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INDUSTRIAL EMPLOYMENT EXPANSION UNDER ALTERNATIVE DEVELOPMENT STRATEGIES: SOME EMPIRICAL EVIDENCE

by

Ranadev Banerji and James Riedel

Institut für Weltwirtschaft an der Universität Kiel
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November 1977

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INDUSTRIAL EMPLOYMENT EXPANSION UNDER ALTERNATIVE DEVELOPMENT STRATEGIES: SOME EMPIRICAL EVIDENCE*

The general consensus in recent literature on development economics is that outward-looking strategies are likely to create more employment opportunities in labour abundant countries than inward-looking strategies. The reasons generally given to support this contention are (i) that inward-looking strategy limits the scope for structural change into relatively labour-intensive branches and (ii) that policies associated with inward-looking strategy tend to distort factor prices thereby giving incentive to the adoption of relatively capital-intensive techniques of production.¹

This paper develops an identity which delineates the components of industrial employment expansion into effects of: (i) productivity change, (ii) capital accumulation and (iii) change in the composition of manufacturing. Applying this identity to India and Taiwan, two countries that have taken very different paths towards economic development, provides some insight into the source of employment expansion and its stringent limitations under alternative development strategies.

I. The Identity

In their seminal study of development in labour surplus countries, Fei and Ranis (1963) derived a "labour absorption equation" which defined the rate of industrial employment expansion to be a function of (i) capital accumulation and (2) technological change. The Fei-Ranis equation, having been derived from a two sector model of development, ignored the implications of changes in the structure of the industrial sector. However, as it is generally believed that factor-intensity and substitutability differ significantly between industrial sectors,²

* The authors acknowledge the helpful comments of J.B. Donges, J.S. Flemming, U. Hilemennz, R.W.T. Pomfret and J.P. Wogart.

¹ See Morawetz (1974); Little, Scitovsky and Scott (1970).

² See, for example, Nerlove (1967).
and since industrial structure is one of the principal targets of development policy, this is a factor which cannot be ignored.

The impact of technological change, capital accumulation and structural change on industrial employment expansion can be delineated by means of the following identity: \(^1\)

\[
L^1 - L^0 = \sum \xi_i^1 X_i^1 - \sum \xi_i^0 X_i^0
\]

\[
= \sum X_i^0 (\xi_i^1 - \xi_i^0) + \sum \xi_i^0 (\bar{X}_i^1 - X_i^0) + \sum \xi_i^0 (X_i^1 - \bar{X}_i^1)
\]

\[
+ \sum (\xi_i^1 - \xi_i^0) (X_i^1 - X_i^0)
\]

where

\(L^j\) = total industrial employment in year \(j\), \(j = 1, 0\)

\(x_i^j\) = output of the \(i^{th}\) sector in year \(j\), valued in constant prices

\(\xi_i^j\) = \(L_i^j / X_i^j\) = labour output ratio in the \(i^{th}\) sector in year \(j\)

\(\bar{X}_i^1\) = \(\sum X_i^1 \cdot \frac{X_i^0}{\sum X_i^0}\) = output of the \(i^{th}\) sector in year 1 assuming the structure of production remains the same as in year 0.

The first term on the right hand side of the above identity expresses the effect of productivity change on industrial employment expansion, holding the growth and structure of output constant. This component expresses the combined effects of (1) capital deepening (or shallowing) and (2) technological change. The second term expresses the effect of "pure growth", holding sectoral labour productivities and the structure constant. It is in other words the effect of

\(^2\) This identity was first used by one of the authors to estimate the employment implications of India's manufactured exports. See Banerji (1975).
capital widening and measures the change in employment associated with a change in the volume of output. The third term expresses the effect of change in the structure of production within the industrial sector, holding sectoral productivities and overall growth constant. The final term is the cross-effect term; it describes the combined effect of all three factors working simultaneously.¹

