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The Employment Impact of Industrial Investment: A Preliminary Report

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Development Economics Department
Industrial Projects Department

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

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THE EMPLOYMENT IMPACT OF INDUSTRIAL INVESTMENT:

A PRELIMINARY REPORT

This paper discusses conceptual issues and measurement techniques with respect to identifying the indirect effects of industrial investment. While the paper is not meant to be an exhaustive survey, it makes extensive use of the available literature in discussing the appropriate measurement of factor intensity. Greatest attention is devoted to the use of input-output analysis to estimate indirect employment as a result of forward and backward linkages from industrial investments. Numerical estimates of indirect employment effects are given at the industrial branch level.

This is a "preliminary" report in several respects. No attempt is made formally to link estimates of indirect employment at the industrial branch level to analysis at the more detailed level of project design and appraisal. In particular, the refinement of project appraisal criteria to introduce sectoral differences in indirect effects is not discussed. The deepening of industrial structure that accompanies development and is reflected in changes in the input-output coefficient matrix over time is also not explicitly dealt with. However, the latter aspect will be examined in a subsequent report.

The paper was prepared by Mr. Joseph Stern, Consultant, under the joint supervision of the Development Economics and Industrial Projects Departments. It was written in connection with the preparation of "Guidelines for Improving Industrial Project Design," under the terms of the Urban Poverty Task Group's Action Program and Interim Report.

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THE EMPLOYMENT IMPACT OF INDUSTRIAL PROJECTS

1. Introduction

Concern about employment in developing countries has shifted over the last two decades from a belief that costless surplus labor could support modern sector expansion to a realization that the growth of productive employment is lagging behind the growth of output. While rates of investment have been high, labor absorption has grown slowly or even declined in some areas. As Robert S. McNamara indicated in his address to the Board of Governors in 1969: "In the developed countries, rapid economic growth implies full employment. But in the developing countries this is not necessarily the case." [44C]. At the same time there is a growing concern about the distribution of increments in national product. A review of the available evidence[1/] seems to indicate that the poor may not be improving their lot, even as rapid development proceeds. In part these two aspects of the development problem -- labor absorption and income distribution -- are related since there are substantial and increasing numbers of people available for work who are unable to maintain an adequate standard of living on the basis of the employment opportunities open to them. The problem can be best characterized as one in which a large number of potential entrants to the modern sector have, of necessity, been absorbed into stagnant or slow-growing sectors -- into traditional agriculture, handicrafts manufacturing and low productivity service activities. [65, pp. 9-10] Hence while creating employment opportunities *per se* may be important perhaps more important is the need to increase the availability of *productive* employment opportunities.

Thanks are due to Jeffrey Lewis, Harvard College, who undertook a considerable portion of the research effort underlying this paper and who painstakingly prepared the various tables and Ms. Mary Lavallee who handled the production aspects of the paper.

1/ See, for example, Hollis B. Chenery, Montek S. Ahluwahlia, C.L.G. Bell, John H. Duloy and Richard Jolly [11].

Policy makers consider industrialization an attractive development strategy because it raises incomes by providing higher productivity employment than non-industrial activities and because it is said to provide the potential for self-sustaining growth through profit reinvestment and through linkages to other sectors which use industrial sector outputs or provide inputs. In addition it is sometimes considered difficult to introduce modern agricultural technology into the tradition-bound rural sector and the presumed price-inelasticity of demand, in the domestic and international markets, further frustrates attempts to use the agricultural sector as the primum mobile for development.

More recently, perhaps in partial response to the concerns about employment creation and income distribution, as well as in recognition that the import substitution strategies of the 1960's produced their own problems, the efficacy of the industrial sector as a vehicle for creating income and employment has been called into question. Although an exclusive emphasis on rural-cum-agricultural development and investment is rare, there is increasing skepticism that industrial projects, especially large ones which may call for a substantial allocation of scarce investible resources, can be an effective mechanism for increasing labor absorption. The question of how one determines the optimal allocation of resources when the maximization of a number of objectives (growth, employment, distribution, self-reliance, etc.) are involved is a complex one so that in practice a number of simple guidelines tend to be used. Such guidelines tend to oversimplify the problem, generally ignoring interdependencies and dynamic considerations. While it may eventually be possible to develop operationally useful guidelines of the employment and productivity impact of particular industrial projects, this preliminary paper has a more limited scope. It reviews some of the allocative "rules-of-thumb" used, noting their limitations and biases while providing some estimates of the labor intensity of various industrial and non-industrial sectors. In doing so some of the relevant literature is surveyed but no claim is made that all issues have been thoroughly reviewed and summarized. While an extensive, though by no means exhaustive, list of references is appended, no attempt has been made to provide a comprehensive survey of the literature or to develop an integrated view of the growth-employment-distribution nexus of problems. This paper should be viewed as an initial effort in a longer run process of reviewing, analyzing and eventually synthesizing the complex issues of employment creation and development.

2. Scope of the Problem

Open unemployment, most commonly measured by the unemployment rate, is but one manifestation of the employment problem. Other indicators, such as low participation rates due to the difficulty of finding jobs, acceptance of part-time employment, high turn-over rates, and various forms of low productivity employment all provide evidence that under-utilization of labor pervades an economy. [6] In fact the evidence is that open unemployment, as traditionally defined, is less of a problem in many developing countries than the fact that a considerable portion of the labor force is, for sheer lack of alternatives, forced to accept employment in low productivity, and hence low wage, activities [16 and 64-a]. Often such low productivity jobs are characteristic of traditional agriculture and service activities. Turnham notes that "these considerations suggest that the employment problem in less-developed countries cannot just be identified with an unemployment problem. Although rates of unemployment are often extraordinarily high, as important (probably more important) is the situation of employed groups who earn and consume very little because their productivity is so low." [65; p. 16]

The high priority attached to the need to increase output, productivity and employment has led some to consider the notion that there is a trade-off between maximum current production and employment. This line of reasoning proceeds as follows. We consider an employment-output maximization trade-off to exist if it is impossible to maximize levels (or growth rates) of employment and output simultaneously. Consider a nation that wishes to maximize a social welfare function which values both the creation of output (production) and employment. If it is impossible to find a unique maximum value for the social welfare function, independent of the relative weights placed on the objective of employment and output creation, then an employment-output trade-off can be said to exist. In discussing the possibility of a trade-off between output and employment it is useful to distinguish between the static and dynamic cases, and we postpone consideration of the dynamic case to section 4.

On the face of it we expect that the use of more labor with a given stock of capital equipment must imply an increase in both employment and output. The exception, sometimes said to characterize agriculture or service activities, would be where the extra workers do not add to, but subtract from output; such workers have a negative marginal product. For the industrial sector Bhalla [7 and 8] provides some examples which show that a more labor-intensive method, in the sense of a method which has a lower capital/output ratio or shows lower costs per worker, also involves more capital per unit of output than a capital-intensive method. Consider the following two projects, each costing $100,000.

	Project A	Project B
Investment	$100,000	$100,000
Capital/Output	2.5	5.0
Capital/Labor	$ 1,000	$ 100
Labor/Output	0.0025	0.05
Employment created	100 jobs	1,000 jobs
Output produced	$ 40,000	$ 20,000

If the investment decision must be made between these two projects and if no substitution of labor for capital is possible, then the more labor-intensive investment project (Project B) would result in a loss of output as compared to the more capital-intensive alternative (Project A) which calls for a sacrifice of potential employment. [61] Note however that Project B is inefficient -- employing both more labor and capital to produce a unit of output as compared to Project A. Moreover, the adoption of an inferior technique implies, ceteris paribus, a trade-off with consumption since it requires a raising of the savings ratio to sustain it at any given level of output. [51a]. To the extent that the policy maker is free to choose the most efficient technique, Project B would never be implemented, since a labor intensive technique that also uses more capital would never be economical.2/

While, as Peacock and Shaw [51a] argue, conflicts between output and employment usually do not arise in a static setting many development economists continue to assume that not only have such conflicts arisen in the past but must necessarily arise in the future. It is sometimes argued that a capital-intensive method of production will result in a lower capital cost per unit of output because capital intensive techniques are more efficient than labor-intensive methods.3/ This position ignores the considerable evidence that in many industries and processes the more labor-intensive methods also save on capital per unit of output. In such instances maximizing current levels of output and employment are consistent. Like most dichotomies, the static conflict between output and employment, or the question of using labor-intensive rather than capital-intensive technologies, is based on an oversimplification

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2/ Stewart and Streeten argue that examples which apparently illustrate the employment-output conflict, such as illustrated above, can be found because the apparently inefficient method reflects a failure to capitalize on potential economies of scale. [61; pp. 2-3]

3/ In part this "debate" fails to come to grips with the relevant indicators of capital and labor intensity. This problem is dealt with below.

of the problem.[4/] To quote Seers: "The question to pose about any technique is whether it is the most appropriate one for a country where there is massive unemployment. Sometimes the most modern technique is the most appropriate: it may be capital-saving as well as labour-saving." [59; p. 382]

The notion of an employment-output trade-off becomes more defensible if we admit that the social objective function will include other arguments besides employment and output or if we view the problem in a dynamic rather than a static framework. While the analysis of the dynamic case is postponed to section 4, consider the following case involving a non-output objective. For distributional reasons, government may decide to increase the supply of a commodity purchased primarily by low income groups. Because of technological considerations this commodity can only be produced through a capital-intensive method. Scarce investment resources may therefore be allocated to this project rather than to a more labor-intensive set of projects. Suppose that a government wishes to provide cheap plastic sandals, a commodity purchased primarily by the low income groups. The most efficient technique involves extrusion of plastic sandals -- a capital intensive technology. Here the potential of a trade-off between employment and output in a static setting arises because the inclusion of an additional objective constrains policy choice.

While some aspects of the employment-output trade-off in a dynamic setting are dealt with later, it is worth noting here a number of factors. related to the development process that may reduce the complementarity between output growth and employment. Among the factors which serve to weaken this link are: (i) the existence and accentuation of a dual-economy structure, i.e., a traditional subsistence sector which is divorced from the rest of the

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4/ Peacock and Shaw [51a] and Stewart and Streeten [61] illuminate the conditions under which it is meaningful to talk of a conflict between the employment and growth objective.

economy; (ii) an increasing disequilibrium in factor prices, resulting in a growing discrepancy between the price of labor and its marginal revenue products and the cost of capital and its marginal contribution to output, leading to an increasing bias in the adoption of labor saving technologies; (iii) the lack of a suitable technology to be used in a relatively labor rich - capital poor environment; and (iv) a rapid growth in population and the economically active labor force which, if wages are sticky downward, is bound to increase the level of unemployment. [64a]

The fact that employment and output growth need not be strictly complementary has led to a concern about the need to increase employment opportunities. The apparent inability of the "modern" sector to absorb surplus labor leads some to argue that one sector, the rural-agricultural sector, should receive primary, if not exclusive attention. There appears to be some belief that the per unit cost of increasing output and employment are lower in agriculture than in industry. It is beyond the scope of this paper to explore this issue in detail. Flanders [17] however notes that while the agriculture-industry argument is rarely presented in such an extreme form, the general idea finds considerable credence in some writings. Not only does she conclude that the extreme agriculture vs. industry position is untenable but that the total capital costs, which should include the cost of increasing the availability of water, fertilizers, pesticides, etc., generally is higher in agriculture than in industry. Programs aimed at improving employment opportunities in the agricultural sector, which in typical developing countries produces about half of the national product and employs about 70 per cent of the labor force, are not likely to be sufficient by themselves in ameliorating the general problem of under- and unemployment. The industrial sector will undoubtedly continue to grow more rapidly than the agricultural sector -- and indeed it must do so if incomes are to rise. Using a dynamic programming model, for example, Adelman and Sparrow concluded that when the social objective function was to minimize the average level of unemployment, "the strategy for unemployment minimization is implemented by an industrialization program, even though in terms of direct labor requirements the primary sector is the third most labor-intensive. The key industries under this program are textiles, footwear and clothing, and mechanical and metallurgical, all of which are greatly expanded. Investment is not used as a public works program, even though plant construction is quite labor-intensive, because construction also makes heavy demands upon the economy's bottleneck resource -- its technical man power." [1; p. 307] Or, consider the data for all Latin American countries for the 1960's which show that, for that region, the non-agricultural sectors had the highest growth rate in terms of output and employment as compared to the agriculture sector. [16]

TABLE 1

Annual Growth Rates in Employment and Output by Sector in Latin America, 1960-1969

	Employment (1)	Output (2)	Elasticity of Employment (1)/(2)
Agriculture	1.5	4.0	0.4
Mining	2.2	4.2	0.5
Manufacturing	2.3	5.9	0.4
Construction	4.0	5.0	0.8
Transport and public utilities	3.4	5.4	0.6
Commerce and finance	4.1	5.1	0.8
Miscellaneous services	4.0	3.9	1.0
Unspecified (services)	8.2	7.3	1.1
Aggregate employment and output	2.8	4.8	0.6

Source: Economic Survey of Latin America 1968 (New York. United Nations, 1970), Tables 1-22 and 1-23.

Although data in Table 1 refer only to Latin America, the sectoral production and employment growth rates show there are representatives of most developing regions. While employment in agriculture has not kept pace with population growth it should be pointed out that the general dominance of that sector still means that most new jobs will be created in agriculture. The increase in service sector employment reflects the fact that those not able to find productive employment elsewhere press themselves into domestic service and government employment, often with very low social productivity and concomitantly low wages.

The notion that development implies the diversion of resources from agriculture to the manufacturing sector is, of course, a long-standing one. Indeed, the stimulation of industry is a necessary condition for the improvement of agriculture because the income generated in the industrial sector will stimulate the demand for agriculture sector products and, in turn, part of the industrial sector output may serve to reduce input constraints on the expansion of the agricultural sector. The problem is not one of deciding on an "agricultural" strategy, as opposed to an "industrial" strategy but rather to recognize that "the development of manufacturing industries does not preclude the development of agriculture. On the contrary, they are mutually dependent: the problem facing the less developed countries is not one of choosing between primary and secondary activities but rather one of ensuring the balanced expansion of all appropriate sectors of the economy ... " [68; pp. 2-3]

The facile agricultural vs. industrial project sector dichotomy is too simple. Equally unsatisfactory is the attempt to consider the employment problem in terms of large-scale vs. small-scale industries with the implicit assumption usually made that small-scale industries (however defined) are more labor intensive and more appropriate for developing economies. In fact capital intensity and size have a wide and continuous range and the current interest in the so-called "intermediate" technology indicates that no clear line exists between large- and small-scale or capital- and labor-intensity. Nevertheless policy makers often rely on operational and shorthand indicators of labor intensity when choosing between particular projects or sectors. While given theoretical and statistical vagaries there is perhaps no such thing as a true or pure index of labor intensity, the different indicators, examined in the next section, can serve a useful purpose for analysis, planning and policy making although their usefulness must be enhanced by analysis at the project rather than at the industry level of aggregation.

3. Direct and Indirect Measures of Labor Intensity

For a number of reasons, the dichotomy between capital-intensive and labor-intensive investments, industries and techniques is confusing and inappropriate. First, under conditions of factor substitution in the production function, the technical choice is not simply dualistic. Under this condition varying amounts of capital can be associated with varying amounts of labor, and output is increased if the input of either factor is increased without a reduction in the other. Since the objective is not simply to maximize employment as such, but to increase productive employment, the optimum degree of labor intensity cannot be chosen without reference to some criterion of efficiency and cost minimization.

Second, different indices can be used to measure labor intensity, be it in agriculture, manufacturing or construction. And, as we shall see below, the ranking of sectors by the varying indices often will differ. Among the various indicators of labor intensity commonly used are the labor-output coefficient (L/O); the ratio of value added (V) per worker (V/L), the share of wages in value added (wL/V); the capital-coefficient (K/V or K/O); and the capital-labor ratio (K/L). Under the assumption that capital is the binding constraint on development, and assuming labor to be homogeneous, the capital-labor (K/L) ratio could be used to provide a static ordering of industries by their degree of direct labor intensity. In addition to the two key assumptions noted above, the usefulness of the indicators of capital (or labor) intensity will depend on assumptions about techniques of production, factor market behavior and the level of aggregation. The indicators can be improved, at least to some extent, by the use of project or plant data. The aggregation across enterprises to obtain industry-wide coefficients may camouflage considerably differences in productive techniques which only become apparent at the project level. Without obtaining details of labor intensity, preferably in terms of physical quantitites (e.g., man-years/unit of physical product) for individual enterprises or projects, the evaluation of broad industrial sectors by any of the various indices, including the capital-labor (K/L) ratio, could be misleading.

