

BIBLIOGRAPHIC INPUT SHEET

BATCH 70

1. SUBJECT CLASSIFICATION	A. PRIMARY Development and economics	DA00-0000-0000
	B. SECONDARY General	

2. TITLE AND SUBTITLE
Policies to encourage the use of intermediate technology

3. AUTHOR(S)
Pack, Howard

4. DOCUMENT DATE 1976	5. NUMBER OF PAGES 57p.	6. ARC NUMBER ARC
--------------------------	----------------------------	----------------------

7. REFERENCE ORGANIZATION NAME AND ADDRESS
AID/TA

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publisher, Availability*)
(Issued as Appen. to Proposal for a program in appropriate technology: PN-AAE-693)

9. ABSTRACT
LDC governments need to be convinced of the benefits of using a labor-intensive approach to their future economic development. They need to alter the prices that businesses pay for their factors of production, so that private decisions related to profit-making can be aligned with the national interest. This would help the small-business sector in many LDCs. The small businesses are labor-intensive and highly profitable, but they have been severely discriminated against by government policies that control credit and the availability of imported raw materials. If governments increase the price that larger companies pay for capital goods, this would also tend to make the companies change their mix of capital and labor and make their processes more labor-intensive. Both the large-business and small-business sectors would benefit from technical advice that would help them maintain profits while making their processes more labor-intensive. These advisors could be organized by A.I.D. or international organizations. They might be resident in a country for a year, or visit for shorter periods. They would be experts in well-specified production processes such as meat packing, rather than being "food processing" specialists. They would be older businessmen rather than academics and would be production managers or supervisors rather than staff engineers. But, without a change in the set of economic incentives faced by business, there is little reason to believe that technical advice by itself will lead to substantial changes in the labor intensity of production. The potential for labor-intensive development in other sectors also exists. Studies show that labor can be effectively substituted for capital in constructing roads and housing.

10. CONTROL NUMBER PN-AAE-695	11. PRICE OF DOCUMENT
----------------------------------	-----------------------

12. DESCRIPTORS Developing countries Factor analysis Foreign aid Government policies	Intermediate technology Production Technical assistance	13. PROJECT NUMBER
		14. CONTRACT NUMBER AID/TA
		15. TYPE OF DOCUMENT

PN-202-695
ATTACHMENT "D"

Policies to Encourage the Use of
Intermediate Technology*

Howard Pack
Department of Economics
Swarthmore College

April, 1976

*This paper has been prepared for the AID Committee on
Intermediate Technology

Introduction

This paper has several purposes; to indicate the policies which an LDC government may choose to alter the relative costs of using the various factors of production; to indicate how much is known empirically about the efficacy of such changes; and finally, to consider how a program to aid LDC governments undertake such changes can best be pursued given the absence of large leverage in the form of any concessionary aid.

The focus on policies which may affect factor prices assumes that if such prices were changed, methods of production could be introduced which are more labor intensive than those currently in use and which will be more profitable at the new factor prices than techniques currently in use. An alternate possibility is that a country is currently using quite labor intensive techniques and the policies considered here are designed to maintain the desirable pattern of factor use. Though it is not our purpose to survey the literature on choice of technique, a summary of some of the conclusions we have reached on the basis of

recent literature is germane at this point.¹

- (1) In a large number of industrial activities a product is producible with a considerable range of alternate ratios of capital to labor. Much of the potential substitution of labor for capital stems from use of labor intensive methods in "peripheral" production activities; labor, with little if any capital, can be used to transport material within the factory, to pack cartons, and store the final product. The evidence for these statements is drawn from observation of both D.C. and LDC factory operations and engineering specifications.

¹Three recent surveys of the rapidly growing literature on micro-substitution possibilities provide a large number of examples of such findings for specific industrial products as well as in construction activities. These are: S.N.Acharya, "Fiscal/Financial Intervention, Factor Prices and Factor Proportions; A Review of Issues," Staff Working Paper 183, IBRD, 1974; David Morawetz, "Employment Implications of Industrialization in Developing Countries; a Survey" The Economic Journal, Sept., 1974. Frances Stewart, "Technology and Employment in LDCs" in Edgar O. Edwards, (ed.) Employment in Developing Nations, (New York, Columbia University Press, 1974). A recent ILO volume, A. Bhalla, ed. Technology and Employment in Industry (Geneva, ILO, 1975, 1975) provides yet more evidence, as do a number of the studies being completed by the Technology and Employment Branch of the World Employment Program. A complete list of these studies is provided in I.L.O. World Employment Programme Research in Retrospect and Prospect (Geneva, I.L.O., 1976) pp. 21-31 and Appendix I. Acharya's review provides an insightful analysis of the difficulties with industry-wide cross section and time series estimates of the elasticity of substitution and thus provides the rationale for emphasis on evidence from individual process level micro-analyses.

- (2) Evidence is also accumulating that the core production process itself, whether cooking of food or production of yarn, offers efficient possibilities for using less expensive equipment and more labor per unit of output. Adaptation of existing equipment, for example, changing the "normal" speed of operation offers still further opportunities to save capital and increase the relative use of labor. Finally, extensive under-utilization of industrial capacity provides considerable scope for increasing the effective labor/capital ratio.
- (3) There are some industries that probably offer limited possibilities for altering the capital/labor ratio compared with that prevalent in advanced economies. These are typically activities in which most LDCs have no comparative advantage and where the basic problem is to forestall their introduction (typically behind tariff walls) rather than to suggest methods of changing production in a more labor intensive direction.

A. The Role of Factor Prices

1. Competitive Environment.

The ratio of labor to capital costs is usually assumed to play a decisive role in determining the ratio of capital to labor used in the production process. Before considering these costs explicitly, some caveats are in order about the simple relationship. The importance of relative factor prices flows from the assumption of a competitive milieu. There is abundant anecdotal and some numerical evidence¹ which suggests that factor prices may play a limited role in non-competitive environments. A firm currently realizing a 30 percent rate of return on equity capital, though using an inappropriate high ratio of capital to labor, may have little incentive to search for more appropriate methods which may raise its return to 35 percent. The losses from foregone leisure and the difficulties often alleged to result from management of a larger labor force make such behavior perfectly plausible. If factor prices are to exert pressure toward adopting socially appropriate techniques, some competitive forces must be present. Given the typical small markets of many LDCs, such pressures are best engendered by international competition rather than the proliferation of large numbers of

¹James Pickett, D.J.C. Forsyth, and N.S.McBain, "The Choice of Technology, Economic Efficiency, and Employment in Developing Countries," in Edgar O. Edwards (ed), Employment in Developing Countries, (New York, Columbia University Press, 1974).

small domestic companies, none of which are likely to reach economically efficient sizes. In the presence of high rates of effective protection of value added, changes in relative factor prices may have some beneficial effects, but they are likely to be highly attenuated. Thus, an integral component of any determined effort to achieve more desirable factor proportions must be some increase in competitiveness in the product markets in which industrial firms participate.

