	2052.19	5.4025	128	1771	625.18	2.8328
999 Unclassified	404	10029	5181.06	1.9357	1170	32979	5266.51	6.2620
Total	11242	387761	88887.88	4.3624	7962	95230	21326.81	4.4653
Grand Total	25909	719906	179818.17	4.0035	17827	313728	97849.86	3.2062

Note: * Number of Employment Per Million Baht of Registered Capital.

Source: Provincial Factory Directories (PFD), Ministry of Industry.

Table 1.9

Labor-Capital Ratio and Index of Relative Competitiveness

Among Smalls Firm by I-O Sector Covering Only UI and DRBI

I-O Sector	Small Firms				Large Firms			
	L/K	Rank	IRC	Rank	L/K	Rank	IRC	Rank
91 Matches	40.33	1	0.82	10	-	-	-	-
79 Wood & Cork Products	23.34	2	0.90	9	3.26	18	-0.88	19
121 Electrical Accumulators &	19.86	3	-0.34	34	22.29	3	-1.00	29
72 Wearing Apparel	17.64	4	-0.55	39	6.15	9	-0.96	20
76 Leather Products	16.65	5	-0.12	28	5.56	11	-0.33	16
80 Wooden Furniture & Fixtures	15.86	6	-0.06	25	1.26	34	0.52	9
73 Carpet & Rugs	15.27	7	-0.97	45	3.75	14	0.88	7
123 Ship Building & Repairing	14.65	8	1.00	5	0.64	41	-1.00	31
126 Motor Cycles & Bicycles	13.48	9	0.60	12	0.98	38	-1.00	22
109 Metal Furniture & Fixtures	13.46	10	-0.26	31	-	-	-	-
69 Textile Bleaching, Printing and Finishing	13.35	11	0.90	8	1.31	33	0.33	10
58 Monosodium Glutamate	12.99	12	4.39	1	-	-	-	-
54 Noodles & Similar Products	12.46	13	0.61	11	2.28	25	1.13	5
133 Recreational & Athletic Equipment	12.00	14	-1.00	47	-	-	-	-
77 Footwear & Except of Rubber	11.82	15	-0.57	40	2.64	21	-0.81	18
114 Wood & Metal Work Machinery	11.10	16	0.11	17	0.40	43	-1.00	39
127 Repairing of Motor Vehicles	10.66	17	-0.42	36	9.48	4	-1.00	26
43 Canning & Preservation of Meat	10.39	18	2.94	2	3.49	17	1.17	3
71 Knitting	10.34	19	-0.44	38	1.22	35	-0.03	12
113 Agricultural Machinery Equipment	10.33	20	0.96	6	0.03	45	-1.00	42
70 Made-Up Textile Goods	10.25	21	-0.21	29	1.42	31	1.18	2
999 Unclassified	9.86	22	0.02	20	1.36	32	0.96	6
97 Other Rubber Products	9.83	23	-0.11	27	3.14	19	-1.00	45
96 Tyers and Tubes	9.24	24	0.92	7	3.71	15	-1.00	37
129 Scientific Equipment	9.11	25	-0.30	33	0.65	40	-1.00	34
110 Structural Metal Products	9.08	26	-0.10	26	9.13	5	-1.00	28
56 Confectionery	8.90	27	-0.26	30	2.47	23	1.16	4
112 Engines & Turbines	8.69	28	-0.05	23	2.33	24	-1.00	24
53 Bakery Products	8.65	29	-1.00	48	1.78	29	-0.26	14
108 Cultery & Hand Tools	8.22	30	-0.04	22	-	-	-	-
116 Office & Household Machinery &	7.97	31	-0.64	42	3.57	16	-1.00	43
117 Electrical Industrial Machinery	7.78	32	-0.39	35	7.83	6	-1.00	23
119 Household Electrical Appliances	6.87	33	-0.06	24	6.89	7	-1.00	25
94 Other Petroleum Products	6.75	34	2.21	4	1.95	28	-1.00	36
90 Cosmetics	6.70	35	0.15	16	6.17	8	-1.00	41
134 Other Manufactured Goods	6.60	36	0.35	14	0.73	39	-1.00	44
75 Tanneries & Leather Finishing	6.33	37	2.54	3	-	-	-	-
100 Glass & Glass Products	6.13	38	-0.63	41	4.07	13	-1.00	32
64 Soft Drinks & Carbonated Water	5.67	39	-0.29	32	1.10	37	-0.30	15
68 Weaving	5.02	40	0.02	21	1.14	36	-0.61	17

Table 1.9 (Continued)

I-O Sector	Small Firms				Large Firms			
	L/K	Rank	IRC	Rank	L/K	Rank	IRC	Rank
120 Insulate Wire & Cable	4.66	41	0.07	18	0.06	44	-1.00	27
44 Milk	4.48	42	0.05	19	2.60	22	0.83	8
88 Drugs & Medicines	3.03	43	-0.74	43	1.62	30	-1.00	21
62 Distilling Spirits Blending	2.93	44	-0.44	37	2.19	26	0.14	11
124 Railroad Equipment	2.92	45	-0.97	46	23.84	1	-1.00	33
63 Breweries	2.88	46	-1.00	49	3.09	20	-0.23	13
84 Basic Industrial Chemicals	2.83	47	0.56	13	2.13	27	-1.00	35
57 Ice	2.60	48	0.28	15	4.38	12	1.28	1
86 Synthetic Resin	0.93	49	-0.91	44	5.97	10	-1.00	38
128 Aircraft	0.59	50	-1.00	50	23.15	2	-1.00	30
89 Soap & Cleaning Preparations	0.50	51	-1.00	51	0.42	42	-1.00	40

Source: Provincial Factories Directories, Ministry of Industry.

CHAPTER 2

SUPPLY-SIDE LINKAGES

2.1 SPATIAL LINKAGES OF REGIONAL INDUSTRIES

This section presents the comparison between intra-regional and inter-regional linkages of industries in the BMR and the outer regions with respect to supplies of inputs and machinery. The data were obtained from the survey of this research project, which covers about 1,000 manufacturing firms.

Table 2.1 shows that, for industries located in the BMR, 40% of the input supplies are from the BMR, 39% from import, and 21% from the outer regions. The regional industries obtain about 16% of their total inputs from the BMR, 12% from import, and 72% from regional supply. By comparison, the industries in the outer regions use a much smaller share of inputs from the BMR and import. Among the regional firms, the proportion of inputs tend to vary with distance from the BMR. The Central Region, which is the closest to the BMR, shows a higher proportion of inputs from the BMR and import than the other regions. An important question is whether these differences are primarily due to choice of industries or choice of input supply sources. If most inputs of the same kinds are available at more or less the same prices in all regions, we might expect to observe that there is no association between the distributional pattern of industries and the distribution of supply sources of inputs.

Table 2.2 shows that the share of regional inputs in total inputs varies with the type of industries as well as with the firm's location. The share of regional inputs shows greater variation among groups of industries for the firms located in the BMR than for those in the outer regions. For the Bangkok firms,[10] the range of variation is from 2% for

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10. Firms in the BMR are referred to as Bangkok firms.

IBIs to 67% for DURBIs. For the regional firms, the share varies less from 53% for UIs to 86% for DURBIs. In the last row of the table, the share of employment in the outer regions over total employment is shown for each group of industries. By comparison,it can be observed that the share of regional employment of each group of industries tends to vary with the share of regional inputs. In other words, the outer regions tend to concentrate their production in the industries that require a high proportion of regional inputs. This pattern of association seems to indicate that the difference in the share of regional inputs between the Bangkok firms and the regional firms is due primarily to different choices of industries rather than choices of input supply sources.

Consider an industry in which the supply of inputs is available at competitive prices throughout the country. The proportion of regional inputs would naturally be higher for firms located in the outer regions than for firms located in the BMR. However, the pattern of spatial distribution should be governed by other factors than the proximity to input supply sources. Consequently, the share of regional employment need not vary systematically with the share of regional inputs.