The ratio of value-added per worker, (V/L), is generally an inappropriate index of labor intensity. As Bhalla notes, "the treatment of value added per employee as an index of factor intensity simply implies that labour productivity is a composite index of the contribution of both capital and labour ... " [9; p. 21]. Only under restrictive, and generally inappropriate, assumptions regarding the factor markets can one conclude that a high ratio of labor to value-added implies a high degree of factor intensity. Thus the ratio of value-added per worker is an appropriate index of factor intensity assuming competitive factor markets and neo-classical production functions.

Equally important, imperfections in the product markets may account for productivity (V/L) differences which are not related to differences in the technical input requirements. Firms operating in a monopolistic market situation may charge high prices for their output, raising measured value-added per worker, a fact that reflects an element of monopoly rent rather than a high contribution of labor, or capital, to production.

Other analysts use the ratio of wages to value-added (wL/V) as an index of labor intensity by which to rank industries. In practice the influence of wage legislation and the role of trade unions distort factor prices and the share of wages in value added, which has thus little relevance to the predictable technical relationship between factor inputs and output. Aside from this problem, the share of wages in value added is a true measure of labor intensity only under the restrictive assumptions of perfect competition in factor and product markets, constant returns to scale and an elasticity of substitution of labor for capital of less than or equal to one. If the elasticity is unity, the relative share of wages and profits in value added will always remain constant. If it is less than unity, then as the K/L ratio rises, the share of wages in value added will increase, while if the elasticity is greater than unity,a rise in the K/L ratio will decrease the share of wages in value added. This could lead to the paradoxical results that a technique which permits labor/capital substitution and could thus potentially be operated in a labor intensive manner may be observed to have a low wage share if the elasticity is greater than unity and it is in fact operated in a capital intensive manner. [9; p. 24] In short, if the elasticity of substitution is unity, the wage share tells us nothing about factor intensity, except if one wishes to make the further restrictive assumption that all activities pay identical wages for a single homogeneous category of labor. And, if the elasticity is not unity, the wage share is a poor indicator of labor intensity so long as we do not have a priori knowledge of the K/L ratio and the substitution elasticity.

The capital-labor ratio (K/L) is one of the most commonly used indicators of labor intensity, especially in studies relating to the employment implications of technological choice. However even the use of this ratio must be circumscribed. Variations in capacity utilization across industries may affect the K/L ratios since industries operating below full capacity may have a smaller labor force, combined with the same amount of fixed capital as an industry operating at full capacity with a larger labor force. Thus the industry which operates below capacity will appear to be relatively capital-intensive when in fact it may not be. Unfortunately, corrections for differences in the degree of capacity utilization are difficult to make. Moreover, the K/L ratio may be influenced by the nature of technological change and by relative factor prices. While neutral technical change will leave K/L unaffected, Hicks' labor-saving technical change will raise it. And the observed K/L ratio may be high because substitution of capital for labor has taken place in response to factor prices, which may be inappropriate. To reject such an activity or technique because of a high K/L ratio would be wrong, for if factor substitution is possible this same process could be labor-intensive when confronted with more appropriate factor prices. Note also that a lower K/L ratio does not necessarily mean a lower degree of mechanization. This is appropriately measured by the amount of fixed capital per worker. The K/L ratio represents capital intensity only if it is a ratio of the stock of investment in fixed capital and in working capital to the flow of labor services. Considerable differences in the K/L ratio can be observed depending on the inclusion or exclusion of inventory capital. [28] 5

The capital-output ratio (K/V or K/O) may also be a poor indicator of labor intensity. First, differences in the durability of capital, and time patterns of output yields need to be taken into account. Second, the valuation of capital raises difficult theoretical problems. Finally, changes in the denominator and numerator need not necessarily take place in response to technological factors. Increases in output may be due to the application of better methods to existing plant without the use of additional capital, the fuller utilization of plant or the introduction of multiple shifts. Unless the contribution of these nontechnical factors can be isolated, inter-industry comparisons of capital-output ratios cannot be a very meaningful indicator of labor intensity.

It is fair to conclude that the ranking of industries or sectors solely on the basis of measured ratios of K/V or K/L, or the ratio of L/V which can be derived therefrom, often yields a misleading index of employment-creating potential. Moreover, as a consequence of some of the problems noted above, the rankings of sectors may not be uniform for different indicators. Tables 2, 3, and 4 summarize available data on labor-output, capital-output, and on capital-labor ratios for Korea, Malaysia and Yugoslavia. While in all three tables some industries show a close ranking between the degree of

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5/ Table 6 and Appendix Table A-4 present capital coefficients for thirty sectors and for eight income levels including and excluding inventory capital. A comparison of these two tables shows the difference in the level of the capital coefficient and the relative capital intensity of the sectors under the alternative definitions.

TABLE 2

Capital vs. Labor Coefficients
Korea

#	Sector	Capital/ Output	Labor/Output Direct	Labor/Output Total	Capital/ Labor
1.	Residential construction	1	29	25	1
2.	Steel pipes and plates	2	46	49	27
3.	Electronics	3	28	39	8
4.	Beverages and tobacco	4	43	27	28
5.	Lumber and plywood	5	33	45	14
6.	Other manufacturing, nes.	6	15	14	6
7.	Other chemicals, nes.	7	37	33	20
8.	Finished textiles	8	12	10	13
9.	Processed foods	9	31	7	19
10.	Household electrical machinery	10	24	30	13
11.	Wood products; furniture	11	8	4	2
12.	Leather, leather products	12	22	18	11
13.	Motor vehicles	13	34	35	25
14.	Banking and insurance	14	9	15	5
15.	Precision and optical products	15	20	26	12
16.	Industrial electrical machinery	16	32	36	29
17.	Coal products	17	41	17	33
18.	Civil works construction	18	13	13	10
19.	Commerce	19	6	11	7
20.	Printing and publishing	20	25	19	21
21.	Glass, clay, stone products	21	10	8	9
22.	Fabrics	22	16	12	16
23.	Metallic products	23	21	24	24
24.	Non-electrical machinery	24	18	21	23
25.	Railway transport	25	35	34	34
26.	Cast and forged steel	26	39	43	38
27.	Rubber products	27	26	29	30
28.	Organic chemicals	28	47	40	44

Table 2 (Cont'd)

#	Sector	Capital/ Output	Labor/Output Direct	Labor/Output Total	Capital/ Labor
29.	Pulp and paper and products	29	36	38	39
30.	Petroleum products	30	52	52	51
31.	Other services, nes.	31	5	5	17
32.	Iron and steel	32	44	48	43
33.	Spinning	33	30	22	37
34.	Chemical fibres	34	40	44	40
35.	Health	35	7	9	22
36.	Non-ferrous metals	36	42	42	41
37.	Rolled steel	37	48	50	46
38.	Shipbuilding and repairing	38	27	32	35
39.	Agriculture and forestry	39	1	1	14
40.	Metallic ores	40	19	28	32
41.	Non-metallic minerals	41	14	6	18
42.	Chemical fertilizers	42	49	46	48
43.	Inorganic chemicals	43	38	37	42
44.	Coal	44	11	16	31
45.	Education	45	3	3	15
46.	Cement	46	51	41	49
47.	Communication	47	14	23	36
48.	Fisheries	48	2	2	26
49.	Transport and storage	49	17	20	45
50.	Water and sanitary services	50	23	31	47
51.	Electricity	51	45	47	50
52.	Real estate	52	50	51	52

Note: nes = not elsewhere specified

Sectors are ranked from lowest to highest in terms of their capital-output and capital-labor ratios while ranking for labor-output ratios is from highest to lowest. Thus electric services has the 51st highest capital-output and 50th highest capital-labor ratio but the 50th lowest labor-output ratio.

TABLE 3

Capital vs. Labor Coefficients
Malaysia

#	Sector	Sector Ranking by Capital/Output	Labor/Output Direct	Labor/Output Total	Capital/Labor
1.	Beverages and tobacco	1	29	33	14
2.	Rubber processing	2	25	4	12
3.	Sawmills and furniture	3	14	9	4
4.	Other foods	4	31	6	24
5.	Oils and fats	5	34	21	31
6.	Processed foods	6	28	23	21
7.	Electrical machinery	7	11	31	18
8.	Other manufactures	8	32	29	27
9.	Leather and footwear	9	8	10	3
10.	Business services	10	30	34	25
11.	Personal services	11	4	5	2
12.	Construction	12	22	19	13
13.	Trade services	13	9	11	5
14.	Other non-metallic products	14	21	26	16
15.	Textiles and clothing	15	16	18	8
16.	Industrial machinery	16	33	36	33
17.	Chemicals and plastics	17	18	25	19
18.	Paper and printing	18	19	22	22
19.	Transport equipment	19	24	32	26
20.	Ferrous metal products	20	27	30	30
21.	Tires and rubber products	21	17	17	20
22.	Padi (rice)	22	2	2	1
23.	Petroleum refining	23	37	37	37
24.	Other gov't services	24	12	13	9
25.	Health services	25	5	7	7
26.	Non-ferrous metal products	26	36	24	35
27.	Industrial chemicals	27	35	35	36
28.	Other agriculture	28	7	8	11
29.	Other mining	29	15	20	23
30.	Education	30	11	16	15
31.	Cement	31	23	28	32
32.	Fishing	32	6	12	17
33.	Coconuts	33	3	3	10
34.	Transport services	34	13	15	28
35.	Oil palm	35	10	14	29
36.	Rubber planting	36	1	1	6
37.	Utilities	37	20	27	34

Note: Sectors are ranked from lowest to highest in terms of their capital-output and capital-labor ratios while ranking for labor-output ratios is from highest to lowest. Thus rubber planting has the 36th (out of 37) highest capital-output ratio, the sixth highest capital-labor ratio and the highest (first rank) labor-output ratio.

TABLE 4

Capital vs. Labor Coefficients

Yugoslavia

#	Sector	Sector Ranking by Capital/ Output	Labor/Output Direct	Labor/Output Total	Capital/ Labor
1.	Construction	1	18	14	2
2.	Leather and footwear	2	14	12	3
3.	Cinema photography	3	28	28	20
4.	Agriculture	4	26	26	17
5.	Misc. manufacturing	5	6	6	4
6.	Trade and catering	6	15	25	8
7.	Handicrafts	7	2	2	1
8.	Electrical machinery	8	16	15	10
9.	Food processing	9	23	22	16
10.	Textiles	10	11	9	6
11.	Printing and publishing	11	10	10	9
12.	Tobacco products	12	19	18	15
13.	Wood products	13	8	3	5
14.	Metal products	14	13	8	11
15.	Shipbuilding	15	20	20	18
16.	Rubber products	16	12	19	12
17.	Chemicals	17	21	23	19
18.	Forestry	18	4	13	7
19.	Non-ferrous metals	19	24	21	22
20.	Building materials	20	9	7	14
21.	Ferrous metals	21	25	16	24
22.	Non-metallic minerals	22	5	5	13
23.	Paper and products	23	22	17	23
24.	Petroleum	24	27	27	26
25.	Coal	25	3	4	21
26.	Transport and communications	26	7	11	25
27.	Electric power	27	17	24	27
28.	Public utilities	28	1	1	28

Note: Sectors are ranked from lowest to highest in terms of their capital-output and capital-labor ratios while the ranking for labor-output ratios is from highest to lowest. Thus public utilities have the highest capital-output, capital-labor and labor-output ratios.

Source: Sudhir Anand [3]

capital and labor intensity in most instances the rankings are very different.[6/] Note that rankings within a country on the basis of K/V, L/V, or K/L would be identical if we observe the same efficiency across all establishments and industries and if the economy is characterized by uniform price vectors and an absence of scale effects. Since in the real world economies do not meet these conditions, aggregation across establishments and enterprises will yield average values that may no longer reflect the actual degree of capital or labor intensity of the sector. Equally important, the rankings across countries are dissimilar. Two additional problems arise in cross-country comparisons. First, sectoral definitions vary among country tables. For example, the Korean table identifies 'steel pipes and plates' as a separate activity, and the data indicate that this sector ranks high (2nd out of 52 sectors), that is, it has a fairly <u>low</u> capital-output ratio whereas the manufacture of 'metallic products' ranks much lower, (23rd out of 52 sectors), i.e., has a higher capital-output ratio. In the Malaysian table all ferrous metal processing is combined into one sector. This sector exhibits a fairly high capital-output ratio, ranking 20th among 37 sectors. Moreover even where the sectoral definitions are standardized differences in the sectoral output mix and hence the relative weights attached to activities subsumed in each sector will vary across countries. Second, the available information is generally derived from value data, distorted by non-equilibrium prices. Hence crudely measured differences in the capital-output ratios across countries may reflect statistical vagaries as much as real factor differences.

6/ See Bhalla [9] for a similar analysis, and conclusion, in which the comparisons between labor and capital intensity are carried out at different levels of aggregation.

In measuring the factor intensity of various sectors account also should be taken of the indirect factor labor and capital use generated by any particular activity. The idea that the production of sectoral output involves purchases of input-supplying activities is fairly obvious. Thus an increase in final demand arising from an increase in, for example, consumption, will call for an increase in the production of the (consumer good) supplying sector. Such an expansion will generate a demand for labor and capital, as indicated by the labor/output (L/O) and capital/output (K/O) coefficients, where labor should ideally be measured in physical units, e.g., number of man-years per unit of output produced. The expansion of the consumer goods supplying sectors in turn requires additional inputs and their production will generate a further expansion of output and labor demand. Adding together the initial increase in labor demand and the subsequent rounds of employment -- the so-called 'indirect' employment which is created as supplying sectors expand production -- yields an estimate of total employment per unit of final demand.[7/], [8/] And similarly one can derive an estimate of the total capital, direct plus indirect, required.

The total employment impact associated with an expansion of output will be larger the less dependent an economy is on imports and the higher the degree of interdependence of the sectors on domestically supplied inputs. The intermediate inputs into a sector can be divided between non-competitive imported inputs, i.e., commodities required for production but not produced domestically, and domestic inputs. The larger the proportion of non-competitive inputs, the weaker the link between the sector and other producers since production will call for additional imports (foreign production) rather than

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7/ See Appendix A for a more detailed description of the direct and total employment coefficients.

8/ Consideration of a related concept -- the forward and backward linkages of various sectors -- is reserved for section 4.

domestic production. The concepts of total and domestic coefficients, as well as direct and indirect employment effects, are discussed more fully in Appendix A.

The ranking of industries by their <u>total</u> employment coefficients, as compared to the more readily available direct labor/output ratios, provides a more complete indicator of the real impact of output expansion on employment.[9/] Similarly, the total capital coefficients yield a more appropriate indicator of the total investment costs associated with an output increase although as capital is more readily imported than labor a more correct assessment of total capital requirements would be based on domestic capital/output ratios. To obtain total employment coefficients one needs not only labor-coefficients by sector but a fully articulated inter-industry matrix as well. Despite the increased reliance on input-output analysis as a planning tool, relatively few developing countries have detailed inter-industry tables. We have obtained fully articulated inter-industry tables for Korea, Malaysia and Yugoslavia together with labor-output coefficients. Hence we have been able to compute total labor coefficients for these three countries, as shown in Appendix Tables A-1, A-2 and A-3. Comparing the <u>total</u> (direct plus indirect) labor coefficients to the <u>direct</u> coefficients yields a simple (Type I) employment multiplier. The simple employment multiplier shows the ratio of the additional total employment resulting from a given expansion output, compared to only the direct increase in employment. The multiplier will be larger the greater the degree of interdependence within an economy, that is, the lesser its dependence on imports.

9/ Krishnamurty [43] notes that the total employment coefficient has its own shortcomings.

The difference between the direct labor coefficient and the total can be dramatic. Consider the "rubber processing" sector in Malaysia. On the basis of the direct employment coefficient this sector ranks 27th out of the 37 sectors identified. After taking account of the indirect labor generated, the "rubber processing" sector ranks third highest in terms of per unit employment generation. The employment multiplier gives an indication of the secondary and subsequent increases in employment which flow from an initial increase in output in comparison to the primary employment effect. However, like all ratio indicators, the size of the multiplier may be large because the denominator (the direct labor coefficient) is small. Thus a sector with a low total labor/output ratio may have a large multiplier because the indirect employment effects are substantial when compared to a relatively small base. In judging which sectors have the largest employment-creating impact per unit of output expansion, one should look at both the direct and total labor coefficients.

For Malaysia we have also calculated the employment multiplier (and the total labor/output ratio) under the assumption that all import coefficients are set to zero. As expected the total employment created when we assume no leakage through imports exceeds the total labor/output ratio when leakages (i.e., imports) do occur.