2. Factor Price Distortions

An LDC company considering beginning or expanding its operations has a variety of methods of production which it may adopt, the actual decision depending on the cost levels of the factors of production; labor, capital and raw materials. It has become conventional to assert that labor costs are "too" high, capital costs too low, and raw materials prices distorted, though not in one direction. What is the precise meaning of these statements? Let us briefly consider each of the first two factor costs.

a. Wages

The hiring of a worker entails the payment of a cash wage, and one or more of the following: payments in kind (housing), non-cash fringe benefits (social security), and in some countries such supplements as "thirteenth month" salary. The cost of hiring a worker is "too" high if the

value of the cash wage and other benefits exceeds the income which the worker could command elsewhere, given his abilities, both inherited and obtained by education and on-the-job experience. It has long been noted that the typical employee in a modern enterprise, be it a factory, bank office, or government agency, earns considerably more than a worker in small scale artisan shops or in self-employment such as barbering. Modern employment also provides incomes considerably in excess of that of agricultural workers and small scale peasant farmers. It is generally believed that the observed income differentials do not represent a reward for greater productive ability, but are artificially high and institutionally supported, reflecting government minimum wage legislation, union bargaining success, and a guilty aversion to paying lower, more appropriate wages which typify other activities. Nevertheless, there have been no studies confirming the hypothesis that such high wage incomes are not the result of greater work related skills; though considerable anecdotal evidence exists which suggests that recipients of high wages are frequently unskilled when initially hired, their productivity may well increase as a result of learning on the job. Even if some of the observed high wage structure is related to productivity, it is likely that union pressure and government minimum wage legislation add to any productivity based differentials.

The statement that wages are too high thus refers to the norm of alternate income possibilities for a similarly skilled worker, either in the urban craft sector or in a variety of rural activities. It does not imply that these wages are excessive in comparison with those in developed countries or that such workers are able to afford a luxurious living standard. High wages accruing to the small group lucky enough to obtain modern sector jobs do imply that production will be undertaken with fewer workers than if wages were lower, thus condemning those not fortunate enough to obtain such jobs to a lower standard of living than would have been possible with a generally lower wage structure. Instead of a million workers employed in the modern sector, each receiving a wage of \$500 per annum, 200,000 workers may receive a wage of \$900, with the remaining workers earning \$150 per annum.

b. The Cost of Plant and Equipment

The cost of utilizing plant and equipment reflects the purchase price of a factory building or machine, and the interest costs incurred in financing it. More precisely, the cost of using plant or equipment is best viewed in terms of the annual expenditure (depreciation of the initial acquisition cost and a yearly financing charge incurred as the

result of a decision to purchase the capital item).¹ The purchase cost of equipment is too low in most LDCs in the sense that the net effect of government foreign trade policies is typically to artificially lower the amount of domestic currency which must be given up to pay for an imported machine. Most LDCs have engaged in a sustained import substitution program, one of whose characteristics is to maintain an overvalued exchange rate i.e., the domestic currency buys too much foreign currency. For many industrial products this artificial cheapening of foreign goods is offset by a relatively high, often prohibitive tariff imposed on imported goods which compete with domestically produced goods. However, no tariff is imposed on imported equipment, ostensibly to encourage domestic investment. Thus, LDC firms purchasing new equipment pay a lower price than would exist if governments did not discriminate between different types of imported goods. A low purchase price of course is reflected in low annual depreciation charges, one of the two major components of the annual cost of using equipment.

¹For a precise measure of the cost of using capital see Dale Jorgenson, "Capital Theory and Investment Behavior," American Economic Review, May, 1963.

As mentioned earlier, the second major cost is the financing charge. The interest rate paid by larger companies in the urban sector is too low as a result of governmentally imposed limitations on the rate of interest. At the existing, low ceiling levels of rates, the total demand for loanable funds exceeds the supply, and the existing supply is rationed among competing companies, none of whom are charged more than the legal maximum. Companies which are unsuccessful in this competition are forced to compete in a gray or black market in which the rates often are three- or fourfold the official one. They are nevertheless quite willing to borrow at these rates, suggesting profitability at least equal to this higher rate. However, the financing charge for new equipment or building will clearly be greater for those (usually small) firms which are forced to compete for funds. Viewed alternately, large firms, receiving as it were, subsidized loans, pay too low an annual financing charge for the capital which they use.¹

¹It has been argued by Ridker that a firm receiving loans at subsidized rates may then relend these competitively, if its internal rate of return is less than the black market rate. If this is the case with respect to loans, allocations of import licenses etc., the validity of the view that capital is underpriced is open to doubt. The implicit position of most analysts has been that such resale is a quantitatively unimportant phenomenon. Clearly more work is required given the implications of an active resale market. See R. Ridker, "Employment and Unemployment in Near East and South Asian Countries, a Review of Evidence and Issues," in Ronald G. Ridker and Harold Lubell, Employment and Unemployment Problems of the Near East and South Asia (New Dehli, Vikas Publications, 1971)

Apart from measures which lead to too low a purchase price and interest rate for many investors, numerous tax regulations further reduce the annual charge for using equipment. For example, investment credits and accelerated depreciation are likely to have adverse effects on the choice of production methods, particularly in view of the already high rates of return being earned by investors, who hardly require additional incentives.¹

The net effect of the existing set of distortions in wages and the cost of capital has presumably been to bias the choice of individual firms towards unnecessarily capital intensive production methods. There is little direct evidence on the excessive use of very modern equipment; rather, much of the literature depends on inferences drawn from the large observed discrepancy between the growth of output and employment in the industrial sector. It is possible, of course, that such differences arise from gains in productivity either reflecting improving workers' skill or better management. Yet given the continuing large flow of new

¹For the effect of such tax practices on the cost of using capital see Jorgenson, op. cit. A detailed list of the existing tax legislation in a large number of Latin American countries is provided in "The Role of Fiscal Incentives for Employment Promotion in the Manufacturing Industries in Central America and Selected Countries in the Carribbean" in Fiscal Measures for Employment in Developing Countries (Geneva, ILO, 1972) pp. 183-212.

equipment from DCs to LDCs, some of this must be inappropriate, given DC wage levels for which the equipment is presumably appropriate, and the fact that equipment is not typically altered. To remove the incentives towards adoption of socially inappropriate equipment, the imperfections in factor markets must be reduced.

3. Types of Factor Price Policies Required.

The following sets of actions are open to LDC governments:

- (1) Removal of the minimum wage, particularly for new employees, or reducing it to the levels prevailing in the craft sector.
- (2) Undertaking policies to shift the supply curve of wage goods in order to reduce their price.
- (3) Limiting the growth of wages paid by the government sector which often serve as a guidepost for private sector wages.¹
- (4) Limiting the fringe benefits such as social security currently in force.

¹For a detailed analysis of this question and its importance in one LDC see, Republic of Kenya, Report of the Commission of Inquiry. (Public Service Structure and Remuneration Commission) (Nairobi, Government Printer, 1971).

- (5) Allowing the official exchange rate to move towards its equilibrium value, i.e., that at which the supply and demand for foreign currency will be equal, without the imposition of tariffs, administrative limits on imports and so on. Alternately, and less desirably, the imposition of tariffs on imported capital goods could be introduced to raise their cost in domestic currency.
- (6) Removal of interest rate ceilings.
- (7) Elimination of tax incentives which reduce the cost of utilizing capital in production.
- (8) Elimination of the licensing of imported raw materials, a practice which has often been shown to discriminate against small labor intensive enterprises.