II. Empirical Evidence

One can hardly think of two countries more dissimilar than India and Taiwan. India is a large country in which economic self-reliance is the cornerstone of development policy. Taiwan is a relatively small country, and accordingly relies heavily on international trade. In pursuit of self-reliance, India has laid particular stress on import-substitution in the industrial sector. The policies which underlie this goal are typical of those adopted elsewhere in promotion of import-substitution: overvalued exchange rate, foreign exchange control, import quotas and tariffs, investment steering and a general reliance on non-market allocation mechanisms. The devaluation of the rupee in 1966 and the subsequent liberalization of trade policies have increased India's exports noticeably, although without having any perceptible influence on the structure of output or industrial employment.²

Taiwan also embarked on a policy of import-substitution in the early phase of industrialization after the second world war, but found the limits to this approach quickly reached in such a small economy. Beginning around 1960 a major revision of policy from an inward-

¹ Clearly, the cross-effect term will normally be large in an economy simultaneously experiencing changes in labour productivity, growth and structure of production, making it impossible to use the identity results as a basis for attributing the observed employment expansion to one factor or another. At the outset it is, therefore, important to note that attributing change in employment to one effect or another under ceteris paribus assumptions by means of the accounting identity is essentially an exercise in counterfactual hypothesizing. For this reason, the identity makes no claim to providing an explanation of employment growth; rather, it helps to isolate the likely areas of explanation.

² See Banerji (1975).
towards an outward-oriented approach was undertaken. The foreign exchange rate was devalued, non-market controls in the external and domestic sectors were relaxed and direct incentives for export expansion were provided. Since 1966 the country has witnessed nothing short of a boom in manufactured exports.

The achievements of the two countries in alleviating unemployment and promoting expansion of industrial employment have been equally dissimilar. The rate of unemployment in India is high and rising; in Taiwan it is low by Indian standards and since 1963 has been falling (see Table I). In Taiwan the rate of industrial employment growth has consistently exceeded the rate of growth of the labour force; however, only after 1966, the period of export boom, was the rate of expansion sufficient to absorb the bulk of unemployed.

The identity results presented in Tables II and III provide some clues as to why the experience of these two countries has been so different.

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1 The unemployment statistics in India are notoriously hard to come by which is perhaps not surprising for a country of India's size where nearly three-fourths of the working population are directly or indirectly engaged in agriculture and related activities. The data presented in Table I are from the Employment Exchange Statistics. The employment figures relate to total employment in the organised sector (covering all establishments in the public sector and non-agricultural establishments employing 10 or more workers in the private sector) of the economy. The unemployed are work seekers registered at the Employment Exchanges. The rate of apparent unemployment is estimated by expressing the number of job seekers as a percentage of the sum total of employed and job seekers. Because of well known shortcomings involved in using the employment exchange data, the above figures provide only a gross indicator of the size and direction of unemployment.

2 It is necessary to outline briefly the limitations of the underlying data. In Taiwan's case, output and employment figures are taken from industrial censuses for all years; output values (labour productivity) have been expressed in constant terms using industrial branch price indexes as deflators. In the case of India, the results for the two periods are, strictly speaking, not comparable because of changes in