In an opposite case, if the input proportion requirement of each industry (at a highly disaggregated level) is relatively inflexible, and one source of supply of each input is decisively more competitive than another, the spatial pattern of distribution of each industry would be partly determined by the locational advantage relating to the input supply sources. In this case, we would expect to see the share of regional employment vary directly with the share of regional inputs. The degree of association between them would depend on the relative strengths between the input procurement advantage and other factors that determine the relative competitiveness between the regions.

Assuming a fixed proportions of inputs, assumption, the Bangkok firms tend to have the locational advantage in the industries that require a high proportion of inputs from the BMR and imports, while the regional firms tend to have the locational advantage in those that require a high proportion of regional inputs. There is a tendency for the regional firms to engage more intensively in the industries that use

a high proportion of regional inputs. The Bangkok firms will tend to specialize in the industries that require a high proportion of inputs from the BMR and imports. Consequently, the share of regional employment will tend to be higher in the group of industries that consist more of those requires a high share of regional inputs.

Although each industry group contains a large number of industries with varying proportions of inputs by sources, our method of grouping implies that most industries in the DURBI group should require a high proportion of regional inputs. It follows that the regional firms would be more competitive in a greater number of these industries relative to the other groups, provided that the input supply advantage is not offset by other factors. Among the rest, the DRBI group is likely to contain proportionally more industries that are regional input intensive, compared to the IBI group and the UI group. Therefore, we might expect that there are proportionally more industries in the DRBI group in which the regional firms are more competitive than firms in the IBI and UI groups. The IBI group contains the import intensive industries. At a more disaggregated level than the I-O, 180-sector classification, it is possible that there are some industries that have a low intensity of imported inputs. However, it should be safe to assume that this group contains proportionally the least number of regional input intensive industries. The regional firms will tend to be less competitive in most of these industries. From these considerations, we may expect that the share of regional employment would be higher in the industry group that shows a higher average share of regional inputs in Table 2.2. Moreover, within each group of industries, there is a tendency for firms in each region to choose the industry sub-groups in which they have an input supply advantage, Therefore, the average share of regional inputs of each industry group would be higher in the regional firms than in the Bangkok firms.

The significance of the input supply sources on the choice of industries may be investigated in greater detail from the data shown in Table 2.3. This table is constructed from our survey data covering 107 firms in the BMR and 760 firms in the outer regions. The disproportion between the sample sizes in Bangkok firms and regional firms made it

necessary to calculate the percentage distribution of employment by pro-rating the surveyed data with the DIW's factory registration data on relative numbers of employment. The most important implication of this table is that Bangkok firms with high regional input shares and regional firms with low regional input shares generate relatively little employment. About 54% of manufacturing employment is generated by the Bangkok firms whose regional input shares are below one third. The regional firms whose regional input shares are higher than two thirds account for about 21% of the manufacturing employment. Only the remaining 25% of the manufacturing employment is generated by the other four groups consisting of the Bangkok firms with moderate and high shares of regional inputs and the regional firms with low and moderate shares of regional inputs.

The breakdown into four groups of industries tends to suggest that firms in the outer regions have limited choice of industries in the IBI and the UI groups. The rows in Table 2.3 show the percentage distribution of employment in each industry group by firm location and the ranges of regional input shares. The table shows that Bangkok firms tend to avoid using a high content of regional inputs; therefore, the groups of firms using a low share of regional inputs account for very high percentages of employment in all industry groups except DURBI. This is probably due to the relatively limited choices of industries with a low regional input content in the DURBI group. The percentage distribution of employment seems to confirm our presumptions that Bangkok firms have a locational advantage in the industries that require a high proportion of inputs from the BMR and import and that these kinds of industries make up a large share in the IBI and the UI groups, thus the share of employment of Bangkok firms using low levels of regional inputs is extremely high in these two groups. The employment share of Bangkok firms with moderate or high regional input contents is very low in all industry groups except DURBI. This exception seems to indicate that to a certain extent other factors favorable to Bangkok firms can offset the high regional input content disadvantage.

The regional firms show the opposite tendency. The groups of firms that use a low proportion of regional inputs account for low percentages of employment in all industry groups. The firms that use a high proportion of regional inputs account for a very high share of employment in the DURBI group. The share of employment in the DURBI and the DRBI groups increases as the proportion of regional inputs increases. This pattern is not found in the IBI and the UI groups. The low employment share of the regional firms with high regional input proportions in these industry groups tends to confirm that there are not many choices in the IBI and the UI groups that require a high proportion of regional inputs.

Table 2.4 shows the supply sources of machinery for Bangkok firms and regional firms of varying sizes. Based on the data in this table, it appears that the most important source of supply of plant machinery in the BMR is imports. About 60% of the firms surveyed in the BMR use imported machinery; 44% use machinery produced in the BMR, and 1% that uses machinery supplied from the outer regions. (The total percentage exceeds 100 because some firms obtained their machinery from more than one source). The percentage of firms that use imported machinery tends to increase with size of the plant, implying that the value of imported machinery should be greater than that indicated simply by the number of firms. For regional factories, supply of machinery from the BMR shows the highest percentage (54%), as compared to those from import (30%) and from regional supply (23%). There is also a tendency for the percentage of firms employing imported machinery to increase with the size of the plant .

Machinery production is generally regarded as a technology intensive industry. However, the technological capability of Thai industry is relatively low compared to the world's major exporters of machinery. Accordingly, domestic machinery producers can offer only limited choices of machinery which generally have relatively low capability. Comparing the machinery producers in the BMR and in the outer regions, it is generally observed that the technological capability of the Bangkok producers is superior.

The data in Table 2.4 may thus be interpreted as showing that the high degree of dependence of the regional industries on the supply of machinery from the BMR and imports is due to the incapability of the regional machinery producers to supply machinery that meets the users' requirements. The extremely low percentage of machinery supplied by the regional firms to Bangkok users implies that the regional machinery producers are not competitive in the BMR market. If the use of imported machinery reflects the technological superiority of the user firms, the data also imply that the Bangkok firms tend to be technologically superior to the regional firms, which, in turn, is due to better access to technology in Bangkok than in the outer regions.

2.2 BACKWARD LINKAGES OF REGIONAL INDUSTRIES WITH THE AGRICULTURAL AND INDUSTRIAL SECTORS

As it was found that the regional industries are relatively more concentrated in resource-based industries, it can be hypothesized that the regional industries have a strong linkage with the agricultural sector and that the linkage within the regional industries is relatively weak. In this section, we will attempt to assess how strong these hypotheses are supported by our survey results.

In our survey, the respondents were requested to identify the types of their major inputs and give the percentage of these major inputs in their total input cost (not more than two types of inputs). From their answers, we classified the firms into 5 groups depending on the type of leading input (the one with the greatest share in total input cost). The 5 categories for the leading input are: agricultural products, simple agro-processing products, minerals, manufactured products, and unclassified products (e.g. water for ice factories). The results are reported in Table 2.5.

The table clearly shows that the regional industries have relatively strong linkage with the agricultural sector: 38.6% of the firms that use agricultural products as their leading inputs comparing

to 18.3% of the Bangkok firms that do so. In most cases, the leading input alone constitutes more than 50% of the total input cost, as can be seen from the lower half of the table. The proportion of the firms whose leading inputs are agro-processing products is also greater than that for the Bangkok firms. On the other hand, the proportion of regional firms whose leading inputs are manufactured products is much lower than is the case for Bangkok firms.

The weak linkage within the regional manufacturing industries can be seen in Table 2.6-2.8. Only 51.8% of the regional firms whose leading inputs are manufactured products obtain more than half of their total inputs from regional supply. This figure can be compared with 91.6% of the Bangkok firms using this type of input who obtain more than half of their total inputs from Bangkok suppliers. The strong linkage between regional industries that use agricultural products and the local agricultural sector is confirmed by a high proportion (89.2%) of them who get more than half of their total inputs from regional sources.

