Structure of Belgium's comparative advantage vis-à-vis the developing world

— A tentative classification of industries (*) —

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I. INTRODUCTION

The objective of this paper is to make a tentative identification of the industries for which Belgium has comparative advantages and disadvantages with respect to the developing world as a whole.

The resource-allocation implication of the notion of comparative advantage makes it particularly attractive as a guideline in the choice of an inter-industry mix that will optimize economic efficiency internally as well as internationally. But the neo-classical version of the model has undergone so many revisionist pressures — some of which quite consistent both conceptually and empirically — that it cannot be relied

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upon in its simple version to function as a reliable, operational guide. The current state of the art has been surveyed elsewhere, (see for example Hufbauer [5] and Stern [24]), and needs no repetition here. The main thrust of this revisionist upsurge has been in empirically demonstrating that both «new» production factors and «demand-related variables» have in addition to the neo-classical precepts, considerable relevance in explaining the commodity-composition of trade between countries. From the neo-factor proportions side, or more appropriately from the production side, the additional variables introduced include human capital [Leontief, 18], [Keesing, 16], [Waehrer, 34], [Roskamp and McMeekin, 22], [Hufbauer, 15], [Vanek, 32] and [Naya, 20] and technological lead [Posner, 21], [Gruber, Mehta and Vernon, 11], [Hufbauer, 14], [Gruber and Vernon, 12] and [Hirsch, 13]. The analysis from the demand side has stressed mainly the preference similarity [Linder, 19] or the availability of differentiated or varied products [Barker, 3], [Snape, 23] the importance of both of which is believed to be empirically confirmed by the increasing intra-industry trade flows between high income countries [Balassa, 1], [Grubel, 7 and 8], [Grubel and Lloyd, 9 and 10]. A few studies have attempted to combine the two sides of the Marshallian scissors in explaining the commodity composition of trade between countries. Considering exports and foreign investments as separate stages in the same dynamic process by which firms which have introduced demand-induced new products try to retain their monopolistic advantage by expanding to foreign markets, Vernon [33] argued that the comparative advantage of the developing countries could be also in the exports of standardized manufactured products, some of which might be capital-intensive. On the basis of the results of a study of Belgium’s trade with her E.E.C.-partners, Jacques Drèze [4 and 5] argued that the interaction between scale economies and product differentiation that is characteristic of particular national markets has an important impact on the determination of the commodity composition of trade between countries. A recent investigation [Tharakan et al. 25] of the penetration of manufactures from the developing countries in the European markets confirm that in addition to the factor proportions variables, the variables of product differentiation and standardization are of some importance in explaining the market share obtained by the developing countries in high income countries. The special relevance of the last two studies for the current investigation is that the structure of Belgium’s trade in manufactures appears to share one characteristic with that of the developing countries: both tend to specialize in standardized products which makes it possible for them to reap the economies of scale which are not provided by their limited national markets. Consequently, in determining the comparative advantage and disadvantage of
Belgium vis-a-vis the developing world, the impact of the standardization variable appears to be largely neutralised [Tharakan et al, 25].

The empirical demonstration of the relevance of a certain set of variables in explaining the commodity composition of trade between countries is one thing; but the derivation of a consistent model of their welfare implications is quite another. Further, while the weight which the national planners and policy makers would be willing to give a particular determinant need not correspond to the welfare maximization criteria of the neo-classical model, neither is it certain that it will correspond to that of a new, modified model. These considerations, as well as the principal characteristics of the Belgian economy (high physical and human capital endowment, low natural resource availability) have induced us to concentrate on a few neo-factor proportions variables with relatively well-known normative implications. These variables are: capital stock per man, the value added per man as a proxy for capital-intensity (with a distinction being made between total value added and non-wage value added) and natural resource product requirements. In the ensuing sections of this paper, we shall briefly present these variables, test the relevance of three of them in explaining the revealed comparative advantage of Belgium’s trade with the developing countries and subsequently isolate the industries for which Belgium has potential comparative advantages and disadvantages vis-à-vis the developing countries.

II. THE VARIABLES

A. Capital stock per man

At the very core of the neo-classical theory of comparative advantages is the proposition that the comparative advantage of a country is a function of the concordance between the pattern of the factor endowment of that land and the factor-intensities of the production processes concerned. The traditional measure of factor-intensity used has been capital stock per man in the industries or branches of industries analysed. The problems of the measurement of capital stock are well-known and need no repetition here. In a recent study [Tharakan, Busschaert, Schoofs and Vaes, 26] an attempt was made to calculate the physical capital per person of a sample of 43 Belgian industries, using balance sheet information of individual firms. The shortcomings of the approach used — mainly the differences in the depreciation and asset valuation practices of the firms, varying proportion of land in the fixed assets, differences in the sample size in the different industries, etc — are explained in the original study. The measurements of the
physical capital stock intensities obtained through this exercise, covered 34 of the products included in the sample of products considered in the present study also. While the estimates thus obtained generally corresponded to the a priori notions concerning the pattern of factor-intensities, in a number of cases, strong deviations of the capital-intensity of particular firms from the industry averages were noticed. The reasons for most of such deviations were located, but there is a danger that where the number of firms in the sample were small, the deviations would strongly distort the average (1). The Spearman rank correlation coefficient between these estimates and the rankings of industries based on the value added per employee (the ‘flow’ estimates of capital-intensity presented in the following section) was 0.56. The firms which showed strong deviations from the industry average were left-out in order to calculate new averages for the eight industries listed in the footnote. The rankings of the entire sample including the new averages yielded a Spearman rank correlation coefficient of 0.71 against the results of the value added approach.