Continued on next page
Table I

APPARENT UNEMPLOYMENT IN INDIA AND TAIWAN

<table>
<thead>
<tr>
<th>Year</th>
<th>Employed (millions)</th>
<th>Unemployed (millions)</th>
<th>Unemployment Rate (%)</th>
<th>Year</th>
<th>Employed (thousands)</th>
<th>Unemployed (thousands)</th>
<th>Unemployment Rate (%)</th>
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<td>7.6</td>
<td>28.8</td>
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<td>69 622</td>
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<td>36 812</td>
<td>7 824</td>
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<td>7 979</td>
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<td>4 922</td>
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<td>8 014</td>
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<td>-6 091</td>
<td>970</td>
<td>-7 313</td>
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<td>-15 549</td>
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<td>80 549</td>
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<td>32 156</td>
<td>-18 474</td>
<td>16 335</td>
<td>57 255</td>
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<td>123 160</td>
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<td>9 123</td>
<td>-11 527</td>
<td>-11 000</td>
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<td>2 106</td>
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<td>5 167</td>
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<td>-7 201</td>
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<td>8 655</td>
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<td>-6 815</td>
<td>3 386</td>
<td>9 454</td>
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<td>-41</td>
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<td>2 356</td>
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<td>-19 750</td>
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<td>-331</td>
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<td>95</td>
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<td>92</td>
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<td>34 585</td>
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<td>6 884</td>
<td>-13 560</td>
<td>2 072</td>
<td>29 081</td>
<td>-10 730</td>
<td>17 062</td>
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<td>8 052</td>
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<td>-8 101</td>
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<td>793</td>
<td>8 063</td>
<td>-1 082</td>
<td>12 793</td>
<td>-2 748</td>
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<tr>
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<td>-9 169</td>
<td>25 103</td>
<td>16 579</td>
<td>-26 673</td>
<td>2 463</td>
<td>-8 196</td>
<td>3 039</td>
<td>14 919</td>
<td>-7 298</td>
<td>18 568</td>
<td>-12 786</td>
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<td>15 112</td>
<td>-4 590</td>
<td>16 336</td>
<td>-7 076</td>
<td>24 982</td>
<td>12 227</td>
<td>-15 860</td>
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<td>-10 239</td>
<td>19 485</td>
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<td>9 044</td>
<td>-2 276</td>
<td>45 003</td>
<td>-2 352</td>
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**Notes:**

| a | Total change | 135 286 | -104 850 | 67 786 | 352 909 | -180 533 | 137 919 | -112 054 | 105 890 | 323 704 | -181 622 | 608 933 | -166 475 | 166 600 | 1032 266 | -429 458 |
| b | Average annual change | 19 327 | -16 978 | 9 683 | 50 416 | -23 793 | 27 583 | -21 511 | 21 178 | 65 140 | -36 324 | 121 787 | -32 095 | 33 320 | 206 453 | -65 892 |
| c | (b) as a % of average annual employment | 5 18 | -4 02 | 2 59 | 13 32 | -6 92 | 5 41 | -4 39 | 6 15 | 12 79 | -7 10 | 13 75 | -3 68 | 3 77 | 23 39 | -9 73 |

**Sources:**

### Table III

**DECOMPOSITION ANALYSIS OF INDUSTRIAL EMPLOYMENT EXPANSION IN INDIA**: 1950 - 1969

(Unit: 100 man-years)

<table>
<thead>
<tr>
<th>ISIC Sector</th>
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<th></th>
<th></th>
<th></th>
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<td></td>
<td>Employment</td>
<td>Productivity Change</td>
<td>Structural Change</td>
<td>Pure Growth</td>
<td>Cross Effect</td>
<td>Employment</td>
<td>Productivity Change</td>
<td>Structural Change</td>
<td>Pure Growth</td>
<td>Cross Effect</td>
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<td></td>
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<td>566.49</td>
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<td>1128.70</td>
<td>-442.50</td>
<td>1886.40</td>
<td>1049.06</td>
<td>-364.26</td>
<td>1128.70</td>
<td>-442.50</td>
<td>1886.40</td>
<td>1049.06</td>
<td>-364.26</td>
</tr>
<tr>
<td>39 Miscellaneous</td>
<td>1535.24</td>
<td>-315.52</td>
<td>444.41</td>
<td>366.20</td>
<td>-373.34</td>
<td>1535.24</td>
<td>-315.52</td>
<td>444.41</td>
<td>366.20</td>
<td>-373.34</td>
</tr>
</tbody>
</table>

| a) Total change              | 1880.60     | -404.19  | 62.27    | 9865.64  | -366.12  | 1880.60   | -404.19   | 62.27    | 9865.64 | -366.12 |
| b) Average annual change     | 235.10      | -525.00  | 7.80     | 210.70   | -457.90  | 235.10    | -525.00   | 7.80     | 210.70  | -457.90 |
| c) (b) as a % of average annual employment | 1.37      | -3.04    | 0.05     | 7.01     | -2.65    | 1.37      | -3.04     | 0.05     | 7.01   | -2.65 |