For the regional firms whose leading inputs are manufactured products, the proportion of them that use a high share of regional inputs gets smaller as the firm size increases. This proportion is 57.2% for small firms (1-19 employees), 33.3% for medium firms (20-99 employees) and 21.1% for large firms (more than 99 employees). No systematic pattern like this is observed for firms in the other categories

The findings in this chapter indicate that the relative uncompetitiveness of the outer regions in the IBI and the UI is partly due to the lack of local supply of inputs for those industries. In the next chapter, it will be shown that the intra-regional linkages on the demand side also offer a limited market for the regional industries. Combining both sides of the linkage effect, we are faced with a fundamental barrier to the development of regional industries: namely the lack of economics of agglomeration. This barrier will persist as long as the degree of industrialization in the outer regions lags behind the BMR. Strong compensatory measures will be required to offset this

disadvantage for the regional industries. Alternative compensatory measures have been attempted, such as the preferential investment incentives offered by the BOI and the establishment of an industrial estate in Lamphun. The BOI's measure has so far produced no noticeable effects for the remote regions. The Lamphun industrial estate failed to attract industrial operators until the recent surge of land prices made the estate price much more competitive.

Table 2.1
Input Proportion by Source of Supply

Percent of Total Input Value

	Greater Bangkok	Import	Outer Regions	Same province
Greater Bangkok	40	39	21	-
Provincial	16	12	72	(43)
Central	23	28	49	(20)
Other Regions	13	6	81	(53)

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 2.2
Share of Regional Inputs in Total Input Value

Percent

	DURBI	DRBI	IBI	UI
Greater Bangkok	67	17	2	14
Provincial	86	77	59	53
Regional Share of Employment	67	37	10	20

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 2.3
Distribution of Employment in Each Industry Group
by Sample Firm Location and Proportion of Regional Inputs

Percent

	Greater Bangkok Firms			Provincial Firms			Total
	Share of Regional Inputs (%)			Share of Regional Inputs (%)			
	0-33	34-66	67-100	0-33	34-66	67-100	
DURBI	12	0	22	0	7	60	100
DRBI	59	0	4	2	11	24	100
IBI	83	1	6	4	2	4	100
UI	68	7	4	6	5	9	100
All Categories	54	4	11	4	5	21	100

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 2.4
Sources of Supply of Machinery

Number of Sample Firms

Size of Firm (Number of Workers)	Greater Bangkok Firms				Provincial Firms			
	Bangkok	Provincial	Import	Total	Bangkok	Provincial	Import	Total
1-5	12	1	4	16	159	65	56	268
6-9	4	0	5	10	91	35	41	166
10-19	16	0	9	23	91	41	44	164
20-49	11	0	16	25	75	32	41	124
50-99	5	0	9	12	26	15	23	55
100-199	1	0	13	15	20	5	19	44
200-499	3	0	9	11	5	4	18	26
500-999	0	0	4	4	0	1	9	9
>=1000	0	0	2	2	1	3	5	7
Total	52	1	71	118	470	203	258	870

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 2.5
Distribution of Sample Firms by Type of Leading Input

Type of Leading Input	Provincial		Greater Bangkok	
	Number of Firms	%	Number of Firms	%
Agricultural	303	38.6	21	18.3
Agro-processing	53	6.8	3	2.6
Mineral	63	8.0	12	10.4
Industry	321	40.9	74	64.3
Others	45	5.7	5	4.3
% Agricultural > 50	290	36.9	21	18.3
% Agro-processing > 50	53	6.8	3	2.6
% Mineral > 50	60	7.6	10	8.7
% Industry > 50	310	39.5	72	62.6
TOTAL	785	100.0	115	100.0

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 2.6
Relationship between Regional Share of Inputs
and Type of Leading Input

Number of Sample Firms

Regional Share of Inputs (Percent)	Type of Leading Input					Total
	Agricultural	Agro-processed	Mineral	Industrial	Others	
Provincial Firms						
0-50	31	22	8	145	7	222
	(10.8)	(43.1)	(13.1)	(48.2)	(16.3)	(28.8)
50.01-100	257	29	53	156	36	550
	(89.2)	(56.9)	(86.9)	(51.8)	(83.7)	(71.2)
Total	288	51	61	301	43	772
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Greater Bangkok Firms						
0-50	19	2	11	66	5	107
	(90.5)	(66.7)	(91.7)	(91.7)	(100.0)	(91.5)
50.01-100	2	1	1	6	0	10
	(9.5)	(33.3)	(8.3)	(8.3)	(0.0)	(8.5)
Total	21	3	12	72	5	117
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Note: Percentage of the Column Total in the Parentheses

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 2.7
Relationship between Firm's Size, Regional Share of Inputs and Type of Leading Input: Provincial Firms

Number of Sample Firms

Regional Share of Inputs (Percent)	Type of Leading Input					Total
	Agricultural	Agro-processed	Mineral	Industrial	Others	
Large Firms						
0-50	1			15		16
	(3.6)			(78.9)		(25.0)
50.01-100	27	10	5	4	2	48
	(96.4)	(100.0)	(100.0)	(21.1)	(100.0)	(75.0)
Total	28	10	5	19	2	64
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Medium Firms						
0-50	9	6	2	26	3	46
	(11.7)	(46.2)	(11.8)	(66.7)	(30.0)	(29.5)
50.01-100	68	7	15	13	7	110
	(88.3)	(53.8)	(88.2)	(33.3)	(70.0)	(70.5)
Total	77	13	17	39	10	156
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Small Firms						
0-50	21	16	6	104	4	151
	(11.5)	(57.1)	(15.4)	(42.8)	(12.9)	(28.8)
50.01-100	162	12	33	139	27	373
	(88.5)	(42.9)	(84.6)	(57.2)	(87.1)	(71.2)
Total	183	28	39	243	31	524
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Note: Percentage of the Column Total in the Parentheses

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 2.8
Relationship between Firm's Size, Regional Share of Inputs and Type of Leading Input: Greater Bangkok Firms

Number of Sample Firms

Regional Share of Inputs (Percent)	Type of Leading Input					Total
	Agricultural	Agro-processed	Mineral	Industrial	Others	
Large Firms						
0-50	5		3	19	2	29
	(100.0)		(100.0)	(90.5)	(100.0)	(93.5)
50.01-100				2		2
				(9.5)		(6.5)
Total	5		3	21	2	31
	(100.0)		(100.0)	(100.0)	(100.0)	(100.0)
Medium Firms						
0-50	5		4	19		28
	(71.4)		(80.0)	(86.4)		(82.4)
50.01-100	2		1	3		6
	(28.6)		(20.0)	(13.6)		(17.6)
Total	7		5	22		34
	(100.0)		(100.0)	(100.0)		(100.0)
Small Firms						
0-50	9	2	4	28	3	46
	(100.0)	(66.7)	(100.0)	(96.6)	(100.0)	(95.8)
50.01-100		1		1		2
		(33.3)		(3.4)		(4.2)
Total	9	3	4	29	3	48
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Note: Percentage of the Column Total in the Parentheses

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

CHAPTER 3

DEMAND-SIDE LINKAGES

3.1 DISTRIBUTION OF DEMAND FOR PRODUCTS OF REGIONAL INDUSTRIES

In investigating the demand-side linkages, it was hoped that the findings would provide implications about the prospects of growth of the regional industries, the relative significance of inter-regional and intra-regional linkages, and the relative competitiveness among types of regional industries. Let us start with Table 3.1, which shows the unweighted average sales distribution of the regional firms in three markets, namely the BMR, export, and the outer regions. The regional market is further divided into the firm's own province and other provinces. The average patterns of sales distribution are shown for the firms in varying employment sizes for two purposes. The first is to reduce the bias caused by the unweighted average figures which would be correct only if all firms had equal output or if the patterns of distribution were the same for firms of all sizes. Our data on the output values of firms are highly questionable, so we decided not to weight the average distribution based on output values. The second purpose is that the grouping of firms by employment levels allows us to compare the variation of sales distribution with the variation of the firms' sizes.

