# THE EVOLUTION OF WEST GERMANY'S STRUCTURE OF FOREIGN TRADE FROM 1962 TO 1972*



by

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Contents

## 1. Introduction

The purpose of this study is to present an analysis of the structural evolution of foreign trade in West Germany and of the displacement of sectoral competitivity.

The malaise being experienced by traditional export branches, as well as the mounting recognition of the need for comprehensive structural changes in the foreign trade sector, render this inquiry both pertinent and timely for the evaluation of future economic policy alternatives.

Generally the assumption reigns that the exports of West Germany increasingly emanate from capital and technology intensive production branches, while imports consist to an ever greater degree of raw materials and labor intensive goods. This trend would be in complete accord with the tenets of traditional international trade theory. We shall therefore employ as one take-off point existing knowledge on the subject. The most renowned being the Heckscher-Ohlin hypothesis in which cost advantages in foreign trade are attributed to relative factor endowments. From this theory it follows that highly developed and capital intensive countries such as the Federal Republic would export relatively capital intensive goods and import labor intensive goods, while the reverse would hold true for less developed countries.

Yet, even under ideal conditions the Heckscher-Ohlin theory is not completely satisfactory because of the indiscriminate nature of its approach. It has been demonstrated that the Heckscher-Ohlin theory is most useful in examining trade with less developed countries[1], whereas trade patterns between industrialized countries with similar capital structures may more fruitfully be explained on the basis of other criteria, such as the degree of research and development, economies of scale, market structures, etc.[2]

The advantage of the Heckscher-Ohlin theory is its exceptional simplicity and its empirical applicability to input-output tables, allowing sectoral interdependences to be taken into consideration.

There are basically two ways to test the Heckscher-Ohlin theory. One consists in a regression analysis of trade flows. This is the method used in Steinherr (1977). A second approach consists in calculating the factor content in trade flows and to carry out a check whether factor trade concords with factor endowments.

The second method, which is the one applied in this paper, has the advantage of integrating input-output relations and of yielding directly information on direct and indirect factor trade. But it has also several disadvantages. A first shortcoming resides in the fact, that no significance in the statistical sense can be attributed to the results. Hence this approach does not allow judgement on questions such as "how much of the trade structure is explained by systematic variations in factor intensities ?", or "are some factors (statistically) significant in explaining trade structure while others are not ?" We felt nevertheless justified in taking this approach since in Steinherr (1977) it is shown that factor proportions do have a statistically significant explanatory power of trade flows in West Germany.

Another problem is that no explicit measures for factor endowments are incorporated into this approach. Of course, such extensions would be possible but extremely difficult from both conceptual and computational points of view. Usually a priori information is introduced such as "it is generally believed that country X is capital rich".(3)

The paper is constructed in the following manner : Section two examins the Heckscher-Ohlin theory as applied to the Federal Republic with the Leontief approach. In section three, net sectoral factor exports and their evolution between 1962 and 1972 are calculated. Subsequently, section four explores the extent to which the evolution of net factor exports can be ascribed to changes in technology, in demand structure, or in factor supply. We shall then conclude with a brief summary of our principal results with a view to their implications for economic policy.

## 2. Factor Proportions and Foreign Trade

### 2.1. The Leontief approach

Factor proportions of the large industrial countries and the resultant trade patterns have to date been examined in a series of publications. The debate was initiated by Leontief (1953), who calculated the factor content in exports and imports and developed a measure ($L_o$)[4] by which capital intensity is indicated by values less than 1, and labor intensity by values greater than 1. For the U.S. Leontief arrived at a value of 1.3 and thus at the surprising conclusions that U.S. exports compared to imports were strongly labor intensive.[5]

The paradox was then confirmed in examinations for other countries as well. Tatemoto and Ichimura (1959) arrived at a value of 0.644 for Japan in the year 1954, indicating strong capital intensity. Labor was abundantly available in Japan at that time.

Roskamp (1963) arrived at a value for Germany in 1954, which according to expectation lay between the values for the U.S and Japan. Full employment had not yet been achieved in Germany in 1954 and capital stock was being rapidly accumulated although starting from a very low level. True to the Leontief paradox, West German trade structure measured weakly capital intensive with a value of 0.993. Since results consistly supported the paradox, ways were sought to reconcile the Heckscher-Ohlin theory with the input-output results.[6]

West German trade structure for 1954 was reexamined by Roskamp and McMeekin (1968). The input-output tables of the Deutsches Institut für Wirtschaftsforschung (DIW) in which 55 sectors are differentiated served as the basis of this study.

In this study they followed Leontief (1956) in considering part of labor income as payment for particular skills, i.e., human capital. Remuneration for employees and the imputed wages for self-employed consist in fact, of two components : remuneration for the pure unskilled labor factor, and what ever is earned beyond that can be considered as compensation for human capital (formal schooling, on the job training, natural aptitudes, etc.).[7]

As a first step, the original Leontief index ($L_o$) was calculated on the basis of different assumptions about the wages corresponding to the remuneration of unskilled labor. As these wages increase, the trade structure was transformed from a capital intensive one ($L_o$ = 0.864) to a strongly labor intensive one ($L_o$ = 1.376).

In the next step, a model comprising unskilled labor, human and physical capital as primary factors was calculated.

With this three-factors model Roskamp and McMeekin resolve the Leontief paradox for West-Germany. Even though exports in 1954 were labor intensive, a high degree of human capital was contained in them.

Since 1954 the West Germany economy has greatly increased employment and its investment in physical and human capital. The foreign trade structure has undergone a marked change as well. The export dependency of the German economy has increased drastically during this time, as did the significance of certain relatively labor intensive sectors, such as machinery and mechanical engineering. For this reason it seems appropriate to again raise the issue of factor proportions.

## 2.2. Method of calculation

The static-open Leontief model serves as the basis of the calculation.

(1) $$(I-A)(Q) = Y$$

where A represents the matrix of the input coefficients, I the unit matrix, Y the vector of final demand. Q represents gross production, the latter being the result of the multiplication of the Leontief inverse with the vector of final demand.