Two extended comments on this group of proposals are in order: first, is it politically feasible; second, will it work? It would be difficult to construct a set of policy proposals which would generate more intense disagreement among many of the most politically powerful groups who perceive the probability of substantial reductions in income. Highly paid, often unionized workers

concentrated in urban areas would be adversely affected. the management of large companies currently enjoying subsidized equipment, low interest rates and access to raw materials would have to contemplate a reduction in windfall profits. Those who would benefit most, workers and entrepreneurs in the craft and small scale sectors, while surely more numerous, are poorly organized and likely to be less politically active. It is easy to see why alterations in factor prices, even where the potential aggregate benefits are understood by the government, may not be attractive to it.¹

A more immediate, technical question is whether factor price changes will work. Changes in technique are most easily made in new production decisions. Existing buildings and equipment most often have limited flexibility not permitting a decrease in the capital/labor ratio. Will firms facing a changed economic environment react in the anticipated direction when expanding their capacity, assuming that scope exists for employing more labor intensive techniques? Put another way, what might intervene between a change in relative factor prices and a change in method of production?

¹A good discussion of some of the political issues is to be found in Warren F. Ilchman and Norman T. Uphoff, "Beyond the Economics of Labor Intensive Development: Politics and Administration, Public Policy, Spring, 1974.

First, as mentioned earlier, unless a reasonably competitive environment exists, the rates of return available in particular highly protected industries may be such that limited effort is forthcoming to adjust factor proportions. The small increment to profits resulting from economizing on the now more costly inputs may not be worth the effort, as long as "reasonable" profitability can be maintained. Even assuming desire to restore or augment profits, a limited amount of managerial time may better be spent cajoling a somewhat higher nominal protection rate for a firm's output, looser quotas on critical inputs, etc., than in adjusting factor proportions. The potential for additional profits in this direction may simply be perceived as greater and more probable than those obtainable by more intensive exploration of other production methods. Avenues to increased profitability other than improved productive efficiency must be closed if changes in factor prices are to provide the strongest impetus to exploration of alternate techniques of production.

Secondly, it is possible that despite the objective existence of more labor intensive production methods, this knowledge is not widely diffused among entrepreneurs. Knowledge of appropriate techniques requires not only

familiarity with production equipment per se, but with alternate methods for carrying out a variety of subsidiary operations such as intraplant movement of material, storage and so on. These operations often provide a major share of employment where the process has not been prematurely mechanized. Moreover, labor intensive peripheral activities are likely to be the least cost method for most LDC companies unless their production volume is atypically large.¹ However, these alternatives are not likely to be advocated by the (large) company's engineer, the equipment salesman, nor the various government agencies. Nevertheless, companies in at least some LDCs do utilize appropriate core equipment and peripheral processes in response to the low wage of labor.² If there is reason to believe that adaptation to changed factor prices is unlikely to be forthcoming due to lacunae in existing knowledge or understanding, some government or private aid will be needed to supplement the eight policies listed above.

¹For calculations of such costs for a typical process see H. Pack, "The Substitution of Labour for Capital in Kenyan Manufacturing, The Economic Journal, March 1976.

²Pack, *ibid.*, and G. Ranis, "Industrial Sector Labor Absorption", Economic Development and Cultural Change, April, 1973.

B. A Survey of Evidence on the Effects of Changes
In Factor Prices.

There have been only a few conscious attempts by LDC governments to alter relative factor prices: the factor mix effects of these have not been systematically analyzed. It could, of course, be argued that the effect of changes in relative factor prices is implicit in the substantial number of studies¹ which utilize the relationship between value added per worker and the wage rate to infer the ease of substitution between capital and labor. A positive estimated relationship is presumptive evidence of the responsiveness of factor proportions to the real wage. The difficulty here is that wage growth over time in an LDC may reflect labor's share of increasing productivity which is itself attributable to organizational changes and learning-by-doing. The growth of wages is thus not exogenous as required for the statistical estimating procedure. The relation between the value added per worker and the wage may thus provide information about wage bargaining rather than the responsiveness of factor proportions to exogenous changes in the level of wages.² More direct

¹For example those cited in the surveys by Acharya and Morawetz, op.cit.

²See H. Pack, "Employment and Productivity Growth in Kenyan Manufacturing," Yale Economic Growth Center Discussion Paper 196, especially pp. 27-29.

evidence on the responsiveness of factor proportions to changes in relative factor prices is thus desirable for robust inferences about the potential effectiveness of a changed economic milieu. Unfortunately, little such evidence is available, as the following survey suggests.

1. Effects of Policy Induced Changes in Factor Prices.

The classic "stories" of successful alteration of factor prices and resultant sustained employment growth are South Korea and Taiwan, both of which allowed market forces to determine (heretofore pegged) rates of interest in commercial and savings banks.¹ In South Korea this change occurred in 1965. Taiwan followed a high real interest policy throughout the 1950's and 1960's.² Table 1

¹Analyses of the changes in policy in South Korea are given in G. Brown, Pricing and Fiscal Policies in South Korea in the 1960's and David N. Cole and Princeton N. Lyman, Korean Development, The Interplay of Politics and Economics, (Cambridge, Harvard University Press, 1971). Unfortunately neither volume, though very useful in other respects, provides systematic analyses of the response of factor proportions to relative price changes. A comparison of South Korea and Taiwan in many dimensions of performance during the 50's and 60's is provided by John C. H. Fei and Gustav Ranis, "A Model of Growth and Employment in the Open Dualistic Economy: the Cases of Korea and Taiwan," The Journal of Development Studies January 1975. However, there is only limited explicit analysis of the response to changed factor prices.

²For a description of Taiwan interest rates see A. G. Chandavarkar, "Some Aspects of Interest Rate Policies in Less Developed Economies, The Experience of Selected Asian Countries," International Monetary Fund, Staff Papers, March, 1971.

Table 1

Compound Rates of Growth

	<u>1953-58</u>		<u>1958-63</u>		<u>1966-69</u>	
	<u>Q</u>	<u>N</u>	<u>Q</u>	<u>N</u>	<u>Q</u>	<u>N</u>
Taiwan	9.0	1.9	13.1	2.8	20.0	13.2
S. Korea	16.1*	5.6**	10.0	8.3	28.8	13.7

* 1954-58

** 1955-58

Q is an index of industrial production

N is the number of employees

Data Source: U.N. The Growth of World Industry, various issues

presents the growth rates in employment and output for three periods for each country.

In South Korea the growth of employment and output diverged quite substantially between 1954 and 1958, were quite similar between 1958 and 1963, and again diverged in the period 1966 to 1969. It is striking that in the period immediately preceding the interest rate reforms of 1965 the growth of average labor productivity was quite low but increased after the reform was implemented. As there has been little systematic investigation of production in Korea, we do not know whether the similar growth rates of output and employment in the 1958-63 pre-reform period indicate no capital deepening or whether it reflects few gains in disembodied technical progress. Conceivably, the increased growth of average labor product after the reform might represent productivity gains as the large group of workers hired in 1958-63 accumulated experience. However, the reform witnessed a growth in the real industrial wage from 100 in 1965 to 132 in 1968 whereas between 1958 and 1963 it fell from 109 to 102.¹ Thus, it could be argued that the rise in the interest rate helped to forestall an even more rapid growth in average labor product as producers responded to a growing real wage. Moreover, improved allocation of new funds, particularly the greater share accruing to efficient small businesses may have accelerated the growth

¹Cole and Lyman, op. cit. Table 7.3

of productivity after 1965. If this is true, the reform and the increase in the cost of capital relative to the real wage may in fact have resulted in a stationary or declining capital-labor ratio whose effect is obscured by productivity growth. Without more knowledge of the movement of the capital stock (despite acknowledged measurement difficulties), it is impossible to infer precise results from this experiment in altering relative factor prices.

