Inter-sectoral Linkages

RESOURCE FLOWS BETWEEN AGRICULTURE AND NON-AGRICULTURE: CRITIQUE OF AN ESTIMATE

Ashoka Mody*

The direction and magnitude of resource flows between agriculture and non-agriculture is an important determinant of the pattern of development. It is surprising, therefore, that there has been only one comprehensive attempt, that by Mundle, to estimate the resource flows between agriculture and non-agriculture during post-Independence India.¹ Mundle's estimates show a net flow of funds into the agricultural sector during the 1950s, but a net outflow of funds from the agricultural sector during the 1960s. Certain independent estimates made by me, based on a methodology different from Mundle's, show that even during the 1960s the flow of funds was into the agricultural sector.² It is proposed, therefore, to examine in this paper the methodology adopted by Mundle and point out some of its biases. Some theoretical implications of the concept of resource transfer used by Mundle are briefly discussed first. This is followed by an examination of the empirical issues.

THE FLOW OF COMMODITY SURPLUS APPROACH AS A MEASURE OF INTER-SECTORAL RESOURCE FLOWS³

To measure the resource flows between agriculture and non-agriculture, Mundle has used the flow of commodity surplus approach, or what is also described as the balance of trade approach. According to this approach, the resource flow from the agricultural sector (R) is the difference between exports of goods and non-factor services of the agricultural sector (E) and its corresponding imports (M), i.e.,

\[ R = E - M. \]

If there are no inter-sectoral factor payments,

\[ R = E - M = Y_A - C_A - I_A, \]

where \( Y_A \), \( C_A \) and \( I_A \) are the income, consumption and investment of the agricultural households. The resource flow from the agricultural sector is, therefore, measured as the difference between the income of agricultural

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2. This is one of the results of the author's M. Phil. thesis being currently finalised.

3. For simplicity, the discussion in this section abstracts from on-farm non-agricultural activities. These may easily be incorporated into the analysis without altering the basic results.
households and their expenditure on consumption and investment. This probably is the concept Mundie has in mind.

If, however, inter-sectoral factor payments exist, the income of the farm households is their income from agriculture plus net factor payments received from non-agriculture. The consumption and investment decision of the farm households would then be based on their total income and not just on agricultural income. In such a situation, an inconsistency arises in the balance of trade approach. It may be seen that,

\[ E = \text{Agricultural product Gross of current input (} X_A \text{) - self-consumption (} C_s \text{) - self-investment (} I_s \text{) - self-supplied current input (} I_a \text{).} \]

and

\[ M = \text{Purchased current input (} I_{cp} \text{) + purchased fixed capital investment goods (} I_{fp} \text{) + purchased consumption goods and services (} C_p \text{).} \]

Also,

\[ X_a = \text{Income from agriculture (} Y_A \text{) + } I_{cs} + I_{cp}. \]

It follows, therefore, that

\[ R = E - M = Y_A - (C_s + C_p) + (I_s + I_{fp}). \]

The total consumption of the farm households (\( C_F \)) is equal to \( C_s + C_p \) and the total investment of the households (\( I_F \)) is equal to \( I_s + I_{fp} \). Hence,

\[ R = Y_A - C_F - I_F. \]

The inconsistency arises on account of farm household consumption and investment being deducted from agricultural income as against total farm household income. The inconsistency may be removed by redefining ‘\( R \)’ as

\[ R = Y_A - C_a - I_a, \]

where \( C_a \) and \( I_a \) are consumption and investment expenditures from only the income derived from agriculture. A break-up of consumption and investment expenditure according to income sources is conceptually not meaningful. In any case, it has not been empirically attempted by Mundie, who estimates the total imports and exports of the agricultural sector and not just what would be traded if there were no factor payments.