(2) $$Q = (I-A)^{-1}Y$$

The three primary factor contents in exports and imports are computed as follows :

$$(3) \qquad E_L = (L)' \, [I-A]^{-1} X$$

$$(4) \qquad I_L = (L)' \, [I-A]^{-1} M$$

$$(5) \qquad E_K = (K)' \, [I-A]^{-1} X$$

$$(6) \qquad I_K = (K)' \, [I-A]^{-1} M$$

$$(7) \qquad E_H = (H)' \, [I-A]^{-1} X$$

$$(8) \qquad I_K = (H)' \, [I-A]^{-1} M$$

where :

L is the vector for the unskilled labor cost per unit of output
K is the vector for the return to capital per unit of output
H is the vector for returns to human capital per unit of output
X is the vector of the export coefficients.
$E_L$ ($I_L$) is the labor content in one DM of exports (imports)
$E_K$ ($I_K$) is the physical capital content in one DM of exports (imports)
$E_H$ ($I_H$) is the human capital content in one DM of exports (imports).

Analogous to the original Leontief index $L_o$, three indexes for primary factors will be calculated from the values (3) - (8).[8]

$$L_1 = \frac{I_K/I_L}{E_K/E_L}$$

$$L_2 = \frac{I_H/I_L}{E_H/I_L}$$

$$L_3 = \frac{I_H/I_K}{E_H/E_K}.$$

The index $L_1$ represents the relationship between physical capital and labor contents in imports and exports. If its value is greater than unity one can interpret that the economy is exporting labor intensive products and is thereby attempting to increase its use of capital.

The index $L_2$ reflects the relationship between human capital and labor. If this index is less than unity, it indicates an attempt to increase the pure labor factor vis-à-vis human capital. In a country such as the Federal Republic, where sophisticated technology calls for use of highly skilled labor, one would expect this index to be less then unity.

$L_3$ reflects the relationship between the two capital variables, human and physical. When this value is less than unity exports are human capital intensive. Germany in this case is attempting to augment its physical capital use through international trade, in so far as she is exporting goods which contain a high degree of human capital. If $L_3$ is greater than unity, it suggests that there is an abundant supply of physical capital available. In this case, Germany is striving to compensate for its lack of investment in human capital through exports.

In the presence of more than two factors of production, caution must be taken in interpreting these indices. A physical capital intensive trade structure, characterized by $L_1 < 1$, indicates only that more net physical capital is being exported (or less imported) than the unskilled labor factor. When simultaneously $L_3 < 1$, then unskilled labor and physical capital will be imported. One example will elucidate such a situation. Assume that in the export of DM 100, the following factor incomes are contained : L = DM 20, K = DM 36 and H = DM 44. Suppose furthermore that the factor content in imports of DM 100 is : L = DM 30, K = DM 40 and H = DM 30. It then follows that $L_1 = 0.74$, $L_2 = 0.45$ and $L_3 = 0.61$.

The export structure is therefore physical and human capital intensive in relation to the unskilled labor factor ; and human capital intensive in relation to physical capital. Unskilled labor is imported for net DM 10, physical capital is imported in sum of DM 4 and human capital is exported in sum of DM 14.

## 2.3. Data

Factor availability can be calculated in several ways that are, at least theoretically, equivalent.

One consists in taking the stocks of factors of production. These stocks are, however, obtained by some form of aggregation of flows. For example, the physical capital stock is usually calculated by integrating capital investments over time, properly discounted. A stock of human capital could be calculated by taking the returns to human capital, capitalized at the competitive equilibrium rate of interest. Similarly, for the stock of unskilled labor.

Another method consists in taking immediately factor returns. In a competitive general equilibrium solution, relative returns should be equal to relative stock values, since the same rate of interest is used to obtain a stock from a flow.

For our empirical calculation we prefer to compute flows, since the true undistorted rate of interest is unknown. We take therefore gross income of employed labor by sector, to which we add labor income of self-employed. From this total labor income we subtract an amount corresponding to the product of a wage for unskilled labor ($W_{min}$) times the number of employed ($E_i$) and selfemployed ($S_i$). The remainder measures the return to human capital.

Computation of physical capital is a non-trivial problem. If investments were aggregated over time and duly discounted, this resulting measure of the capital stock would only be unbiased if economic activity and relative prices remained unchanged. For example, the true, economically meaningful, value of a physically intact machine decreases when the price of its output falls, or if the output does not find a purchaser.

It may therefore be preferable to measure capital by some flow of returns. We have based our calculations alternatively on capital income and on depreciation. Depreciation is directly obtainable from input-output tables. Capital income can be computed by subtracting an imputed labor income to selfemployed ($W_i S_i$) from gross income of property and entrepreneurial activity. Average wage of a sector is certainly below the labor income of selfemployed so that the computed human capital is underestimated and physical capital is overestimated.

Neither measure is unproblematic. Profits depend on the financial structure of a firm, on accounting practices, and exhibit strong cyclical variations. Depreciation, in contrast, is still dependent on accounting practices, but varies less over the business cycle, is less dependent on how capital

is financed and takes better the age structure of the capital stock into account. It has, however, the disadvantage that some intangible capital (e.g., good-will, patents) is not fully accounted for. Profit figures are preferable in this regard.

The point of departure for this analysis is served by the nominal tables of the DIW for 1962 and 1972, in which five primary inputs are identified.(9)

1. Imports
2. Depreciation
3. Indirect taxes and subsidies
4. Gross incomes of employed labor ($\ell_i$)
5. Gross incomes from entrepreneurial activity and property ($k_i$)

The gross incomes of employed labor, and of entrepreneurial activity and capital are divided amongst the primary factors as explained (see also Appendix 1), so that three factor incomes can be established :

$L_i$ = return to the factor unskilled labor

$K_i^H$ = return to human capital

$K_i^P$ = return to physical capital.

After division by sectoral gross outputs, the vectors L, K, H to be employed in equations (3) - (8) emerge.

## 2.4. Results

By taking alternatively the average incomes of each of the 56 sectors as the minimum pay takes, various values for $L_1$, $L_2$, $L_3$ could be arrived at for the years 1962 and 1972. The relevant results are surely limited to, say, the fifteen sectors with the lowest average income, within which the pay-rates for unskilled, male laborers are found. Within this group, the results rarely deviate (see Table 1). The physical capital component is calculated twice : once on the basic of depreciation values and subsequently on the basis of return to capital.

Regardless of how physical capital is calculated, the results indicate that West German exports which had been labor intensive in 1954, were physical capital and human capital intensive in 1962. When physical capital is calculated on the basis of returns to capital, the increase in physical capital intensity is exorbitant : exports become even more physical capital than human capital intensive. Calculations made on the basis of depreciation also show an increase in physical, in relation to human, capital intensity, without, however, even approaching unity.

The results for 1972 are, at first sight, astonishing. West German exports become again more labor intensive and less human capital intensive (of course always in relation to imports). The intensity of human capital in relation to physical capital clearly increased during this time span.