The data on Taiwan are equally ambiguous. From 1953 to 1963 there was substantial growth in labor productivity. Yet Fci and Ranis find only a 33 percent increase in capital per worker in the industrial sector between 1952 and 1969; a small increase must have characterized 1953 and 1963. If the data are correct, this implies that the 1953 to 1963 growth in labor productivity must have been attributable to intersectoral shifts and/or intrasector productivity growth, perhaps stimulated by the high real interest rates. However, between 1966 and 1969 there was a marked increase in the rate of job growth relative to that of output, perhaps reflecting a decrease in the potential for further disembodied productivity growth. In sum, it is difficult to easily identify the impact of appropriate factor prices on Taiwan's employment performance, certainly not at the aggregate level.

A paper by Williamson designed to explore the effects of changes in relative factor prices in the Phillipines brought about by import liberalization and devaluation indirectly considers changes in the ratio of capital to labor costs on the rate of growth of employment.¹ Williamson finds that the elasticity of substitution of labor for capital is greater than unity and that the speed of adjustment of companies to changes in the wage rate is fairly rapid. However, he does not explicitly use the price of capital in his analysis and his method is open to many of the objectives mentioned by Acharya. He does find that during the period of liberalization intersectoral resource allocation dramatically improved, an oft-predicted but rarely verified benefit of liberalization. If this indeed occurred, output could grow more rapidly than employment for the entire industrial sector even if capital deepening were discouraged by the change in relative factor prices.²

¹J. G. Williamson, "Relative Price Changes, Adjustment Dynamics and Productivity Growth: The Case of Phillipine Manufacturing" Economic Development and Cultural Change, Oct. 1971.

²Williamson notes that intra-sector productivity growth was negative during this period so that there was limited aggregate growth in industrial productivity despite the gain from reallocation.

Another study of Williamson,¹ also analyzing the impact of factor prices in the Phillipines, uses the price of capital and the capital stock explicitly, thus leading to more confidence in the results.² Williamson finds that changes in the ratio of wages to the user cost of capital explain a substantial fraction of the growth of capital-labor ratios in the Phillipines between 1960 and 1966. Despite the growth in the user cost of capital, nominal wages rose more rapidly, inducing increasing capital intensity.

We briefly note the experience of Singapore during the 1960's as an illustration of the potential effects of a constant or slowly rising nominal wage. Between 1968 and 1971, the rate of growth of output in the industrial sector was 24.0, that of employment 17.7, and that of real wages 2.3 percent per annum.

Finally, the effect of import quotas has often been cited as a major deterrent to the success of small, labor

¹J. G. Williamson, "Capital Accumulation, Labor Saving and Labor Absorption Once More," Quarterly Journal of Economic, Feb., 1971.

²See, however, Gary Saxonhouse's comment on Williamson, Quarterly Journal of Economics, May, 1975.

intensive craft firms who do not have the ability to "lobby" for a fair allocation of raw materials. After the liberalization of Pakistan's foreign exchange regime in the early 1960's, many of the efficient, smaller machine producing firms were able to expand their scale as imported raw materials could be purchased in the open market. As the system gradually moved back towards quantitative controls, these firms complained of difficulty in obtaining sufficient materials to continue their expansion, thus slowing the rate of growth of both output and employment.¹

The preceding survey of the response of employment to changes in relative factor prices omits an important effect, namely, the more rapid growth of capital accumulation generated by a substantial response of total private saving to increased real interest rates. In South Korea, Brown found a substantial correlation of the private saving rate with the real rate of interest.² Thus, private saving as a percentage of GNP increased from 3.9 percent in the year immediately preceding the interest reform to 9.8 percent by 1967. Moreover, statistical analysis confirms this increase was entirely attributable to the rise in the real

¹For an extended discussion see Hiromitsu Kaneda and Frank C. Child, "Small-Scale, Agriculturally Related Industry in the Punjab," (Davis, 1971.) Working Paper 11.

²Brown, *op. cit.* and G. Brown "The Impact of Korea's 1965 Interest Rate Reform" (mimeo).

interest rate and not to higher real income.

Unfortunately, there are no other analyses of the interest responsiveness of total private saving rather than of one form of saving such as savings accounts,¹ but if such interest responsiveness is typical, its potential for aiding capital accumulation and hence employment is evident.

The preceding survey of the little evidence available indicates that changes in factor prices, particularly that of capital, are difficult to document as a source of the rapid growth of industrial employment in Taiwan, and South Korea. Relatively constant wages seem to have played an important role in Singapore's successful employment performance, while the increased price of capital appears to have had limited effect in the Phillipines given relatively rapid growth in industrial wages. Whether or not the success, such as it was, of Singapore, South Korea and Taiwan are replicable in other economies is open to question. A number of special factors exist. In the two latter countries strong governments, made stronger by immediate external threats, were able to obtain the acquiescence of sectors

¹ Raymond F. Mikesell and James E. Zinser, "The Nature of the Savings Function in Developing Countries: a Survey of the Theoretical and Empirical Literature," Journal of Economic Literature, March, 1973.

of classes who might otherwise have opposed policies leading to potential losses from the change in economic environment. In Singapore, recent racial clashes and the separation from Malaysia may have had similar effects on cooperation. Secondly, all three countries are relatively well endowed with entrepreneurs: thus, given a change to a more favorable economic environment, we would expect greater adaptation to the new opportunities than might characterize more skill-constrained economies. The ability to search for new production methods, to adapt central core processes¹ and to exploit new labor intensive product lines made profitable by the altered factor prices may be a relatively rare capability. Moreover, in all three economies, domestic abilities were augmented by considerable foreign skill, usually in the form of direct investment. Few LDCs are likely to be as open to such aid, given current ideological propensities.² A third factor was the openness of these economies. The competitive structure, especially the emphasis on exports, undoubtedly increased the responsiveness to changed relative factor prices, for reason indicated earlier. Finally, in at least two of the countries (Singapore and Taiwan) either a strong agricultural sector or the

¹For examples see Gustav Ranis, "Industrial Sector Labor Absorption," Economic Development and Cultural Change, Oct., 1973.

²On the probable benefits from direct MNC investment see G. Helleiner, "Manufactured Exports from Less Developed Countries and Multinational Firms." The Economic Journal, March, 1973.

imports of food from a relatively stable world market allowed the price of a major wage good to be kept steady, thus reducing any upward pressure which might have developed on the nominal wage paid by industrialists.

2. Effects of Differences in Factor Prices Facing Firms of Different Size

Given some of the difficulties in interpreting the classical cases of policy induced changes in factor prices and the possibility that these may be unusual-entrepreneur or skill-rich nations-are there alternate empirical bases on which to base an assessment of the potential beneficial effects of moving towards a more rational factor price configuration? There is a rapidly accumulating body of evidence whose major implication is that differentials in factor prices faced by firms of different sizes have indeed led to alternate methods of production. The higher wage and the lower interest rates typically paid by large firms appear to have resulted in sharp variations in factor proportions among firms within the same industry in a given country. Such cross sectional evidence suggests that a change in factor-price ratios is likely to be effective if combined with competitive pressures in the output market. We turn to a review of the available evidence.

A large number of empirical studies have examined differences which exist among firms of different size (as measured

by number of employees). Of particular interest is the increase in the capital-labor ratio as the size of firm increases for a given two digit industry such as textiles or food processing. This pattern at least partly represents the increase in the use of equipment, tools, and mechanical conveyors in response to increasing wage levels as firm size goes up; it being well documented that the wage per worker is highly correlated with firm size. The earliest demonstration of these now conventional findings appeared in analyses of Japanese manufacturing¹ and the results have been verified for almost all LDCs which have

¹Among the studies of Japan are two by T. Watanabe, "Economic Aspects of Dualism in the Industrial Development of Japan," Economic Development and Cultural Change, April 1965 and "Industrialization, Technological Progress and Dual Structure" in L. Klein and K. Ohkawa, Economic Growth: the Japanese Experience Since the Meiji Era (Homewood, Richard D. Irwin, 1968).