A further conceptual difficulty with the balance of trade approach is that it does not account for indirect taxation. Since indirect taxes result only in a change of relative prices, their effects on ‘real’ resource transfer cannot be measured through the balance of trade accounting framework. This may be brought out by assuming a situation in which there are no factor service payments, current or capital transfers between the two sectors, and indirect taxes are levied only on non-agricultural goods. At least a portion of the indirect tax levied on the non-agricultural goods consumed by the agricultural sector may be assumed to be shifted on to the agricultural consumers. The trade account would, however, be balanced, thereby showing no net flow in either direction. It is clear, however, that the indirect tax results in a real resource transfer from agriculture, since it reduces the real purchasing power of the agricultural sector. Mundie has deflated exports and imports by the relevant price indices to measure resource flows in terms of base year.

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prices. In doing so he has indirectly taken into account changes in resource flows due to changes in indirect taxes. There, however, still remains the problem of accounting for the indirect tax burden on agriculture in the base year. A solution to this problem would be to value the exports and imports of the agricultural sector at border prices, net of indirect tax, and add on the indirect tax burden of agriculture to the trade balance. The total resource flow \( R' \) would then be

\[
R' = E - M + \text{Indirect tax burden of agriculture.}^5
\]

These conceptual problems must be borne in mind when interpreting Mundle’s results.

THE EMPIRICAL ISSUES

The flow of commodities between the agricultural and non-agricultural sectors involves the building up of the flows of consumer goods, intermediate goods and capital goods. Such a procedure becomes necessary because of the form of data availability. It is, however, analytically meaningful inasmuch as it provides insights into the pattern of linkages between the two sectors. The disaggregated approach allows, moreover, the making of some generalisations which are not possible at an aggregate level of flows.

Consumer Goods

Any empirical exercise on inter-sectoral consumer goods flows must be based on some assumptions. We examine below the sensitivity of the estimates to differences in the assumptions regarding the classification of the population and consumer goods as agricultural and non-agricultural. We do so on the basis of three time-series of consumer goods flows generated by Mundle. These estimates are in subsequent discussion referred to as M(I), M(II) and M(III).^6 In the construction of M(I) the implicit assumption is that the rural and urban populations coincide with the agricultural and non-agricultural populations respectively. M(II) and M(III) are, however, based on a break-up of the rural and urban populations into their agricultural and non-agricultural components. Thus, according to M(I) the resource flow into the agricultural sector \( R \) is

\[
R = N_i C_{is} - N_i C_{si},
\]

and according to M(II) and M(III) the resource flow \( R' \) is

\[
R' = (N_{ii} C_{is} + N_{is} C_{si}) - (N_{ii} C_{si} + N_{ii} C_{is})
\]

where

- \( N_i \) is the rural population,
- \( N_{ii} \) is the rural agricultural component,
- \( N_{is} \) is the rural non-agricultural component,
- \( N_s \) is the urban population,
- \( N_{si} \) is the urban agricultural component,
- \( N_{ss} \) is the urban non-agricultural component.

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5. Since \((E - M)\) valued at border prices, net of indirect tax, has no exact financial counterpart ‘\( R' \)’ may be regarded only as an ordinal measure of real resource flow.

6. M(I) and M(II) are from Mundle, Economic and Political Weekly, February 1975, op. cit., and M(III) from Mundle: The Intersectoral Transfer of Resources between Agriculture and Non-agriculture in India, op. cit.
\( C_{11} \) is the per capita consumption of agricultural goods in the rural sector, 
\( C_{12} \) is the per capita consumption of non-agricultural goods in the rural sector, 
\( C_{21} \) is the per capita consumption of agricultural goods in the urban sector, and 
\( C_{22} \) is the per capita consumption of non-agricultural goods in the urban sector.

In \( M(III) \) there is a refinement in the classification of goods. Firewood, \( pan \) and \( supari \), which are classified in \( M(I) \) and \( M(II) \) as non-agricultural goods, are reclassified in \( M(III) \) as agricultural goods. Thus a comparison of \( M(I) \) and \( M(II) \) enables one to analyse the sensitivity to population classification, whereas the sensitivity to goods classification may be judged by comparing \( M(II) \) and \( M(III) \).