1. Organised sector only.

**Sources:**
1. Census of Indian Manufactures, Directorate of Industrial Statistics, Cabinet Secretariat, Calcutta, various issues
2. Annual Survey of Industries, Central Statistical Organisation, Cabinet Secretariat, Calcutta, various issues
A comparison of development in the two countries reveals that on an average annual basis industrial employment expansion in Taiwan has been faster than in India. It is clear from Table II that the elimination of unemployment as a serious economic problem in Taiwan was the consequence of the tremendous export boom which commenced in the mid-1960s. In neither the import substitution phase (1954-1961) nor the policy reorientation phase (1961-1966) was the rate of expansion sufficient to absorb the bulk of unemployed (approximately 10 per cent of the labour force). In both India and Taiwan, the primary source of employment expansion in the periods examined was capital accumulation. In both countries, as the pure growth effect suggests, the growth of industrial output in each period would have been associated with much faster expansion in employment than actually has been the case, if labour productivity had not changed. On the other hand, it is obvious that a rate of expansion of 27 per cent in Taiwan in the 1966-1972 period due to "pure growth" (under ceteris paribus assumption) would have been precluded by labour supply constraints. In India the rate of expansion due to pure growth, however, in neither period reached a rate sufficient to bring the labour supply constraint into force.

Second, it is observed that structural change, which as we have noted is a principal target of industrialization policy, can have a

Footnote continued from previous page

statistical coverage. Unlike Taiwan, the periods in India do not indicate different policy phases, but are chosen purely for reasons of statistical convenience. The 1950-1958 figures are from the Census of Manufactures covering about 46 per cent of the industries and only those factories which employed 20 or more workers and used power. The 1960-1969 figures are from the Annual Survey of Industries, covering all industries but only factories employing 50 or more workers with the aid of power or 100 and more workers without the aid of power. The relatively smaller units, in other words, are left out. This, however, is not a serious omission since nearly 85 per cent of India's total factory employment is nevertheless covered by these statistics. The output data have been deflated by the indexes of wholesale manufacturing prices. ("Index Numbers of Wholesale Prices in India", Office of the Economic Advisor, Government of India, New Delhi.)
very significant impact on industrial employment expansion. In the case of Taiwan we find that, had technology remained constant, changes in the structure of production alone would have increased employment by 4.15 per cent per annum in the 1961-1966 period. This was the phase of policy reorientation during which obstacles were removed and incentives were provided to entrepreneurs to exploit comparative advantages in world markets. The period of intensive comparative advantage exploitation (1966-71) witnessed an equally strong structural change effect, having favourable implications for Taiwan's employment. Interestingly, even during the import substitution phase in Taiwan (1954-1961) structural change was on the average in favour of relatively labour-intensive branches.\(^1\)

One observes that during the early phase of import substitution in India (1950-1958) structural change was likewise in favour of relatively labour-intensive branches, although the relative magnitude of the shift was considerably less than in Taiwan. The extent of import substitution in Taiwan in the 1950s was of course less than in India. These results stand in contrast to the experience of India in the 1960s when structural change moved clearly in the direction of relatively capital-intensive (low \(L/X\)) branches. This reversal in the direction of structural change in India is perhaps explained by India's progression into a more advanced stage of import substitution during which emphasis shifted from the early targets of consumer goods

\[1\] It should be noted that

\[\sum (x_i^1 - \bar{x}_i^1) = 0.\]

Therefore, the structural change component,

\[\sum \lambda_i^0 (x_i^1 - \bar{x}_i^1) \geq 0,\]

if structural change on average is labour-intensive, neutral or capital-intensive.
to the relatively more capital-intensive intermediate and capital goods sectors. The employment implications of neglecting principles of comparative advantage in pursuit of self-reliance are clearly revealed by these findings.