The possibility that a particular industry might retain its comparative advantage through significant changes in the factor-intensity of the production process is, of course, of considerable interest here. Rigorously stated, such a shift in comparative advantage would require much more than changes in factor-intensities or even rankings in a given country, over time. While we shall return to the question of inter-country comparison of factor-intensity rankings, it is clear that evidence of intertemporal changes in factor-intensities can be useful first indicators in exploring the possible shifts in comparative advantages. Estimates of capital-intensity for 15 sectors in Belgium for a period of 16 years from 1955 to 1970 are available [Van den Broeck, 28] but unfortunately they are at a highly aggregative level. Nevertheless, some of the industries shown in the disaggregative approach reappear here and in any case even aggregative estimates are of some use in giving general indications of possible shifts. Hence we analysed the degree of inter-temporal stability of the rankings of the capital stock per worker in the relevant 15 sectors mentioned in the Van Den Broeck study, for the period between 1959 and 1970 and found that the «crossovers» were marginal. This apparent stability at highly aggregative levels does not, of course, say anything about possible shifts within particular sub-sectors or branches.

(1) The candidates for such distortions in the original sample of 43 industries covered were, Footwear, Biscuits, Chocolates and Sugar Goods. Cotton Spinning, Cereals, Printing Brochage and Binding, Printing of Newspapers and Periodicals and Coalmining.
B. Capital-intensity according to the flow concept

Given some of the shortcomings inherent in the capital stock estimates, it was found useful to estimate the capital-intensity of a sample of Belgian industries, using the 'flow concept' popularized by Lary [17], in which the value added per employee in manufacture was used as a proxy for the flows of both human and physical capital. The capital-intensity according to the flow concept was measured for 69 Belgian industries (2) [Tharakan, Busschaert, Schoofs and Vaes, 26]. We could also separate the non-wage value added part (which Lary considers as a good proxy for physical capital) from the total value added in manufacture. Measurements of both the 'non-wage value added' and total value added for the sample of products considered in this study are presented in the Annex (table A.1.). The Spearman rank correlation between these two measures for the original sample of 69 industries was as high as 0.97. In spite this high degree of similarity, there were some important deviations between the two sets of rankings. The most striking examples (in the original sample) of industries having lower rankings on the basis of non-wage value added than in the estimates of total value added, and thus implying a higher skilled labour content than the average, were: Clay Working, Sugar Refining, Dairy Products, Glass Manufacturing, Spinning or Carding Wool and the Chicory Industry. The most important examples of the opposite case — where the skilled labour content is relatively low — were: Jam, Candid Fruits, etc., Chocolate and Sugar Goods, Tobacco Manufactures, Sawing Mills and the sorting of Rags and Textile Waste.

Estimates of 'non-wage value added' (at more aggregative levels) were also used for an extensive, multi-country test of the possibility of factor-intensity reversals [Vandoorne, 29, 30, 31]. The results showed that the 'reversals' do occur rather extensively if you compare the rankings of 'cumulative' (direct and indirect) factor-intensities of different production processes across countries. But given the possibility of locating different stages of the production activity in different countries, the more important question from a policy point of view is whether large scale reversals of direct factor-intensities do occur. A comparison of the rankings of factor-intensities of 20 odd sectors at three digit ISIC levels for 14 countries (3) with different factor price

(2) It was calculated for each one of these industries by taking the total sales and the transfers to other establishments, deducting from it the cost of materials used, and adjusting these results for changes in inventories of finished products and of goods in processing between the first and the last day of the year.

(3) These countries were: The U.S.A., Great Britain, Sweden, Denmark, Norway, Australia, Canada, Spain, Greece, South Korea, Turkey, Egypt, Singapore and Chili.
ratios yielded a Kendall’s coefficient of concordance of 0.61. But this rather high coefficient masks a certain number of important ‘cross-overs’.

Graph-A-I in the annex shows the comparison of factor-intensity rankings between Belgium and Singapore. This is a crucial comparison as both countries approximate a free trade situation and thus minimise possible distortions. This comparison shows that Belgium is relatively more capital-intensive than Singapore in sectors such as Plastics (ISIC 356), Pottery and Clay Products (ISIC 361/69), Wood Products (ISIC 331/32), Machinery (ISIC 382/85) and Paper and Paperproducts (ISIC 341). In most of these cases, Belgium also deviates from the general pattern of relative factor-intensities in other countries.