While the total, direct plus indirect, employment coefficient provides a more complete assessment of the employment impact of various sectors, they still fall short of taking full account of all the production-income-employment interactions. An increase in employment generates an increase in wage incomes. As incomes change, consumer expenditures on goods and services will ordinarily change also. Since consumer expenditures are one sector of final demand, the income induced changes will lead to a change in final demand (i.e., consumer expenditures), and that in turn will set off a second round of output-employment-income changes, and back again to final demand for a third time and so on to fourth, fifth and later rounds. [46] These consumption-income induced effects can be estimated by augmenting the usual inter-industry table by a wage (labor) row and a household purchase column. Thus wage payments are treated akin to intermediate goods purchases and deliveries to household are treated like deliveries to other intermediate sectors. Calculating the employment impact including the expenditure induced employment effects yields a more complete estimate of the direct-plus-indirect employment effect. Comparing such employment increases to the direct employment coefficient yields an employment multiplier which is called a Type II multiplier. As might be expected, the effect of the introduction of the consumption income relationship is to raise all the employment multipliers.

The difference between the two multipliers depends on a number of factors. First, the extent to which income, wage and non-wage, is spent. Second, if different types of wage income recipients have differing marginal propensities to consume then the composition of the labor force in each sector will have an impact on the size of the Type II multiplier. Consider a sector in which the wage bill accrues primarily to professional and managerial labor (e.g., the banking and insurance sector) and that these classes have a higher marginal propensity to save than do manual workers. Additional employment created in such a sector would have a lower impact in terms of additional consumer expenditures than would the creation of employment in a sector in which the income was nearly completely spent on consumer goods. Similarly, differences in the import propensities will affect the Type II multiplier. Thus, if the income recipients are a class characterized by a preference for foreign goods, the subsequent impact on domestic production and employment will be dampened. Third, the expenditure elasticities may vary by type of wage or income recipient. Thus some income recipients may spend their income on commodities with relatively high capital or import content and thus dampen the creation of employment, and subsequent wage incomes, arising from an initial increase in their income.[10/] If possible, the calculation of Type II multipliers should take account of the composition of the employment in each sector, the savings propensity of various income recipients, and their expenditure elasticities.

For illustrative purposes, Type II multipliers have been calculated using the inter-industry table for Korea together with the employment and wage coefficients. Using data of wage incomes by sectors[11/] and the labor coefficients an average wage rate was calculated for each sector.[12/] The employment and wage data, adjusted for an assumed 0.90 propensity to consume, made it possible to augment the input-output table by showing labor purchases as an intermediate input. Estimates of the marginal consumption proportions for Korea were used to incorporate household purchases as part of the intermediate sectoral deliveries.[13/]

The Type I and Type II multipliers are brought together in Table 5. While under the rough assumptions used here the ranking of sectors by their employment multiplier is only marginally affected it is clear that the

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10/ A considerable effort has been made to incorporate such differential expenditure effects in project evaluation techniques. Cf. UNIDO [66-a], Little-Mirrlees [44-b] and Squire and van der Tak [59-a] where the argument is made that the appropriate value to be placed on employment creation depends on who the income recipients are and on their savings propensity.

11/ For the agriculture sectors, where the unincorporated enterprise income undoubtedly includes a substantial return to labor, we arbitrarily added half of such income to labor income.

12/ To the extent that the average wage rate is not representative of the return to labor, if for example the dispersion in wage levels and skill classes around the mean is very large, the calculated increase in income, consumption and subsequent round employment effects will be misspecified.

13/ It would be more appropriate to use appropriate Engel elasticities.

TABLE 5

Korea: Type I and Type II Employment Multipliers

#	Sector	Type I Multiplier	Type I Rank	Type II Multiplier	Type II Rank
1.	Petroleum products	27.58	1	41.65	1
2.	Cement	6.67	2	11.50	2
3.	Coal products	5.53	3	9.39	3
4.	Beverages and tobacco	5.37	4	7.21	4
5.	Processed foods	4.76	5	6.17	6
6.	Organic chemicals	4.14	6	6.10	7
7.	Chemical fertilizers	3.73	7	6.86	5
8.	Non-ferrous metals	3.00	8	5.09	9
9.	Fiber spinning	2.96	9	3.94	12
10.	Electricity	2.93	10	5.15	8
11.	Residential construction	2.60	11	4.29	10
12.	Other chemicals, nes.	2.58	12	3.80	14
13.	Inorganic chemicals	2.45	13	4.04	11
14.	Real estate	2.37	14	3.33	23
15.	Cast and forged steel	2.30	15	3.88	13
16.	Railway transport	2.30	16	3.65	15
17.	Rolled steel	2.28	17	3.65	17
18.	Synthetic resin and chemical fibres	2.27	18	3.63	18
19.	Motor vehicles	2.26	19	3.65	16
20.	Pulp, paper and paper products	2.18	20	3.41	21
21.	Steel pipes and plates	2.11	21	3.57	19
22.	Printing and publishing	2.11	22	3.46	20
23.	Industrial electrical machinery	2.08	23	3.35	22
24.	Rubber products	1.96	24	2.73	27
25.	Wood products and furniture	1.95	25	2.51	30
26.	Iron and steel	1.91	26	2.85	24
27.	Leather and leather products	1.91	27	2.64	28
28.	Finished textiles	1.76	28	2.26	37
29.	Fabrics	1.75	29	2.29	36
30.	Other manufactures, nes.	1.70	30	2.38	33

Table 5 (Cont'd)

#	Sector	Type I Multiplier	Type I Rank	Type II Multiplier	Type II Rank
31.	Household electrical machinery	1.63	31	2.23	38
32.	Non-electrical machinery	1.59	32	2.34	34
33.	Metal products	1.58	33	2.20	39
34.	Shipbuilding and repairing	1.58	34	2.78	25
35.	Civilian construction	1.57	35	2.45	32
36.	Transport and storage	1.55	36	2.34	35
37.	Water and sanitary services	1.55	37	2.49	31
38.	Glass, clay and stone products	1.54	38	2.11	41
39.	Precision and optical products	1.54	39	2.06	42
40.	Services, nes.	1.53	40	2.00	44
41.	Metallic ores	1.52	41	2.76	26
42.	Lumber and plywood	1.40	42	1.97	45
43.	Health	1.37	43	1.95	46
44.	Coal	1.34	44	2.56	29
45.	Electronics	1.33	45	1.93	47
46.	Banking and insurance	1.26	46	2.15	40
47.	Communications	1.24	47	2.06	43
48.	Fishing	1.17	48	1.48[a]	50
49.	Non-metallic minerals	1.17	49	1.70	48
50.	Agriculture and forestry	1.17	50	1.44[a]	51
51.	Commerce	1.16	51	1.41	52
52.	Education	1.10	52	1.68	49

Note: [a] Wage income includes half of unincorporated enterprise income.

estimated total employment impact is substantially higher when all interactions are accounted for than in the case which omits the income-expenditure induced changes. A caveat must be added, however, which applies with equal force to the Type I multipliers. The analysis neglects possible supply constraints, including skilled labor, foreign exchange and savings, and assumes no lag between an increase in demand and an increase in output.[14/]

The attempt to link employment increases to wage induced changes in income is related to recent experiments in which input-output models were used to calculate the impact on a number of economic parameters, including employment, from a change in the distribution (rather than the level) of income.[15/] While results vary depending on the assumption made in general it appears that redistribution of income would have only a slight positive effect on employment. Cline, in reviewing the evidence, concludes that employment would not automatically rise as a result of income redistribution "although the studies do suggest some scope for employment gains through special measures shifting techniques within those sectors for which some variation in factor combinations is found possible." [12; p. 383] The question of the choice of technique is one we return to in section 4.

As noted cross-country comparisons using inter-industry data are hazardous because of differences in sectoral definitions, prices, and commodity composition. A comparable set of inter-industry tables, together with labor- and capital-output coefficients have recently been prepared [60]. Tables 6 and 7 show the direct labor and capital coefficients for 30 sectors by eight

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14/ Cf. Krishnamurty [43] and Bhara R. Hazari and Krishnamurty [21-a] for a more complete discussion.

15/ Cline [12] summarizes these simulations of income redistribution effects. See also Stern. [16]

TABLE 6.a

DIRECT LABOR COEFFICIENTS BY DEVELOPMENT LEVEL

(man-years/$'000 of output)

#	Sector	Income Level															
		$200		$500		$750		$1550		$1850		$2550		$2800		$4600	
1.	Agriculture, residual[a/]	n.a.	( )	n.a.	( )	n.a.	( )	0.57	(1)	0.47	(1)	0.17	(2)	0.05	(23)	0.05	(19)
2.	Transportation	1.51	(1)	1.23	(1)	0.95	(1)	0.40	(2)	0.13	(11)	0.12	(6)	0.11	(6)	0.07	(7)
3.	Services, nes.	0.86	(2)	0.71	(2)	0.56	(2)	0.26	(3)	0.21	(2)	0.18	(1)	0.15	(1)	0.08	(3)
4.	Communications	0.62	(3)	0.51	(3)	0.40	(3)	0.18	(11)	0.13	(13)	0.11	(12)	0.09	(15)	0.04	(21)
5.	Furniture and fixtures	0.51	(4)	0.37	(5)	0.32	(6)	0.19	(7)	0.15	(6)	0.12	(8)	0.10	(12)	0.05	(14)
6.	Construction	0.49	(5)	0.38	(4)	0.33	(4)	0.20	(6)	0.12	(14)	0.09	(19)	0.08	(18)	0.05	(18)
7.	Wood and cork	0.42	(6)	0.35	(6)	0.32	(5)	0.23	(4)	0.17	(3)	0.13	(3)	0.12	(2)	0.08	(4)
8.	Glass	0.34	(7)	0.29	(7)	0.26	(7)	0.19	(9)	0.14	(9)	0.11	(14)	0.09	(16)	0.06	(11)
9.	Cement	0.34	(8)	0.29	(8)	0.26	(8)	0.19	(10)	0.14	(10)	0.11	(15)	0.09	(17)	0.06	(12)
10.	Printing	0.31	(9)	0.27	(9)	0.25	(9)	0.19	(8)	0.15	(7)	0.12	(9)	0.10	(13)	0.06	(13)
11.	Primary metal processing	0.29	(10)	0.25	(10)	0.24	(10)	0.20	(5)	0.16	(5)	0.13	(4)	0.11	(5)	0.06	(9)
12.	Resource extraction,nes.[b/]	0.29	(11)	0.25	(11)	0.22	(11)	0.16	(12)	0.13	(12)	0.11	(10)	0.10	(10)	0.04	(23)
13.	Trade	0.21	(12)	0.17	(13)	0.15	(13)	0.11	(19)	0.08	(21)	0.06	(23)	0.05	(24)	0.02	(29)
14.	Textiles, wearing apparel	0.19	(13)	0.18	(12)	0.17	(12)	0.16	(13)	0.14	(8)	0.12	(5)	0.11	(3)	0.08	(2)
15.	Machinery	0.15	(14)	0.15	(14)	0.14	(14)	0.13	(14)	0.17	(4)	0.11	(13)	0.10	(11)	0.05	(15)
16.	Chemical products, nes.	0.15	(15)	0.12	(17)	0.11	(18)	0.07	(22)	0.05	(27)	0.04	(25)	0.04	(25)	0.03	(26)
17.	Industrial chemicals	0.14	(16)	0.11	(18)	0.10	(20)	0.07	(23)	0.05	(25)	0.04	(26)	0.04	(26)	0.02	(27)
18.	Fertilizer	0.14	(17)	0.11	(19)	0.10	(21)	0.07	(24)	0.05	(26)	0.04	(27)	0.04	(27)	0.02	(28)
19.	Shipbuilding	0.13	(18)	0.13	(15)	0.12	(15)	0.11	(17)	0.10	(18)	0.10	(18)	0.09	(14)	0.05	(17)
20.	Rubber	0.12	(19)	0.11	(20)	0.10	(19)	0.09	(20)	0.08	(22)	0.07	(22)	0.07	(21)	0.06	(10)
21.	Metal products	0.12	(20)	0.12	(16)	0.12	(16)	0.12	(15)	0.12	(15)	0.12	(7)	0.11	(4)	0.06	(9)
22.	Paper	0.11	(21)	0.11	(21)	0.11	(17)	0.11	(16)	0.11	(17)	0.11	(16)	0.11	(8)	0.07	(5)
23.	Food processing	0.10	(22)	0.09	(22)	0.09	(23)	0.07	(25)	0.06	(24)	0.06	(24)	0.05	(22)	0.04	(22)
24.	Professional instruments	0.09	(23)	0.09	(23)	0.10	(22)	0.11	(18)	0.12	(16)	0.11	(11)	0.10	(9)	0.07	(6)
25.	Electricity, gas, water	0.06	(24)	0.06	(24)	0.05	(25)	0.04	(27)	0.04	(28)	0.03	(28)	0.03	(28)	0.03	(24)
26.	Electrical machinery	0.05	(25)	0.05	(25)	0.05	(26)	0.07	(26)	0.07	(23)	0.08	(21)	0.07	(20)	0.05	(20)
27.	Motor vehicles	0.04	(26)	0.04	(26)	0.04	(27)	0.03	(28)	0.03	(29)	0.03	(29)	0.03	(29)	0.03	(25)
28.	Industry, nes.	0.04	(27)	0.04	(27)	0.05	(24)	0.08	(22)	0.09	(20)	0.11	(17)	0.11	(7)	0.09	(1)
29.	Petroleum refining	0.04	(28)	0.03	(28)	0.03	(28)	0.02	(29)	0.02	(30)	0.02	(30)	0.01	(30)	0.01	(30)
30.	Aircraft	-		-		-		-		0.10	(19)	0.08	(20)	0.07	(19)	0.05	(16)

Notes: a/ Agriculture other than livestock, oil crops, grains and roots.

b/ Resource extraction other than copper, lead, tin, nickel, bauxite, iron, coal, petroleum and natural gas.

( ) = rank

nes. = not elsewhere specified.

n.a. = not available.

TABLE 6.b

TOTAL LABOR COEFFICIENTS BY DEVELOPMENT LEVEL

(man-years/$'000 of output)