Strikingly disparate pattern of the capital intensity of exports from India and Taiwan provides some evidence in support of the conjecture that it is trade-development policy that has led to the differing contributions of structural change to employment creation.

Table IV

INDEX NUMBER OF THE WEIGHTED AVERAGE CAPITAL-INTENSITY
OF MANUFACTURED EXPORTS

From India and Taiwan: 1950-1970 selected years

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>(1950 = 100)</td>
<td>100.0</td>
<td>103.5</td>
<td>105.1</td>
<td>107.6</td>
</tr>
<tr>
<td>Taiwan</td>
<td>(1955 = 100)</td>
<td>-</td>
<td>100.0</td>
<td>100.9</td>
<td>95.8</td>
</tr>
</tbody>
</table>

Note: 1 Defined as $\left(\frac{K}{L}\right)_i \cdot e_i$, where $\left(\frac{K}{L}\right)_i$ is the capital to labour ratio in industry $i$; $e_i$ is the share of the $i$th industry in total manufacturing exports. The industries considered are the same as those shown in Tables II and III.


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1 Banerji (1975) presents evidence supporting this contention. Also see Bhagwati and Desai (1970), p. 108.
In Taiwan, the average capital intensity (i.e. capital to labour ratio) of manufactured exports, weighted by the sectoral shares of total manufactured exports, declined over time, particularly with the beginning of the policy reorientation phase (1960). This implied an increase in the share of labour-intensive manufactures in Taiwan’s exports to world markets. The opposite was the case in India; the weighted average capital intensity of manufactured exports from India continually increased during the period under consideration. That the industrial structure of India, influenced by government policy, displayed a distinct capital-intensive bias is further revealed by an examination of the shift in the country’s composition of industries. The index of the weighted average capital intensity of manufacturing industries, taking as weights the share of sectoral value added in total manufacturing value added, increased from 100 in 1951, to 123.8 in 1960 to 134.2 in 1968. The sign of the structural change effect already revealed the employment implications of this pattern of industrial development.

The third result concerns the impact of productivity change on industrial employment expansion. In both India and Taiwan productivity change has had a negative impact on employment expansion. This is hardly surprising; the apparent limits to technological change in the direction of more labour-intensive methods of production of a given commodity are widely known. What is interesting and perhaps surprising,

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1 For Taiwan, the sectoral capital-intensity measures include direct and indirect capital to labour ratios in production and are computed from the 1969 Input-Output Tables. For India, the capital intensities are direct capital to labour ratios and are derived from the 1965 annual survey of industries. For details see, Riedel (1975) and Banerji (1975).

2 The sectoral value added shares were computed from the 1961, 1960 and 1968 censuses of Indian industries and refer only to the organised sector of the industrial economy.
however, is that the rate of labour-productivity change in both countries has remained remarkably constant over time. This has occurred despite contrasting experience in wage movements in the two countries (see Table V).

Table V

MANUFACTURING WAGE MOVEMENT IN INDIA AND TAIWAN
(compound annual growth)

<table>
<thead>
<tr>
<th></th>
<th>India</th>
<th>Taiwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>Nominal Wage</td>
<td>Real Wage</td>
</tr>
<tr>
<td>1950-1958</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td>1961-1969</td>
<td>7.0</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources: Indian Labour Statistics, Labour Bureau, Department of Labour and Employment, Government of India; various issues.