The data shown in Table 3.1 tend to confirm that there is a systematic pattern of variations between sales distribution and the firm sizes. Small firms are highly concentrated in the local market. On average, the firms with fewer than 10 employees sell more than 80% of their output in their own province and more than 95% of their output in the regional market. As the firm's size increases, the shares of the local market and the regional market decline, while the combined share of BMR and exports increases progressively. The share of the BMR market shows an obvious increase with the firm size up to the range of 50-99 employees. The share of export sales shows an increasing pattern up to

the size of 100-199 employees. As the firm size increases beyond 199, the sample sizes become so small that not much confidence should be placed on these data. Keeping in mind the irregularity of the market distribution pattern among the groups of large firms due to insufficient sample size, the data show that the share of BMR market tends to stabilize at the employment level of 20-49 and beyond. The share of export tends to increase with the employment level throughout the whole range, while the shares of the regional market and the local market tend to decrease correspondingly.

If the sales distribution is weighted by the number of workers, the overall average of the export share is 36%, the BMR share is 24% and the regional market share is 40%. These figures imply that the BMR and export markets are quite important to the employment generation in the regional industries. Without BMR and exports as market outlets, the employment in regional industries would fall to only 40% of the actual employment level. If the indirect impacts are taken into account, the reduction is likely to be much more severe. Many firms would not survive without sales to BMR and export markets. The share of sales to the regional market will also be wiped out if these firms are out of business. As they go out of business, the impact would be amplified through the linkage effect: these firms may be crucial suppliers of the inputs, or buyers of the outputs, of other firms. Another repercussion is the income effect, which would further reduce the demand in the regional market.

In Table 3.2, the sample firms are classified into 4 groups according to their market orientations . Group 1 is called Bangkok-oriented firms and defined as those whose sales to BMR exceed 50% of total sales. Groups 2 and 3 are called export-oriented firms and defined by their export share in total sales. Group 2 covers the firms whose export shares exceed 50%, while group 3 covers those whose export shares are between 20% and 50%. Group 4 covers all of the rest. The majority of group 4 firms have sales highly concentrated in the regional market. Thus, they are referred to as the regional market-oriented firms.

Out of the sample of 837 firms, there are 104 Bangkok-oriented firms, 60 export-oriented firms and 675 regional market-oriented firms. Of the export-oriented firms, there are 49 firms in group 2 and 11 firms in group 3. Comparison of the size of the firms among these groups either by the average or the median employment level of each group points to the same conclusions: that export-oriented firms tend to be larger than Bangkok-oriented firms and Bangkok oriented firms tend to be larger than regional market-oriented firms. Among the export-oriented firms, those with a higher export share tend to be larger. The median employment level of the regional market-oriented firms is 8, while that of the Bangkok oriented firms is 38. The median employment level of group 2, export-oriented firms (higher export share) is 144 as compared to 87 for group 3 firms (lower export share).

The same table also shows that, among the regional firms with fewer than 10 employees, the combined number of Bangkok-oriented and export-oriented firms represents less than 4% of the total number of firms in this size range. For the firm size between 10 and 49 employees, the proportion of the Bangkok-oriented firms increases to 18%, while the proportion of the export-oriented firms remains below 3%. For employment size between 50 and 499, about 32% of the firms are Bangkok oriented, 31% are export-oriented and 37% are regional market-oriented. Among the firms with more than 499 employees, 19% are Bangkok-oriented, 75% are export-oriented and only 12% are regional market-oriented.

These findings imply that the BMR and export markets provide the important growth opportunity for the regional industries. As a regional firm becomes larger, it needs a larger market to absorb its output. BMR is not only a large market in itself but also a major transit point for inter-regional distribution and for export to other countries. A related implication is that in promoting the market for small regional firms, attention should, in general, be paid to the regional market demand. To promote the market for large regional firms, measures to facilitate the inter-regional linkages among the outer regions and between the outer regions and BMR as well as export promotion measures are important.

If there is less friction in the inter-regional linkages, it is interesting to know what types of industries would gain based on their comparative advantages and what industries would lose as the natural protection barriers are weakened. In attempting to answer this question, albeit partially, each group of firms (Bangkok-oriented, export-oriented, etc.) is broken down by product type as classified by the TSIC-2-digit level in Table 3.3. The table has to be interpreted cautiously due to the small sample sizes in many categories.

Food, beverages and tobacco (TSIC-31) is the leading sector both in terms of the number of firms as well as the number of workers in the Bangkok-oriented and the export-oriented groups. For the regional market-oriented group, it ranks second in terms of the number of firms but leads all other sectors in terms of the number of employees. Wood products (TSIC-33) is also an important sector for every group of firms. It accounts for a relatively high proportion of the number of firms as well as the number of workers in all of the groups of firms. Comparison among the other sectors cannot be made with confidence, as the number of firms in each sector is too small. The presence of one large firm in any sector produces a great impact on the relative employment level of the sector with respect to the other sectors. For the export-oriented firms, chemical and rubber products (TSIC-35) stand out as another important sector.

Metal products and machinery (TSIC-38) and non-metallic products (TSIC-36) are also leading sectors in the regional market-oriented group, both in terms of the number of firms and the number of employees. Textiles (TSIC-32) and chemical and rubber products show a high proportion of employees but a rather low share of the number of firms.

The metal products and machinery sector accounts for the greatest number of firms in the regional market-oriented group and ranks as the third largest in terms of employment level. It is interesting to note that this sector is almost negligible in the Bangkok-oriented and the export-oriented groups. This sector consists mostly of non-resource-based industries. Its prominent features are that most industries in

this sector are technology intensive and skill intensive. These industries also exhibit remarkably strong inter-industry linkages. Agglomeration of the related industries in this sector is necessary to support and strengthen the competitiveness of each other. Such agglomeration can only be found in the BMR. The outer regions lack most of the supporting industries as well as modern technology and skilled labor. Therefore they can hardly compete in the BMR market and foreign countries. Most of these firms are small and confined to their local markets. The average number of employees of the regional market-oriented firms in this sector is only about 8 workers. Their survival seems to rest upon differentiated products and services which, in turn, are enhanced by market separation due to geographical reasons.

Table 3.4 reclassifies the types of industries by our method as introduced in Chapter 1. An interesting pattern emerges: the Bangkok-oriented and the export-oriented firms are highly concentrated in the resource-based industries. For the strongly export-oriented group (group 2), 32 out of 49 firms are DURBIs, 8 firms are DRBIs, 3 and 6 firms are IBIs and UIs respectively. This pattern of distribution contrasts with that of the regional market-oriented firms. The proportion of DURBIs in the regional market-oriented firms is 26%, as compared to 65% in the export-oriented firms and 43% in the Bangkok-oriented firms. The DRBIs are distributed in approximately the same proportion among the 3 groups of firms (17% in regional market-oriented firms, 16% in export-oriented firms and 18% in Bangkok-oriented firms). Nonresource-based industries (IBIs and UIs) account for a high proportion in the regional market-oriented firms (57%) and low proportions in the export-oriented firms and the Bangkok-oriented firms (18% and 38% respectively). The sample size of the firms in group 3 is too small for comparison. It may be combined with group 2 to represent the broader definition of export-oriented firms.

To give a more complete picture, there should be comparisons in terms of employment, value added and output distribution patterns. As reliable data on value added and output are not available, only the employment data will be presented. The distribution of employment may be taken as a crude approximation of the other two variables. This

should be more meaningful than the distribution of firms, since it takes into account the relative sizes of the firms. In some categories in which the sample size (number of firms) is small, the presence of a large firm can greatly change the distribution pattern. In these cases, it is necessary to identify the exceptionally large firms.