#	Sector	Income Level															
		$200		$500		$750		$1550		$1850		$2550		$2800		$4600	
1.	Agriculture, residual[a/]	n.a.	( )	n.a.	( )	n.a.	( )	0.64	(1)	0.58	(1)	0.20	(2)	0.10	(21)	0.08	(17)
2.	Transportation	1.64	(1)	1.33	(1)	1.04	(1)	0.44	(2)	0.17	(15)	0.15	(9)	0.14	(5)	0.09	(6)
3.	Services, nes.	1.00	(2)	0.82	(2)	0.65	(2)	0.31	(5)	0.24	(4)	0.21	(1)	0.18	(1)	0.09	(7)
4.	Communications	0.81	(3)	0.66	(3)	0.52	(3)	0.23	(13)	0.16	(19)	0.14	(12)	0.12	(15)	0.06	(22)
5.	Furniture and fixtures	0.80	(4)	0.60	(4)	0.51	(4)	0.32	(4)	0.25	(3)	0.18	(3)	0.16	(2)	0.10	(2)
6.	Construction	0.75	(5)	0.58	(5)	0.50	(5)	0.30	(6)	0.20	(9)	0.16	(6)	0.14	(7)	0.10	(3)
7.	Glass	0.69	(6)	0.53	(6)	0.42	(6)	0.29	(7)	0.21	(8)	0.15	(11)	0.13	(8)	0.09	(8)
8.	Cement	0.68	(7)	0.51	(8)	0.40	(9)	0.29	(8)	0.20	(10)	0.15	(10)	0.13	(9)	0.08	(18)
9.	Wood and cork	0.67	(8)	0.52	(7)	0.42	(7)	0.36	(3)	0.29	(2)	0.16	(7)	0.14	(6)	0.10	(4)
10.	Primary metal processing	0.57	(9)	0.48	(9)	0.41	(8)	0.28	(9)	0.21	(7)	0.17	(4)	0.15	(4)	0.09	(9)
11.	Fertilizer	0.55	(10)	0.38	(12)	0.32	(12)	0.18	(17)	0.15	(20)	0.10	(24)	0.09	(22)	0.06	(23)
12.	Printing	0.53	(11)	0.41	(11)	0.37	(10)	0.26	(10)	0.22	(5)	0.16	(8)	0.13	(10)	0.09	(10)
13.	Petroleum refining	0.52	(12)	0.42	(10)	0.33	(11)	0.16	(23)	0.09	(29)	0.08	(27)	0.07	(27)	0.04	(29)
14.	Resource extraction,nes.[b/]	0.47	(13)	0.36	(13)	0.27	(14)	0.16	(24)	0.18	(13)	0.11	(19)	0.11	(17)	0.06	(24)
15.	Chemical products, nes.	0.46	(14)	0.32	(16)	0.24	(19)	0.17	(19)	0.13	(23)	0.09	(25)	0.08	(25)	0.06	(25)
16.	Paper	0.43	(15)	0.31	(18)	0.25	(18)	0.22	(14)	0.19	(12)	0.13	(16)	0.12	(14)	0.09	(11)
17.	Food processing	0.41	(16)	0.34	(14)	0.28	(13)	0.17	(20)	0.13	(24)	0.11	(21)	0.10	(18)	0.07	(20)
18.	Metal Products	0.39	(17)	0.32	(17)	0.27	(15)	0.24	(11)	0.21	(6)	0.17	(5)	0.16	(3)	0.10	(5)
19.	Textiles, wearing apparel	0.39	(18)	0.33	(15)	0.27	(16)	0.24	(12)	0.20	(11)	0.14	(13)	0.13	(11)	0.09	(12)
20.	Industrial chemicals	0.37	(19)	0.26	(22)	0.19	(23)	0.14	(26)	0.11	(28)	0.07	(28)	0.06	(29)	0.05	(26)
21.	Trade	0.37	(20)	0.30	(19)	0.26	(17)	0.16	(25)	0.12	(26)	0.09	(26)	0.08	(24)	0.04	(30)
22.	Shipbuilding	0.37	(21)	0.27	(21)	0.16	(25)	0.20	(15)	0.14	(22)	0.14	(14)	0.13	(12)	0.09	(13)
23.	Rubber	0.37	(22)	0.28	(20)	0.22	(20)	0.18	(18)	0.15	(21)	0.11	(20)	0.10	(19)	0.09	(14)
24.	Machinery	0.36	(23)	0.24	(24)	0.20	(21)	0.19	(16)	0.18	(14)	0.14	(15)	0.11	(16)	0.08	(19)
25.	Electricity, gas, water	0.29	(24)	0.25	(23)	0.20	(22)	0.11	(29)	0.08	(30)	0.07	(29)	0.07	(28)	0.05	(27)
26.	Industry, nes.	0.28	(25)	0.22	(25)	0.18	(24)	0.17	(21)	0.17	(14)	0.13	(17)	0.13	(13)	0.11	(1)
27.	Professional instruments	0.27	(26)	0.17	(26)	0.15	(26)	0.17	(22)	0.17	(17)	0.12	(18)	0.10	(20)	0.09	(15)
28.	Electrical machinery	0.25	(27)	0.16	(27)	0.14	(27)	0.14	(27)	0.13	(25)	0.10	(23)	0.09	(23)	0.07	(21)
29.	Motor vehicles	0.24	(28)	0.14	(28)	0.11	(28)	0.11	(28)	0.11	(27)	0.07	(30)	0.06	(30)	0.05	(28)
30.	Aircraft	-		-		-		-		0.16	(18)	0.10	(22)	0.07	(26)	0.08	(16)

Notes: a/, b/ See Table 6.a.

( ) = rank

nes. = not elsewhere specified

n.a. = not available

TABLE 6.c

LABOR MULTIPLIERS BY DEVELOPMENT LEVEL

#	Sector	Income Level							
		$200	$500	$750	$1550	$1850	$2550	$2800	$4600
1.	Petroleum refining	14.51 (1)	13.88 (1)	11.64 (1)	7.77 (1)	5.12 (1)	5.05 (1)	5.03 (1)	4.05 (1)
2.	Industry, nes.	6.67 (2)	5.57 (3)	4.21 (5)	2.39 (7)	1.85 (11)	1.71 (14)	1.61 (19)	1.51 (21)
3.	Motor vehicles	6.30 (3)	10.10 (2)	9.92 (2)	4.14 (2)	3.59 (2)	3.48 (2)	3.88 (3)	2.71 (2)
4.	Electrical machinery	5.52 (4)	5.23 (4)	4.25 (4)	2.28 (9)	1.89 (10)	1.80 (12)	1.78 (14)	1.68 (14)
5.	Electricity, gas, water	5.32 (5)	4.49 (5)	4.03 (6)	2.78 (4)	2.28 (5)	2.15 (6)	2.07 (7)	1.78 (10)
6.	Paper	4.09 (6)	3.57 (8)	3.11 (10)	2.03 (12)	1.68 (16)	1.64 (17)	1.56 (20)	1.47 (24)
7.	Fertilizer	4.02 (7)	4.02 (6)	3.56 (7)	2.99 (3)	2.82 (3)	2.76 (3)	2.78 (5)	2.70 (3)
8.	Food processing	3.95 (8)	3.63 (7)	3.19 (8)	2.44 (6)	2.10 (8)	1.98 (8)	1.96 (9)	1.74 (12)
9.	Metal products	3.29 (9)	2.75 (14)	2.58 (14)	1.95 (13)	1.71 (12)	1.61 (20)	1.56 (21)	1.64 (16)
10.	Chemical products, nes.	3.17 (10)	3.20 (9)	3.10 (11)	2.59 (5)	2.68 (4)	2.73 (4)	2.81 (4)	2.58 (4)
11.	Rubber	3.15 (11)	2.87 (12)	2.57 (15)	2.13 (10)	1.98 (9)	1.80 (11)	1.74 (15)	1.58 (20)
12.	Professional instruments	3.01 (12)	3.08 (10)	2.81 (12)	1.78 (16)	1.57 (19)	1.65 (16)	1.91 (10)	1.49 (23)
13.	Shipbuilding	2.93 (13)	2.79 (13)	6.65 (3)	2.12 (11)	2.21 (6)	1.83 (10)	1.85 (11)	1.88 (8)
14.	Industrial chemicals	2.84 (14)	3.02 (11)	3.15 (9)	2.33 (8)	2.15 (7)	2.41 (5)	2.49 (6)	2.17 (5)
15.	Machinery	2.47 (15)	2.55 (15)	2.75 (13)	1.81 (15)	1.64 (18)	1.67 (15)	1.84 (12)	1.72 (13)
16.	Textiles, wearing apparel	2.07 (16)	1.89 (18)	1.72 (19)	1.61 (20)	1.52 (22)	1.42 (26)	1.37 (26)	1.34 (28)
17.	Glass	2.03 (17)	1.98 (16)	1.85 (17)	1.63 (19)	1.56 (20)	1.59 (22)	1.63 (18)	1.61 (18)
18.	Cement	2.00 (18)	1.96 (17)	1.87 (16)	1.56 (21)	1.48 (23)	1.48 (24)	1.51 (23)	1.51 (22)
19.	Primary metal processing	1.99 (19)	1.88 (19)	1.73 (18)	1.45 (24)	1.35 (26)	1.36 (27)	1.35 (27)	1.41 (25)
20.	Trade	1.78 (20)	1.81 (20)	1.69 (20)	1.52 (23)	1.54 (21)	1.61 (19)	1.66 (17)	1.92 (7)
21.	Printing	1.71 (21)	1.66 (21)	1.58 (23)	1.45 (25)	1.44 (24)	1.47 (25)	1.52 (22)	1.63 (17)
22.	Resource extraction, nes.[b]	1.66 (22)	1.63 (22)	1.65 (21)	1.88 (14)	1.40 (25)	1.61 (21)	1.45 (24)	1.61 (19)
23.	Wood and cork	1.59 (23)	1.57 (24)	1.50 (25)	1.67 (18)	1.70 (13)	1.51 (23)	1.40 (25)	1.40 (26)
24.	Furniture and fixtures	1.58 (24)	1.63 (23)	1.60 (22)	1.69 (17)	1.66 (17)	1.63 (18)	1.67 (16)	1.85 (9)
25.	Construction	1.52 (25)	1.55 (25)	1.51 (24)	1.56 (22)	1.70 (14)	1.73 (13)	1.83 (13)	1.98 (6)
26.	Communications	1.31 (26)	1.30 (26)	1.30 (26)	1.32 (27)	1.27 (29)	1.27 (28)	1.27 (28)	1.35 (27)
27.	Services, nes.	1.17 (27)	1.16 (27)	1.17 (27)	1.20 (28)	1.16 (30)	1.15 (30)	1.16 (30)	1.23 (30)
28.	Transportation	1.08 (28)	1.08 (28)	1.09 (28)	1.12 (29)	1.28 (28)	1.26 (29)	1.26 (29)	1.27 (29)
29.	Agriculture, residual[a]	n.a.	n.a.	n.a.	1.33 (26)	1.30 (27)	1.98 (9)	2.02 (8)	1.77 (11)
30.	Aircraft	-	-	-	-	1.69 (15)	2.01 (7)	3.89 (2)	1.67 (15)

a/, b/ See Table 6.a.

( ) = rank

nes. = not elsewhere specified

n.a. = not available

TABLE 7.a.

DIRECT CAPITAL COEFFICIENTS BY DEVELOPMENT LEVEL a/

($ of capital/$ of output)

#	Sector	Income Level							
		$200	$500	$750	$1550	$1850	$2550	$2800	$4600
1.	Printing	0.51 (1)	0.51 (1)	0.51 (2)	0.51 (2)	0.51 (4)	0.51 (5)	0.51 (5)	0.51 (5)
2.	Furniture and fixtures	0.53 (2)	0.53 (3)	0.53 (3)	0.53 (4)	0.53 (6)	0.53 (6)	0.53 (6)	0.53 (6)
3.	Construction	0.58 (3)	0.51 (2)	0.43 (1)	0.28 (1)	0.27 (1)	0.25 (1)	0.24 (1)	0.21 (1)
4.	Textiles, wearing apparel	0.59 (4)	0.59 (4)	0.59 (4)	0.59 (6)	0.59 (7)	0.59 (7)	0.59 (7)	0.59 (7)
5.	Electrical machinery	0.67 (5)	0.63 (5)	0.60 (5)	0.52 (3)	0.48 (3)	0.48 (3)	0.48 (3)	0.47 (3)
6.	Chemical products, nes.	0.69 (6)	0.69 (6)	0.69 (7)	0.69 (7)	0.69 (9)	0.69 (9)	0.69 (10)	0.69 (10)
7.	Rubber	0.70 (7)	0.70 (8)	0.70 (8)	0.70 (8)	0.70 (10)	0.70 (10)	0.70 (11)	0.70 (11)
8.	Shipbuilding	0.73 (8)	0.69 (7)	0.66 (6)	0.58 (5)	0.51 (5)	0.50 (4)	0.50 (4)	0.50 (4)
9.	Wood and cork	0.76 (9)	0.76 (9)	0.76 (9)	0.76 (10)	0.76 (12)	0.76 (13)	0.76 (13)	0.76 (13)
10.	Professional instruments	0.82 (10)	0.79 (10)	0.77 (10)	0.70 (9)	0.67 (8)	0.66 (8)	0.66 (8)	0.66 (9)
11.	Agriculture, residual b/	0.83 (11)	0.99 (17)	0.99 (18)	1.20 (22)	1.33 (24)	1.46 (24)	1.58 (25)	1.97 (27)
12.	Services, nes.	0.84 (12)	0.81 (11)	0.80 (11)	0.76 (11)	0.74 (11)	0.71 (11)	0.68 (9)	0.62 (8)
13.	Food processing	0.89 (13)	0.89 (12)	0.89 (12)	0.89 (14)	0.89 (17)	0.89 (17)	0.89 (17)	0.89 (17)
14.	Primary metal processing	0.92 (14)	0.92 (13)	0.92 (13)	0.92 (15)	0.92 (18)	0.92 (18)	0.92 (18)	0.92 (18)
15.	Motor vehicles	0.92 (15)	0.93 (14)	0.96 (16)	0.92 (16)	0.86 (15)	0.85 (15)	0.85 (15)	0.80 (14)
16.	Paper	0.93 (16)	0.93 (15)	0.93 (15)	0.93 (17)	0.93 (19)	0.93 (19)	0.93 (19)	0.93 (19)
17.	Cement	0.99 (17)	0.99 (18)	0.99 (19)	0.99 (19)	0.99 (20)	0.99 (20)	0.99 (20)	0.99 (20)
18.	Metal products	1.01 (18)	0.96 (16)	0.92 (14)	0.81 (12)	0.76 (13)	0.75 (12)	0.75 (12)	0.75 (12)
19.	Glass	1.02 (19)	1.02 (20)	1.02 (20)	1.02 (20)	1.02 (21)	1.02 (21)	1.02 (21)	1.02 (21)
20.	Machinery	1.05 (20)	1.00 (19)	0.97 (17)	0.86 (13)	0.81 (14)	0.80 (14)	0.82 (14)	0.80 (15)
21.	Industrial chemicals	1.14 (21)	1.14 (21)	1.14 (22)	1.14 (21)	1.14 (22)	1.14 (22)	1.14 (22)	1.14 (23)
22.	Industry, nes.	1.22 (22)	1.15 (22)	1.09 (21)	0.93 (18)	0.87 (16)	0.85 (16)	0.85 (16)	0.85 (16)
23.	Trade	1.46 (23)	1.42 (23)	1.39 (23)	1.32 (23)	1.27 (23)	1.22 (23)	1.16 (23)	1.05 (22)
24.	Resource extraction,nes. c/	1.57 (24)	1.57 (24)	1.57 (24)	1.57 (24)	1.57 (25)	1.57 (25)	1.57 (24)	1.57 (24)
25.	Petroleum refining	1.77 (25)	1.77 (25)	1.77 (25)	1.77 (25)	1.77 (26)	1.77 (26)	1.77 (26)	1.77 (25)
26.	Fertilizer	1.82 (26)	1.82 (26)	1.82 (26)	1.82 (26)	1.82 (27)	1.82 (27)	1.82 (27)	1.82 (26)
27.	Electricity, gas, water	3.83 (27)	3.87 (27)	3.92 (27)	4.02 (27)	4.12 (28)	4.20 (29)	4.30 (30)	4.44 (30)
28.	Communications	5.27 (28)	5.06 (28)	4.95 (28)	4.63 (28)	4.42 (29)	4.19 (28)	3.90 (29)	3.39 (29)
29.	Transportation	6.30 (29)	6.08 (29)	5.80 (29)	5.30 (29)	4.68 (30)	4.26 (30)	3.77 (28)	2.83 (28)
30.	Aircraft	-	-	-	-	0.36 (2)	0.35 (2)	0.35 (2)	0.35 (2)

a/ Plant, equipment and inventory investment.

b/ Agriculture other than livestock, oil crops, grains, roots.

c/ Resources other than copper, lead, tin, nickel, bauxite, iron, coal, petroleum and natural gas

nes. = not elsewhere specified.