Thus, by means of international trade, the Federal Republic in 1954 indirectly exported the factors labor and human capital and imported physical capital.

This situation was fundamentally altered by 1962 due to a scarcity of labor and the replenishment of physical capital : the Federal Republic now exchanged (indirectly) human capital for simple labor. As regards physical capital, the results are not unequivocal. (We will, however, demonstrate in section 3, that physical capital was imported in 1962).

Although these trade patterns were not transformed through 1972, there was a change of trend : a smaller amount of simple labor and more physical capital was indirectly traded for human capital. The reasons behind this development will become apparent in section 4.

As an additional check for these results, sectors were ranked by physical and human capital intensity and net exports per unit of output (see Table 2). The Spearman rank-correlation coefficient between physical capital and net exports is negative and positive for human capital and net exports. This concords perfectly with the input-output results.

## 3. Evolution of Net Sectoral Factor Exports

In section 2 we examined factor proportions in West German foreign trade on an aggregate level. In the subsequent chapters the sectoral displacements which occured between 1962 and 1972 will be looked at. Direct and indirect net exports of the three production factors unskilled labor physical and human capital will be calculated for this purpose.

The net factor exports are given as that quantity of factor remuneration that is contained in one DM of exports minus one DM of imports. Through this procedure structural effects of foreign trade are exclusively considered. The influence of the balance of payments surplus is in this way excluded. The following equations are at the basis of the calculation :

$$(9) \qquad F(L) = (L)(I-A)^{-1}(X-M)$$

$$(10) \qquad F(K) = (K)(I-A)^{-1}(X-M)$$

$$(11) \qquad F(H) = (H)(I-A)^{-1}(X-M).$$

F(L), F(K) and F(H) represent the vectors of the net factor exports. (L), (K) and (H) are matrices with factor incomes per unit of output on the main diagonal.

The results of this calculation are summarized in table 3.[10] A comprehensive interpretation of all sectors would transcend the scope of this study. Consequently we have restricted our focus to the total and to two significant sectors.

| Sector | F(L) | | F(K) | | F(H) | |
|---|---|---|---|---|---|---|
| | 1962 | 1972 | 1962 | 1972 | 1962 | 1972 |
| Agriculture | -0.150 | -0.064 | -0.016 | -0.011 | -0.004 | -0.006 |
| Road vehicles | 0.011 | 0.167 | 0.003 | 0.006 | 0.006 | 0.011 |
| Total of all 56 sectors | -0.097 | -0.033 | -0.001 | -0.005 | 0.044 | 0.028 |

These results provide useful information regarding the implications of sectoral resource displacement. If resources are shifted from import competing sectors to net export sectors, then more will be imported and exported under conditions of constant domestic demand. Assuming that the structure of imports and exports remains constant with this increase of the international division of labor, each of the entries in table 3 can be interpreted to mean that for one DM of increased imports and exports the sectoral factor export will change in this amount. For example, in 1962 for one DM of trade, labor was indirectly imported through agricultural goods for an equivalent of DM 0.15. Viewed alternatively, as a result of increasing international division of labor the agricultural sector would have been deprived of DM 0.15 of labor income.

These results are distinctly affected by three influences : first, the structure of the export and import vectors, i.e. the share of a sector in total imports and exports (see table 4) ; secondly, the factor proportions within a sector (see table 1) and, thirdly, the inter-industry structure.

In 1972, a resource displacement would have had a far less significant effect on the loss of labor income in agriculture than in 1962 : merely DM 0.064.

This can be attributed in the first place to the considerable reduction of the proportion of agriculture in total imports, and secondly, to the decreased labor income per output unit. The increased share of human capital on every output unit overcompensates for the lower import quotient, so that the potential loss increased from 0.004 to 0.006.

In the road vehicles industry an increase in total imports and exports would mean a considerable rise in income of all three production factors. The inputs of the three factors per output unit, as well as the share of this industry in total exports, increased markedly, accounting for virtually all the increase in net factor exports.

These results clearly indicate, that in interpreting the implications of a growing international division of labor for sectoral factor incomes and factor exports, one cannot merely consider factor intensities, but

also has to take into account inter-industry structure and the export and import shares.

Machinery and mechanical engineering (20) was the greatest exporter of all three factors of production in 1962. However, in 1972, it was compelled to relinquish first place to road vehicles (21) as regards physical capital. The chemical industry (14), electrical equipment (24) and the iron works industry (10) follow in diverse rank. The following table offers a brief overview.

Industries with the largest net factor exports

| | 1962 | | | | | | 1972 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | | K | | H | | L | | K | | H | |
| Rank | Sector | F(L) | Sector | F(K) | Sector | F(H) | Sector | F(L) | Sector | F(K) | Sector | F(H) |
| 1 | 2o | .o3o | 2o | .oo43 | 2o | .o14 | 2o | .o29 | 21 | .oo6 | 2o | .o17 |
| 2 | 24 | .o15 | 14 | .oo38 | 1o | .oo7 | 21 | .o16 | 2o | .oo5 | 21 | .o12 |
| 3 | 21 | .o11 | 1o | .oo36 | 14 | .oo6 | 24 | .o11 | 14 | .oo1 | 14 | .oo6 |
| 4 | 1o | .o1o | 21 | .oo33 | 21 | .oo6 | 14 | .oo7 | 1o | .oo3 | 24 | .oo5 |

The results for all 56 sectors confirm the conclusions we arrived at with the Leontief approach : in 1962 as in 1972 the Federal Republic imported the simple labor factor and exported human capital. The change of trend, already alluded to, is also clearly visible. In 1972 less labor is imported and less human capital is exported than in 1962.

The Federal Republic imported physical capital in 1962 and to an even greater degree in 1972. This result should not be weighted too heavily, however, as the computations allow for considerable imprecision. For example, the negative sign of the sum effect is strongly influenced by the result of the agriculture sector. A smaller value of 12 % there would already result in a change of sign for the total. Since the calculation of physical capital in the agriculture sector admits such deviations, we tend not to attribute too

much importance to the numerical precision of the results. It can be concluded with some contalnty, however, that although the Federal Republic was perhaps not a net importer of physical capital during this time, it was still not a significant exporter.

## 4. Decomposition of Changes in Factor Trade

Until now the development of foreign trade from 1962 to 1972 has been analyzed on a global and sectoral basis. The reasons underlying this structural change have been left unconsidered.

Equations (9) to (11) demonstrate, that the observed changes have three origins :

(i) A change in composition of imports and exports, i.e. the vectors X and M (trade effect).