The results of a large number of analyses of the dual structure of Japanese industry are summarized by M. Shinohara in B. Hoselitz, ed. The Role of Small Industry in the Process of Economic Growth (The Hague, Mouton, 1968).

Among the studies which confirm the general qualitative pattern of increasing capital-labor ratios by firm size within two or three digit branches are:

Gustav Ranis, Industrial Efficiency and Economic Growth: A Case Study of Karachi, (Karachi, Institute of Development Economics, 1961);

A. R. Khan, "Capital Intensity and the Efficiency of Factor Use-A Comparative Study of the Observed Capital-Labor Ratios of Pakistani Industries," The Pakistan Development Review, Summer, 1970;

Saul Trejo, Industrialization and Employment Growth: Mexico 1950-65 (Ph.D. Dissertation, Yale University, 1971);

Patricio Meller, "Production Functions for Industrial Establishments of Different Sizes: the Chilean Case", Annals of Economic and Social Measurement, Fall, 1975;

I.L.O. Sharing in Development-a Programme of Employment, Equity and Growth for the Phillipines (Geneva, ILO, 1974).

been investigated, the major exception being Taiwan. Table 2 presents fairly typical wage patterns by firm size for the entire manufacturing sector in Mexico in 1965 and Pakistan in 1960. Disaggregation by two digit branch reveals a similar pattern.

Thus, even if companies of all sizes paid the same interest rate and had equal access to imported equipment at the same price, such wage differentials provide presumptive evidence that larger firms devote more effort to economize on labor than smaller ones. However, equal access to loan finance and equipment are not good descriptions of reality.¹ Typically, small firms finance their expansion from the saving of the entrepreneur, his relatives and close friends; a group likely to have limited resources. If borrowing outside of this primary group occurs, it is usually from "grey" market lenders who charge two to four times the going rate charged by commercial banks. On the other hand, commercial banks and governmentally sponsored industrial development banks usually lend to the larger firms at relatively low interest

¹ See, for example, George Rosen, Some Aspects of Industrial Finance in India (Glencoe, The Free Press, 1962); Report on the Economic Survey of Bombay (Bombay University of Bombay, 1959); ILO. Sharing in Development, op. cit.; Trejo. Industrialization and Employment Growth, op. cit.

Table 2

Wage per Worker by Size of Firm

Mexico - 1965		Pakistan - 1960	
<u>Firm Size</u> <u>(number of</u> <u>employees</u>	<u>Wage Index</u> <u>(over 500 = 100)</u>	<u>Firm Size</u> <u>(number of</u> <u>employees</u>	<u>Wage Index</u> <u>(100 and over = 100)</u>
1-5	21	1-9	58
6-15	41	10-19	76
16-25	55	20-49	89
26-50	61	50-99	96
51-75	68	100 and over	100
76-100	70		
101-250	78		
251-500	88		
> 500	100		

Sources: Trejo, op. cit., p. 112

Ranis, op. cit., p. 33

rates. If interest rates of 10 or 12 percent are charged by these large institutions, smaller firms will typically pay 30 to 40 percent.¹

The pattern of wage and interest differentials (as well as differential access to import licenses) must be assumed to play a major role in the pattern of increasing capital-intensity by size of firm as shown in Table 3 for Pakistan and Mexico.

The pattern depicted for all firms regardless of branch typically also holds when the firms are disaggregated to the two digit level, though inevitably some exceptions arise. The smallest companies exhibit very low capital-labor ratios, high average product of capital and usually a somewhat lower average product of labor. As size increases, the capital-labor ratio and output per worker increase and the output per unit of capital declines. Further analysis typically reveals that the smaller firms are at least as efficient as the larger ones in the sense that if both were to face the same socially relevant factor prices (say the wage rate paid by small firms and an interest rate which

¹See the evidence provided by Chandavarkar, op. cit. pp. 61-62.

Table 3

Capital-Labor Ratios by Firm Size

<u>Mexico</u>		<u>Pakistan</u>	
<u>Size (number of employees)</u>	<u>Capital per worker (pesos)</u>	<u>Size (number of employees)</u>	<u>Capital per worker (rupees)</u>
1-5	10,489	1-9	.63
6-15	31,488	10-19	1.96
16-25	48,603	20-49	2.13
26-50	57,498	50-99	2.37
51-75	62,072	≥ 100	2.92
76-100	63,789		
101-250	80,384		
250-500	96,180		
> 500	104,777		

Sources: Trejo, op. cit., Table 18

Ranis, op. cit., Table 2

measures the rate of return either in agriculture or small scale industry), the average cost of production in smaller firms would be competitive with that of larger firms, indeed often lower.

While features of production other than differences in factor price ratios might explain some of the observed characteristics by firm size,¹ most studies have concluded that they play a major role. Thus, the examination of capital-labor ratios by firm size provides a rich body of data which confirms the likely responsiveness of entrepreneurs to changes in their cost structure. Such studies have been executed for a sufficiently large number of diverse countries so that one may infer such responsiveness is a fairly universal phenomenon in Asia and Latin America, not limited to countries with a particular history or culture. It characterizes both large and small countries, those which are usually thought to be skill-rich and those which are not.

¹ For example, production functions in which capital becomes increasingly efficient relative to labor as the desired level of output goes up. See, H. Pack and M. Todaro, "Industrialization, Employment and the Choice of Alternative Vintage Equipment in Less Developed Countries," Discussion Paper 95, Economic Growth Center, Yale University, mimeo.

In addition to the analysis of census and survey data, a substantial literature exists based on interview techniques and confirms the robustness of the small scale sector. A number of these studies detail the skilled entrepreneurship which characterizes many craft firms in LDCs.¹

However, it should be noted that neither the presence of abundant entrepreneurship nor many examples of efficient small-scale craft firms have been confirmed in sub-Saharan Africa. A recent ILO study of Kenya,² despite its emphasis on the potential role of the "informal sector," offers little empirical evidence that craft firms, with say 2 to 25 employees exist. Rather, the informal sector consists primarily of self-employed craftsmen such as tailors and carpenters who do not produce products which can compete with typical industrial goods in contrast to the craft firms found in the

¹For example, Edward H. Smith, "The Diesel Engine Industry in Pakistan's Punjab," (Islamabad, A.I.D., 1970); Leonard Dudley, "Learning and Productivity Change in Metal Products," American Economic Review, Sept., 1972 analyzes the Colombian metal working industry; H. Kaneda and Frank Child "Small Scale Agriculturally Related Industry in the Punjab," (Davis, 1971). For a very useful survey of additional studies see Bruce Johnston and Peter Kilby, Agriculture and Structural Transformation (New York, Oxford University Press, 1975), Especially chapters 3, 7, and 8.

²Employment, Incomes and Equality in Kenya, (Geneva, ILO, 1972)

Indian subcontinent or Latin America.¹ The absence of smaller firms and able entrepreneurs would, if generally true, require a different approach to obtaining labor intensive development, as the response to changes in factor prices may not be adequate.