( ) = rank

TABLE 7.b

TOTAL CAPITAL COEFFICIENTS BY DEVELOPMENT LEVEL [a/]

($ of capital/$ of output)

#	Sector	Income Level															
		$200		$500		$750		$1550		$1850		$2550		$2800		$4600	
1.	Printing	1.27	(1)	1.12	(4)	1.11	(5)	1.16	(2)	1.21	(5)	1.06	(5)	1.00	(5)	1.13	(4)
2.	Electrical machinery	1.33	(2)	0.95	(1)	0.89	(2)	1.07	(1)	1.08	(3)	0.85	(2)	0.83	(3)	0.97	(2)
3.	Professional instruments	1.42	(3)	1.00	(2)	0.94	(3)	1.21	(4)	1.23	(6)	0.92	(3)	0.81	(2)	1.15	(5)
4.	Textiles, wearing apparel	1.44	(4)	1.36	(7)	1.22	(7)	1.29	(6)	1.29	(8)	1.05	(4)	1.06	(7)	1.15	(6)
5.	Services, nes.	1.46	(5)	1.40	(9)	1.36	(10)	1.30	(7)	1.26	(7)	1.17	(8)	1.11	(10)	1.05	(3)
6.	Construction	1.51	(6)	1.38	(8)	1.27	(8)	1.16	(3)	1.15	(4)	1.06	(6)	1.05	(6)	1.16	(7)
7.	Furniture and fixtures	1.55	(7)	1.48	(11)	1.42	(12)	1.41	(9)	1.40	(9)	1.28	(12)	1.29	(13)	1.29	(8)
8.	Motor vehicles	1.61	(8)	1.06	(3)	1.02	(4)	1.53	(11)	1.61	(13)	1.27	(11)	1.09	(9)	1.29	(9)
9.	Shipbuilding	1.64	(9)	1.29	(5)	0.84	(1)	1.26	(5)	1.00	(2)	1.08	(7)	0.99	(4)	1.30	(9)
10.	Agriculture, residual[b/]	1.69	(10)	1.84	(19)	1.60	(17)	1.85	(20)	2.11	(24)	1.92	(24)	2.38	(25)	2.74	(26)
11.	Rubber	1.75	(11)	1.52	(12)	1.37	(11)	1.59	(13)	1.62	(14)	1.35	(15)	1.30	(14)	1.47	(15)
12.	Chemical products, nes.	1.76	(12)	1.47	(10)	1.27	(9)	1.57	(12)	1.63	(15)	1.32	(13)	1.24	(11)	1.51	(17)
13.	Machinery	1.78	(13)	1.30	(6)	1.13	(6)	1.35	(8)	1.41	(10)	1.17	(9)	1.06	(8)	1.36	(12)
14.	Wood and cork	1.82	(14)	1.68	(13)	1.51	(14)	1.63	(14)	1.68	(17)	1.33	(14)	1.43	(17)	1.49	(16)
15.	Trade	1.90	(15)	1.83	(18)	1.79	(20)	1.72	(17)	1.66	(16)	1.58	(20)	1.51	(19)	1.41	(13)
16.	Metal products	1.98	(16)	1.76	(16)	1.62	(18)	1.67	(16)	1.60	(12)	1.41	(16)	1.38	(15)	1.46	(14)
17.	Food processing	2.02	(17)	1.94	(20)	1.88	(21)	1.83	(19)	1.77	(18)	1.67	(21)	1.61	(20)	1.55	(18)
18.	Industry, nes.	2.02	(18)	1.82	(17)	1.56	(15)	1.65	(15)	1.57	(11)	1.23	(10)	1.26	(12)	1.33	(11)
19.	Industrial chemicals	2.04	(19)	1.72	(14)	1.49	(13)	1.77	(18)	1.94	(21)	1.53	(19)	1.45	(18)	1.76	(21)
20.	Primary metal processing	2.07	(20)	1.99	(22)	1.93	(24)	1.86	(22)	1.79	(19)	1.70	(22)	1.63	(21)	1.56	(20)
21.	Paper	2.15	(21)	1.75	(15)	1.59	(16)	1.85	(21)	1.87	(20)	1.44	(17)	1.42	(16)	1.55	(19)
22.	Resource extraction,nes.[c/]	2.24	(22)	1.97	(21)	1.72	(19)	1.47	(10)	2.16	(25)	1.49	(18)	1.71	(23)	1.97	(24)
23.	Glass	2.40	(23)	2.15	(23)	1.92	(23)	2.05	(23)	2.09	(22)	1.72	(23)	1.68	(22)	1.77	(22)
24.	Cement	2.44	(24)	2.15	(24)	1.90	(22)	2.16	(24)	2.09	(23)	1.92	(25)	1.88	(24)	1.84	(23)
25.	Petroleum refining	3.56	(25)	3.44	(26)	3.33	(26)	3.16	(26)	3.01	(26)	2.85	(26)	2.72	(26)	2.52	(25)
26.	Fertilizer	3.62	(26)	3.07	(25)	3.09	(25)	2.99	(25)	3.42	(27)	2.86	(27)	2.85	(27)	2.94	(27)
27.	Electricity, gas, water	4.51	(27)	4.51	(27)	4.52	(27)	4.56	(27)	4.62	(28)	4.65	(30)	4.71	(30)	4.78	(30)
28.	Communications	5.85	(28)	5.61	(28)	5.46	(28)	5.09	(28)	4.84	(29)	4.57	(28)	4.24	(29)	3.67	(29)
29.	Transportation	6.70	(29)	6.47	(29)	6.17	(29)	5.68	(29)	5.06	(30)	4.63	(29)	4.13	(28)	3.22	(28)
30.	Aircraft	-		-		-		-		0.94	(1)	0.63	(1)	0.50	(1)	0.89	(1)

a/, b/, c/ See Table 7.a

( ) = rank

nes. = not elsewhere specified

TABLE 7.c.

CAPITAL MULTIPLIERS BY DEVELOPMENT LEVEL [a/]

#	Sector	Income Level $200		$500		$750		$1550		$1850		$2550		$2800		$4600	
1.	Furniture and fixtures	2.90	(1)	2.77	(2)	2.68	(4)	2.69	(2)	2.66	(3)	2.45	(4)	2.43	(4)	2.48	(4)
2.	Construction	2.60	(2)	2.73	(3)	2.96	(3)	4.17	(1)	4.32	(1)	4.27	(1)	4.41	(1)	5.54	(1)
3.	Chemical products	2.57	(3)	2.50	(4)	2.54	(5)	2.40	(4)	2.41	(5)	2.26	(6)	2.25	(7)	2.23	(6)
4.	Rubber	2.55	(4)	2.41	(6)	2.31	(10)	2.33	(6)	2.35	(7)	2.14	(10)	2.10	(13)	2.16	(9)
5.	Printing	2.49	(5)	2.38	(8)	2.32	(8)	2.39	(5)	2.38	(6)	2.22	(7)	2.20	(9)	2.27	(5)
6	Cement	2.46	(6)	2.39	(7)	2.37	(6)	2.17	(10)	2.14	(11)	1.99	(14)	1.96	(15)	1.88	(15)
7.	Textiles, wearing apparel	2.46	(7)	2.37	(9)	2.29	(12)	2.31	(7)	2.31	(8)	2.21	(8)	2.20	(10)	2.19	(8)
8.	Wood and cork	2.39	(8)	2.35	(10)	2.29	(13)	2.23	(8)	2.21	(10)	2.16	(9)	2.13	(11)	2.11	(10)
9	Glass	2.35	(9)	2.26	(13)	2.19	(14)	2.09	(12)	2.05	(13)	1.94	(18)	1.90	(17)	1.79	(18)
10.	Paper	2.34	(10)	2.33	(11)	2.33	(7)	2.12	(11)	2.05	(14)	2.04	(13)	1.94	(16)	1.80	(17)
11.	Shipbuilding	2.33	(11)	2.44	(5)	6.40	(1)	2.63	(3)	3.15	(2)	2.70	(3)	2.74	(2)	2.67	(3)
12.	Food processing	2.27	(12)	2.198	(14)	2.12	(17)	2.06	(14)	1.99	(15)	1.88	(19)	1.82	(20)	1.75	(19)
13.	Primary metal processing	2.25	(13)	2.17	(15)	2.10	(18)	2.02	(15)	1.95	(16)	1.84	(20)	1.77	(21)	1.70	(20)
14.	Agriculture, residual [b/]	2.11	(14)	2.08	(17)	1.80	(22)	1.83	(22)	1.66	(25)	1.64	(24)	1.58	(24)	1.61	(24)
15.	Fertilizer	2.06	(15)	2.01	(18)	1.89	(20)	1.89	(19)	1.87	(21)	1.74	(22)	1.69	(22)	1.69	(21)
16.	Electrical machinery	2.02	(16)	2.27	(12)	2.31	(11)	2.19	(9)	2.27	(9)	2.31	(5)	2.27	(6)	2.22	(7)
17.	Petroleum refining	2.01	(17)	1.94	(22)	1.88	(21)	1.78	(24)	1.70	(23)	1.61	(25)	1.54	(25)	1.42	(25)
18.	Metal products	1.99	(18)	1.98	(20)	2.00	(19)	2.08	(13)	2.12	(12)	2.07	(11)	2.01	(14)	1.99	(12)
19.	Motor vehicles	1.99	(19)	3.39	(1)	3.69	(2)	1.91	(16)	1.92	(18)	1.96	(15)	2.25	(8)	2.02	(11)
20.	Industrial chemicals	1.93	(20)	1.99	(19)	2.18	(15)	1.85	(20)	1.77	(22)	1.84	(21)	1.84	(19)	1.65	(23)
21.	Professional instruments	1.80	(21)	2.09	(16)	2.14	(16)	1.90	(18)	1.94	(17)	2.06	(12)	2.37	(5)	1.94	(13)
22.	Machinery	1.76	(22)	1.98	(21)	2.32	(9)	1.91	(17)	1.90	(20)	1.95	(17)	2.11	(12)	1.86	(16)
23.	Services, nes.	1.74	(23)	1.72	(23)	1.70	(24)	1.71	(25)	1.69	(24)	1.66	(23)	1.64	(23)	1.68	(22)
24.	Industry, nes.	1.71	(24)	1.72	(24)	1.75	(23)	1.85	(21)	1.91	(19)	1.96	(16)	1.90	(18)	1.93	(14)
24.	Resource extraction,nes. [c/]	1.43	(25)	1.42	(25)	1.48	(25)	1.80	(23)	1.38	(26)	1.58	(26)	1.42	(26)	1.36	(26)
26.	Trade	1.30	(26)	1.29	(26)	1.29	(26)	1.30	(26)	1.31	(27)	1.30	(27)	1.30	(27)	1.34	(27)
27.	Electricity, gas, water	1.18	(27)	1.17	(27)	1.15	(27)	1.14	(27)	1.12	(28)	1.11	(28)	1.10	(28)	1.08	(30)
28.	Communications	1.11	(28)	1.11	(28)	1.10	(28)	1.10	(28)	1.10	(29)	1.09	(29)	1.09	(30)	1.08	(29)
29.	Transportation	1.06	(29)	1.06	(29)	1.06	(29)	1.07	(29)	1.08	(30)	1.09	(30)	1.10	(29)	1.14	(28)
30.	Aircraft	-		-		-		-		2.62	(4)	3.02	(2)	2.68	(3)	2.72	(2)

a/, b/, c/ See Table 7.a

( ) = rank

nes. = not elsewhere specified.

income levels[16/] as well as the total employment and capital coefficients. The data clearly show the pattern of substitution for labor as development proceeds. For nearly all sectors the estimated labor-output ratios decline, as income levels increase, reflecting an increase in labor productivity. Moreover the relative labor intensity of various sectors change as development increases. For example construction, which is relatively labor-intensive at low income levels, becomes less so as incomes rise. A reduction in the labor-output ratio should reflect a change in relative factor prices. As labor becomes scarce, relative to capital, substitution will reduce the labor-capital ratio and increase labor productivity. Inappropriate factor price policies may however encourage labor substitution unrelated to changes in relative factor endowments. As the data indicate, scope exists for such substitution. The direct labor and capital coefficients have been used to derive total labor and capital coefficients. Again we note that when account is taken of indirect effects the ranking of industries by their labor and capital intensity changes, sometimes dramatically.

Inter-industry analysis assumes strict proportionality between inputs and outputs, an assumption that is often called into question. The strict proportionality assumption can be relaxed somewhat, so that account can be taken of the degree of under-employment which characterizes some sectors, e.g., agriculture.[17/] Following Krishnamurty [43] we define the wage-bill, W_i, in sector i as $W_i = w_i h_i L_i$ where w_i is wage-per-hour, h_i is the average number of hours worked per laborer and L_i is the number of workers employed in sector i. We can rewrite the above equation as $L_i = W_i / w_i h_i$ so that the numbers directly employed in sector i (L_i) would be a function of the wage bill, the hourly wage rate and the number of hours worked. If the inter-industry

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16/ See Appendix B-1 for the sector specification and [60] for the countries included at each income level.

17/ To the extent that under-utilized capital characterizes various sectors, the assumption of strict proportionality between capital and output is also inappropriate.

assumptions of proportionality and nonsubstitutability between factor inputs and output are to be maintained, then W_i/wi must be a fixed proportion of total output, X_i. We can however vary L_i, the total number of workers employed, depending on h_i, the number of hours each one works. In this manner, we can explicitly introduce the question of whether output expansion leads to additional employment in a certain sector or a reduction in underemployment.

Consider the employment generation estimates provided by Ahmed [2] for Bangladesh. As shown in the table below, assuming no reduction in hours worked (h_i) the largest increase in the total number of jobs created is in the agricultural sector.

TABLE 8

Total Employment Generated by Final Demand of Tk. 10 million in the j^{th} Sector of Bangladesh: 1964/65

#	Sector	Total Number of Jobs Created: Unadjusted	Adjusted
1.	Agriculture	12,886	1,127
2.	Industry	9,809	7,382
3.	Construction	7,198	5,329
4.	Electricity and gas	2,200	1,701
5.	Transport	4,785	4,556
6.	Trade	7,992	7,972
7.	Government services	5,416	5,178

Source: [2] and [43]

But if we assume that all of the increased labor demand in agriculture takes the form of fuller employment, not new jobs, the ranking of the sectors is substantially altered [43; p. 69]. The agricultural sector, rather than being the primary employment-creating activity, becomes the lowest ranked activity in terms of new jobs. This outcome reflects of course an extreme assumption , but illustrates an important point. Only a more disaggregated analysis with a more realistic assessment on the degree of job creation as opposed to a reduction in under-employment can provide a more accurate indicator of the employment impact of alternative activities.

While some of the restrictive assumptions of input-output analysis can be modified, it nevertheless has certain shortcomings as a planning tool. [43] Other analytic tools, such as dynamic input-output models, activity analysis as well as project analysis, provide alternative techniques for judging the employment-creating potential of various investments or expansion of activities. While these methods take account of some of the objections to simple input-output analysis they too rely on restrictive assumptions or use partial analysis. And the application of advanced analytic tools may not be possible in the context of the rather shaky data base of many less developed countries. While it may sometimes be better to examine the problem of employment creation at the project, firm or industry level rather than at the economy-wide or inter-sectoral level, the evidence clearly suggests that indirect employment effects in developing countries are important and that ignoring them can lead to serious error. Looking at the question of employment creation in an inter-industry framework provides a means of tracing the indirect effects of an increase in final demand. We need to know these relations even if precision is not always attainable in their measurement and even if these relationships are not as stable as we would like them to be.

4. Dynamic Considerations and Linkages

It was noted earlier that in a static framework one normally assumes that an increase in employment will result from an increased level of production, although various forces may serve to weaken the complementarity between employment and output. However, it is more generally accepted that policies aimed at maximizing employment at one period of time (a static consideration) may be suboptimal when one considers the need to maximize employment over time. [51a] Galenson and Pyatt, for example, have argued that unemployment may have grown even in those developing countries where total production increased " ... not because ... economic planners are unacquainted with the maxims of production theory, but rather because it turns out that in light of all the facts available to them (and not usually to the theorist) modern machine technology offers the greatest promise of economic growth." [19-a; p. 216]

Various analysts have expressed the need to consider the future flow of savings (and investment) and the future demand for goods which arise from allocative decisions taken today. In project analysis it is increasingly recognized that the "shadow" wage rate, which adjusts prices to reflect opportunity costs, should be corrected for the fact that the creation of wage income increases current consumption, reducing investment, future output and employment. As Galenson and Leibenstein noted "it is high labor productivity that makes possible high levels of living" [19; p. 350] and if maximization of income per capita at some future point of time is the objective then the correct criterion for allocating investment must be to choose for each unit of investment that alternative that gives each employed worker greater productive power than any other alternative technique. In its bluntest form, the Galenson-Leibenstein thesis argues "that successful economic development ... in the face of gross backwardness, hinges largely upon the introduction of modern technology upon as large a scale as possible." [18; p. 370]

Why would a policy that maximizes employment in the current period result in slower growth of income than a policy that yields a lower level of current employment? First, other things being equal, two policies that generate the same initial income level from an equal level of investment but with different levels of employment will differ in their impact on the distribution of income. If savings propensities differ among classes, total savings may be reduced if the share of income going to that income class with a lower savings rate is raised. Note that an implicit assumption is made that government policy is incapable of raising the savings rate to some optimal level so that the economy's savings effort must be increased by channeling income to certain groups. The same argument underlies the inclusion of consumption as a "cost" in estimating the shadow price of labor for project analysis. [59a; p. 77]. Second, Leibenstein [44a] asserts that the pace of technological change depends in part on the degree of capital intensity. Attempts to favor labor intensive methods in the interest of employment creation may inhibit the pace of technological change. Finally, the greater the pace of technological change within a sector, the greater is that sector's ability to compete effectively in export markets. In dynamic terms, it may face demand conditions which may be characterized as relatively income elastic vis-a-vis the more labor intensive sector. [51a] Seers notes that " ... [development] requires a fast expansion of exports ... [and] the danger of reduced efficiency affecting competitive power in world markets, or the ability to undertake further import substitution, is a real one." [59; p. 384] Turnham and Jaeger reach a similar conclusion. While being critical of policies that bias relative prices in favor of capital intensive industries (e.g., low interest rates, labor legislation that raises real wages above productivity levels, overvalued exchange rates) they are not entirely adverse to capital intensive production, despite their realization of the employment issues involved, because "the clothing, footwear, canned mushroom or artificial wig pattern of the typical export success story is not every country's idea of a foundation for a modern industrial sector." [65; p. 99] In a dynamic setting, the need to maintain efficiency so as to stimulate exports and efficient import substitution, to maximize savings and to stimulate technological change may justify a certain degree of capital intensity.18/

If, accepting these arguments, industrial investment should be 'capital intensive' where will the surplus labor be absorbed? Galenson [8] argues that the bulk of employment will come in the service and commerce sectors19/.
Galenson notes that:

> " The promotion of employment is best pursued by ensuring a rapid growth of manufacturing capacity and output. Using highly labour-intensive techniques in manufacturing may create more jobs in the manufacturing sector, but if this is accomplished at the expense of immediate production or of the rate of growth of manufacturing capacity, there may be an offsetting loss of job opportunities in tertiary employment. In approaching the choice of manufacturing technique with employment creation in mind, it is important to add another dimension to the analysis: the impact on tertiary employment. If, as might well be the case in certain circumstances, it seems socially desirable to sacrifice a portion of manufacturing output through the use of labour-intensive techniques, in order to relieve unemployment, such policy might prove irrational unless new manufacturing employment offset the tertiary employment foregone as a consequence of diminished output." [18; p. 518].