(ii) A change in factor incomes per output unit (i.e. the vectors L, K, H) that reflect factor accumulation and the related development on factor markets as well as factor productivity (factor effect).

(iii) A change in the applied technology as a result of interindustriel relations, i.e. the Leontief inverse (inter-industry effect).

The significance of these components will now be determined for each sector. The following approach allows a simple, though very unsophisticated, definition of these effects :

Global change :

$$(L_T) = (L)_{62}(I-A)^{-1}_{62}X_{62} - (L)_{72}(I-A)^{-1}_{72}X_{72} \tag{12}$$

Trade effect :

$$(L_X) = (L)_{62}(I-A)^{-1}_{62}(X_{62}-X_{72}) \tag{13}$$

Factor effect :

$$(14) \qquad (L_P) = \left[(L)_{62} - (L)_{72}\right](I-A)^{-1}_{62}X_{62}$$

Inter-industry effect :

$$(15) \qquad (L_A) = (L)_{62}\left[(I-A)^{-1}_{62} - (I-A)^{-1}_{72}\right]X_{62}$$

In equations (12) to (15) the effects for the simple labor factor are calculated. For the remaining factors (K) and (H) the calculations are analogous. The import side is determined by the exchange of the vector of export coefficients X for the vector of import coefficients M.

In equations (12) the total change in labor income induced by one DM export is calculated.

Factor income would have developed as in equation (13) with the same technology and factor composition as in 1962, but the product composition of 1972. Holding other variables constant factor incomes due to changes in the structure of sectoral factor inputs and in technology can be computed from equations (14) and (15) respectively.(11)

The results appear in table 5. If all sectors are considered together, the following picture emerges. We already know that a smaller portion of the factor labor was imported in 1972 than in 1962. This can be traced back primarily to the changed export and import structures (-0.043427) and only secondly to factor accumulation and factor productivity (-0.024915). The inter-industry effect plays a subordinate role here, as it did with the change in the net export of physical and human capital.

What were the factors responsible for the observed increase in physical capital imports between 1962 and 1972 ? The foreign trade structure developed in such a way that less physical capital would have been imported. In other words, West Germany exported more capital intensive goods in 1972 than in 1962 and this change was greater than the one on the import side. However, this effect is totally over-shadowed by an opposing factor effect. Since West-Germany would have been a net importer of physical capital,

with a constant foreign trade and input-output structure, an increase in the physical capital stock naturally results in an increase in physical capital imports.

The reduction in exports of human capital can be traced back to all three effects, but primarily to the trade and factor effects. That is, the share of human capital in West German imports was greater in 1972 than in 1962, without however arriving at an equivalent increase on the export side. At the same time human capital intensity appears to have diminished. This latter result can be questioned, however, since the precision of intertemporal comparisons is not absolute due to the method of calculation for human capital.

Agriculture and road vehicles construction will again be offered as examples for the sectoral results.

The results for agricultural are of particular importance, since it experienced a fundamental structural change between 1962 and 1972. The results of this sector often lie near or even above the net results for all 56 sectors. The share of agriculture in total exports increased from 0.9 % to 1.2 %, while its share in total imports sunk from 18.58 % to 10.07 % (compare table 4). As a result the net import of all factors naturally decreased (trade effect).

During the time under consideration, the share of employment in agriculture sunk 30 %. Physical capital and human capital clearly replaced the unskilled labor factor. This is also reflected in the factor effect. Less labor is imported, but more physical human capital.

Thus net import of all factors of productions decreased, although slightly, because of the diminished significance of agricultural goods for intermediary demand.

The situation is quite different in the road vehicles industry. This sector is a net exporter of all factors and exhibited an increase in all factors between 1962 and 1972 (see Table 3). Because its share in total exports increased from 10.2 % to 12.8 %, but its share in total imports only from 2.7 % to 3.1 % (see table 4), due to the trade effect the net export of all produc-

tion factors increased between 1962 and 1972. In this, the trade effect dominates the change in the factors labor and human capital.

As is to be expected, the factor exports also increased due to the factor and inter-industry effects. A fundamental substitution of labor as occured to a certain extent even in machinery and mechanical engineering (sector 20) however was not realized in the road vehicles industry.

The evolution of West Germany's trade structure between 1962 and 1972, as described in sections 2 and 3, can now be interpreted as follows :

(i) Due to what we have termed "trade effects" net imports of physical capital and unskilled labor increased and net exports of human capital decreased. These results derive from the fact that West Germany's imports in raw materials, on the one hand, and in technologically advanced goods, on the other increased faster than imports in standardized industrial goods. On the export side, labor and capital intensive sectors (machinery, automobiles) increased their share in total exports.

(ii) The "factor effect" by itself produced a reduction of net unskilled labor imports and an increase in net physical capital imports. This can be explained by two related phenomena. On the one hand, unskilled foreign workers have been massively employed by the German economy since 1961. On the other hand, the rate of physical capital accumulation has slowed down in the 1960's. Thus, direct import of unskilled labor replaced, to a certain extent, the indirect import of unskilled labor (embodied in commodity imports). Both developments are interrelated since augmenting the unskilled labor stock made it possible to increase production that otherwise only could have been realized by accelerated physical capital accumulation.

Maintenance of traditional patterns of specialization also reduced the possibility (and the pressure) for rapid accumulation of human capital - explaining its diminished net export.

If one recognizes that the Federal Republic can only maintain long-term competitive advantages in physical and human capital intensive sectors, then the general evolution of the 1960's was suboptimal. German exports continued to be concentrated in branches which due to their labor-intensive nature, one should either have reduced in relative scale, or sought to trans-

form technologically. A transfer of resources to physical and human capital intensive sectors either did not take place, or did so to an insufficient degree.

## 5. Concluding observations

With this study we have intended to test the Heckscher-Ohlin theory with West-German data and to demonstrate, the implications of the production and foreign trade structure of the Federal Republic for factor trade. Certain prevalent and unquestioned views on the subject have proven themselves to be empirically not verifiable. Particularly, we arrived at the conclusion, that West Germany imports the factors labor and to a lesser degree physical capital. Thus, it seems that physical capital in West-Germany is not available abundantly relative to other factors of production.

These results certainly do not contradict the Heckscher-Ohlin hypotheses because three factors of production are considered in this study. Even if one does not question the assumption that the Federal Republic is a country rich in physical capital, there is no contradiction with the fact that West Germany is a net importer of physical capital, because human capital is available in relative abundance and is being exported.