For the Bangkok oriented firms, the distribution of employment is 2784 in DURBI (35%), 743 in DRBI (9%), 1277 in IBI (16%) and 3085 in UI (39%). These figures show a higher proportion of the two non-resource-based groups than expected. In the IBI group, there is a single firm employing 750 workers, while the other 16 firms employ the remaining 527 workers. This particular firm is a paper mill which is classified as an IBI, since the industry as a whole uses a high proportion of imported inputs. However, this paper mill produces the kinds of pulp and paper that utilize domestic raw materials intensively. The major raw materials are kenaf, bamboo and wood. This firm thus actually belongs to a sub-industry that should be classified as DURBI. If it is reclassified in this way, the employment in DURBI will increase to 3534 (45%) while that in IBI will drop to 527 (7%) only.

In the UI group, there is a textile plant employing 1000 workers and 6 other textile plants that employ 1378 workers. The textile industry alone accounts for 77% of the total employment in UI, (2378 out of 3085). This is an interesting case since textiles is a relatively labor intensive industry. Its high proportion of Bangkok-oriented, regional industries implies that the regional industries may have a comparative advantage in labor-based industries, in addition to resource-based industries. There may be a good prospect for the expansion of labor based industries in the outer regions, provided that the labor wage rate is not distorted by the minimum wage law.

The dominance of resource-based industries is quite obvious in the export oriented group. DURBI accounts for 82% of the total employment in group 2 (strongly export oriented), and 81% of the total employment of groups 2 and 3 combined. In contrast, the employment in DURBI represents only 33% of the total employment in the regional market oriented firms. The share of UI in total employment of export-oriented

firms (group 2 and group 3 combined) is only 11%, while it accounts for 42% in the regional market-oriented firms.

In summary, the investigation in this section reveals that BMR and exports are significant market outlets for resource-based industries in the outer regions, especially those that are relatively large. While the regional market as a whole is larger than BMR, considering its shares in the country's population and GDP, it is fragmented by geographical distribution of the population. The regional market for regional firms tends to be localized within the province or in a few adjacent provinces. Transportation costs and close contact with local customers provide a natural protection for the small firms serving the local market. Reducing the frictions in the inter-regional linkages may hurt these firms but tends to promote growth opportunities for those possessing comparative advantages. Comparison of the findings in this section with those in the previous chapter produces an interesting conclusion: that the industries with strong intra-regional linkages on the supply side (those in DURBI and DRBI) show strong inter-regional linkages on the demand side.

3.2 MARKETING CHANNELS OF REGIONAL INDUSTRIES

The most popular marketing channels of the Bangkok-oriented regional firms are direct sales to other factories and selling to wholesalers. In contrast, the most popular channels of the regional-market-oriented firms are self-retailing and selling to retailers. The high percentage of Bangkok-oriented firms with direct sales to factories (55%, see table 3.2.1) indicates that there is a significant inter-industry linkage between BMR and regional factories. Only 16% of regional market-oriented firms sell their products directly to factories, while 73% retail their products by themselves, 31% sell through retailers and 27% sell to wholesalers (see Table 3.2.2). These figures suggest that regional market-oriented firms' products are relatively more concentrated in consumer goods, while Bangkok-oriented firms' products are more concentrated in intermediate products. The low proportion of direct sales to factories by the regional-market firms

might also be taken as an indication that there is a lack of forward linkages in the regional market for local firms.

Synthesizing the evidence here with that in the earlier chapters, we may conclude that the linkages among manufacturing industries in the outer regions are rather loose. Relatively few industries which exhibit intra-regional, inter-industry linkages. For products which involve multi-stage manufacturing production, the regional industries tend to concentrate on either end of the production chain. The upstream resource-based industries, especially the large producers, often find limited user industries in the region. They have to establish forward linkages with user industries in BMR or export to other countries. For example, the major user of processed tobacco is the cigarette plant in Bangkok, the major users of processed rubber, apart from the export market, are tire industries in BMR. Large downstream industries are mostly concentrated in Bangkok. (e.g., furniture and fixtures, machinery, motor vehicles, garment and household appliances) Downstream industries in the outer regions are generally small. Their small size provides low demand for local producers of intermediate or industrial products. The size of these firms, in turn, is limited due to lack of local supporting industries, which makes them uncompetitive in the market outside their regions.

Table 3.1
Distribution of Sales from Provincial Sample Firms to Greater Bangkok, Export and Regional Market

Percent

Size of Firm (Number of Workers)	Distribution of Sales to					Number of Firms
	Greater Bangkok	Export	Outer Regions	This = Province	+ Other Provinces	
1-5	2.17	0.56	97.47	89.95	7.52	185
6-9	2.06	0.97	96.73	80.74	15.99	124
10-19	10.76	0.48	88.57	71.89	16.68	126
20-49	27.63	2.84	68.65	49.83	18.82	95
50-99	32.40	15.46	49.65	25.38	24.27	39
100-199	26.47	35.41	33.65	13.23	20.42	32
200-499	11.36	29.36	56.57	29.13	27.44	14
500-999	39.75	30.00	26.25	5.00	21.25	4
>=1000	20.05	79.00	0.00	0.00	0.00	5
Total	11.49	5.15	82.72	67.77	14.95	624

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 3.2
Distribution of Provincial Sample Firms by Market Orientation

Upper part: Number of Firms,
Lower Part: Percent

Size of Firm (Number of Workers)	Market Orientation				Total
	Bangkok Oriented	Export Oriented	Semi-export Oriented	Regional Oriented	
1-5	7	1	0	249	257
6-9	5	1	1	157	164
10-19	20	1	0	138	159
20-49	32	5	2	84	123
50-99	18	10	4	22	54
100-199	13	16	0	13	42
200-499	6	6	1	10	22
500-999	2	4	3	1	9
>=1000	1	5	0	1	7
Total	104	49	11	675	837
1-9	2.9	0.5	0.2	96.4	100
10-49	18.4	2.1	0.7	78.7	100
50-199	32.3	27.1	4.2	36.5	100
200-499	27.3	27.3	4.5	45.5	100
>=500	18.8	56.2	18.8	12.5	100

Notes:
1. Firm selling >= 50% of its total sales to Greater Bangkok is Bangkok oriented firm.
2. Firm exporting >= 50% of its total sales is export oriented firm.
3. Firm exporting between 20% - 49% of its total sales is semi-export oriented firm.
4. The rest is defined as regional market oriented firm.
5. Columns may not add up to total as certain firms satisfy more than one condition.

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 3.3
Distribution of Sample Firms and Employment
By TSIC Classification

TSIC Code	Industry	Bangkok Oriented Firms		Export Oriented Firms		Regional Market Oriented Firms	
		No. of Firms	No. of Workers	No. of Firms	No. of Workers	No. of Firms	No. of Workers
31	Food, Beverages, Tobacco	41	1964	13	7262	183	4760
32	Textiles	2	1065	2	170	14	1748
33	Wood Products	17	926	9	1094	88	1954
34	Paper Products And Printing	4	784	1	750	15	150
35	Chemical, Rubber Products	5	208	11	1446	38	1387
36	Non-metallic Mineral Products	2	515	2	203	79	2219
37	Basic Metal Products	0	0	0	0	5	128
38	Metal Products And Machinery	6	196	1	8	254	2089
39	Others	0	0	1	910	24	516
	Total	77	5658	40	11843	700	14951

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 3.4
Distribution of Bangkok Oriented Firms, Export Oriented Firms, and Regional Market Oriented Firms by Group of Industries