18/ For the employment impact of export promotion see Cole and Westphal [13], Ranis [53], and Tyler [66].

19/ Galenson's argument of course assumes that such tertiary sector employment will be productive employment and not the "employment of last resort" which often characterizes service activities. See Baer and Herve [4] for a graphical interpretation of this position.

While the Galenson argument has a certain appeal, statistical data do not support his hypothesis. Using pooled cross-country-time series data no significant stable relationship could be estimated between tertiary sector employment and manufacturing sector employment.

A different rationale for emphasizing certain sectors in a dynamic setting is the "linkage" concept first formulated by Hirschman [23]. In Hirschman's view development proceeds best not by promoting a balanced growth path, "where every activity expands perfectly in step with every other," [23; p. 63] but by selecting those activities where progress will induce further progress elsewhere. Thus rather than viewing development as a series of alternatives (agriculture versus industry, export promotion versus import substitution, heavy versus light industry, etc.) public investment should be in "efficient sequences ... that tend to maximize 'induced' investment decisions ..." [23; p. 98]. If an industry showing a high degree of interdependence, as measured by the proportion of output sold to other industries (forward linkage) and the proportion of output that represents purchases from other industries (backward linkage) is established early in the growth process then the output using and input supplying industries would receive an important growth stimulus. Chenery and Watanabe [11a] appraised the degree of interdependence of various industries using developed country (Italy, Japan and the United States) data. (See Table 9.) To the extent that one expects the commodity composition of developing countries to hear eventually some resemblance to that of the developed countries whose input-output tables were used to measure the degree of forward and backward linkages, their analysis is relevant.

TABLE 9

AVERAGE DEGREE OF INTERDEPENDENCE
OF
ECONOMIC SECTORS IN ITALY, JAPAN AND THE UNITED STATES

	Sector	Backward Linkage a/	Forward Linkage b/
I.	"Intermediate Manufacture" (high backward and forward linkage)		
	1. Iron and steel	66	78
	2. Non-ferrous metals	61	81
	3. Paper and products	57	78
	4. Petroleum products	65	68
	5. Coal products	63	67
	6. Chemicals	60	69
	7. Textiles	67	57
	8. Rubber products	51	48
	9. Printing and publishing	49	46
II-A	"Final Manufacture" (backward linkage high; forward linkage low)		
	1. Grain milling	89	42
	2. Leather and products	66	37
	3. Lumber and wood products	61	38
	4. Apparel	69	12
	5. Transport equipment	60	20
	6. Machinery	51	28
	7. Nonmetallic minerals	47	30
	8. Processed foods	61	15
	9. Shipbuilding	58	14
	10. Miscellaneous industries	43	20
II-B	"Intermediate Primary Production" (forward linkage high, backward linkage low)		
	1. Metal mining	21	93
	2. Petroleum and natural gas	15	97
	3. Coal mining	23	87
	4. Agriculture and forestry	31	72
	5. Electric power	27	59
	6. Nonmetallic minerals	17	52

Table 9 (Cont'd)

	Sector	Backward Linkage a/	Forward Linkage b/
III.	"Final Primary Production" (Low backward and forward linkage)		
	1. Fishing	24	36
	2. Transport	31	26
	3. Services	19	34
	4. Trade	16	17

Notes: a/ Backward linkage (L_B) is the ratio of inter-industry purchases to total production (%), i.e., $L_{Bj} = \sum_i X_{ij} / X_j = \sum_i a_{ij}$

where X_{ij} represents the number of units of commodity i used in the production of X_j units of commodity j.

b/ Forward linkage (L_F) is the ratio of inter-industry sales to total demand (%), i.e., $L_{Fi} = \sum_j X_{ij} / Z_i$

where Z_i is the sum of inter-industry sales ($\sum_j X_{ij}$) and final demand sales (Y_i).

Source: [11a; p. 14 and 23]

A recent article by Yotopoulos and Nugent [71] measures the degree of forward and backward linkage using a number of developing country inter-industry tables. In addition they also define a total linkage index which, analogously to the total employment coefficient, considers the indirect effects that emanate from the direct linkage effects.[20/] Table 10 presents the total sectoral linkage indices for both developing and developed countries. The industries exhibiting the highest total linkages are leather, basic metals, clothing and textiles. The lowest linkages are found in agriculture, services, mining and utilities. On the basis of this evidence Yotopoulos and Nugent conclude that a clear priority for secondary production, especially manufacturing, over agriculture and services has been established. A test to see whether countries that emphasized high-linkage sectors were indeed able to achieve higher rates of growth than did countries that emphasized low linkage sectors failed to establish any clear relationship between an emphasis on high linkage sectors and growth.[21/]

All other things being equal, the larger the linkage the greater the employment creation potential. In fact, however, different sectors are characterized by different labor/output ratios. In a more detailed study, Yotopoulos and Nugent report on a study using Taiwanese inter-industry data to calculate both production and employment linkage indices. The data are reproduced in Table 11.

20/ The total linkage effect is defined as:

$$L_{Tj} = \sum_i r_{ij}$$

where r_{ij} coefficients measure the direct plus indirect output of sector j needed to increase the delivery by sector j to final users. See Appendix A for a more complete exposition.

21/ A note of caution is in order here. The calculation of linkage indices, based on inter-industry tables, suffers from the same shortcomings (e.g., use of broad sectoral aggregates, fixed coefficients) noted in the discussion of direct plus indirect employment coefficients. Jones [42] points out a number of conceptual difficulties in the measurement of linkages and notes that ex-ante linkage measures require a matrix that includes domestic as well as import-substitutable intermediates.

TABLE 10

TOTAL LINKAGE INDEX

#	Sector	Developing Countries Linkage Index	Rank	Developed Countries Linkage Index	Rank
1.	Leather	2.39	1	2.08	10
2.	Basic metals	2.36	2	2.40	2
3.	Clothing	2.32	3	2.33	4
4.	Textiles	2.24	4	2.34	3
5.	Food, beverages	2.22	5	2.43	1
6.	Paper	2.17	6	2.24	5
7.	Chemicals and petroleum refining	2.13	7	2.19	7
8.	Metal products and machinery	2.12	8	2.21	6
9.	Wood, furniture	2.07	9	2.09	8
10.	Construction	2.04	10	2.09	9
11.	Printing	1.98	11	1.99	13
12.	Other manufactures	1.94	12	2.02	11
13.	Rubber	1.93	13	1.99	12
14.	Nonmetallic minerals	1.83	14	1.91	15
15.	Agriculture	1.59	15	1.81	16
16.	Utilities	1.49	16	1.93	14
17.	Mining	1.47	17	1.70	17
18.	Services	1.41	18	1.62	18

Source: [71; pp. 162-163]

TABLE 11

Linkage Indices: Taiwan 1966

	Industry	Inter-Industry Linkage	Employment Linkage
1.	Food agriculture	1.898 (7)	0.852 (3)
2.	Other agriculture	1.497 (10)	0.908 (1)
3.	Capital (working) for agriculture	2.455 (3)	0.725 (10)
4.	Food processing	2.158 (6)	0.673 (12)
5.	Mining	1.580 (11)	0.863 (2)
6.	Textile and rubber	2.623 (2)	0.819 (6)
7.	Non-metal products	2.172 (5)	0.764 (9)
8.	Metal products	2.793 (1)	0.825 (5)
9.	Utility	1.883 (8)	0.713 (11)
10.	Construction	2.417 (4)	0.839 (4)
11.	Transport and communication	1.858 (9)	0.787 (7)
12.	Services and other	1.286 (12)	0.768 (8)

( ) = rank Source: [72; p. 602].

While as before the highest production linkages are found for metal products and textiles, when the criterion is employment linkage the ranking changes. The experiment using the Taiwanese data is subject to some of the limitations inherent in using inter-industry tables. First, as noted[22/], the labor-output coefficient need not be stable since additional output can be produced with the same amount of labor but with each worker working more hours, and second, by 1966 Taiwan's level of economic development already exceeded that found in many presently developing countries.

Finally, the measurement of linkages, as that of employment multipliers, is in any case based on calculation which assumes that certain production responses will in fact materialize. In fact, the forward "linkages" associated with basic metals can be captured by importing steel and the backward "linkages" can be captured by exporting iron ore and coal. In a narrow sense indirect effects are most relevant if non-tradables are involved. Moreover, calculated multipliers may only materialize in fact if the supplying sectors have high (or infinite) elasticities of supply. To the extent that a required input, including skilled labor, is absent the expansion forecast through multipliers or linkage indices will not materialize. One might argue that economies of scale in certain industrial sectors make it necessary to plan related sectors simultaneously and, to return to Hirschman's original conception, forward and backward linked activities are less likely to be realized in the absence of the stimulus of domestic production.

In actual fact it is possible that too much is made of the capital intensive/labor intensive development strategy question. The real choice open to a developing economy, when objectives other than employment creation are also given weight, is often fairly small. A careful analysis of industrial

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22/ See pp. 35-6.

strategy based on project analysis in Tanzania concluded that "the choice between two conceptually very different strategies (a capital intensive vs. a labor intensive investment strategy) comes down in practice to a selection of only two or three major industries to include in one strategy and not the other. There is a large core of industries common to both strategies, an outcome that might not be predicted from the contrasting a priori specifications of each." [56; p. 23] Although the labor intensive strategy would create 24 per cent more employment than the capital intensive strategy (235,000 jobs vs. 292,000 jobs) this is over a twenty-year period. It is fair to conclude that within the industrial sector capital intensive investment in activities where there is little scope for technological choice can be efficient and add to employment.

It is often suggested that if developing countries would only adopt the "right" technology, the unemployment problem would be ameliorated, if not eliminated. In part, however, the problem is that the alternative technologies recommended are not as readily available as assumed. Pack and Todaro suggest that a serious effort to develop a technology reflective of the relative factor endowments characteristic of developing countries requires the establishment of capital goods sectors in the developing countries themselves. [51] Perhaps equally important, the use of more labor intensive techniques may require additional managerial talent. If such talent is scarce, then a capital intensive technology may well be appropriate because to the extent that skilled labor is required in some fixed relation to unskilled labor, the effective supply of surplus unskilled labor is reduced [1 and 4]

Moreover, the choice of technique is also dependent upon the different weights attached to profit yields over time. If an economy can choose between labor intensive and a capital intensive production technology, then if only initial profits are considered and all future profits have a zero weight, the optimal solution leads to the choice of the labor intensive means of production. Maximizing the average rate of profits yields an optimal solution with more capital intensive technologies. Depending on the relative weights attached to profits over time, different degrees of capital (or labor) intensity become optimal. [52-a] It is clear that simple neoclassical analyses of the choice of technique ignore some important points: the direct and indirect effects of capital formation on the quality and quantity of labor, and the effects on the rate of savings of the distribution of income resulting from a particular choice of technique. [19-a] Once these factors are taken into account the problem of choosing an optimum technique no longer admits to a solution in terms of a neat general purpose formula. None of this argues that policy efforts aimed at increasing employment, including attempts to "get the relative prices right," are not important. But in reality the technological choices confronting a developing economy may be quite limited and the need to maximize employment and per capita incomes at some future point in time may rule out any strict short-term attempt to allocate investment resources to labor intensive sectors or projects only.

5. Conclusion

The growing concern among development economists with the need to increase productive employment is well founded. The experience of the last two decades has demonstrated that the development strategies pursued by most developing countries have not increased labor absorption sufficiently to substantially reduce or eliminate under- and unemployment. Yet attempts to focus on simple indicators of the employment impact of alternative investments are not likely to yield the sought solution. It is difficult to define the degree of labor intensity unambiguously. The usual measures of labor/output, capital/labor and capital/output ratios provide meaningful indices of technological characteristics only under highly restrictive assumptions. In reality these measures are often misleading guides of the true employment potential of various sectors. The labor/output ratio provides only a measure of the direct employment created per unit of output. At a minimum account should also be taken of the further expansion of output and employment which flows from the initial expansion. Ranking of acitivites by such total, direct plus indirect, labor/output coefficients may be substantially different from rankings by direct labor coefficients only. Yet it is important to point out again that while direct output and employment measures may neglect a large part of the economy-wide impact of industrial sector expansion, it is unwarranted to attempt to measure all indirect effects in the appraisal of investment alternatives. This is especially so if the approach is highly mechanistic, relying on the rigid assumptions of inter-industry analysis, and focuses on broad sectors rather than, more appropriately, on projects and activities. Indirect effects must be taken into account and the inter-dependence among industrial projects and between the industrial sector and the economy as a whole must be recognized. But such indirect effects and linkages involve considerations beyond the somewhat rigid inter-industry calculations which serve to indicate their importance.

Equally important is the need to consider the dynamic aspects of development. The need to increase savings and investment, to improve productivity and wages as well as employment, and to maximize future income per capita may imply a reliance on capital, as compared to labor, intensive technologies. None of this argues against policies that emphasize the need to stimulate employment nor as a general plea for capital intensity But the evidence suggests that identification of an appropriate set of investment projects is more complex than it first appears and that reliance on simple indicators is likely to lead to self-defeating results. Considerable further work needs to be done before the complex interactions of development policies on employment creation is fully understood.

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APPENDIX A

Total Employment Requirements

A major application of interindustry analysis is to provide insights into the effects of interdependence among economic activities. In simplest terms an input-output table shows the direct purchases that will be made by a given industry from all other industries for each unit (dollar's) worth of current output. But this does not represent the total additions to output resulting from additional sales to the final demand. An increase in final demand for the products of an industry within the processing sector (coming from household demand for instance) will lead to both direct and indirect increases in output of all industries. If, for example, industry A expands, it will purchase inputs from industries B, C, D and so on. But an expansion of output in sector B will call for additional production from sectors A, C, D and so on. The summation of all these repercussions which are caused by the initial expansion are referred to as total additions to output. The table showing all the direct plus indirect purchases by a sector in response to an output induced change is called the inverse coefficients matrix.[1/]

A primary use of the inverse coefficients is to calculate the total, rather than merely the direct, requirements for a given target of final demand. Multiplying the sectoral demand estimates by the inverse coefficients yields estimates of the total increase in production required. The total increase in production for an industry will in general be greater than but in no event less than the increase in the final demand for the industry's product.

1/ See for example Hollis B. Chenery and Paul G. Clark, Interindustry Economics. New York: John Wiley and Sons, Inc., 1964; and William H. Miernyk, The Elements of Input-Output. New York: Random House, 1965 for an introduction to inter-industry analyses.

The inverse coefficients can also be used to estimate the total increase which an expansion of final demand will require in terms of primary factors -- labor and capital. If estimates are available of the number of workers required to produce a unit of output then multiplication of the inverse coefficients by these direct labor-output ratios yields estimates of the total labor demand generated in any industry by a unit output expansion. It is also possible to break down total labor into various skill categories, e.g., trained and untrained workers, and hence derive more detailed estimates of total employment generation.[2/] All interindustry analysis assumes that the technologically observed relationship between inputs, of goods and primary factors, per unit of output remains constant. To the extent that technological change or changes in prices induce substitution, the estimated coefficients must be changed.

We can describe the above general statements more rigorously. Consider an economy disaggregated into n sectors or industries, each comprising enterprises producing similar products.[3/] For ease of exposition we assume no foreign trade. Let the physical output [4/] of sector i be represented by X_i,

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2/ Cf. Jack Alterman, "Interindustry Employment Requirements," Monthly Labor Review, Vol. 88 (July 1965), pp. 841-850.

3/ For a more precise statement of the conditions which should characterize the industries included in each sector, see for example, W. Duane Evans and Marvin Hoffenberg, "The Interindustry Relations Study for 1947," The Review of Economics and Statistics, Vol. XXXIV, No. 2 (May 1952) pp. 97-142.