The comparison between the foreign trade structures of 1962 and 1972 further indicates that in 1972 there was less labor imported, less human capital exported and more physical capital imported than in 1962. We also pursued the question as to what reasons were responsable for these changes. The answer must be primarily sought in the change of the foreign trade structure and in sectoral factor uses. The considerable drop in the share of agriculture in total imports, and, the more than proportional increase in the import of basic materials and high technology equipment combined with an increasing export share of traditional industries constitute the predominent effects on the foreign trade structure. The development of factor uses was primarily influenced by the direct import of an unskilled labor force , which allowed for a decrease in the indirect import of labor via commodities.

What is the significance of these results for economic policy ? Since 1972 the need for structural changes in foreign trade as elsewhere has become all the more compelling. In order to remain competitive in internationa markets in the long term, new investments have to be chanelled in first priority into human capital and technology intensive industries. On the basis of a small explanatory value of physical capital intensity in a regression analysis of the foreign trade structure Wolters (1977) concludes that it is a mistake to focus on physical capital intensive industries. He thereby condemns the current official structural policy. Wolters'conclusion is nevertheless not compelling. Weak physical capital intensity in strongly export dependent industries may precisely indicate the necessity of increased capital investment there.

The primary conclusion of this study is that the Federal Republic enjoys a sizeable competitive advantage in human capital intensive goods. Economic policy should therefore focus on exapansion of this human capital stock and the reallocation of resources to human capital intensive industries.

The import of unskilled labor has allowed relatively labor intensive branches to be maintained and has impeded a sectoral resource displacement or increase in capital intensity within these sectors. Even if full employment were soon reachieved,an assessment of the policy toward foreign labor immigration is therefore called for.

Footnotes

(1) As in Fels (1972).

(2) See Baldwin (1971), Hufbauer (1970), Pagoulatos and Sorenson (1976) and Wolter (1977).

(3) International comparisons of factor price ratios could yield information about factor endowments, but within the logic of the Heckscher-Ohlin model, there is a tendency for international factor price equalization.

(4) $L_o = (I_K/I_L)/(E_K/E_L)$ where $I_K$ and $I_L$ represent capital and labor contents, resp., in one unit of the import vector on the basis of domestic technology, and $E_K$ and $E_L$ are the capital and labor contents , resp., in one unit of the export vector.

(5) In the remainder of this text a characterization of "exports" should always be understood as exports relative to imports.

(6) Bhagwati (1964) provides a summary of the Leontief paradox debate, with view to the significance of particular hypotheses.

(7) This assumption, however, neglects that differences in income, even under conditions of perfect competition, can be traced back to such other factors as work conditions (pleasantness, social recognition, etc.).

(8) A crucial assumption of the Heckscher-Ohlin theory is that production functions are the same in all countries. Short of factor-price equalization, different economies will only use different factor inputs if relative factor prices are different (due to differences in factor endowments). The relevant measure of factor content in imports is therefore not the actual factor content but the one necessary if the home country produced these commodities. These assumptions are of course strenuous in case of raw materials and some agricultural goods.

(9) The 56 sectors of the table are presented in Appendix II.

(10) In the calculation of human capital, $W_{min}$ was assumed equal to DM 6.500,- for 1962 and DM 13.500,- for 1972. Physical capital was calculated on the basis of depreciation.

(11) The sum of the three effects does not add up to the global change because our method of computation is based on linear extrapolation. If thus neglects multiplicative terms and weights changes with base year observations. It should also be pointed out that one should abstain from reading "causal" explanations into the results. There are no behavioral assumptions underlying this approach ; rather, ex-post data is mechanically being decomposed.

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## Appendix I

Since average wages of different sectors are assumed to correspond to wages of unskilled labor ($W_{min}$), the latter can be larger or smaller than average wages ($W_i$) in remaining sectors. Calculation of $L_i$, $H_i$, $K_i$ is therefore based on the following procedure.

1. $W_i > W_{min}$

1.1. Returns to unskilled labor :

$$L_i = W_{min}(B_i + S_i)$$

where $B_i$, $S_i$ are the number of employed and selfemployed, resp., in sector i.

1.2. Returns to human capital :

$$K_i^H = (W_i - W_{min})(B_i + S_i)$$

1.3. Returns to physical capital

$$K_i^P = k_i - W_i S_i$$

Capital income is equal to gross income from entrepreneurial activity and property ($k_i$) net of an imputed wage for selfemployed. Alternatively depreciation is used.

2. $W_i < W_{min}$

In this case we set $W_i$ = W min in (1.2) so that $K_i^H = 0$.

Appendix II

Sectors

1. Agriculture, forestry, fishery
2. Electric power generation and distribution
3. Gas and water
4. Coal mining
5. Iron ore mining
6. Potash & rock salt mining
7. Mineral Oil extraction
8. Mining (other)
9. Building materials
10. Iron and steel
11. Iron & steel foundries
12. Steel drawing and cold rolling mills
13. Non-ferrous metal
14. Chemicals
15. Mineral oil refining
16. Rubber and asbestos manufactures
17. Sawmills and timber processing
18. Cellulose and paper
19. Constructional steel
20. Machinery
21. Vehicles
22. Aerospace
23. Shipbuilding
24. Electrical engineering and electronics
25. Precision engineering and optics
26. Steel forging
27. Hardware and metal goods
28. Fine ceramics
29. Glass
30. Timber manufactures
31. Musical instruments, toys, jewelry & sport articles
32. Paper and board manufactures
33. Printing & duplicating
34. Plastic manufactures
35. Leather
36. Textiles
37. Clothing
38. Grain milling
39. Edible oils and margarine
40. Sugar
41. Brewing & malting
42. Tobacco manufactures
43. Other food and beverages
44. Artisanal production and small industry
45. Construction
46. Wholesale trade
47. Retail trade
48. Railway transportation
49. Shipping, water ways , and ports
50. Other transports
51. Postal services
52. Banking and insurance
53. Rental of housing
54. Other services
55. State services incl. social security
56. Households