C. Natural resource product requirement

Vanek’s proposition [32] that the natural resource endowment of a given country is a distinct and important determinant of its comparative advantage has largely survived the sharp criticisms [Travis, 27] against it and appears to be particularly relevant in the analysis of the patterns of comparative advantages and disadvantages of a natural resource scarce country such as Belgium. Vanek’s method was used to estimate the direct and cumulative natural resource product requirements for 61 Belgian sectors corresponding to the 1965 Belgian input/output classification [Tharakan, Busschaert, Schoofs and Vaes, 26]. The results pertaining to the sample of products included in the present study are given in table A.I. in the Annex.

Each product is, of course, produced with a number of inputs according to an input-structure which is approximated by the input/output tables. Some of these inputs are natural resource products (*), while others are not. Each one of these inputs, in turn, use in their production, a certain amount of natural resource products and non-natural resource products as inputs. As a result, the total or cumulative natural

\[ (*) \text{ Specified here to contain:} \]
\[ (01) \text{ agricultural, wood and forest products;} \]
\[ (02) \text{ fishing products;} \]
\[ (14) \text{ coal;} \]
\[ (16) \text{ crude petroleum and natural gas;} \]
\[ (33) \text{ iron ore;} \]
\[ (34) \text{ ores of non-ferrous metals;} \]
\[ (35) \text{ non-metallic minerals.} \]

The figures in the brackets refer to the Belgian (1965) Input/Output classifications.
resource product requirement (5) often turn out to be much higher than the direct natural resource product requirement, especially for those products at higher levels of processing. For these reasons, the cumulative natural resource product requirements is the more appropriate variable for the present analysis.

D. Revealed comparative advantage

The pattern of the comparative advantage of Belgium vis-a-vis the developing countries, which is the endogenous variable in this study, was quantified by calculating a simple, modified version of the 'revealed' comparative advantage of Belgium (6). The index of ‘revealed’ comparative advantage popularised by Balassa [2] has its shortcomings among which the most important ones are the implicit assumptions of uniformity of tastes and uniform incidence of duties on the trade flows concerned. In spite of these limitations, this index remains one of the best available measures for quantifying the verified patterns of comparative advantages between countries.

Table I in the Annex shows, for a sample of products, the measures of 'revealed' comparative advantage for Belgium, vis-a-vis the devel-

(5) The total natural resource product requirement was calculated as follows: the structure of the input/output table is defined as

\[(I-A)^x = f\]

where:

- \(I-A\) = the identity matrix minus the matrix of direct coefficients;
- \(x\) = vector of total output, and;
- \(f\) = vector of final demand.

The same structure can be also represented as

\[(I-A)^{-1} f = x\]

where:

- \((I-A)^{-1}\) = the inverse of \((I-A)\) or the matrix of the direct and indirect coefficients.
- Matrix \((I-A)^{-1}\) consists of elements \(b_{jk}\) which indicate the input of good \(i\) which is required to produce a unit of final demand of good \(k\). We are interested here only in the additional amount of natural resource products \(i\) (sectors 01, 01, 12, 16, 33, 34 and 35) that are required to produce one unit of \(k\).
- Hence the total natural resource product requirement for each of the products \(k\)

\[\text{TNRPR}_k = \sum_i i^* b_{ik}\]

(6) The indices used in the estimation of the comparative advantages in the present study can be defined as follows

\[\frac{X_{BJL DC}}{M_{BJL DC}}\]

where:

- \(X_{BJL DC}\) represents the value of the exports of Belgium of product \(j\) to the developing world in a given year, and;
- \(M_{BJL DC}\) represents the value of the imports of Belgium of product \(j\) from the developing world for the same year.
ping countries. The data pertain to the year 1970. As will be explained in
the ensuing section, 'distortions' were minimal in that year and hence
these figures probably approximate rather well the underlying pattern
of revealed comparative advantage of Belgium with respect to the third
world.

III. EMPIRICAL VERIFICATION

Having thus quantified the variables which the current state of the
tory suggests as having positive resource allocation implications, we
have empirically tested their relevance in explaining the «revealed
comparative advantage» of Belgium vis-à-vis the developing countries.
The underlying hypothesis which has been indicated in the review of
the literature presented in the introduction will be here concisely sum-
med up. In essence, it holds that in planning the policy measures for a
more optimal allocation of resources between countries of highly diffe-
ring factor endowments, the concordance of the factor-intensity/factor
endowment criterion is an important one. But it is also argued that some
of the «extended» neo-factor proportions variables, particulary the na-
tural resource requirement, which have specifiable normative implic-
tions are, relevant variables in this context. But it is stressed that
additional elements such as the possibility of factor-intensity reversals
in a limited number of cases and the deviation between the 'human' and
physical capital-intensities should be taken into consideration in deri-
ving policy oriented recommendations (7). It is further argued that the
role of the physical standardization/differentiation variable (which ap-
parently has relevance in the pattern of comparative advantages being
studied here) is largely neutralised in the present case as both Belgium
and the developing countries share to some extent, the same advantage
arising in this field. Finally it is accepted that Belgium's trade with other
high income countries, which have similar resource endowment pat-
tern, will be probably determined mainly by demand side variables, the
resource allocation implications of which are, of course, ambiguous.