4/ More interindustry tables are of course expressed in value rather than physical units. Under certain assumptions the transformation from physical to value units is straightforward. If relative prices change, including exchange rates, the representativeness of coefficients, expressed in value terms is called into question. It is also difficult to compare value coefficients across countries with differing relative price structures.

and let X_{ij} represent the amount of the output of sector i absorbed by sector j as an input. In addition we define y_i as the quantity of sector i product delivered to final demand. The balance between production and sales is defined by the following accounting identities:

$$\begin{array}{l} X_{11} + X_{12} + X_{13} + \dots X_{1n} + y_1 = X_1 \\ X_{21} + X_{22} + X_{23} + \dots X_{2n} + y_2 = X_2 \\ X_{31} + X_{32} + X_{33} + \dots X_{3n} + y_3 = X_3 \\ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \\ X_{n1} + X_{n2} + X_{n3} + \dots X_{nn} + y_n = X_n \end{array} \qquad (1)$$

Assume that the production function for each sector permits no substitution so that the general production function of the form

$$X_j = f\ (X_{ij},\ X_{2j} \dots X_{nj}) \qquad (2)$$

takes the form of minimum requirements for each input:

$$X_j \leq X_{ij} \;/\; a_{ij} \qquad (2a)$$

Assuming efficiency no more than the limitational amount of any input would be used so that the partial relationship of (2a) reduces to

$$X_{ij} = a_{ij}\ X_j \qquad (2b)$$

where a_{ij} is the direct input coefficient of industry i into industry j. Thus a_{ij} measures the quantity of the output of industry i required by industry j per unit of total output. Substituting (2b) into (1) we obtain

$$\begin{array}{l} a_{11}\ X_1 + a_{12}\ X_2 + a_{13}\ X_3 + \dots + a_{1n}\ X_n + y_1 = X_1 \\ a_{21}\ X_1 + a_{22}\ X_2 + a_{23}\ X_3 + \dots + a_{2n}\ X_n + y_2 = X_2 \\ a_{31}\ X_1 + a_{32}\ X_2 + a_{33}\ X_3 + \dots + a_{3n}\ X_n + y_3 = X_3 \\ \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \\ a_{n1}\ X_1 + a_{n2}\ X_2 + a_{n3}\ X_3 + \dots + a_{nn}\ X_n + y_n = X_n \end{array} \qquad (3)$$

Assuming that the levels of final demand (y_i) are exogenously given, these n equations can be solved for the n unknown production levels. The general solution can be presented as:

$$
\begin{aligned}
X_1 &= r_{11}\, y_1 + r_{12}\, y_2 + r_{13}\, y_3 + \ldots + r_{1n}\, y_n \\
X_2 &= r_{21}\, y_1 + r_{22}\, y_2 + r_{23}\, y_3 + \ldots + r_{2n}\, y_n \qquad (4) \\
X_3 &= r_{31}\, y_1 + r_{32}\, y_2 + r_{33}\, y_3 + \ldots + r_{3n}\, y_n \\
&\cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \\
X_n &= r_{n1} y_1 + r_{n2}\, y_2 + r_{n3}\, y_3 + \ldots + r_{nn}\, y_n
\end{aligned}
$$

The r_{ij} coefficients are the direct plus indirect coefficients which measure the direct and indirect output of sector j needed to increase the delivery made by sector j to final users. In general each r_{ij} in solution (4) depends on all the input coefficients a_{ij}.

Once the production levels, X_1, X_2, X_3, ... X_n, in each sector corresponding to each component of final demand are known, the corresponding factor requirements are easily determined from factor input coefficients. Assume that the employment requirements of an industry are proportional to its output, then if L_i denotes the total employment in industry i, its labor-input coefficients, ℓ_i is defined as:

$$\ell_i = \frac{L_i}{X_i} \qquad i = 1,2,3, \ldots n \qquad (5)$$

$$\text{or} \quad L_i = \ell_i\, X_i \qquad (5a)$$

Employment in each industry may be related to the components of final demand by substituting the values given for X_i in (4) into (5a):

$$L_i = \ell_i\, r_{i1}\, y_1 + \ell_i\, r_{i2}\, y_2 + \ldots + \ell_i\, r_{in}\, y_n \qquad (6)$$

$$i = 1,2,3 \ldots n$$

Thus multiplying the labor-output coefficients, ℓ_i, by the inverse elements, r_{ij}, reflecting the total change in output for a given level of final demand, Y_i, yields an estimate of the direct plus indirect labor required for the expansion of final demand. Note that the total employment coefficients, referred to in the text, are column sums of the labor coefficients multiplied by the inverse elements (r_{ij}).

The above can be more succinctly summarized in terms of matrix notation. Let A by the matrix of coefficients a_{ij} and I be an identity matrix, with ones down its diagonal and zeros elsewhere. The column vactors X and Y stand for arrays:

$$X = \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ \cdot \\ \cdot \\ \cdot \\ X_2 \end{bmatrix} \qquad Y = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \\ \cdot \\ \cdot \\ \cdot \\ Y_n \end{bmatrix}$$

We rewrite equation set (3) as:

$$AX + y = X \qquad (7)$$

which can be rewritten as:

$$(I\text{-}A)\ X = y \qquad (7a)$$

The inverse, $(I - A)^{-1}$, is defined as matrix R. Multiplying (7a) by the inverse we solve for X as follows:

$$X = (I - A)^{-1} y \qquad (8)$$

$$= Ry \qquad (8a)$$

where each element of R is r_{ij}. Multiplying a vector of direct labor-output coefficients (L) times R yields the total, direct plus indirect, labor coefficients.

It is important to realize that the indirect effects on domestic resources, labor and capital, are moderated through <u>leakages from imports</u>. To estimate the total employment effect of output expansion, the coefficient matrix, A, should relate only to domestic intermediate inputs purchased per unit of output.

Thus if A denotes a matrix of technically determined input coefficients, including both imported and domestically produced intermediate inputs, we can define A^d, the matrix of domestically produced intermediate inputs as

$$A^d = A - A^m \qquad (9)$$

where A^m is a matrix of import coefficients. The import coefficients reflect purchases which must come from non-domestic suppliers because no domestic production capacity exists. Such imports are designated non-competitive imports. As the economy's structure becomes more "developed", the relative importance of non-competitive imports will decline. The inverse matrix, R, required to calculate direct plus indirect employment coefficients is now given by

$$X = (I - A^d)y \qquad (8^1)$$

$$= R^d\ Y \qquad (8a^1)$$

Put in its simplest terms, the above formulation recognized that imported intermediate inputs do not generate domestic employment.

APPENDIX TABLES

Appendix Table A-1

Korea: Direct and Total Labor Coefficients and Employment Multipliers

(Workers/Billion Won)

#	Sector	Labor/Output Ratio Direct	Labor/Output Ratio Total	Employment Multiplier
1.	Petroleum products	0.005	0.138	27.58
2.	Cement	0.057	0.380	6.67
3.	Coal products	0.138	0.763	5.53
4.	Beverages and tobacco	0.120	0.645	5.37
5.	Processed foods	0.234	1.067	4.76
6.	Organic chemicals	0.094	0.390	4.14
7.	Chemical fertilizers	0.081	0.302	3.73
8.	Non-ferrous metals	0.124	0.372	3.00
9.	Fiber spinning	0.232	0.687	2.96
10.	Electricity	0.100	0.293	2.93
11.	Residential construction	0.251	0.651	2.60
12.	Other chemicals, nes.	0.196	0.505	2.58
13.	Inorganic chemicals	0.182	0.446	2.45
14.	Real estate	0.067	0.159	2.37
15.	Cast and forged steel	0.161	0.371	2.30
16.	Railway transport	0.199	0.454	2.30
17.	Rolled steel	0.085	0.194	2.28
18.	Synthetic resin and chem. fibres	0.148	0.336	2.27
19.	Motor vehicles	0.201	0.454	2.26
20.	Pulp, paper and paper products	0.195	0.426	2.18
21.	Steel pipes and plates	0.100	0.211	2.11
22.	Printing and publishing	0.334	0.704	2.11
23.	Industrial electrical machinery	0.215	0.447	2.08
24.	Rubber products	0.327	0.641	1.96
25.	Wood products and furniture	0.665	1.296	1.95

Appendix Table A-1 (Cont'd)

#	Sector	Labor/Output Ratio Direct	Labor/Output Ratio Total	Employment Multiplier
26.	Iron and steel	0.116	0.222	1.91
27.	Leather and leather products	0.382	0.728	1.91
28.	Finished textiles	0.553	0.972	1.76
29.	Fabrics	0.489	0.854	1.75
30.	Other manufactures, nes.	0.492	0.838	1.70
31.	Household electrical machinery	0.365	0.595	1.63
32.	Non-electrical machinery	0.433	0.689	1.59
33.	Metal products	0.416	0.658	1.58
34.	Shipbuilding and repairing	0.321	0.507	1.58
35.	Civilian construction	0.540	0.848	1.57
36.	Transport and storage	0.448	0.695	1.55
37.	Water and sanitary services	0.368	0.569	1.55
38.	Glass, clay and stone products	0.637	0.980	1.54
39.	Precision and optical products	0.420	0.646	1.54
40.	Services, nes.	0.816	1.250	1.53
41.	Metallic ores	0.423	0.644	1.52
42.	Lumber and plywood	0.216	0.303	1.40
43.	Health	0.709	0.974	1.37
44.	Coal	0.590	0.793	1.34
45.	Electronics	0.296	0.395	1.33
46.	Banking and insurance	0.638	0.801	1.26
47.	Communications	0.538	0.666	1.24
48.	Fishing	1.699	1.989	1.17
49.	Non-metallic minerals	1.008	1.179	1.17
50.	Agriculture and forestry	2.186	2.555	1.17
51.	Commerce	0.812	0.942	1.16
52.	Education	1.453	1.599	1.10

Appendix Table A-2

Malaysia: Direct and Total Labor Coefficients and Employment Multipliers

1970 (man-years/M $'000)

#	Sector	Labor/Output Ratio Direct (1)	Total (2)	Employment Multiplier I(a) (3)=(2)/(1)	Employment Multiplier I(b)
1.	Nonferrous metal products	0.005	0.100	19.29	18.33
2.	Other foods	0.016	0.276	17.46	18.67
3.	Rubber processing	0.028	0.325	15.94	16.11
4.	Oils and fats	0.007	0.103	14.70	15.34
5.	Processed foods	0.020	0.100	5.05	6.62
6.	Other manufactures	0.015	0.062	4.15	5.88
7.	Industrial chemicals	0.006	0.021	3.41	8.96
8.	Construction	0.040	0.130	3.25	2.64
9.	Beverages and tobacco	0.020	0.054	2.74	5.15
10.	Tires and rubber prod.	0.056	0.152	2.71	3.89
11.	Electrical machinery	0.025	0.059	2.41	3.71
12.	Ferrous metal products	0.025	0.061	2.39	3.93
13.	Business services	0.017	0.040	2.30	2.57
14.	Petroleum refining	0.003	0.006	2.05	2.89
15.	Paper and printing	0.049	0.100	2.02	3.16
16.	Cement	0.038	0.070	1.97	2.10
17.	Industrial machinery	0.010	0.018	1.88	3.16
18.	Chemical products	0.053	0.095	1.81	2.28
19.	Non-metallic products,nes.	0.045	0.078	1.74	1.99
20.	Sawmills and furniture	0.137	0.226	1.64	1.68
21.	Transport equipment	0.036	0.058	1.62	1.28
22.	Utilities	0.047	0.070	1.50	1.66
23.	Textiles and clothing	0.100	0.149	1.49	2.60
24.	Leather and footwear	0.170	0.225	1.32	1.48
25.	Other agriculture	0.181	0.236	1.30	1.48
26.	Trade services	0.168	0.215	1.28	1.35
27.	Other government services	0.152	0.196	1.28	1.36
28.	Transport services	0.146	0.176	1.21	1.27
29.	Health services	0.215	0.242	1.13	1.15
30.	Oil palm	0.162	0.182	1.12	1.19
31.	Personal services	0.294	0.320	1.09	1.13
32.	Fishing	0.199	0.212	1.06	1.09
33.	Education	0.159	0.167	1.05	1.06
34.	Rubber planting	1.133	1.157	1.02	1.03
35.	Other mining	0.104	0.107	1.02	1.11
36.	Padi (rice)	0.794	0.807	1.02	1.02
37.	Coconuts	0.348	0.351	1.01	1.01

Note: Employment multiplier I(a): with imports

Employment multiplier I(b): assuming zero import coefficients.

Appendix Table A-3

Yugoslavia: Direct and Total Labor Coefficients and Employment Multipliers

1968 (Labor Inputs/Thousand Dinars)

#	Sector	Labor/Output Ratio Direct (1)	Total (2)	Employment/ Multiplier (3)=(2)/(1)
1.	Ferrous metals	0.007	0.025	3.50
2.	Paper and products	0.009	0.024	2.78
3.	Non-ferrous metals	0.008	0.021	2.73
4.	Cinema photography	0.004	0.010	2.34
5.	Construction	0.011	0.025	2.27
6.	Food processing	0.008	0.019	2.22
7.	Tobacco products	0.011	0.024	2.22
8.	Electrical mach.	0.011	0.025	2.17
9.	Shipbuilding	0.010	0.021	2.12
10.	Chemicals	0.009	0.018	2.04
11.	Agriculture	0.007	0.013	2.00
12.	Petroleum	0.005	0.011	1.96
13.	Leather/footwear	0.014	0.027	1.89
14.	Metal products	0.015	0.028	1.85
15.	Textiles	0.016	0.030	1.82
16.	Wood products	0.020	0.035	1.79
17.	Electric power	0.010	0.018	1.75
18.	Misc. manufacturing	0.021	0.032	1.56
19.	Printing and publishing	0.017	0.027	1.54
20.	Building materials	0.019	0.028	1.52
21.	Non-metallic minerals	0.022	0.032	1.49
22.	Rubber products	0.015	0.023	1.47
23.	Transport and communications	0.020	0.027	1.33
24.	Coal	0.027	0.033	1.22
25.	Handicrafts	0.048	0.058	1.22
26.	Trade and catering	0.014	0.016	1.18
27.	Forestry	0.023	0.026	1.15
28.	Public utilities	0.065	0.070	1.09

Source: Sudhir Anand, "Input-Output Analysis Applied to Employment: A Case Study of Yugoslavia," Population and Human Resource Division, IBRD, Washington, D.C., April 1972. (Unpublished.)