C. Policy Advice to LDCs

1. The Need for LDC Government Agreement

I will take as a point of departure that a labor intensive development process will require the active cooperation of the central government of an LDC. Although it is possible to attempt to stimulate labor intensive production without a redirection of government policies, this appears to me to be unsustainable in the absence of changes in relative factor prices and increased competitiveness in product markets. One might envision, for example, advice on an individual basis from A.I.D. financed private advisers on small business and appropriate technology to a target group of companies in an LDC. However, the aid recipients will not, in the aggregate, be able to obtain an increasing share of investible funds unless current policies of arti-

¹A careful study of Nigerian small business can be found in Peter Kilby, Industrialization in an Open Economy: Nigeria 1945-1966 (Cambridge, Cambridge University Press, 1969). Chapter 10, in particular, emphasizes the lack of success of small manufacturing firms.

ficially low interest rates combined with credit rationing are abandoned. While small businesses usually exhibit high rates of return and could successfully compete for capital in a competitive market, their very smallness and absence of collateral work against them in a rationed market. Similarly, the extensive use of import licenses in the allocation of both capital and intermediate goods works to their disadvantage as it necessitates substantial allocations of managerial time, to say nothing of cash payments, to obtain the requisite licenses. In another vein, unless wage good output is increased and its price thus kept low, the growth of nominal wages to both small and large firms will produce strong incentives to rely on increasingly capital intensive techniques. In sum, the requisite changes in the allocation of investment funds, import licenses, and the price of wage goods are beyond the influence of private, non-profit organizations and any other industrial extension agencies which work directly with LDC firms.

Often it is argued that extension activities will generate a sufficient number of success stories so that the demonstration effect will induce a perhaps unwilling government to pursue a labor intensive strategy, including a liberalization of the credit and foreign exchange markets. Such a strategy raises fundamental moral and political

questions which are presumably sufficiently obvious that they need not be discussed here. Apart from this, it is unlikely to work. Although a small number of firms may, with intensive advice, identify new products, purchase appropriate equipment and undertake labor intensive low cost production, it is difficult to understand how this can occur on a sufficiently large scale without a prior change in government policies; who will lend to large numbers of small enterprises at low officially sanctioned interest rates given the perceived risks, the absence of collateral, and disproportionately high administrative costs. Yet if the "demonstration from below" approach is to be persuasive it is necessary for it to occur simultaneously on a large scale in a number of industries and regions and thus requires substantial amounts of investment funds.

More generally, this "private-non-government" approach is, in a fundamental sense, predicated on the absence of entrepreneurs: it assumes that the critical constraint which has limited the growth of firms with appropriate techniques is the scarcity of able and knowledgeable businessmen. Yet this assumption, for many countries, is counterfactual. The same group of studies which analyze the production and factor price characteristics of firms of different sizes also show that large numbers of small firms

(say with less than 50 employees) are present in many non-African LDCs in most branches of production; that on the basis of reported data they have made correct factor choices given the factor prices they face; and that they exhibit extremely high rates of return on their invested capital. For example, in Pakistan, the rate of return on fixed capital was over 18 percent for medium size firms (20-49 employees) and less than 12 percent for firms with more than 100 employees.¹ These are not the characteristics one would expect if the true bottleneck on expansion of firms using appropriate technology were the absence of entrepreneurial skills. Indeed, they are more suggestive of remarkably adaptive behavior in an economic environment which is skewed to favor large enterprises. While private technical aid efforts can undoubtedly improve existing performance, particularly in suggesting new products and indicating relevant sources of tools and equipment, there is little reason to doubt that had small businesses been able to obtain access to critical inputs, such growth would already have occurred in many countries.² It is for these

¹Ranis, Industrial Efficiency and Economic Growth, Table 14. Similarly high rates of return have been found in other countries.

²Trejo op.cit., pp. 125-30 finds substantial growth for those small Mexican companies which were able to borrow externally. Also see the references in footnote 1, page 26.

reasons that I take as the starting point the need to convince the central government of the desirability of pursuing a more labor intensive policy in those cases where this has not been true.

It should be emphasized that the emphasis on the need to change the economic environment does not imply that a variety of technical services cannot be beneficial to LDCs, only that by themselves they are unlikely to exert sufficiently large quantitative effects to alter the course of an otherwise capital intensive development policy. Similarly, the emphasis on the probable efficiency of relatively small companies is not meant to deny the possibility that large companies may be efficient and capable of adopting correct factor proportions in their production processes. Indeed there is evidence that such firms are, given the correct set of incentives and capable management, quite adroit in identifying and adopting labor intensive techniques.¹ While larger firms, too, may derive benefits from technical advice, in the absence of economic incentives there may be no reason for them to seek or utilize such aid.

¹See the Kenyan examples in Pack, "Employment and Productivity Growth in Kenyan Manufacturing," op. cit.

2. Aggregate Implications of Correct Factor Choice

Governments may be unaware of the range of choices open to them in pursuing greater employment growth and of the magnitude of the additional jobs which could be created. Their existing policies may not be malevolent but a response to perceptions, such as a shortage of investment opportunities, which are not accurate descriptions of the reality of their economies. Indeed, many of the most harmful government interventions were designed to increase domestic industrial output and employment in a world in which it was thought that international trade could only be harmful to LDCs because of the alleged deterioration in the terms of the trade.¹ It is ironic that the policies undertaken to effect import substituting industrialization, originally advocated by those most concerned with income distribution and unemployment, are now cited as presumptive evidence of the opposition of LDC governments to policies which could ameliorate current income maldistribution and improve low level employment opportunities. While to be sure there are now some groups,

¹For an excellent discussion of these issues see I. Little, T. Scitovsky, and A. Scott, Industry and Trade in Some Developing Countries, (New York, Oxford University Press, 1970).

both business and labor, deriving considerable windfall benefits from the existing system, there is also extensive evidence of the recognition by many governments of the need to alter current policies if violent change is to be avoided.

Given my premise that changes in technique require changes in factor prices, it is necessary to follow a two pronged strategy of advice: (1) where governments are insufficiently aware of the employment gains which will result from a change in policy, a demonstration is needed of the aggregate gains:¹ (2) enhancement of the govern-

¹The continuing blindness of many LDC governments and intellectuals to the perversity of capital intensive development policy is shown with exemplary clarity in the following:

In this latest effort to improve the country's image, a typical example is "From Blueprints to Bricks," an expensively prepared booklet recently published by the Indian Embassy in Washington. Indian sensitivity about the ...oxcart as a metaphor for the country's backwardness is reflected in the fact that the booklet ... devotes an entire page to answering the question: "Is India still dependent on the oxcart?" (New York Times, March 2, 1976) p.7

The article then details the concern of the Indian government to extol mechanized production of all types, and Nehru is cited as having referred to modern, capital intensive projects as "the new temples of Modern India." The same article quotes an economist in Bombay:

ment's ability to achieve the employment goals.

a. Effects on Employment and Output.

There have been a large number of studies of the choice of technique at the process level, ranging from flour milling to can sealing to methods of road construction.² Despite the demonstrated availability of alternate techniques at the process level, there are nevertheless very few studies of the aggregate effects which would be forth-

1 cont'd

I go overseas and my friends think of India as a long line of hungry, half-naked peasants. Why, the mechanized assembly lines are as much a symbol of where India's going as the bloody ox-cart that everybody always writes about.

Despite a decade of attempts to show the relationship between capital intensive industrial production and underemployment in urban areas, there is little evidence that the message has been absorbed by LDC leaders.