The essence of the hypothesis which was thus retained was tested
using the following variation of the commonly used [Fels, 6], [Wolter,
35] regression model :

(7) Nevertheless, we remain rather agnostic about the reliability of the human capital
variable in arriving at an optimal international inter-industry mix because a number of
developing countries have high human capital endowment.
\[
\frac{X_{BjLDC}}{M_{BjLDC}} = f(K_{jB}, NRC_{jB})
\]

where:

- \(X_{BjLDC}\) = the Belgian exports of product \(j\) to the developing countries;
- \(M_{BjLDC}\) = the Belgian imports of product \(j\) from the developing countries;
- \(K_{jB}\) = capital-intensity of the process of production of \(j\) in Belgium represented, alternatively, by the value added per man and non-wage value added per man as explained below;
- \(NRC_{jB}\) = the total natural resource products required in the production of product \(j\) in Belgium.

Assuming a simple linear relationship between the variables, the regression equation was written as follows:

\[
\frac{X_{BjLDC}}{M_{BjLDC}} = \beta_0 + \beta_1K_{jB} + \beta_2NRC_{jB} + \epsilon
\]

where:

- \(\frac{X_{BjLDC}}{M_{BjLDC}}\), \(K_{jB}\) and \(NRC_{jB}\) have same meaning as explained above. \(\beta_0\), \(\beta_1\) and \(\beta_2\) are the parameters to be estimated and \(\epsilon\) refers to the error term.

**Table 1**

Regression results

<table>
<thead>
<tr>
<th>No.</th>
<th>CONSTANT</th>
<th>(K_{jB}) (total value added per man)</th>
<th>(K_{jB}) (non-wage value added per man)</th>
<th>(NRC_{jB}) (total natural resource product requirement)</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16.305</td>
<td>0.637</td>
<td>-1.852</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.8)</td>
<td>(1.35)</td>
<td>(-3.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15.44</td>
<td>0.695</td>
<td>-1.888</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.35)</td>
<td>(1.02)</td>
<td>(-3.98)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-14.94</td>
<td>1.218</td>
<td>-1.036</td>
<td>0.036</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.47)</td>
<td>(1.53)</td>
<td>(-1.47)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note*: Figures in brackets are t values.
The regression results obtained are given in Table I. The data used in this cross-section regression for all the variables, except NRCjB (total natural resource product requirements) pertain to the year 1970 (8). The year of 1970 (or 1965 for that matter) was a relatively normal year, in the sense that no major economic convulsions took place during that period. It was also the pre-GSP period and hence whatever distortions in the trade flows caused by the trade restrictions would have been mostly mutual.

The first regression in which non-wage value added per man was used as an explanatory variable together with the total natural resource product requirement in explaining the revealed comparative advantage of Belgium, both independent variables have yielded the theoretically appropriate signs and acceptable levels of significance, although the performance of the natural resource product requirement variable is clearly far more important. The R\(^2\), at 0.34 is respectable for a cross-section. In the second regression, where total value added per man was used instead of non-wage value added per man, the results are quite similar although the total value added variable has performed slightly less significantly than the non-wage value added variable. Given the high rank correlation between these two variables (as mentioned earlier) the similarity of performance of the two equations is to be expected. Finally, it should be noted that equation three clearly establishes that the total capital-intensity (total value added per man) alone can explain only a small part of the pattern of the revealed comparative advantage of Belgium vis-à-vis the developing countries (9).

IV. A TENTATIVE IDENTIFICATION.

The scatter diagram (Graph-I) shows the relationship between total value added per person and total natural resource requirements in the production of 48 Belgian industries out of which 38 were included in the sample used in the regressions reported in the preceding section. The normative implications of these exogenous variables, their verified

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(8) For the total natural resource product requirements variable, the data pertaining to 1965 had to be used, as the Belgian input/output table for 1970 was far too aggregative for our purposes.

