This note inquires into the relationship between country size and comparative advantage. Having indicated the inappropriateness of an approach to the problem by D.B. Keesing in the June 1963 issue of the American Economic Review, the author presents alternative formulations to demonstrate that small countries are at a disadvantage in the international trade of manufactured goods. Further statistical tests are offered to indicate that, within the manufacturing sector, small countries tend to have a comparative advantage in semimanufactures and a disadvantage in finished manufactures. The results hold for a group of countries including developed and developing nations, as well as for a group comprising developed countries only.

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Country Size and Trade Patterns: A Note
Bela Balassa

In the June 1968 issue of the *American Economic Review*, D.B. Keesing has advanced the proposition that small countries are at a disadvantage in the international trade of manufactured goods because their limited national markets restrict the possibilities of exploiting internal and external economies. According to Keesing, this "size effect" would give rise to a positive correlation between per capita exports of individual categories of manufactured goods and population, while a negative correlation would obtain between per capita imports and population. In turn, an "income effect" is said to exist if the partial regression coefficient of per capita exports and imports with respect to income per head exceeds unity.

Having tested for the size effect in a cross-section analysis of 31 countries in regard to 40 commodity categories, Keesing claims that "the regression results strongly confirmed the hypothesis. Small countries appeared to experience a comparative disadvantage in most of the important manufacturing industries uncompensated by a comparative advantage in others" (5, pp. 454-55). He also reports to have found a significant income effect in the relationship between per capita exports (imports) of these manufactured goods and income per head.

Following Chenery (2), the general formula used in the calculations is

\[ \log \left( \frac{X_i}{N} \right) = \log a_1 + b_{1i} \log \left( \frac{Y}{N} \right) + b_{2i} \log N + \xi_i, \]

when \( X_i \) and \( N_i \) denote the exports and imports of individual categories of manufactured goods, \( Y \) refers to gross national product, and \( N \) to population.
It is my contention that the statistical tests suggested by Keesing cannot be used to establish these propositions and, at any rate, his formulation is not appropriate for the problem at hand. I will present evidence on these points and will also formulate and test alternative hypotheses concerning the relationship between country size and trade patterns.

II

Keesing's method provides an example of the "fallacy of composition", i.e. the inappropriateness of arguing from the particular to the general. While the partial elasticity of per capita exports and imports of individual categories of manufactured goods with respect to population is statistically significant at the 5 percent level in 105 of the 160 regressions, this result may be due to influences other than the disadvantages of small countries in manufacturing industries. Thus, the observed positive correlation between per capita exports of particular categories of manufactured goods and population may be explained by the fact that small countries tend to specialize in a few export products and hence only some of these countries -- or none of them -- will export any one commodity. Specialization, in turn, leads to high per capita imports of various manufactured goods and thus contributes to the observed negative correlation between per capita imports of manufactured goods and population.

To eliminate the influence on the results of the specialization of small countries in a few commodities, I have taken as the dependent variable the

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1/ Regressions have been run separately in regard to the exports and imports of the 40 commodity categories for the entire group of 31 countries and for a subgroup of 18 developed countries.