The estimation procedure involves the blowing-up of per capita expenditure estimates by population figures. A variation in either the population or the per capita estimates, therefore, changes the magnitude of net flows. It may be seen from Table I that all the three estimates show a net import of consumer goods into agriculture. \( M(II) \), however, shows a considerably smaller net import than \( M(I) \). This follows from the fact that the rural

**Table I—Net Flow of Consumer Goods into the Agricultural Sector according to Different Assumptions**

<table>
<thead>
<tr>
<th>Year</th>
<th>( M(I) )</th>
<th>( M(II) )</th>
<th>( M(III) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1951-52</td>
<td>2,666.5</td>
<td>1,752.33</td>
<td>1,030.10</td>
</tr>
<tr>
<td>1952-53</td>
<td>2,493.2</td>
<td>1,667.76</td>
<td>962.54</td>
</tr>
<tr>
<td>1953-54</td>
<td>1,896.9</td>
<td>1,152.70</td>
<td>632.96</td>
</tr>
<tr>
<td>1954-55</td>
<td>1,672.2</td>
<td>1,063.33</td>
<td>511.48</td>
</tr>
<tr>
<td>1955-56</td>
<td>2,011.9</td>
<td>1,239.42</td>
<td>539.66</td>
</tr>
<tr>
<td>1956-57</td>
<td>1,755.4</td>
<td>997.93</td>
<td>317.39</td>
</tr>
<tr>
<td>1957-58</td>
<td>2,149.4</td>
<td>1,284.52</td>
<td>529.62</td>
</tr>
<tr>
<td>1958-59</td>
<td>2,311.5</td>
<td>1,361.37</td>
<td>507.64</td>
</tr>
<tr>
<td>1959-60</td>
<td>2,433.2</td>
<td>1,463.71</td>
<td>548.35</td>
</tr>
<tr>
<td>1960-61</td>
<td>2,918.7</td>
<td>1,659.91</td>
<td>630.03</td>
</tr>
<tr>
<td>1961-62</td>
<td>2,658.2</td>
<td>1,560.35</td>
<td>587.22</td>
</tr>
<tr>
<td>1962-63</td>
<td>—</td>
<td>—</td>
<td>512.58</td>
</tr>
<tr>
<td>1963-64</td>
<td>2,841.0</td>
<td>1,718.68</td>
<td>460.07</td>
</tr>
<tr>
<td>1964-65</td>
<td>2,934.5</td>
<td>1,522.51</td>
<td>650.43</td>
</tr>
<tr>
<td>1965-66</td>
<td>—</td>
<td>—</td>
<td>623.42</td>
</tr>
<tr>
<td>1966-67</td>
<td>—</td>
<td>—</td>
<td>694.12</td>
</tr>
<tr>
<td>1967-68</td>
<td>3,326.8</td>
<td>1,702.9</td>
<td>831.46</td>
</tr>
<tr>
<td>1968-69</td>
<td>—</td>
<td>—</td>
<td>949.46</td>
</tr>
<tr>
<td>1969-70</td>
<td>—</td>
<td>—</td>
<td>1,039.99</td>
</tr>
<tr>
<td>1970-71</td>
<td>—</td>
<td>—</td>
<td>1,111.83</td>
</tr>
</tbody>
</table>

**Source:** \( M(I) \) and \( M(II) \) are from Mundle, *Economic and Political Weekly*. February 1975, *op. cit.*, and \( M(III) \) from Mundle: *The Intersectoral Transfer of Resources between Agriculture and Non-agriculture in India*, *op. cit.*

7. All estimates are based on NSS consumption expenditure data. \( M(III) \) has, however, been adjusted for consistency with the CSO consumption expenditure estimates. The justification for doing so is debatable. For our purpose, it may be pointed out that adjustment does not make an appreciable difference to the magnitude of the net imports into agriculture.
population is significantly larger than the agricultural population, and correspondingly, the urban population is smaller than the non-agricultural population. The appreciable difference is a warning that the rural population may not be substituted for the agricultural population. Similarly, a minor change in the per capita expenditures \( (i.e., C_{11}, C_{12}, C_{21}, C_{22}) \) makes a substantial difference to net flows. The per capita expenditures change as a result of the re-classification of commodities as agricultural and non-agricultural. It will be noted that \( M(\text{III}) \) is much lower than \( M(\text{II}) \) although commodities (firewood, \textit{pan} and \textit{supari}), which account for only about 5 per cent of the rural per capita consumption expenditure and less of urban consumption expenditure, were re-classified.