(9) The results are not distorted by the presence of multicollinearity as can be seen from the simple correlation coefficients which were as follows:

- \( K_{jB} \) (non-wage value added) \( \leftrightarrow \) \( NRC_{jB} = 0.204 \)
- \( K_{jB} \) (total value added) \( \leftrightarrow \) \( NRC_{jB} = 0.193 \).
TABLE II
The structure of comparative advantage of Belgian industries — A tentative classification

<table>
<thead>
<tr>
<th>TYPE-I</th>
<th>TYPE-II</th>
<th>TYPE-III</th>
<th>TYPE-IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leather Tanning</td>
<td>Weaving</td>
<td>Petroleum Refineries</td>
<td>Non-Ferrous Metals</td>
</tr>
<tr>
<td>Meat Preparations</td>
<td>Wadding</td>
<td>Agglomerates of Coal ((^\star))</td>
<td>Breweries ((^\star))</td>
</tr>
<tr>
<td>Diary Products (HS,(^\star))</td>
<td>Clay Products (R,HS)</td>
<td>Iron and Steel</td>
<td>Other Beverages</td>
</tr>
<tr>
<td>Wool Spinning (HS,(^\star))</td>
<td>Alcohol ((^\star))</td>
<td>Chocolate (L.S,(^\star))</td>
<td>Chemicals</td>
</tr>
<tr>
<td>Cotton Spinning</td>
<td>Agglomerates of Cement</td>
<td>Quarries</td>
<td>Printing Newspapers</td>
</tr>
<tr>
<td>Combing of Wool</td>
<td>Manufactures of Paper &amp; Cardboard ((^\star))</td>
<td>Oils and Fats ((^\star))</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>Jute Spinning</td>
<td>Tobacco (L.S)</td>
<td>Cokes ((^\star))</td>
<td>Printing and Binding of Books</td>
</tr>
<tr>
<td>Canned Vegetables</td>
<td>Wood sawing (L.S)</td>
<td>Sugar (HS)</td>
<td>Soap, Perfumes, etc.</td>
</tr>
<tr>
<td>Washing and Carbonizing of Wool</td>
<td>Wastage of Textiles (L.S)</td>
<td></td>
<td>Paper and Cardboard (R)</td>
</tr>
<tr>
<td>Canned Fish</td>
<td>Manufactures of Wood (R)</td>
<td></td>
<td>Glass (HS)</td>
</tr>
<tr>
<td>Grain Milling</td>
<td>Baskets, etc. ((^\star))</td>
<td></td>
<td>Rubber</td>
</tr>
<tr>
<td></td>
<td>Felt</td>
<td></td>
<td>Plastics (R)</td>
</tr>
<tr>
<td></td>
<td>Ceramics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hosiery</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fur</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Footwear</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clothing &amp; Confection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
Type-I = Industries with high, cumulative natural resource product requirements and low total value added per person.
Type-II = Industries with low, cumulative natural resource product requirements and low total value added per person.
Type-III = Industries with high, cumulative natural resource product requirements and high total value added per person.
Type-IV = Industries with low, cumulative natural resource product requirements and high total value added per person.

**Abbreviations used:**
(\(^\star\)) indicates that the product concerned was not included in the regressions;
R indicates a strong possibility of factor-intensity reversals;
HS indicates high skill content;
LS indicates low skill content.
Note to Graph-I

a) the industries plotted in the scatter can be identified by referring to their numbers in Table-A-I in the annex.
b) the vertical line indicates the simple arithmetic mean of the cumulative natural resource requirements and the horizontal line the total value added per person, for the industries included in the sample.
relevance in explaining the revealed comparative advantage of Belgium vis-à-vis the developing countries and the non-linearity of their relationship make them ideal tools in making a tentative identification of the sectors in which Belgium would have comparative advantages and disadvantages with respect to the developing countries.

In table-II, we have classified the industries plotted in the diagram into 4 different categories. Type-I consists of industries with high cumulative natural resource product requirements and low total value added per person. Type-IV on the other hand, consists of industries with low, cumulative natural resource product requirements and high total value added per person. In between these two classifications we have two other categories of which one (type-II) consists of industries with low, cumulative natural resource product requirements and low, total value added per person, while the other (type-III) shows industries with high, cumulative natural resource product requirements and high, total value added per person. Note that the vertical and horizontal lines in the graph which indicate the demarcation between these four categories represent the simple arithmetic mean of the samples (consisting of 48 industries) pertaining to the two variables (K_jB and NRC_jB). Further, the few industries in which factor-intensity reversals between Belgium and developing countries appear to be possible and the most striking examples of higher and lower than average human capital-intensity are indicated in the table.

Table-II should be interpreted with caution. In general and subject to the qualifications which will be mentioned below, the industries included in the type-I category are the ones in which Belgium has clear disadvantages vis-à-vis the developing countries. It is quite possible that given the nature of existing protection, in some of the branches within these sectors Belgian firms might be still doing well. But clearly from the point of view of better allocation of resources, a large number of branches within these industries would be good candidates for international industrial redeployment. It should be noted that two of the industries in this category, namely diary products and the spinning of wool, have in Belgium, high human skill content.

The industries listed under the type-IV classification, are in general those for which Belgium has comparative advantage vis-à-vis the developing countries. But, of course, this does not guarantee that all the Belgian industries in this category will perform well, especially in cases where they have to face competition of other high income countries. It should be also noted that in the case of plastics, factor-intensity reversals seem to take place and hence its resource allocation implications
within the context of the international redeployment of industries are indeterminate. It is also possible that in some of the branches of the sectors listed under type-IV, the capital-intensity might be rather low and the natural resource product requirements somewhat high. The analysis of the aggregative and disaggregative measures of capital stock in sub-section A of section II casts some doubts about the reliability of the high value-added figures obtained for paper and paperboard, and to a lesser extent in the case of printing of newspapers and printing of books.