In India while the growth of nominal wages accelerated over time that of real wages decelerated. In Taiwan, real wages have increased over time at a steadily increasing rate, although the course of nominal wages has been more erratic due to differences in inflation rates in different periods. In the light of these observations, a plausible explanation for the constant growth of labour productivity
might be that (i) there is little allowance for technical substitut-
ability between production factors and (ii) that technological change
is exogenously determined. Both of these possibilities would imply
that relative factor prices have little influence on choice of tech-
nique. While production function investigations of aggregate indus-
tries have found a high degree of substitutability (Bruton, 1973, p. 7),
studies of more narrowly defined products have generally found the
scope for substitution to be extremely limited, existing primarily in
peripheral or ancillary activities (Morawetz, 1974, p. 520). The
implication of this evidence, circumstantial though it is, is that
industrialization policies bearing on the choice of industry may have
a greater influence on factor proportion problems in developing coun-
tries than those related to the choice of techniques per se.

III. Summary and Conclusions

The evidence presented in this paper supports in general the
contention that outward-looking policies favour a faster expansion of
industrial employment than do inward-looking policies. The primary
source of employment expansion in both India and Taiwan was capital
accumulation, which was offset in both countries by the negative
effect of productivity change.

In Taiwan, the significant positive effect of structural change
in favour of relatively labour-intensive branches was an additional
impetus to employment expansion. In India, on the other hand, in
pursuit of economic self-reliance, the structure shifted towards
relatively capital-intensive industries thereby hampering employment
expansion.

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1 Note, however, that relative prices may still affect the choice of
industries. It may well be, for instance, that the artificial
cheapening of capital relative to labour favours the choice of
capital-intensive industries rather than the choice of capital-
 intensive techniques.
The experience of Taiwan does not, of course, readily lend itself to the solution of India's employment problems. Perhaps only in a small open economy which faces a very elastic demand in world markets is employment expansion at a rate such as occurred in Taiwan possible. In a closed economy an acceleration in the rate of growth must be accompanied pari passu by shifts in the structure of production into intermediate and capital goods branches. In an open economy no such domestic transformation in structure is required as the necessary intermediate and capital goods can be acquired with the proceeds from exports. In India, the share of manufacturing employment in the total being about 12 per cent, industrial output would have to increase by at least 25 per cent per annum just to absorb a three per cent annual increase in the labour force - assuming labour productivity remained constant. Such an expansion would entail a shift in industrial structure which is clearly in excess of anything feasible. Indeed, if, as evidence suggests, intermediate and capital goods branches tend to be relatively capital intensive (Riedel, 1975), the rate of expansion and the magnitude of structural change would have to be significantly greater than 25 per cent per annum in order to keep pace with the growth of the labour force. The upshot is that industrial employment expansion per se will not provide the solution to India's unemployment problem as was the case in Taiwan. Clearly the solution to the problem cannot be divorced from its magnitude.

This conclusion does not, however, mitigate the importance of adopting industrialization policies which at least work in the right direction. It is in this regard that the experience of Taiwan holds some relevance for the problems of India, and that a comparison of the process of industrial expansion in the two countries yields some lessons for other countries. Surely India's employment problem will not be solved by emulating the experience of Taiwan. But it is probably safe to conclude that unless Indian planners pay more heed to principles of comparative advantage in designing industrialization policy, the employment problem will only worsen in that country.
Before closing we would like to re-emphasise the important point that the conclusions drawn above are based on an identity which in itself provides no explanations of employment growth. In fact, we know that the three "effects" we have attempted to isolate interact in many important ways. The presence of large cross-effect terms in particular implied that in both countries the changes in labour productivity, growth and industrial structure occurred simultaneously. Attempts to isolate them, as we did with the help of an identity, represented, therefore, no more than counterfactual hypothesizing. In this light the results presented here are perhaps of greatest value in pointing the direction for future research. In particular, our findings suggest that structural change within the industrial sector is an area which deserves much more attention than it has heretofore received in addressing the issues of employment in developing countries.
References