The consumption expenditure estimates are derived from the National Sample Survey (NSS). In view of the extreme sensitivity of the estimates of net flow to changes in per capita expenditures, it is necessary to examine how the biases in the NSS data influence the magnitude of the flows. Two well-known criticisms of the pattern of expenditure reflected by the NSS studies are that: (1) they over-estimate the per capita expenditure on foodgrains and (2) they under-estimate the per capita expenditure on products typically consumed by the rich, such as consumer durables. These contentions are based on a comparison of total consumer expenditure as reflected by the NSS and the production and trade figures independently arrived at. An over-estimate of the per capita foodgrains consumption would imply that the value of the exports of the agricultural sector should be lower than that reflected by the NSS data; and correspondingly, an under-estimate of per capita durable goods consumption would imply that the value of imports of the agricultural sector should be higher than the NSS based figure. Both these biases reinforce each other and suggest greater net imports into agriculture than shown by Mundle’s figures.

In estimating the balance of trade, Mundle uses \( M(\text{III}) \) for the consumer goods component. Among the three estimates of consumer goods flows, \( M(\text{III}) \) incorporates the most refined classification of population and commodities. Thus it is unlikely that the errors arising from the NSS data bias are nullified by a misclassification of population and commodities.

\textit{Intermediate Goods}

Using a methodology very different from Mundle’s, we constructed a time-series of the net flow of intermediate goods. This series was found to be in close agreement with Mundle’s. The estimates show a large net outflow from the agricultural sector.

9. It is assumed, of course, that the distortions in the NSS data apply to both the rural and urban areas, though not necessarily in equal degree.
10. Mundle: The Intersectoral Transfer of Resources between Agriculture and Non-agriculture in India, \textit{op. cit.}
11. Author’s M. Phil. thesis.
Capital Goods

The export of capital goods by the agricultural sector may reasonably be assumed to be negligible. The import of capital goods, though a small fraction of the imports of all producer goods, is not insignificant. Mundle has estimated the import of capital goods into the agricultural sector on the basis of disaggregated estimates of capital formation in agriculture. Mundle has assumed that the entire labour component of capital formation is provided by the agricultural households. This may be a good approximation in the case of private capital formation in agriculture. The assumption may, however, not be a valid one in the case of public investment in agriculture. To the extent the labour for public investment projects is drawn from non-agricultural households, Mundle under-estimates the resources being withdrawn from the non-agricultural sector for capital formation in agriculture. The under-estimation would be equivalent to the amount of wage goods that the non-agricultural households working on public investment projects would command as a result of wage payments received.

SOME CONCLUDING OBSERVATIONS

In terms of the discussion in the first section, it appears that Mundle has not accounted for indirect taxation in any systematic fashion and has, therefore, under-estimated the resource flow from the agricultural sector.

The empirical exercise, on the other hand, under-estimates the flow into the agricultural sector in regard to (a) consumer goods and (b) public capital formation in agricultural. A further deficiency of the empirical exercise, which was not discussed above, and which also leads to the under-estimation of the resources flow into agriculture is non-consideration of public expenditure on schemes of agricultural improvement and research, co-operation, community development, etc., and the various subsidies.

INTER-SECTORAL TERMS OF TRADE IN INDIA, 1947-78

M. S. Rathore, A. L. Nadda and V. K. Singh*

One way of attaining higher and faster rate of growth and development of the economy is that the agricultural sector supports the industrial sector, i.e., net resources flow out of the agricultural sector into industry. In support of it, a prime example of economic development of Japan and Soviet Union is cited. However, in a general sense, it is being argued that the State’s ability

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