The industries classified under type-II and type-III present a more qualified picture than those which were examined under the other two classifications. Type-II contains a large number of industries for which Belgium has comparative disadvantages with respect to the developing countries, although in some cases, this may be partially compensated by the low natural resource product requirement. In the case of clay products and manufactures of wood, possible factor-intensity reversals might neutralise the Belgian disadvantage. In addition, the clay products industry in Belgium has a rather high skill content. Note also that wood sawing, wastage of textiles and tobacco, all have relatively low skill-intensity ranking and might thus be doubly vulnerable to competition from the developing countries.

In the case of the industries classified under type-III, their high capital-intensity provides an advantage for Belgium vis-à-vis the developing countries. But some of the industries listed here could run into difficulties because of their high natural resource requirements (10). Note also that the chocolate industry in Belgium has a relatively low ranking according to the skill content.

V. CONCLUDING REMARKS

In the preceding analysis we have first reviewed the current state of the theoretical knowledge concerning the determinants of an optimal division of labour between countries of different factor endowments. Isolating the variables with well-established resource allocation implications, we have quantified them with respect to the Belgian economy. Subsequently, we have empirically verified that the quantified variables are significant in explaining the pattern of revealed comparative advantage of Belgium with respect to the developing countries. We

(10) Also note that four of the industries included in this classification could not be taken into account in the regression sample.
have then classified, using four degrees of relationship between the exogenous variables, the entire sample of industries into categories which in general indicate the structure of the comparative advantage of Belgium vis-à-vis the developing countries. The available evidence concerning the possibility of factor-intensity reversals and the degree of skill content were used to qualify the above mentioned classification and to indicate that the structure of comparative advantage described here should not be interpreted in a static sense. It is stressed that due to various reasons such as policy distortions, the actual performance of some of these sectors can vary from what is suggested by the underlying structure of comparative advantage and disadvantage. It is also possible that particular branches within given sectors might have characteristics that deviate substantially from the boundaries of each category. Further, it should not be forgotten that the sectors for which Belgium has comparative advantage vis-à-vis the developing countries might not, in concrete cases, perform well due to competition from other high income countries. But subject to these reservations, the Belgian policy with respect to an optimal international division of labour should benefit by taking into account, the pattern of specialization suggested by the results presented above.
### ANNEX

#### TABLE A-I

The variables

<table>
<thead>
<tr>
<th>No (a)</th>
<th>Sectors</th>
<th>Revealed comparative advantage of Belgium vis-à-vis the LDC's</th>
<th>Value added per man 1970</th>
<th>Non-wage value added per employee 1970</th>
<th>Cumulative natural resource product requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Quarries</td>
<td>0.0661</td>
<td>596.474</td>
<td>362.460</td>
<td>1.085.848</td>
</tr>
<tr>
<td>28</td>
<td>Meat preparations</td>
<td>0.1224</td>
<td>340.530</td>
<td>156.955</td>
<td>960.813</td>
</tr>
<tr>
<td>52</td>
<td>Canned fish</td>
<td>1.6178</td>
<td>194.824</td>
<td>62.836</td>
<td>516.172</td>
</tr>
<tr>
<td>46</td>
<td>Canned vegetables</td>
<td>0.4031</td>
<td>227.703</td>
<td>98.248</td>
<td>516.172</td>
</tr>
<tr>
<td>37</td>
<td>Marmelade</td>
<td>0.0511</td>
<td>297.592</td>
<td>135.610</td>
<td>-</td>
</tr>
<tr>
<td>29</td>
<td>Dairy products</td>
<td>769.4583</td>
<td>338.053</td>
<td>121.068</td>
<td>1.069.264</td>
</tr>
<tr>
<td>53</td>
<td>Grain milling</td>
<td>0.2908</td>
<td>91.738</td>
<td>34.810</td>
<td>588.870</td>
</tr>
<tr>
<td>41</td>
<td>Bakeries &amp; Cookies</td>
<td>353.5000</td>
<td>261.081</td>
<td>91.148</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>Sugar</td>
<td>5.9061</td>
<td>406.329</td>
<td>137.373</td>
<td>673.590</td>
</tr>
<tr>
<td>10</td>
<td>Chocolate</td>
<td>12.3690</td>
<td>620.416</td>
<td>438.889</td>
<td>389.845</td>
</tr>
<tr>
<td>27</td>
<td>Alcohol and Barm</td>
<td>1.1110</td>
<td>342.903</td>
<td>-</td>
<td>202.301</td>
</tr>
<tr>
<td>3</td>
<td>Breweries</td>
<td>-</td>
<td>843.287</td>
<td>610.647</td>
<td>202.301</td>
</tr>
<tr>
<td>4</td>
<td>Other Beverages</td>
<td>0.2449</td>
<td>721.975</td>
<td>513.247</td>
<td>202.301</td>
</tr>
<tr>
<td>32</td>
<td>Tobacco</td>
<td>1.0436</td>
<td>328.050</td>
<td>145.979</td>
<td>277.319</td>
</tr>
<tr>
<td>13</td>
<td>Oils and Fats</td>
<td>0.0281</td>
<td>556.192</td>
<td>290.693</td>
<td>721.224</td>
</tr>
<tr>
<td>12</td>
<td>Margarine</td>
<td>1.2000</td>
<td>591.748</td>
<td>305.901</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Chemicals</td>
<td>8.2282</td>
<td>677.823</td>
<td>384.692</td>
<td>159.531/207.979</td>
</tr>
</tbody>
</table>