2/ Keesing raises this possibility but fails to take account of it in deriving his final conclusions.
<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Number of countries</th>
<th>Coefficients of independent variables</th>
<th>Constant term</th>
<th>$R^2$</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Y/N</td>
<td>N</td>
<td>Z</td>
<td></td>
</tr>
<tr>
<td>1. $X^m/N$</td>
<td>31</td>
<td>1.73 (7.3) 0.15 (1.0)</td>
<td>-4.05 (4.0.6)</td>
<td>0.66</td>
<td>2.22</td>
</tr>
<tr>
<td>2. $X^m/N$</td>
<td>31</td>
<td>0.79 (1.8) 0.06 (0.4) 0.93 (2.6)</td>
<td>-1.54 (16.9)</td>
<td>0.72</td>
<td>2.31</td>
</tr>
<tr>
<td>3. $X^m/N$</td>
<td>18</td>
<td>0.36 (0.6) 0.16 (1.2)</td>
<td>0.32 (3.3)</td>
<td>0.11</td>
<td>1.12</td>
</tr>
<tr>
<td>4. $X^m/N$</td>
<td>31</td>
<td>0.94 (10.9) -0.39 (6.9)</td>
<td>0.84 (22.8)</td>
<td>0.87</td>
<td>2.15</td>
</tr>
<tr>
<td>5. $X^m/N$</td>
<td>31</td>
<td>0.72 (4.3) -0.11 (7.2) 0.22 (1.6)</td>
<td>1.14 (40.2)</td>
<td>0.89</td>
<td>2.27</td>
</tr>
<tr>
<td>6. $X^m/N$</td>
<td>18</td>
<td>0.66 (1.8) -0.11 (5.2)</td>
<td>1.65 (33.1)</td>
<td>0.67</td>
<td>2.58</td>
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<tr>
<td>7. $X^m/X$</td>
<td>31</td>
<td>0.60 (3.2) 0.27 (2.2)</td>
<td>-3.33 (41.8)</td>
<td>0.32</td>
<td>1.66</td>
</tr>
<tr>
<td>8. $X^m/X$</td>
<td>31</td>
<td>0.30 (0.8) 0.24 (2.0) 0.29 (0.9)</td>
<td>-2.54 (31.8)</td>
<td>0.33</td>
<td>1.69</td>
</tr>
<tr>
<td>9. $X^m/X$</td>
<td>18</td>
<td>-0.16 (0.9) 0.38 (3.6)</td>
<td>-0.41 (5.5)</td>
<td>0.48</td>
<td>1.50</td>
</tr>
<tr>
<td>10. $X^m/N$</td>
<td>31</td>
<td>-0.05 (1.0) -0.08 (2.1)</td>
<td>0.23 (9.9)</td>
<td>0.15</td>
<td>2.43</td>
</tr>
<tr>
<td>11. $X^m/N$</td>
<td>31</td>
<td>-0.07 (0.6) -0.08 (2.1) 0.02 (0.2)</td>
<td>0.28 (11.7)</td>
<td>0.15</td>
<td>2.44</td>
</tr>
<tr>
<td>12. $X^m/N$</td>
<td>18</td>
<td>0.22 (1.1) -0.12 (2.8)</td>
<td>0.14 (41.1)</td>
<td>0.37</td>
<td>3.00</td>
</tr>
<tr>
<td>13. $X^{sm}/X^m$</td>
<td>31</td>
<td>-0.27 (5.7) -0.09 (2.8)</td>
<td>0.89 (45.3)</td>
<td>0.53</td>
<td>1.61</td>
</tr>
<tr>
<td>14. $X^{sm}/X^m$</td>
<td>31</td>
<td>-0.10 (1.2) -0.07 (2.4) -0.16 (2.2)</td>
<td>0.69 (21.3)</td>
<td>0.57</td>
<td>1.56</td>
</tr>
<tr>
<td>15. $X^{sm}/X^m$</td>
<td>18</td>
<td>-0.13 (0.7) -0.07 (1.8)</td>
<td>0.10 (13.6)</td>
<td>0.08</td>
<td>1.16</td>
</tr>
</tbody>
</table>

1/ Explanation of symbols: $Y$ = gross national product, $N$ = population, $X$ = total exports, $X^m$ = exports of manufactured goods, $X^{sm}$ = exports of semimanufactures, $M$ = imports, $M^m$ = imports of manufactured goods, $Z$ = dummy variable taking value of 1 for developed countries and zero for developing countries. All variables other than $Z$ are expressed in logs; $t$ values are shown in parenthesis.
per capita exports \( \text{equations (1) to (3)}/ \) and imports \( \text{equations (4) to (6)}/ \) of all manufactured goods rather than of individual product categories. The regression results of equations (1) to (3) give no evidence of a size effect in regard to exports, irrespective of whether we consider the 31 or the 18 country group. And while there is indication of an income effect in the 31 country group, on closer inspection this is shown to be due to the lack of homogeneity within the sample. Thus, introducing a dummy variable in equation (2) to differentiate between developed and developing countries, the income effect ceases to be statistically significant and there is even less indication of a size effect. On the other hand, the size effect, although not the income effect, appears significant in the import regressions \( \text{equations (4) to (6)}. \)

III

The differences in the results of the export and import regressions can be explained by the existence of a negative correlation between total trade per head and country size which biases downwards the regression coefficient estimated with respect to population in equations (1) to (6). In effect, manufactured exports (imports) per head -- the dependent variable in Keesing's formulation -- is the product of two ratios: the share of manufactured exports (imports) in total exports (imports) and total exports (imports) per head. These ratios are subject to different influences, and hence the

1/ Defined to include commodity classes 5 to 8 of the Standard International Trade Classification.