Number of Firms, in the parentheses are percent of row total

	DURBI	DRBI	IBI	UI	Total
Bangkok Oriented					
Number of Firms	45	19	17	23	104
	(43.3)	(18.3)	(16.3)	(22.1)	(100.0)
Number of Workers	2784	743	1277	3085	7889
	(35.3)	(9.4)	(16.2)	(39.1)	(100.0)
Export Oriented					
Number of Firms	32	8	3	6	49
	(65.3)	(16.3)	(6.1)	(12.2)	(100.0)
Number of Workers	15254	882	212	2160	18508
	(82.4)	(4.8)	(1.1)	(11.7)	(100.0)
Semi-Export Oriented					
Number of Firms	3	2	2	4	11
	(27.3)	(18.2)	(18.2)	(36.4)	(100.0)
Number of Workers	1190	560	758	221	2729
	(43.6)	(20.5)	(27.8)	(8.1)	(100.0)
Regional Market Oriented					
Number of Firms	178	116	106	275	675
	(26.4)	(17.2)	(15.7)	(40.7)	(100.0)
Number of Workers	4595	1567	1944	5759	13865
	(33.1)	(11.3)	(14.0)	(41.5)	(100.0)
Total					
Number of Firms	258	145	128	308	839
	(30.8)	(17.3)	(15.3)	(36.7)	(100.0)
Number of Workers	23823	3752	4191	11225	42991
	(55.4)	(8.7)	(9.7)	(26.1)	(100.0)

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 3.5
Marketing Channels of Bangkok Oriented Firms

Size of Firm (number of employment)	Small (1-19)	Medium (20-99)	Large (>=100)	Total
		Number of Firms		
(A) Direct to Factory	7	14	12	33
(B) to Wholesaler	6	11	1	18
(C) to Retailer	1	0	0	1
(D) Self Retailing	1	1	1	3
(E) To Government Agency	0	0	0	0
(F) Other Channels	2	2	1	5
(Z) More than 1 Channel	14	20	6	40
Total	31	48	21	100
ZA	6	14	4	24
ZB	9	17	4	30
ZC	9	7	2	18
ZD	7	8	2	17
ZE	3	2	1	6
ZF	0	1	0	1
		Percent of Column Total		
(A) Direct to Factory	22.6	29.2	57.1	33.0
(B) to Wholesaler	19.4	22.9	4.8	18.0
(C) to Retailer	3.2	0.0	0.0	1.0
(D) Self Retailing	3.2	2.1	4.8	3.0
(E) To Government Agency	0.0	0.0	0.0	0.0
(F) Other Channels	6.5	4.2	4.8	5.0
(Z) More than 1 Channel	45.2	41.7	28.6	40.0

Notes: ZA: Z with A (i.e. Direct sales to factory plus other channels)
ZB: Z with B
ZC: Z with C
ZD: Z with D
ZE: Z with E
ZF: Z with F

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 3.6
Marketing Channels of Regional Market Oriented Firms

Size of Firm (number of employment)	Small (1-19)	Medium (20-99)	Large (>=100)	Total
		Number of Firms		
(A) Direct to Factory	23	7	3	33
(B) to Wholesaler	23	8	4	35
(C) to Retailer	33	4	0	37
(D) Self Retailing	238	18	2	258
(E) To Government Agency	1	0	1	2
(F) Other Channels	1	1	0	2
(Z) More than 1 Channel	219	67	15	301
Total	538	105	25	668
ZA	46	20	8	74
ZB	99	39	10	148
ZC	125	39	7	171
ZD	176	49	7	232
ZE	62	15	7	84
ZF	5	3	0	8
		Percent of Column Total		
(A) Direct to Factory	4.3	6.7	12.0	4.9
(B) to Wholesaler	4.3	7.6	16.0	5.2
(C) to Retailer	6.1	3.8	0.0	5.5
(D) Self Retailing	44.2	17.1	8.0	38.6
(E) To Government Agency	0.2	0.0	4.0	0.3
(F) Other Channels	0.2	1.0	0.0	0.3
(Z) More than 1 Channel	40.7	63.8	60.0	45.1

Notes: ZA: Z with A (i.e. Direct sales to factory plus other channels)
ZB: Z with B
ZC: Z with C
ZD: Z with D
ZE: Z with E
ZF: Z with F

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

Table 3.7
Marketing Channels of Export Oriented Firms

Size of Firm (number of employment)	Small (1-19)	Medium (20-99)	Large (>=100)	Total
		Number of Firms		
GROUP 2				
(A) Direct Exporting	2	4	13	19
(B) Through Trading Firms	1	2	3	6
(C) Through Importer's Agent	0	2	1	3
(D) Other Channels	0	1	1	2
(Z) More than 1 Channel	0	4	10	14
Total	3	13	28	44
ZA	0	3	10	13
ZB	0	4	6	10
ZC	0	4	6	10
ZD	0	0	0	0
		Percent of Column Total		
(A) Direct Exporting	66.7	30.8	46.4	43.2
(B) Through Trading Firms	33.3	15.4	10.7	13.6
(C) Through Importer's Agent	0.0	15.4	3.6	6.8
(D) Other Channels	0.0	7.7	3.6	4.5
(Z) More than 1 Channel	0.0	30.8	35.7	31.8
		Number of Firms		
GROUP 3				
(A) Direct Exporting	1	1	2	4
(B) Through Trading Firms	0	4	0	4
(C) Through Importer's Agent	0	0	0	0
(D) Other Channels	0	0	0	0
(Z) More than 1 Channel	0	1	2	3
Total	1	6	4	11
ZA	0	1	2	3
ZB	0	0	1	1
ZC	0	1	1	2
ZD	0	0	0	0
		Percent of Column Total		
(A) Direct Exporting	100.0	16.7	50.0	36.4
(B) Through Trading Firms	0.0	66.7	0.0	36.4
(C) Through Importer's Agent	0.0	0.0	0.0	0.0
(D) Other Channels	0.0	0.0	0.0	0.0
(Z) More than 1 Channel	0.0	16.7	50.0	27.3

Notes: ZA: Z with A (i.e. Direct sales to factory plus other channels)
ZB: Z with B
ZC: Z with C
ZD: Z with D

Source: Rural Industries and Employment Project Survey, TDRI, 1989.

CHAPTER 4

SUMMARY AND RECOMMENDATIONS

4.1 SUMMARY

The benefits from the industrialization process of Thailand have so far been concentrated in Bangkok and the five surrounding provinces (BMR). The BMR accounted for about 78% of the country's total GDP from manufacturing in 1987, leaving only 22% to be shared among the remaining 67 provinces. In these outer provinces, manufacturing generally contributed a small fraction of the provincial income. The low degree of their industrialization is closely associated with low per capita income. At the national level, manufacturing has been growing faster than the service sector and much faster than the agricultural sector. The spatially unbalanced growth of manufacturing has raised concern over the worsening trend of income disparity.

An investigation into the role of natural resources reveals that the regional industries are relatively more competitive in resource-based industries especially those in the upstream group. Among four groups of industries, only the upstream resource-based group shows greater employment in the outer regions than in the BMR. The downstream resource-based group has lower employment in the outer regions than in the BMR, but the ratio of employment in the outer regions over the BMR of this group is higher than the average ratio for all industries. The import-based industry group is highly concentrated in the BMR. The share of employment in the regional industries in this group is only 10%. The unclassified industry group also shows a relatively low share of employment in the outer regions.

The relative competitiveness can also be seen from the ability to compete in the external market. The number of export-oriented firms and Bangkok market-oriented firms in the regional industries is proportionally the highest in the upstream resource-based group, and second highest in the downstream resource-based group, and far lower in

the import-based and unclassified groups. A similar comparison based on the number of employees to take into account the size difference among firms also shows a similar pattern of competitiveness. An interesting exception is that a labor intensive industry like textiles can be competitive in the outer regions. If not constrained by the minimum wage regulation, there could be a good potential to develop labor intensive industries in the outer regions.

In the analysis of the backward linkages, it was found that Bangkok industries use imported inputs nearly twice as much as inputs from other regions in the country. It is interesting to examine whether their strong backward linkages with import and weak linkages with the regional industries are influenced by certain policy biases. On the average, import substitution industries require higher import content than export oriented industries. Therefore the biased policy in favor of import substitution must be at least partly responsible for the dominance of import over regional supply of inputs.