**Notes:**
- **(a)** Numbers in this column correspond to the rankings according to the total value added per person.
<table>
<thead>
<tr>
<th>No</th>
<th>Sectors</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Soap, Perfumes etc.</td>
<td>68,6667</td>
<td>545,488</td>
<td>286,871</td>
<td>93,354</td>
</tr>
<tr>
<td>9</td>
<td>Pharmaceuticals</td>
<td>5,9768</td>
<td>628,292</td>
<td>388,129</td>
<td>93,354</td>
</tr>
<tr>
<td>21</td>
<td>Rubber</td>
<td>22,6682</td>
<td>405,254</td>
<td>170,223</td>
<td>103,659</td>
</tr>
<tr>
<td>33</td>
<td>Sawing of wood</td>
<td>0,0472</td>
<td>326,528</td>
<td>158,646</td>
<td>247,183</td>
</tr>
<tr>
<td>35</td>
<td>Wood manufacturing</td>
<td>2,4297</td>
<td>325,082</td>
<td>133,361</td>
<td>347,183/32,351</td>
</tr>
<tr>
<td>38</td>
<td>Baskets etc.</td>
<td>307,8974</td>
<td>293,877</td>
<td>119,005</td>
<td>347,183</td>
</tr>
<tr>
<td>18</td>
<td>Paper &amp; Cardboard</td>
<td>11,3235</td>
<td>446,413</td>
<td>172,496</td>
<td>214,127</td>
</tr>
<tr>
<td>31</td>
<td>Paper &amp; Cardboard Manufacturing</td>
<td>257,8276</td>
<td>334,722</td>
<td>132,815</td>
<td>127,683</td>
</tr>
<tr>
<td>7</td>
<td>Printing newspapers</td>
<td>214,1000</td>
<td>653,997</td>
<td>395,733</td>
<td>75,155</td>
</tr>
<tr>
<td>14</td>
<td>Printing and Binding of books</td>
<td>32,7714</td>
<td>551,885</td>
<td>338,692</td>
<td>75,155</td>
</tr>
<tr>
<td>25</td>
<td>Leather tanning</td>
<td>0,3522</td>
<td>350,687</td>
<td>136,751</td>
<td>577,668</td>
</tr>
<tr>
<td>47</td>
<td>Fur</td>
<td>1,7500</td>
<td>214,640</td>
<td>72,530</td>
<td>162,741</td>
</tr>
<tr>
<td>49</td>
<td>Gloves</td>
<td>0,7738</td>
<td>211,851</td>
<td>69,415</td>
<td>188,567</td>
</tr>
<tr>
<td>50</td>
<td>Washing &amp; Carbonizing of wool</td>
<td>0,0167</td>
<td>207,679</td>
<td>49,986</td>
<td>606,129</td>
</tr>
<tr>
<td>44</td>
<td>Wool combing</td>
<td>0,0666</td>
<td>244,869</td>
<td>75,713</td>
<td>606,129</td>
</tr>
<tr>
<td>36</td>
<td>Spinning of wool</td>
<td>—</td>
<td>321,405</td>
<td>134,185</td>
<td>606,129</td>
</tr>
</tbody>
</table>
ANNEX