²See the references in footnote 1, page 2.

coming if all sectors adopted appropriate techniques.¹

A fortiori, LDC policy makers cannot know these magnitudes. Thus an important contribution to generating LDC interest in the possibilities offered by labor intensive techniques can be made by:

(1) a systematic cataloging of the economically efficient techniques by industry, which have so far been established. This would include for each process specific production alternatives such as the type of core production equipment available, alternate peripheral processes, the sources and costs of relevant equipment. Some sample cost accounting analysis such as that shown in Table 4 below might aid the understanding of officials.

(2) The use of the above information in projection of some plan or set of growth objectives which the LDC government finds plausible or desirable. Such a plan may be the

¹An exception is Victor E. Tokman, "Income Distribution, Technology and Employment in Developing Countries: An Application to Ecuador," Journal of Development Economics, May, 1975. Tokman's estimates of the aggregate gains do not take account of potential substitution possibilities in many production activities in which considerable scope for additional labor intensity has been demonstrated. Nevertheless, even within this fairly restricted framework, it is shown that total manufacturing employment could be increased by 17 percent over a ten year period above that which would be generated by continuing to use current techniques in expanding production capacity.

official plan document but this is not necessary. Projections can be made of probable total employment growth without altering current production methods and with say two alternative factor price regimes using more labor intensive techniques. The saving in capital obtained by producing the planned output in a less capital intensive manner should also be calculated, as this is a major benefit that is insufficiently emphasized in most analyses. The output of some projects which were not included in the original plan, but which now become feasible because of the freed investment resources, should be calculated.

An illustration of the method is presented in Table 4 using data from a study on the choice of technique in textile production. Four methods of producing woven shirting material were identified, each exhibiting considerably different labor requirements and capital costs. Columns 1 and 2 indicate the inputs required to produce an additional 100 million square yards of material, an increase well within the goals of some development plans. Column 3 indicates the capital-labor ratio associated with each type of process. Column 4 shows the amount of investible funds saved by adopting the Lancashire loom, the least capital intensive one, rather than each of the others. Column 5 indicates the additional employment which would be generated by investing the funds so saved in an activity whose capital-labor ratio was no

Table 4

Aggregate Effects of Alternate Weaving Techniques

Type of Loom	Requirements per 100 million square yards per annum		Capital/Labor Ratio (2)/(1) (3)	Investment Funds Saved Using Lancashire (4)	Additional Indirect Employment (5)	Percent- age Increase In Output (6)
	(1) Manyears	(2) Investment				
Lancashire	2,180	\$ 35,820,000	\$ 1,645			
Battery	1,110	71,635,000	6,454	\$ 35,815,000	21,772	100
Airjet	820	78,777,000	9,665	42,957,000	26,114	120
Sulzer	510	150,063,000	29,715	114,243,000	69,449	319

Source: Underlying data were obtained from Cotton and Allied Textiles (Manchester, The Textile Council, 1969). The data are analyzed more extensively in H. Pack, "The Choice of Technique and Employment in the Cotton Textile Industry," in A. Bhalla, ed., Technology and Employment in Industry, (Geneva, International Labour Office, 1975).

greater than that of the Lancashire loom. These, of course, must be added to the differences shown in Column 1 to derive the total employment differentials. Finally, column 6 presents the percentage increase in output which could be generated by investing the saved funds in additional weaving capacity. Obviously, other possibilities will be open, the output gain calculated here simply provides some orders of magnitude.¹

The potential contribution of AID or a sponsored organization in systematizing information on available techniques and analyzing their implication for a given LDC is obvious. Existing evidence on the benefits to be derived, industry by industry, assure that these are likely to be enormous and such calculations are likely, at the least, to stimulate LDC governments to consider some of the policies necessary to realize them.

b. Other Policies

Convincing the government of a country of the desirability of changing the economic policies to establish a climate more favorable to labor intensive development is necessary, but may not be sufficient to obtain such development.

¹For a more detailed discussion of these and other issues see H. Pack, "The Choice of Technique and Employment in the Textile Industry" in A. Bhalla, ed. Technology and Employment in Industry, Geneva (International Labour Office, 1975).

Although we know that firms of diverse sizes use different techniques, the speed with which changes to appropriate production methods will be made may be accelerated by the presence of good advisory services, especially when there is a demonstrated absence of entrepreneurship.

1. Extension Services

Extension-type activities are likely to be best implemented by those who have been involved in industrial production management over a long period. These managers are likely to have seen the continuous evolution of production methods and are aware that the 1976 method differs considerably from 1956, to say nothing of 1936 and that the latter two were quite viable in their time. Labor intensive methods, particularly in the peripheral processes, characterized American and Western European production until well after World War II.

These older techniques can still be used to produce many high quality products which are in no way inferior to those produced with more recent equipment. Thus, a large pool of westerners exist who have been involved in relevant production management who could convey both the physical feasibility of labor intensive production as well as some of the organizational methods and innovations which surely occurred and increased productivity. They will be more attuned to the possibility of manufacturing with something other than the latest method, especially where wages are a fraction of the U.S. 1955 levels and interest rates are

four to five times those in the western countries. By contrast, recent graduate engineers with little production experience are unlikely to be quite so open to alternate production possibilities. They have been exposed to the latest edition of a textbook in food processing and may be unaware that earlier editions showed different equipment. Moreover, most engineering texts and courses concentrate almost exclusively on the technical aspects of production, such as the chemical changes which occur, rather than on costs. Rarely are there discussions of the number of workers used by a machine or the relative costs of different types of equipment. Without exposure to the concepts of costs and the discipline of product prices, engineers are likely to be less open than those with production experience, who may, in fact, have had similar academic training.

Most of the empirical studies of successful use of labor-intensive methods in LDCs are based on factory visits. Plant managers who have been successful in such adaptive behavior are often articulate advocates of the physical feasibility and economic rationality of substituting labor for capital. Thus, in addition to aid from western managers, visits by industry teams of successful adaptive managers from LDCs could constitute an important source of advice and encouragement. These visits would in

addition have the not unimportant side benefit of conferring prestige on manufacturers who successfully avoid capital intensive patterns; they will demonstrate to the recipients of technical counseling that there are avenues to achieve supra-national recognition other than installing an automated rolling mill. Moreover, such missions may even lead to a strengthening of the position and prestige of the successful managers in the country of origin of the advisers.

No apriori case can be made about the size of firms which are likely to derive the greatest benefit from extension advice. The evidence cited in Section B on the characteristics of firm by size suggests that smaller firms have had, by force of circumstance, to undertake more labor intensive production in the past. Presumably, they possess more knowledge about the sources of used or appropriate new equipment and the types of adjustments that may be made to take advantage of inexpensive inputs. Nevertheless, such past adaptation might have been more extensive and productive with more information and advice. Some production alternatives and potential products may not have entered the set of choices among which small firms made past decisions. On the other hand, large companies with perhaps limited experience in choosing labor intensive processes, may initially need guidance in identifying sources of information. However, they may require less aid insofar as they employ a technical

staff which may be used in these activities. Thus, the provision of industrial extension services should, at the outset, be neutral with respect to size until information on the intensity of need can be obtained.