III : Tables 1 to 5

Calculation of factor trade indeces for 1962 and 1972 based on the alternative assumptions that one
average wage in the fifteen sectors with the lowest average wages corresponds to the return to unsk

| | | a) Physical capital measured with depreciation | | | b) Physical capital measured wi capital income | | |
|---|---|---|---|---|---|---|---|
| | $W_{min}$ | $L_1$ | $L_2$ | $L_3$ | $L_1$ | $L_2$ | |
| | 6.674584 | 0.807344 | 0.501207 | 0.620810 | 0.457294 | 0.501207 | 1 |
| | 6.956989 | 0.820201 | 0.506073 | 0.617011 | 0.464572 | 0.506073 | 1 |
| | 5.928571 | 0.805791 | 0.615910 | 0.764355 | 0.456410 | 0.615910 | 1 |
| | 6.565657 | 0.809376 | 0.518087 | 0.642488 | 0.456742 | 0.518087 | 1 |
| | 7.906040 | 0.859577 | 0.523522 | 0.609046 | 0.496976 | 0.523522 | 1 |
| | 7.437923 | 0.841117 | 0.513433 | 0.610418 | 0.476420 | 0.513433 | 1. |
| | 7.367110 | 0.838049 | 0.511642 | 0.610515 | 0.474692 | 0.511642 | 1 |
| | 7.171659 | 0.829631 | 0.508992 | 0.613516 | 0.469913 | 0.508992 | 1 |
| | 7.349168 | 0.837265 | 0.511196 | 0.610555 | 0.474239 | 0.511196 | 1 |
| | 6.256065 | 0.805533 | 0.568434 | 0.705662 | 0.456265 | 0.568434 | 1. |
| | 4.944327 | 0.807991 | 0.716366 | 0.886602 | 0.457657 | 0.716366 | 1. |
| | 7.661640 | 0.859506 | 0.518547 | 0.609692 | 0.481737 | 0.518547 | 1. |
| | 5.906347 | 0.805845 | 0.518891 | 0.768002 | 0.456441 | 0.518991 | 1. |
| | 4.629630 | 0.808300 | 0.738013 | 0.913382 | 0.457652 | 0.739013 | 1. |
| | 6.450031 | 0.805425 | 0.534853 | 0.664063 | 0.456243 | 0.534953 | 1. |
| | 14.719101 | 0.966444 | 0.724889 | 0.750057 | 0.788293 | 0.724889 | 0. |
| | 12.958333 | 0.957436 | 0.762972 | 0.796891 | 0.780945 | 0.762972 | 0. |
| | 17.545455 | 1.009238 | 0.794539 | 0.787266 | 0.823199 | 0.794539 | 0. |
| | 17.509934 | 1.008759 | 0.793287 | 0.786400 | 0.822907 | 0.793287 | 0. |
| | 18.117155 | 1.016780 | 0.817472 | 0.803981 | 0.829354 | 0.817472 | 0. |
| | 15.740402 | 0.982129 | 0.741549 | 0.755043 | 0.801086 | 0.741549 | 0 |
| | 18.108729 | 1.016666 | 0.817040 | 0.803647 | 0.829257 | 0.817040 | 0 |
| | 17.775134 | 1.012302 | 0.802989 | 0.793231 | 0.825697 | 0.802989 | 0 |
| | 14.979724 | 0.970514 | 0.728736 | 0.750876 | 0.791613 | 0.728735 | 0 |
| | 15.919540 | 0.984789 | 0.744813 | 0.756317 | 0.803256 | 0.744813 | 0 |
| | 12.777003 | 0.957331 | 0.768928 | 0.803200 | 0.780860 | 0.768928 | 0 |
| | 18.034698 | 1.015555 | 0.813336 | 0.800799 | 0.823433 | 0.813336 | 0 |
| | 12.926627 | 0.957439 | 0.764001 | 0.798026 | 0.780944 | 0.764061 | 0 |
| | 15.013224 | 0.971045 | 0.729294 | 0.751040 | 0.792446 | 0.729294 | 0 |
| | 17.314607 | 1.00[illegible]3 | 0.786371 | 0.781664 | 0.820575 | 0.786371 | 0 |

Table 2

Ranking of net exports per unit of output, physical and human capital in intensity (1972)

| Rank [1] | $\frac{X-M}{Q}$ | Sector | $\frac{K}{L}$ | Sector | $\frac{H}{L}$ | Sector |
|---|---|---|---|---|---|---|
| 34 | - 0.512263 | 22 | 0.096592 | 37 | 0.000000 | 37 |
| 33 | - 0.298105 | 18 | 0.144180 | 31 | 0.109609 | 35 |
| 32 | - 0.233451 | 17 | 0.147556 | 35 | 0.165956 | 31 |
| 31 | - 0.222782 | 35 | 0.155256 | 19 | 0.179225 | 36 |
| 30 | - 0.216911 | 13 | 0.160667 | 24 | 0.297032 | 25 |
| 29 | - 0.156753 | 31 | 0.162586 | 30 | 0.316677 | 34 |
| 28 | - 0.156074 | 36 | 0.169103 | 25 | 0.335904 | 43 |
| 27 | - 0.139964 | 39 | 0.176458 | 20 | 0.341387 | 32 |
| 26 | - 0.133787 | 37 | 0.189362 | 26 | 0.342011 | 28 |
| 25 | - 0.121489 | 43 | 0.199798 | 27 | 0.383745 | 17 |
| 24 | - 0.085422 | 15 | 0.210210 | 22 | 0.386381 | 27 |
| 23 | - 0.014253 | 30 | 0.211166 | 23 | 0.411967 | 30 |
| 22 | - 0.006180 | 29 | 0.217172 | 32 | 0.441333 | 22 |
| 21 | - 0.004900 | 38 | 0.225708 | 34 | 0.446798 | 42 |
| 20 | 0.003985 | 42 | 0.227366 | 28 | 0.481481 | 26 |
| 19 | 0.015685 | 41 | 0.229101 | 16 | 0.486068 | 12 |
| 18 | 0.017056 | 32 | 0.240123 | 33 | 0.490495 | 24 |
| 17 | 0.024844 | 11 | 0.277453 | 36 | 0.503751 | 16 |
| 16 | 0.030834 | 33 | 0.291358 | 29 | 0.511196 | 11 |
| 15 | 0.034434 | 16 | 0.303704 | 39 | 0.517898 | 29 |
| 14 | 0.037246 | 19 | 0.340035 | 11 | 0.565373 | 13 |
| 13 | 0.053382 | 34 | 0.353086 | 42 | 0.586602 | 20 |
| 12 | 0.060878 | 10 | 0.355834 | 43 | 0.615457 | 23 |
| 11 | 0.062547 | 40 | 0.364444 | 13 | 0.620882 | 33 |
| 10 | 0.064919 | 23 | 0.375091 | 21 | 0.629630 | 40 |
| 9 | 0.074741 | 27 | 0.410256 | 12 | 0.662887 | 38 |
| 8 | 0.090088 | 12 | 0.451977 | 17 | 0.677697 | 18 |
| 7 | 0.090774 | 24 | 0.583562 | 14 | 0.694736 | 19 |
| 6 | 0.090801 | 26 | 0.607407 | 38 | 0.703849 | 21 |
| 5 | 0.100994 | 28 | 0.665509 | 18 | 0.723140 | 10 |
| 4 | 0.139903 | 14 | 0.682202 | 10 | 0.733545 | 41 |
| 3 | 0.161298 | 25 | 0.838164 | 41 | 0.828172 | 14 |
| 2 | 0.269782 | 20 | 0.940171 | 40 | 0.974074 | 39 |
| 1 | 0.313289 | 21 | 1.331881 | 15 | 1.273057 | 15 |