TABLE A-1

The variables

<table>
<thead>
<tr>
<th>No (a) Sectors</th>
<th>Revealed comparative advantage of Belgium vis-à-vis the LDC’s (1)</th>
<th>Value added per man 1970 (2)</th>
<th>Non-wage value added per employee 1970 (3)</th>
<th>Cumulative natural resource product requirements (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 Jute spinning</td>
<td>0.0506</td>
<td>236.709</td>
<td>68.409</td>
<td>606.129</td>
</tr>
<tr>
<td>42 Cotton spinning</td>
<td>0.4352</td>
<td>258.949</td>
<td>93.780</td>
<td>606.129</td>
</tr>
<tr>
<td>39 Felt</td>
<td>15.8182</td>
<td>281.943</td>
<td>101.855</td>
<td>291.911</td>
</tr>
<tr>
<td>24 Wadding</td>
<td>64.9000</td>
<td>354.284</td>
<td>159.098</td>
<td>291.911</td>
</tr>
<tr>
<td>34 Wasteage of textiles</td>
<td>20.2286</td>
<td>326.126</td>
<td>178.423</td>
<td>291.911</td>
</tr>
<tr>
<td>23 Weaving</td>
<td>3.8833</td>
<td>379.563</td>
<td>189.455</td>
<td>291.911</td>
</tr>
<tr>
<td>43 Hosiery</td>
<td>0.7926</td>
<td>250.112</td>
<td>108.318</td>
<td>282.678</td>
</tr>
<tr>
<td>51 Clothing &amp; Confect.</td>
<td>1.0724</td>
<td>201.365</td>
<td>68.679</td>
<td>162.741</td>
</tr>
<tr>
<td>48 Footwear</td>
<td>0.2947</td>
<td>214.638</td>
<td>47.571</td>
<td>198.099</td>
</tr>
<tr>
<td>17 Cokes</td>
<td>0.0000</td>
<td>497.757</td>
<td>202.782</td>
<td>677.127</td>
</tr>
<tr>
<td>6 Agglomerates of coal</td>
<td>0.0000</td>
<td>671.804</td>
<td>395.358</td>
<td>1132.914</td>
</tr>
<tr>
<td>1 Petrol. refineries</td>
<td>1.1235</td>
<td>1149.846</td>
<td>733.137</td>
<td>475.489</td>
</tr>
<tr>
<td>26 Clay products</td>
<td>43.3889</td>
<td>350.547</td>
<td>134.622</td>
<td>134.953</td>
</tr>
<tr>
<td>40 Ceramics</td>
<td>4.1579</td>
<td>263.863</td>
<td>77.885</td>
<td>134.953</td>
</tr>
<tr>
<td>19 Glass</td>
<td>301.6520</td>
<td>426.273</td>
<td>154.844</td>
<td>87.233</td>
</tr>
<tr>
<td>30 Agglomerates cement</td>
<td>82.8571</td>
<td>335.492</td>
<td>129.769</td>
<td>215.151</td>
</tr>
<tr>
<td>8 Iron and steel</td>
<td>83.3228</td>
<td>638.065</td>
<td>345.685</td>
<td>5549.959/236.656</td>
</tr>
<tr>
<td>2 Non-ferrous metals</td>
<td>0.0488</td>
<td>861.381</td>
<td>292.348</td>
<td>313.126</td>
</tr>
<tr>
<td>22 Plastics</td>
<td>22.7603</td>
<td>402.128</td>
<td>194.120</td>
<td>76.881</td>
</tr>
<tr>
<td>16 Scrap</td>
<td>0.1032</td>
<td>532.842</td>
<td>320.040</td>
<td>—</td>
</tr>
</tbody>
</table>

A comparison of factor-intensity rankings between Belgium and Singapore

Singapore

351/54
314
371
313
372
383
311/12
355
381
362
384
342
356
382/85
331/32
361/69
341
390
323/24
321
322

Belgium

351/54: Industrial Chemicals/Petroleum, Coal Products.
314: Tobacco.
371: Iron and Steel.
313: Beverages.
372: Non-ferrous Metals.
383: Electrical Machinery.
311/12: Food Products.
355: Rubber Products.
381: Metal Products.
362: Glass and Glass Products.
384: Transport Equipment.
342: Printing and Publishing.
356: Plastic Products n.e.c.
382/85: Machinery n.e.c./Professional Goods.
331/32: Wood Products/Furniture and Fixtures.
361/69: Pottery, China, etc./Non-metal Products n.e.c.
390: Other Industries.
323/24: Leather and Leather Products/Footwear.
321: Textiles.
322: Wearing Apparel.

REFERENCES


SUMMARY

Structure of Belgium’s comparative advantage vis-a-vis the developing world

— A Tentative Classification of Industries —

This study attempts a tentative identification of the industries for which Belgium has comparative advantages and disadvantages vis-a-vis the developing world as a whole. On the basis of a review of the current state of the theoretical knowledge concerning the determinants of an optimal inter-industry mix between countries with different factor endowments, the variables with well-established resource allocation implications were isolated and quantified with respect to the Belgian economy. Subsequently, an empirical verification of the significance of the quantified variables in explaining the revealed comparative advantage of Belgium vis-a-vis the developing countries was carried out. Then, using four degrees of relationship between the exogenous variables, the entire sample of industries was classified into categories which reflect the structure of the comparative advantage of Belgium vis-a-vis the developing world. The available evidence concerning the possibility of factor intensity reversals and the degree of skill content were used to qualify the above mentioned classification and to indicate that the structure of comparative advantage described here should not be interpreted in a static sense. It is stressed that due to various reasons such as policy distortions, the actual performance of some of these sectors can vary from what is suggested by the underlying structure of comparative advantage of Belgium. It is also possible that particular branches within given sectors might have characteristics that deviate substantially from the boundaries of each category.