Supply of inputs from Bangkok and imports accounts for 81% of the total inputs used by Bangkok industries. In contrast, these two sources of supply account for only 28% of the total inputs used by regional industries. The relative competitiveness of the regional industries tends to increase with the share of inputs from regional sources in the total inputs. Firms that use regional inputs for more than two thirds of the total inputs account for 69% of the total employment in the regional industries. Most of them are resource-based industries, particularly the upstream resource-based group. There are proportionally fewer firms and less employment in the import-based and the unclassified groups at all levels of regional input intensity. At a low level of regional input intensity, they are handicapped by the transportation cost of inputs from Bangkok and imports, on top of other factors that generally favor Bangkok firms. At a high level of regional input intensity, only a few industries in these groups are lucky enough to have the local supply of the required inputs. For most industries in the import-based and the unclassified groups, the high proportion of regional inputs is just impossible because most of the required inputs have to be imported or produced in the BMR.

Most of the basic industrial raw materials and intermediate products are either highly concentrated or solely produced in the BMR. Examples are basic steel products (steel bars, wires, rods, pipes, and fittings, galvanized iron sheets, tin plates, structural steel sections), synthetic fibers, thread and yarns, engines, motors and generators, industrial chemicals and machinery parts, Although cement and fuel oils are produced outside the BMR, they are cheaper in Bangkok than in most of the outer provinces, since the distribution system is centered in Bangkok.

On the demand side, the concentration of several downstream end products in the BMR has strengthened the intra-regional linkages in the BMR and the inter-regional linkages between tne BMR and the outer regions. The intra-regional linkages in the regional industries are relatively strong between the agricultural sector and the agro-processing industries and relatively weak among the manufacturing industries. The demand from Bangkok and exports generates about 60% of the employment in the regional industries.

4.2 RECOMMENDATIONS

The prime objective of regional industrialization has most often been expressed in relation to income distribution problems. Of greatest concern are the worsening trend of income distribution between the BMR and other regions, limited job opportunity in the outer regions particularly the Northeast, and the increase of landless rural population and its implications on deforestation and political stability. Equally important but rarely mentioned is the aspect of economic efficiency. The two objectives, while often seen as conflicting, should be pursued simultaneously. Failure to achieved either of them would build up resisting pressure which would eventually lead to policy reversal. Income disparity tends to intensify political polarization, which could bring great damage to economic development. Neglecting economic efficiency may impose great burdens on the economy and result in stagnation.

Proper selection of policy instruments could bring these two objectives in harmony. The recommendations offered here attempt to identify these types of policies and measures. The recommendations may be regarded as consisting of two sets. The first set emerges from the recognition that there are certain policy distortions which not only produce inefficiency in resource allocation but also bias against the development of regional industries. The second set is based on measures directly aimed at promoting regional development of industries to offset the unbalanced growth pattern between the BMR and the outer regions. The efficiency aspect of the latter approach accrues from the reduction of the social cost of over congestion in the BMR and the increase of resource mobility in the outer regions.

4.2.1 Correction of Policy Biases

The production and employment structure of the regional industries shows that their competitiveness is relatively strong in resource-based industries. Studies relating to the trade pattern and trade policies of Thailand generally indicate that Thailand's exports consist mainly of resource-based (or primary) products and the policies have been anti-export. The anti-export policies are not deliberate but result from measures that protect of import substitution industries. The protective measures raise the cost of production of other industries and the cost of living in general. The beneficiaries of this policy are the protected industries, which are highly concentrated in the BMR.

On the basis of comparative advantage, the correction of this policy bias would promote economic efficiency and benefit export oriented sectors. The major export-oriented sectors in Thailand are the agricultural sector, the resource-based industries particularly the agro-processing industries, and the labor intensive industries. The regional economy is highly dependent on these sectors. The majority of the population works in agriculture. The industries in which they have revealed competitiveness are resource-based. The labor-intensive

industries can be expected to be more important if the distortion in the labor market is corrected.

The findings in this paper confirm that export is a significant market for regional industries. The export market allows the regional firms to grow beyond the size permitted by the domestic market. Small regional firms are predominantly regional market-oriented. The proportion of export-oriented firms in the regional firms increases with the firm's size. Among the firms with more than 500 employees, the export-oriented firms and semi export-oriented firms account for about 75% of the total number of the firms. More than 80% of the export-oriented firms are in upstream resource-based industries. Therefore the correction of the anti-export policy bias should allow the regional industries to strengthen their comparative advantage. The agricultural sector would also benefit from the liberalized trade policy, and the higher real income of the farmers would stimulate regional industrialization as demonstrated in the regression equation in Chapter 1.

Thailand's comparative advantage has gradually shifted from resource-based industries to labor-intensive industries. According to this trend, the labor-intensive industries will become increasingly more important. Therefore, promotion of labor-intensive industries in the outer regions is necessary to keep the pace of regional industrialization with the national trend. The stumbling block to the development of labor intensive industry in the outer regions is the legal minimum wage rates in these regions, which are higher than the market equilibrium rates. The massive migration of the regional workers to the BMR is clear evidence of the excess supply of labor in the outer regions, which in turn implies that the legal wage rates are higher than the market equilibrium rates. The distortion of the wage rate prevents the regional industries from exploiting their natural comparative advantage in the labor-intensive industries.

At present, there is little linkage among the regional manufacturing industries, since their relative strength is confined to resource-based industries. The development of labor-intensive

industries would expand the industrial base of the regional industries and strengthen their inter-industry linkages. The failure of this development would leave industrialization in the outer regions farther behind the BMR, since the prospect for growth of labor-intensive industries is more promising than for resource-based industries at the present stage of development of Thailand. The fast-growing, labor-intensive industries in the BMR have a great absorptive capacity for labor, so that much more migration to the BMR is inevitable. This will in turn exacerbate the congestion problems in the BMR.

The measures to correct the policy bias may be the followings:

1. Reducing the average level and the dispersion of the rates of import duties.

2. Avoiding the use of quantitative restrictions on imports.

3. Strengthening the system of export promotion measures aiming to increase accessibility for small producers, particularly those in the outer regions. The benefit of the present system of export promotion is enjoyed by a few large producers.

4. The minimum wage policy should be reviewed and the rate should be gradually adjusted to approaching the market equilibrium level of each locality. The mechanism for determinating the minimum wage rate may have to be reorganized. One possible alternative is to establish local committees to participate in this process.

4.2.2 Direct Measures to Promote Regional Industrialization

The direct promotional measures can cover a very wide range of instruments such as tax and financial incentives, infrastructural development, promotion of specific industrial zones and/or industrial estates, manpower development and education, industrial extension and marketing promotion. Unlike the previous set of policy recommendations which deal primarily with the direction of change, this approach deals

primarily with the problems of magnitude. There can be little doubt about the benefits of direct promotion, but the big question is whether the amount of incremental benefit justifies the incremental cost. For detailed recommendations, it requires analysis at the project level, which is beyond the purpose of this study. However, the importance and the potential contributions of these measures to regional industrialization deserve serious consideration.

On infrastructural development, this study has placed special emphasis on transportation. The dominant route at present is between the outer regions at the periphery and the BMR at the center of the transportation network. This pattern of transportation is due to the role of Bangkok as the major transit for foreign trade and nationwide distribution and as the largest market and supply source of most inputs. From the regression analysis, the distance from Bangkok was found to inhibit industrialization in the remote regions. The relationship between the distance variable and the degree of industrialization could be explained by the stronger linkage between the BMR and the Central Region than between the BMR and more remote regions. Though the physical distance cannot be changed, the transportation costs can be. The reduction in transportation costs may be achieved by improving the transportation system or by providing alternative routes to Bangkok -- e.g., expanding the number and capacity of international airport and seaport in the outer regions and accelerating development in the outer regions. Another supporting argument for developing transportation development in the outer regions is the significant direct relationship between the expenditure on road construction and the degree of industrialization.