*Footnote 1, see p.32*

Table 3 a)

1962

Net factor exports (direct plus indirect)

| | F(L) | F(K) | F(H) |
|---|---|---|---|
| 1: | - 0.15584632 | - 0.01635095 | - 0.00405160 |
| 2: | - 0.00000095 | - 0.00000203 | - 0.00000101 |
| 3: | 0.00040616 | 0.00035476 | 0.00002856 |
| 4: | 0.00794813 | 0.00270446 | 0.00522164 |
| 5: | - 0.00523746 | - 0.00176685 | 0.00000000 |
| 6: | 0.00025537 | 0.00015715 | 0.00024664 |
| 7: | - 0.00143521 | - 0.00255148 | - 0.00126347 |
| 8: | - 0.00349852 | - 0.00075353 | - 0.00003534 |
| 9: | - 0.00056043 | - 0.00020281 | - 0.00030426 |
| 10: | 0.01054912 | 0.00360812 | 0.00706916 |
| 11: | 0.00244481 | 0.00056419 | 0.00146803 |
| 12: | 0.00197982 | 0.00076993 | 0.00091717 |
| 13: | - 0.00292726 | - 0.00078007 | - 0.00138235 |
| 14: | 0.00881217 | 0.00375309 | 0.00648365 |
| 15: | - 0.00047194 | - 0.00043564 | - 0.00041621 |
| 16: | 0.00166636 | 0.00025198 | 0.00068868 |
| 17: | - 0.00216564 | - 0.00054087 | - 0.00046846 |
| 18: | - 0.00245692 | - 0.00105099 | - 0.00134609 |
| 19: | 0.00259252 | 0.00031908 | 0.00132940 |
| 20: | 0.03031766 | 0.00436099 | 0.01447962 |
| 21: | 0.01090175 | 0.00335438 | 0.00599409 |
| 22: | - 0.00255320 | - 0.00013093 | - 0.00117113 |
| 23: | 0.00285372 | 0.00066378 | 0.00080402 |
| 24: | 0.01543585 | 0.00195095 | 0.00491086 |
| 25: | 0.00498607 | 0.00067898 | 0.00107016 |
| 26: | 0.00278525 | 0.00042535 | 0.00100484 |
| 27: | 0.00600309 | 0.00087416 | 0.00180485 |
| 28: | 0.00197273 | 0.00035806 | 0.00028466 |
| 29: | 0.00121098 | 0.00022179 | 0.00036836 |
| 30: | 0.00024691 | 0.00002619 | 0.00005255 |
| 31: | 0.00049680 | 0.00003755 | 0.00008880 |
| 32: | 0.00018940 | 0.00001958 | 0.00002527 |
| 33: | - 0.00021942 | - 0.00003617 | - 0.00007943 |
| 34: | 0.00063356 | 0.00007818 | 0.00012500 |
| 35: | - 0.00094542 | - 0.00008429 | - 0.00009769 |
| 36: | - 0.00651519 | - 0.00111945 | - 0.00085115 |
| 37: | - 0.00110248 | - 0.00006918 | 0.00000000 |
| 38: | - 0.00000333 | - 0.00000198 | - 0.00000172 |
| 39: | - 0.00080430 | - 0.00026435 | - 0.00048371 |
| 40: | - 0.00010526 | - 0.00008313 | - 0.00009015 |
| 41: | - 0.00033078 | - 0.00018386 | - 0.00018088 |
| 42: | - 0.00008075 | - 0.00001381 | - 0.00001873 |
| 43: | - 0.00662432 | - 0.00207589 | - 0.00155859 |
| 44: | 0.00261148 | 0.00030796 | 0.00000000 |
| 45: | 0.00021621 | 0.00002338 | 0.00006748 |
| 46: | 0.00851006 | 0.00089570 | 0.00152087 |
| 47: | 0.00098939 | 0.00010013 | 0.00000000 |
| 48: | 0.00182479 | 0.00083326 | 0.00082599 |
| 49: | 0.00271978 | 0.00203348 | 0.00181108 |
| 50: | 0.00100990 | 0.00039729 | 0.00051218 |
| 51: | - 0.00022669 | - 0.00006409 | - 0.00006788 |
| 52: | - 0.00078234 | - 0.00011145 | - 0.00044360 |
| 53: | 0.00004601 | 0.00070589 | 0.00000000 |
| 54: | - 0.03907327 | - 0.00377658 | 0.00000000 |
| 55: | - 0.00120269 | - 0.00011452 | - 0.00081545 |
| 56: | 0.00000000 | 0.00000000 | 0.00000000 |
| Total[2)] | - 0.09755423 | - 0.00173610 | 0.04407462 |

*Footnote 2, see p.32*

Table 3 b)

1972

Net factor exports (direct plus indirect)