Appendix Table A-4.a

DIRECT CAPITAL COEFFICIENTS BY DEVELOPMENT LEVEL [a]

($ of capital/$ of output)

#	Sector	Income Level $200	$500	$750	$1550	$1850	$2550	$2800	$4600
1.	Agriculture, residual[b]	0.10 (1)	0.18 (1)	0.26 (1)	0.47 (8)	0.60 (15)	0.73 (19)	0.86 (23)	1.25 (25)
2.	Furniture and fixtures	0.36 (2)	0.36 (2)	0.36 (2)	0.36 (3)	0.36 (5)	0.36 (5)	0.36 (5)	0.36 (5)
3.	Textiles, wearing apparel	0.38 (3)	0.38 (3)	0.38 (3)	0.38 (4)	0.38 (6)	0.38 (6)	0.38 (6)	0.38 (6)
4.	Chemical products, nes.	0.41 (4)	0.41 (4)	0.41 (5)	0.41 (6)	0.41 (7)	0.41 (8)	0.41 (8)	0.41 (8)
5.	Professional instruments	0.46 (5)	0.43 (5)	0.40 (4)	0.33 (2)	0.30 (3)	0.29 (3)	0.29 (3)	0.29 (3)
6.	Rubber	0.48 (6)	0.48 (6)	0.48 (8)	0.48 (9)	0.48 (11)	0.49 (11)	0.48 (11)	0.48 (11)
7.	Printing	0.51 (7)	0.51 (8)	0.51 (9)	0.51 (12)	0.51 (12)	0.51 (12)	0.51 (12)	0.51 (12)
8.	Electrical machinery	0.52 (8)	0.48 (7)	0.46 (7)	0.38 (5)	0.34 (4)	0.33 (4)	0.33 (4)	0.33 (4)
9.	Wood and cork	0.55 (9)	0.55 (10)	0.55 (10)	0.55 (13)	0.55 (13)	0.55 (13)	0.55 (13)	0.55 (13)
10.	Fertilizer	0.57 (10)	0.57 (11)	0.57 (12)	0.57 (14)	0.57 (14)	0.57 (14)	0.57 (14)	0.57 (14)
11.	Construction	0.58 (11)	0.51 (9)	0.43 (6)	0.28 (1)	0.27 (2)	0.25 (1)	0.24 (1)	0.21 (1)
12.	Food processing	0.63 (12)	0.63 (13)	0.63 (15)	0.63 (15)	0.63 (17)	0.63 (16)	0.63 (16)	0.63 (18)
13.	Shipbuilding	0.63 (13)	0.59 (12)	0.56 (11)	0.46 (7)	0.41 (8)	0.40 (7)	0.40 (7)	0.40 (7)
14.	Machinery	0.67 (14)	0.63 (14)	0.59 (13)	0.48 (10)	0.43 (9)	0.42 (9)	0.44 (10)	0.42 (9)
15.	Metal products	0.68 (15)	0.63 (15)	0.59 (14)	0.48 (11)	0.43 (10)	0.42 (10)	0.42 (9)	0.42 (10)
16.	Motor vehicles	0.73 (16)	0.74 (16)	0.76 (16)	0.73 (17)	0.67 (18)	0.66 (17)	0.66 (17)	0.60 (15)
17.	Paper	0.79 (17)	0.79 (17)	0.79 (17)	0.79 (19)	0.79 (20)	0.79 (20)	0.79 (19)	0.79 (19)
18.	Primary metal processing	0.83 (18)	0.83 (19)	0.83 (19)	0.83 (20)	0.83 (21)	0.83 (21)	0.83 (20)	0.83 (20)
19.	Services, nes.	0.84 (19)	0.81 (18)	0.80 (18)	0.74 (18)	0.74 (19)	0.71 (18)	0.68 (18)	0.62 (17)
20.	Cement	0.84 (20)	0.84 (20)	0.84 (20)	0.84 (21)	0.84 (22)	0.84 (22)	0.84 (21)	0.84 (21)
21.	Glass	0.84 (21)	0.84 (21)	0.84 (21)	0.84 (22)	0.84 (23)	0.84 (23)	0.84 (22)	0.84 (22)
22.	Industrial chemicals	0.93 (22)	0.93 (23)	0.93 (23)	0.93 (23)	0.93 (24)	0.93 (24)	0.93 (24)	0.93 (23)
23.	Industry, nes.	0.97 (23)	0.90 (22)	0.84 (22)	0.69 (16)	0.62 (16)	0.60 (15)	0.60 (15)	0.60 (16)
24.	Resource extraction, nes.[c]	1.29 (24)	1.29 (24)	1.29 (24)	1.29 (24)	1.29 (26)	1.29 (26)	1.29 (26)	1.29 (26)
25.	Trade	1.47 (25)	1.42 (25)	1.39 (25)	1.32 (25)	1.27 (25)	1.22 (25)	1.16 (25)	1.05 (24)
26.	Petroleum refining	1.48 (26)	1.48 (26)	1.48 (26)	1.48 (26)	1.48 (27)	1.48 (27)	1.48 (27)	1.48 (27)
27.	Electricity, gas, water	3.83 (27)	3.87 (27)	3.92 (27)	4.02 (27)	4.12 (28)	4.20 (29)	4.39 (30)	4.44 (30)
28.	Communications	5.27 (28)	5.06 (28)	4.95 (28)	4.63 (28)	4.42 (29)	4.19 (28)	3.90 (29)	3.39 (29)
29.	Transportation	6.30 (29)	6.08 (29)	5.80 (29)	5.30 (29)	4.68 (30)	4.26 (30)	3.77 (28)	2.83 (28)
30.	Aircraft	-	-	-	-	0.25 (1)	0.25 (2)	0.25 (2)	0.24 (2)

[a] Plant and equipment capital only.

[b] Agriculture other than livestock, oil crops, grains, roots.

[c] Resources other than copper, lead, tin, nickel, bauxite, iron, coal, petroleum, and natural gas

( ) = rank

nes. = not elsewhere specified.

Appendix Table A-4.b

TOTAL CAPITAL COEFFICIENTS BY DEVELOPMENT LEVEL a/

($ of capital/$ of output)

#	Sector	Income Level: $200	$500	$750	$1550	$1850	$2550	$2800	$4600
1.	Agriculture, residual b/	0.77 (1)	0.89 (3)	0.78 (4)	1.04 (5)	1.24 (12)	1.17 (17)	1.51 (24)	1.87 (26)
2.	Professional instruments	1.02 (2)	0.71 (1)	0.65 (1)	0.82 (1)	0.81 (2)	0.60 (2)	0.52 (2)	0.74 (2)
3.	Electrical machinery	1.14 (3)	0.80 (2)	0.76 (3)	0.89 (2)	0.87 (4)	0.68 (3)	0.67 (3)	0.77 (3)
4.	Textiles, wearing apparel	1.15 (4)	1.07 (6)	0.96 (7)	1.01 (4)	1.00 (5)	0.81 (4)	0.81 (5)	0.87 (4)
5.	Printing	1.23 (5)	1.09 (7)	1.08 (9)	1.12 (8)	1.16 (9)	1.02 (11)	0.96 (10)	1.07 (13)
6.	Furniture and fixtures	1.27 (6)	1.21 (10)	1.15 (11)	1.13 (9)	1.11 (8)	1.01 (9)	1.01 (12)	0.99 (6)
7.	Machinery	1.37 (7)	0.99 (5)	0.85 (5)	0.98 (3)	1.00 (6)	0.82 (5)	0.74 (4)	0.94 (5)
8.	Motor vehicles	1.38 (8)	0.91 (4)	0.87 (6)	1.29 (14)	1.34 (17)	1.04 (12)	0.89 (7)	1.03 (9)
9.	Chemical products, nes.	1.41 (9)	1.17 (9)	1.00 (8)	1.24 (10)	1.27 (14)	1.01 (10)	0.95 (8)	1.14 (14)
10.	Services, nes.	1.44 (10)	1.39 (14)	1.35 (17)	1.28 (12)	1.22 (11)	1.15 (16)	1.09 (15)	1.02 (8)
11.	Rubber	1.45 (11)	1.25 (11)	1.12 (10)	1.29 (15)	1.31 (15)	1.08 (15)	1.03 (14)	1.15 (16)
12.	Construction	1.45 (12)	1.33 (12)	1.21 (12)	1.08 (6)	1.06 (7)	0.97 (7)	0.95 (9)	1.01 (7)
13.	Shipbuilding	1.46 (13)	1.14 (8)	0.74 (2)	1.09 (7)	0.85 (3)	0.91 (6)	0.83 (6)	1.07 (12)
14.	Wood and cork	1.46 (14)	1.33 (13)	1.21 (13)	1.29 (16)	1.31 (16)	1.05 (14)	1.11 (16)	1.14 (15)
15.	Metal products	1.60 (15)	1.40 (15)	1.27 (14)	1.28 (13)	1.20 (10)	1.04 (13)	1.02 (13)	1.05 (11)
16.	Industry,nes.	1.72 (16)	1.53 (17)	1.30 (15)	1.34 (17)	1.26 (13)	0.98 (8)	0.99 (11)	1.04 (10)
17.	Food processing	1.72 (17)	1.65 (19)	1.59 (20)	1.53 (18)	1.46 (18)	1.37 (21)	1.31 (19)	1.23 (17)
18.	Industrial chemicals	1.80 (18)	1.52 (16)	1.31 (16)	1.55 (19)	1.68 (22)	1.32 (20)	1.25 (17)	1.50 (21)
19.	Trade	1.88 (19)	1.82 (21)	1.78 (23)	1.70 (21)	1.64 (19)	1.56 (23)	1.49 (22)	1.38 (19)
20.	Resource extraction,nes. c/	1.92 (20)	1.68 (20)	1.47 (19)	1.25 (11)	1.83 (23)	1.26 (18)	1.45 (20)	1.66 (25)
21.	Primary metal processing	1.94 (21)	1.87 (22)	1.81 (24)	1.73 (22)	1.65 (20)	1.56 (24)	1.49 (23)	1.41 (20)
22.	Paper	1.95 (22)	1.58 (18)	1.44 (18)	1.66 (20)	1.66 (21)	1.28 (19)	1.26 (18)	1.35 (18)
23.	Glass	2.15 (23)	1.93 (24)	1.72 (21)	1.82 (24)	1.84 (24)	1.51 (22)	1.47 (21)	1.52 (22)
24.	Cement	2.24 (24)	1.97 (25)	1.74 (22)	1.96 (25)	1.89 (25)	1.73 (26)	1.69 (26)	1.63 (24)
25.	Fertilizer	2.28 (25)	1.89 (23)	1.86 (25)	1.77 (23)	2.03 (26)	1.61 (25)	1.58 (25)	1.60 (23)
26.	Petroleum refining	3.23 (26)	3.12 (26)	3.01 (26)	2.83 (26)	2.68 (27)	2.52 (27)	2.40 (27)	2.19 (27)
27.	Electricity, gas, water	4.50 (27)	4.50 (27)	4.51 (27)	4.55 (27)	4.60 (28)	4.63 (30)	4.69 (30)	4.76 (30)
28.	Communications	5.84 (28)	5.60 (28)	5.46 (28)	5.08 (28)	4.83 (29)	4.56 (28)	4.23 (29)	3.66 (29)
29.	Transportation	6.68 (29)	6.45 (29)	6.16 (29)	5.66 (29)	5.04 (30)	4.60 (29)	4.10 (28)	3.18 (28)
30.	Aircraft	-	-	-	-	0.76 (1)	0.51 (1)	0.40 (1)	0.69 (1)

a/, b/, c/ See Table A-4.a.

( ) = rank

nes. = not elsewhere specified

Appendix Table A-4.c

CAPITAL MULTIPLIERS BY DEVELOPMENT LEVEL [a/]

#	Sector	Income Level $200	$500	$750	$1550	$1850	$2550	$2800	$4600
1.	Agriculture, residual[b/]	8.08 (1)	5.08 (1)	3.32 (5)	2.63 (10)	2.17 (18)	2.00 (21)	1.85 (22)	1.74 (21)
2.	Fertilizer	4.20 (2)	3.99 (2)	3.67 (3)	3.59 (2)	3.57 (2)	3.16 (3)	2.99 (4)	2.97 (3)
3.	Furniture and fixtures	3.58 (3)	3.40 (4)	3.27 (6)	3.25 (3)	3.17 (4)	2.90 (6)	2.85 (7)	2.87 (4)
4.	Chemical products, nes.	3.45 (4)	3.32 (5)	3.36 (4)	3.15 (4)	3.13 (5)	2.91 (5)	2.87 (6)	2.82 (5)
5.	Textiles, wearing apparel	3.04 (5)	2.91 (6)	2.79 (10)	2.81 (5)	2.79 (9)	2.65 (10)	2.61 (11)	2.59 (8)
6.	Rubber	3.03 (6)	2.86 (7)	2.73 (11)	2.73 (7)	2.74 (10)	2.48 (12)	2.40 (12)	2.45 (11)
7.	Food processing	2.75 (7)	2.64 (9)	2.54 (14)	2.44 (14)	2.33 (14)	2.18 (15)	2.09 (17)	1.97 (17)
8.	Cement	2.66 (8)	2.58 (12)	2.55 (13)	2.33 (15)	2.28 (15)	2.12 (17)	2.06 (18)	1.96 (18)
9.	Wood and cork	2.66 (9)	2.60 (11)	2.53 (15)	2.45 (13)	2.41 (13)	2.35 (13)	2.28 (14)	2.25 (13)
10.	Glass	2.55 (10)	2.44 (16)	2.37 (18)	2.25 (17)	2.18 (17)	2.06 (20)	2.00 (19)	1.87 (19)
11.	Construction	2.50 (11)	2.64 (10)	2.84 (8)	3.90 (1)	3.98 (1)	3.92 (1)	4.00 (2)	4.84 (1)
12.	Paper	2.48 (12)	2.47 (15)	2.46 (16)	2.22 (18)	2.14 (19)	2.11 (18)	2.00 (20)	1.83 (20)
13.	Printing	2.41 (13)	2.31 (19)	2.25 (20)	2.29 (16)	2.28 (16)	2.14 (16)	2.12 (15)	2.15 (14)
14.	Shipbuilding	2.41 (14)	2.54 (13)	3.70 (2)	2.77 (6)	3.34 (3)	2.86 (7)	2.89 (5)	2.74 (7)
15.	Metal products	2.38 (15)	2.41 (17)	2.45 (17)	2.69 (8)	2.81 (8)	2.69 (9)	2.63 (10)	2.57 (9)
16.	Primary metal processing	2.35 (16)	2.26 (20)	2.19 (21)	2.09 (19)	2.00 (22)	1.89 (23)	1.81 (23)	1.71 (22)
17.	Professional instruments	2.33 (17)	2.73 (8)	2.83 (9)	2.68 (9)	2.84 (7)	2.99 (4)	3.43 (3)	2.82 (6)
18.	Electrical machinery	2.23 (18)	2.52 (14)	2.59 (12)	2.52 (11)	2.65 (11)	2.71 (8)	2.64 (9)	2.56 (10)
19.	Petroleum refining	2.18 (19)	2.11 (22)	2.03 (22)	1.91 (23)	1.81 (24)	1.70 (24)	1.62 (24)	1.48 (25)
20.	Motor vehicles	2.16 (20)	3.64 (3)	3.93 (1)	2.03 (21)	2.05 (21)	2.09 (19)	2.37 (13)	2.12 (16)
21.	Machinery	2.11 (21)	2.41 (18)	2.86 (7)	2.48 (12)	2.53 (12)	2.59 (11)	2.76 (8)	2.43 (12)
22.	Industrial chemicals	2.08 (22)	2.13 (21)	2.33 (19)	1.96 (22)	1.87 (23)	1.93 (22)	1.93 (21)	1.71 (23)
23.	Industry, nes.	1.83 (23)	1.84 (23)	1.90 (23)	2.06 (20)	2.14 (20)	2.20 (14)	2.12 (16)	2.13 (15)
24.	Services, nes.	1.73 (24)	1.71 (24)	1.69 (24)	1.68 (25)	1.66 (25)	1.63 (26)	1.61 (25)	1.63 (24)
25.	Resource extraction, nes.[c/]	1.49 (25)	1.48 (25)	1.53 (25)	1.87 (24)	1.42 (26)	1.64 (25)	1.46 (26)	1.39 (26)
26.	Trade	1.29 (26)	1.28 (26)	1.28 (26)	1.29 (26)	1.29 (27)	1.28 (27)	1.29 (27)	1.31 (27)
27.	Electricity, gas, water	1.17 (27)	1.16 (27)	1.15 (27)	1.13 (27)	1.12 (28)	1.10 (28)	1.09 (28)	1.07 (30)
28.	Communications	1.11 (28)	1.11 (28)	1.10 (28)	1.10 (28)	1.09 (29)	1.09 (29)	1.08 (30)	1.08 (29)
29.	Transportation	1.06 (29)	1.06 (29)	1.06 (29)	1.07 (29)	1.08 (30)	1.08 (30)	1.09 (29)	1.12 (28)
30.	Aircraft	-	-	-	-	3.01 (6)	3.48 (2)	6.52 (1)	3.06 (2)

a/, b/, c/ See Table A-4.a.

( ) = rank

nes. = not elsewhere specified.

APPENDIX B-1

Interindustry Sector Classification

(for Tables 5, 6 and App. Table A-4)

#	Sector Name	ISIC Reference [a]
1.	Textiles, wearing apparel	23/243/244
2.	Manufacture of wood and cork	25
3.	Furniture and fixtures	26
4.	Paper and products	27
5.	Printing, publishing and allied industries	28
6.	Manufacture of rubber products	30
7.	Basic industrial chemicals	311 (part of)
8.	Fertilizer	311 (part of)
9.	Chemical products, including fats and oils and paints and varnishes	312/313/319
10.	Cement	324/331/339
11.	Glass products	332/333
12.	Metal products	341/342/35
13.	Manufacture and repair of motor vehicles	383/384/385
14.	Shipbuilding and repair and manufacture of railway equipment	381/382/389
15.	Aircraft	386
16.	Non-electrical machinery	36
17.	Electrical machinery	37
18.	Manufacture of professional, scientific, optical instruments and goods	391/392
19.	Misc. industries (manufacture of watches, clocks, jewelry,) not elsewhere specified	393/394/395/399
20.	Electricity, gas, steam, water sanitary services	511 (part of) 512/513/52

Note: [a] Relates to former ISIC definitions given in: International Standard Industrial Classification of All Economic Activities. Statistical Papers, Series M. No. 4, Rev. 1, Statistical Office of the U.N.

Interindustry Sector Classification (Cont'd)

#	Sector Name	ISIC Reference [a]
21.	Construction	40
22.	Trade, storage, warehousing	61/72
23.	Transport services	71
24.	Communications	73
25.	Services, not elsewhere specified	852/853/854

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DATE	NAME AND EXTENSION	ROOM NUMBER

DATE	NAME AND EXTENSION	ROOM NUMBER