2. Tax Policies

Although higher interest and foreign exchange costs are likely to provide strong incentives to the search for more labor intensive equipment, some measures are open to the government to augment these incentives, yet perhaps reduce opposition to the impending changes. Most LDC governments levy some form of business profits tax: indeed, the wide variety of tax holidays and accelerated depreciation are directed at reducing these taxes in the hope of generating greater investment. As indicated earlier, many of these devices decrease the cost of using capital and implicitly encourage capital intensive production methods and should thus be ended. An alternate set of tax provisions for reducing the tax burden might be substituted which would further encourage the search for labor intensive techniques. Reductions in the average rate applicable to a given level of income could be made contingent on companies presenting a costing of alternate production processes when considering either replacement or expansion. Presentation of detailed cost estimates for at

least one more labor intensive process, including peripheral activities, could be made the standard for being placed in a preferred tax category. If the company chose the more capital intensive process despite lower costs at the prevailing market prices of factors, its average tax rate would be increased, rather than lowered.

Table 4 illustrates the calculation, along with supporting evidence, which would be submitted by companies. Some fairly difficult issues are embedded in these calculations, particularly with respect to the interest and wage rates to be used by firms. If the prevailing market levels are not socially appropriate, the computations will have limited usefulness as a guide to tax policy. However, some firms may find that even, at existing factor prices, labor intensive equipment yields the lowest costs.¹

Clearly, given limited administrative ability, all firms could not be required to submit such proposals. Presumably, it would be best to start with the largest companies and then move down through the size distribution until administrative ability is exhausted. An

¹See, for example, the study of Pickett et al., op. cit.

Table 4

Costs of Weaving Shirting Material
(dollars per 100 yards)

	<u>Lancashire Loom</u>	<u>Airjet (Elitex)</u>	<u>Sulzer Loom</u>
Space	.198	.093	.152
Power	.385	.385	.291
Weft Waste	.035	.408	.338
Pirning	.472	-	-
Capital Costs* (including depreciation and interest charges, assuming an interest rate of 20 percent per annum)	.658	2.167	3.796
Cost of Labor (wage=\$832 per year)	1.744	.652	.404
Average Unit Costs	3.493	3.705	4.981

Source: Cotton and Allied Textiles, Vol. II, p. 83 for lines 1-4. Line 6 calculated from pages 86-90.

*including transport and installation costs equal to 20 percent of the cost of a battery loom.

obvious and important potential role for bilateral advice would be a catalogue of alternate processes as well as training for LDC administrators, facilitating their ability to establish the accuracy of the alternatives presented. Compliance with tax provisions could be aided by the extension service.

Such tax provisions require some confidence that more efficient, labor intensive alternatives exist whose adoption would, in fact, result in lower costs for the firm. That such choice exists in most industrial activities is an underlying assumption of this paper. At a corrected set of interest and foreign exchange rates more labor intensive techniques are, in fact, likely to be the least cost techniques for producing a large number of products.

3. Strengthening Ability to Finance Loans

One other area in which a considerable contribution could be made by AID is strengthening the ability of LDC lending institutions. The arguments made earlier for increasing the access of small scale, labor-intensive firms to capital ignored the ability of the existing lending institutions to effectively implement lending programs. Clearly, not all loan applicants will have a reasonable chance of success. Some screening must take place even with high rates of interest which should discourage the

less efficient firms from applying. Moreover, the book-keeping involved after the loans are made is not an easy task given the potentially large number of borrowers and the relatively limited experience found in the financial sector in many LDCs. Augmenting the administrative capacity of the lending sector may thus allow the removal of a critical bottleneck to small scale lending. Fortunately, the bookkeeping for these loans should be a fairly labor intensive activity, providing jobs for many high school graduates. Assuming that both the processing and book-keeping of loan programs will not be automated, the training would best be undertaken by those who have had administrative experience before routine banking activities were themselves automated. This criterion suggests older middle level banking officials in the DCs or some of the demonstrably successful ones from LDCs as the "teachers."

Conclusions

The emphasis of this review of issues has been on the necessity of convincing LDC governments of the benefits to be obtained by a labor intensive approach to their future economic development and the need for them to alter the prices which businesses pay for their factors of production in order to align the private profit decision with that of the national interest. The major beneficiary

of the proposed changes would be the small business sector which in many countries has been found to be labor intensive and highly profitable, but severely discriminated against by current policies with respect to credit and the availability of imported raw materials. Increasing the price that larger companies pay for capital goods by freeing the interest rate from legal limits, as well as raising the price of foreign equipment, is also likely to result in their changing the mix of capital and labor used in their production. If this first order of the agenda can be achieved, it would constitute an important change in perception and commitment, without which almost all other actions are likely to be futile. Nevertheless, it would be pollyanish to assume that changes in factor prices are a magic wand whose movement will immediately lead to a maximum adjustment in factor proportions.

Even without technical aid or extension services, the labor intensity of aggregate output should increase as the result of the expansion of the quantitative importance of small firms and adjustments by larger ones. Both sectors, though, would almost certainly benefit from a variety of technical advice which would increase familiarity with efficient, but older, equipment and peripheral processes, such as material movement. The particular form which such

aid should take has not been specified, though the individuals who should provide it are identified as those who have had production experience in particular industries before some of the recent mechanization. These advisers could be organized by AID or international organizations: they might be resident in a country for a year or visit for shorter periods; they would be expert in well specified production processes such as meat packing rather than "food processing" generalists; they would thus be older businessmen rather than academics, production managers or supervisors rather than staff engineers.

Such technical advice should strengthen the adjustment in factor proportions to changes in factor prices, providing yet more concrete evidence to governments of the beneficial effects of the latter. But, it must be noted that without a change in the set of economic incentives faced by business, there is little reason to believe that technical advice by itself will lead to substantial changes in the labor intensity of production.

The entire discussion of this paper has been in terms of the options open to affect the development of the manufacturing sector. Although in many LDCs manufacturing employment is a relatively small part of total employment, it is nonetheless true that an increase of 50 percent in the number

of satisfactory jobs provided by this sector could make a substantial dent in the number of poor currently engaged in informal urban activities.

The potential for labor intensive development in other sectors can also be shown to exist. The import of most analyses of the green revolution is the potential labor intensiveness of the new technology, a potential often not realized because of distorted price structures, particularly the subsidization of modern farm equipment such as tractors.¹ The correction of distorted factor prices would thus result in greater numbers of agricultural jobs, reducing the absorptive burden of the industrial sector.

A number of studies are beginning to appear about the possibilities of substituting labor for capital in construction activities such as roads and housing.² These analyses confirm the possibility of limiting the use of equipment in some, though not all, phases of construction

¹For a good review of the issues see Johnston and Kilby. Agriculture and Structural Transformation, op. cit.

²Examples are George Irwin, Roads and Redistribution (Geneva, ILO, 1975) and a forthcoming ILO study on alternate techniques available in home construction, by W. Paul Strassman. A number of IBRD studies are also in process.

projects. While here, too, factor prices faced by private contractors and/or government agencies will be of importance, other obstacles such as the organization of huge numbers of workers, difficulties with the seasonal supply of workers, and so on will be considerably more important than in the manufacturing sector; thus, organizational improvement would probably require more emphasis than in the manufacturing sector.

The priorities outlined imply substantial scope for AID: arranging for advisers who can persuade LDC governments of the need for change; providing these advisers with a detailed information system about available production options (including peripheral operations as well as core equipment); and providing advice on techniques for altering factor prices including the use of variations in profit tax rates to induce a search for appropriate equipment. Provision of technical production advice will also require substantial AID efforts in identifying individuals who are not among the traditional purveyors of development wisdom. Intensive search within the business community will thus be necessary.

These activities, carefully implemented for (initially) a limited number of countries should be instrumental in augmenting the number of employment opportunities which allow higher incomes than those earned by the poorest segments of the non-rural population.