2/ With regard to per capita exports, the following relationship is shown (t-values in parenthesis):

\[
\log \frac{X}{N} = -0.28 + 0.06 \log \frac{Y}{N} - 0.29 \log N; R^2 = 0.83.
\]

(6.8) (10.9) (4.6)

2/ In symbols, \( \frac{X}{N} = \frac{X}{X}; \frac{X}{N} \) and \( \frac{X}{N} = \frac{X}{N}; \frac{X}{N}. \)
equations cannot provide an appropriate test of the relationship between country size and comparative advantage. For the latter purpose, I have reformulated the regressions by taking the share of the exports (imports) of manufactured goods in total exports (imports) as the dependent variable.

The results shown in equations (7) to (12) give evidence of a size effect in regard to exports as well as for imports in both country groups. There also appears to be an income effect in regard to exports in the 31 country group, but this will again disappear as we introduce a dummy variable in equation (8) to express the degree of development. This modification will, however, reduce only slightly the size effect. On the average, a doubling of the population seems to be accompanied by a one-fourth increase in the share of manufactured goods in total exports while the increase is nearly two-fifths if we consider the developed country group. The magnitude of the size effect, as well as the explanatory power of the regressions, is considerably smaller in the case of imports.

It would appear, then, that small countries are at some disadvantage in the international trade of manufactured goods although the size effect explains only a relatively small part of intercountry variations in trade patterns. The existence of a size effect provides support of Linder's hypothesis that production for domestic markets is a precondition for exporting manufactures (6, p.87), since large countries are in an advantageous position in producing manufactured goods subject to economies of scale. The

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1/ The explanatory power of the regressions is, however, lower than in the case of equations (1) to (6) where the positive correlation between income and exports (imports) raised the value of the correlation coefficients.

2/ Deviations from zero rather than from one are relevant in this case since the dependent variable is now expressed in terms of relative shares while in the previous formulation it was expressed in per capita terms.
results also support the thesis that small countries tend to gain the most from trade liberalization and from regional integration (1).

IV

But manufactured products is a heterogenous category and, from the point-of-view of international specialization, a distinction should be made between semimanufactured goods and finished manufactures. Semimanufactures are mostly standardized commodities produced in single-product firms which require neither a vast array of suppliers of parts and components nor extensive selling and merchandizing efforts in foreign markets. In turn, finished manufactures are differentiated products which may involve vertical as well as horizontal specialization in the production process, and their exportation necessitates considerable effort and expense in selling abroad. Within the manufacturing sector, therefore, we may expect small countries to have a comparative advantage in semimanufactures and a disadvantage in finished manufactures.

This hypothesis, first advanced by Jacques Drèze with regard to Belgium (3,4), restricts the validity of Linder's proposition to finished manufactures because standardized semi-products will not generally require the availability of a home market. In fact, we find numerous examples, in countries as diverse as Belgium, Hong Kong and Portugal, that domestic consumption plays only a supplementary role as market outlet for standardized manufactures. In all such cases, products conforming to certain specifications can be sold in international markets at the going price.

To test this hypothesis, I have introduced the share of semimanufactures in the exports of manufactured goods as a dependent variable, using the same
The results shown in equations (13) to (15) provide evidence of a size effect, indicating that small countries tend to have a comparative advantage in exporting semimanufactures and a disadvantage in exporting finished goods. On the average, the ratio of exports of semimanufactures to all manufactures falls by 7 percent as population doubles. Again, there is no indication of an "income effect" if we differentiate between developed and developing countries.

I have indicated that information pertaining to individual commodity categories cannot be used to demonstrate the existence of a "size effect" and an "income effect" in international trade, and have also shown that equations incorporating per capita exports (imports) of manufactured goods as a dependent variable do not permit us to derive conclusions concerning the pattern of international specialization. Introducing alternative formulations of the problem, I have offered evidence on the existence of a size effect which creates disadvantages for small countries in the international trade of manufactured goods. Further statistical tests have been provided to indicate that, within the manufacturing sector, small countries tend to have a comparative advantage in semimanufactures and a disadvantage in finished manufactures. The conclusions provide support of the thesis that small countries are likely to gain the most from trade liberalization and regional integration because they will thereby tend to have their opportunities equalized with those of large nations.

1/ In defining semimanufactures and finished manufactures, I relied on the classification scheme suggested by UNCTAD (7).
References


7. UNCTAD, The Definition of Primary Commodities, Semi-manufactures, and Manufactures, July 2, 1965 (mimeo).