Electricity is another type of infrastructure generally believed to be strongly influenced the decision on plant location. The relationship between electricity and water supplies and the degree of industrialization is also confirmed in this study. There are three major aspects of the supply of electricity: accessibility, the outage problem and pricing. If regional industrialization is a serious development goal, the effort to solve the accessibility and the outage problems should be accelerated. On electricity pricing, a uniform price

structure has been adopted between regions, despite the difference in unit cost between the Bangkok Metropolitan Electricity Authority (BMEA) and the Provincial Electricity Authority (PEA). This approach has put the PEA in a difficult financial position and thus restrained its development. Cross subsidy between these two agencies is an alternative system whose desirability depends on the policy objective. Cross subsidization could be more easily achieved by merging the two agencies than by keeping them separate.

Energy-intensive industries may be attracted to the regions where the cost of electricity supply is lower than average by a special pricing schedule that reflects the true marginal social cost. A possible candidate for this scheme is Kanchanaburi, where two of the largest hydroelectric dams in the country are situated. Water supply and natural resources in this province are also ample. If the growth pole strategy is adopted as part of the regional industrialization policy, the potential of this province should not be overlooked. The special pricing scheme for electricity may be incorporated into the development plan of specific areas such as this one. The rationale for this pricing strategy rests upon the economic efficiency of marginal cost pricing, while it is also a direct promotion to the industrialization of such the specific area.

The development of regional infrastructures can accelerate regional industrialization in various ways. First, the expenditure on regional infrastructure development spurs the demand in the regional economy through the direct demand for construction, maintenance and other input requirements of the projects, the indirect demand through the backward linkage effect, and the induced demand through the income effect. These benefits of the infrastructural development projects on the regional economy may be enhanced by giving preferential treatment to promote the participation of the local contractors and subcontractors. Second, the availability of well-developed infrastructures is a crucial factor in the firm's decision to locate a plant. Third, the initial settlement of industrial plants attracted by the well-developed infrastructures would further attract related industries to locate in their vicinity. This is

evident from the tendency of industries to concentrate in the BMR and the booming investment in the Eastern Seaboard.

While the development of regional infrastructures is a major precondition for regional industrialization, the need to expand the BMR infrastructures is also increasingly pressing. In recent years, there has been rapid growth of manufacturing investment in the five provinces surrounding Bangkok as well as in other nearly provinces such as Chon Buri, Chachoengsao, Ayutthaya and Saraburi. Massive investment in infrastructure is required to accommodate the industrial expansion in this region otherwise the infrastructural shortage will become the main bottleneck to the national development. This brings us to a basic key issue of the balancing the resource allocation for financing the infrastructural development between this region and the more remote regions without jeopardizing macroeconomic stability. The industrial growth in the core region should be accommodated while its tendency to lead to overcongestion in Bangkok should be checked and the development in the outer regions be stimulated. The user-financing approach to infrastructural development projects in the BMR should be used more extensively as a guide for efficient resource allocation and as a source of additional finance. This approach is more relevant to the BMR since its growth momentum only needs accommodation. Stimulation is unnecessary and probably undesirable in view of the congestion problem and the existing disparity between regions. The allocation of resources for investment in infrastructures should thus be based on the following principles:

1. The development of infrastructures in the BMR should aim to solve the congestion problem. The benefits would go directly to BMR's residents, therefore the cost of these projects should be shouldered directly by the BMR's residents.

2. The development of regional infrastructures should aim to promote regional economic development. This would also ease the congestion problem in the BMR. Therefore, it would be justified to finance these projects from the general tax revenues when the user-financing approach is impracticable.

The user financing approach may include the following:

1. Construction of new roads in the BMR should be financed by road users. Examples include the wide use of toll roads, increasing automobile registration fees, and a special tax on gasoline and other vehicle's fuels.

2. Pricing of public utilities and other state enterprise's services should reflect real economic costs. More emphasis should be placed on solving the deficit problem of such state enterprises as the BMTA and MWWA.

3. Accelerating the process of privatization particularly in solving the shortage of infrastructures such as ports, water supply in certain industrial areas, promotion of private industrial estates, telecommunication and construction of new highways and express ways.

4. Reassessing the value of land to reflect the actual market prices more accurately for the purpose of taxing land ownership. The tax rate may have to be revised with a progressive rate scheme, since the increase in the value of land is largely due to public investment in infrastructures such as roads, water supply, electricity transmission lines and telecommunication.

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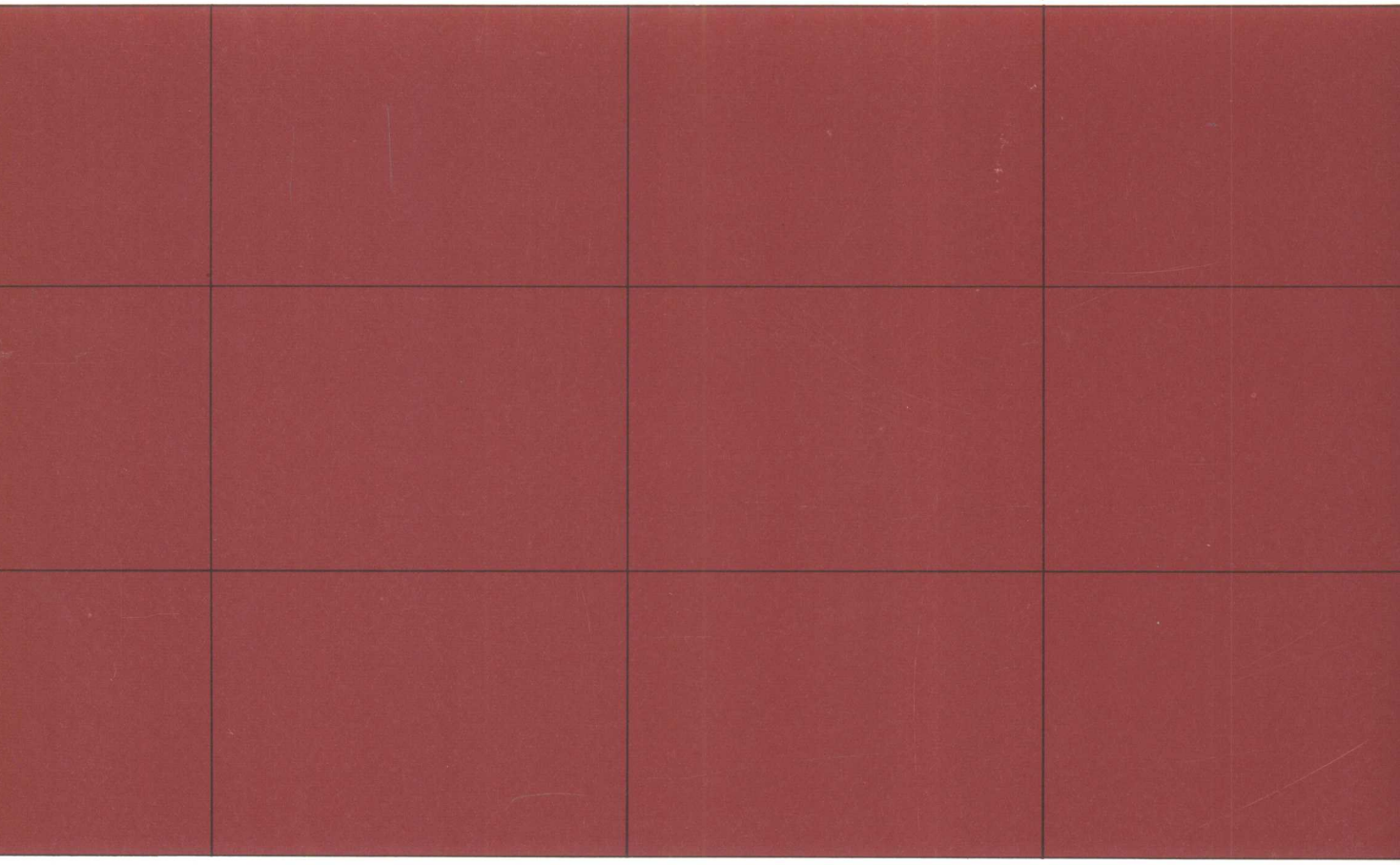

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