| | F(L) | F(K) | F(H) |
|---|---|---|---|
| 1: | - 0.06487934 | - 0.01146053 | - 0.00585885 |
| 2: | - 0.00019032 | - 0.00039860 | - 0.00019158 |
| 3: | 0.00017362 | 0.00029072 | 0.00000000 |
| 4: | 0.00332689 | 0.00090520 | 0.00229799 |
| 5: | - 0.00175370 | - 0.00064952 | - 0.00136399 |
| 6: | 0.00024948 | 0.00010920 | 0.00007476 |
| 7: | - 0.00174890 | - 0.00842061 | - 0.00818311 |
| 8: | - 0.00195218 | - 0.00053711 | - 0.00112856 |
| 9: | - 0.00071138 | - 0.00044414 | - 0.00049912 |
| 10: | 0.00426559 | 0.00290999 | 0.00308462 |
| 11: | 0.00159043 | 0.00054080 | 0.00081302 |
| 12: | 0.00094630 | 0.00038823 | 0.00045997 |
| 13: | - 0.00188920 | - 0.00068851 | - 0.00106810 |
| 14: | 0.00736367 | 0.00429716 | 0.00609839 |
| 15: | - 0.00044873 | - 0.00059766 | - 0.00057126 |
| 16: | 0.00147882 | 0.00033880 | 0.00074496 |
| 17: | - 0.00110920 | - 0.00050133 | - 0.00042565 |
| 18: | - 0.00158081 | - 0.00105205 | - 0.00107131 |
| 19: | 0.00105687 | 0.00016408 | 0.00073424 |
| 20: | 0.02974916 | 0.00524947 | 0.01745093 |
| 21: | 0.01672113 | 0.00627194 | 0.01176915 |
| 22: | - 0.00160958 | - 0.00033835 | - 0.00071036 |
| 23: | 0.00039878 | 0.00008421 | 0.00024543 |
| 24: | 0.01143056 | 0.00183651 | 0.00560663 |
| 25: | 0.00229037 | 0.00038731 | 0.00068031 |
| 26: | 0.00212677 | 0.00040273 | 0.00102400 |
| 27: | 0.00316840 | 0.00063304 | 0.00122421 |
| 28: | 0.00061010 | 0.00013872 | 0.00020866 |
| 29: | 0.00017753 | 0.00005173 | 0.00009194 |
| 30: | - 0.00030901 | - 0.00005024 | - 0.00012730 |
| 31: | - 0.00073901 | - 0.00010655 | - 0.00012264 |
| 32: | 0.00016683 | 0.00003623 | 0.00005695 |
| 33: | 0.00010726 | 0.00002576 | 0.00006659 |
| 34: | 0.00119947 | 0.00027073 | 0.00037984 |
| 35: | - 0.00253042 | - 0.00037338 | - 0.00027736 |
| 36: | - 0.00751832 | - 0.00208598 | - 0.00134747 |
| 37: | - 0.00382788 | - 0.00036974 | 0.00000000 |
| 38: | - 0.00003463 | - 0.00002104 | - 0.00002296 |
| 39: | - 0.00031642 | - 0.00009610 | - 0.00030822 |
| 40: | 0.00001436 | 0.00001350 | 0.00000904 |
| 41: | - 0.00034669 | - 0.00029058 | - 0.00025431 |
| 42: | - 0.00007759 | - 0.00002740 | - 0.00003467 |
| 43: | - 0.00538567 | - 0.00191641 | - 0.00180907 |
| 44: | 0.00274903 | 0.00033515 | 0.00000000 |
| 45: | 0.00000120 | 0.00000019 | 0.00000064 |
| 46: | 0.00852533 | 0.00136925 | 0.00301813 |
| 47: | 0.00075397 | 0.00009150 | 0.00008451 |
| 48: | 0.00111855 | 0.00036855 | 0.00092031 |
| 49: | 0.00249870 | 0.00243176 | 0.00070604 |
| 50: | - 0.00020987 | - 0.00011746 | - 0.00011414 |
| 51: | - 0.00000790 | - 0.00000331 | - 0.00000502 |
| 52: | 0.00011805 | 0.00003023 | 0.00012759 |
| 53: | 0.00002292 | 0.00038562 | 0.00000000 |
| 54: | - 0.03309977 | - 0.00445035 | 0.00000000 |
| 55: | - 0.00541832 | - 0.00061747 | - 0.00444016 |
| 56: | 0.00000000 | 0.00000000 | 0.00000000 |
| Total [2)] | - 0.03323479 | - 0.00525610 | 0.02804368 |

*Footnote 2 see p.32*

Table 4

## Import and export coefficients

| | 1962 | | 1972 | |
|---|---|---|---|---|
| | IMPORTS | EXPORTS | IMPORTS | EXPORTS |
| 1: | 0.18584 | 0.00934 | 0.10068 | 0.01227 |
| 2: | 0.00293 | 0.00182 | 0.00382 | 0.00151 |
| 3: | 0.00011 | 0.00014 | 0.00008 | 0.00023 |
| 4: | 0.01141 | 0.03515 | 0.00368 | 0.01575 |
| 5: | 0.01839 | 0.00022 | 0.00911 | 0.00002 |
| 6: | 0.00014 | 0.00342 | 0.00015 | 0.00157 |
| 7: | 0.03667 | 0.00077 | 0.04715 | 0.00044 |
| 8: | 0.00951 | 0.00050 | 0.00723 | 0.00070 |
| 9: | 0.01153 | 0.00631 | 0.01053 | 0.00544 |
| 10: | 0.03551 | 0.06410 | 0.03766 | 0.04800 |
| 11: | 0.00116 | 0.00237 | 0.00133 | 0.00216 |
| 12: | 0.00130 | 0.01033 | 0.00364 | 0.00727 |
| 13: | 0.04325 | 0.01612 | 0.03382 | 0.01511 |
| 14: | 0.03878 | 0.10580 | 0.05639 | 0.11162 |
| 15: | 0.03040 | 0.01465 | 0.02756 | 0.00944 |
| 16: | 0.00450 | 0.00801 | 0.00727 | 0.00886 |
| 17: | 0.01624 | 0.00271 | 0.01040 | 0.00243 |
| 18: | 0.02178 | 0.00447 | 0.01773 | 0.00584 |
| 19: | 0.00199 | 0.00819 | 0.00382 | 0.00687 |
| 20: | 0.05095 | 0.18043 | 0.05224 | 0.18275 |
| 21: | 0.02711 | 0.10244 | 0.03101 | 0.12856 |
| 22: | 0.01548 | 0.00138 | 0.00944 | 0.00276 |
| 23: | 0.00218 | 0.01388 | 0.00853 | 0.01004 |
| 24: | 0.02655 | 0.07444 | 0.04907 | 0.08555 |
| 25: | 0.00506 | 0.02097 | 0.00915 | 0.01650 |
| 26: | 0.00145 | 0.00879 | 0.00214 | 0.00647 |
| 27: | 0.01104 | 0.03272 | 0.01606 | 0.02735 |
| 28: | 0.00146 | 0.00675 | 0.00367 | 0.00538 |
| 29: | 0.00199 | 0.00606 | 0.00524 | 0.00486 |
| 30: | 0.00433 | 0.00411 | 0.00778 | 0.00603 |
| 31: | 0.00542 | 0.00725 | 0.00780 | 0.00481 |
| 32: | 0.00162 | 0.00219 | 0.00302 | 0.00387 |
| 33: | 0.00318 | 0.00498 | 0.00388 | 0.00610 |
| 34: | 0.00285 | 0.00338 | 0.00848 | 0.01207 |
| 35: | 0.00889 | 0.00530 | 0.01407 | 0.00470 |
| 36: | 0.05151 | 0.02592 | 0.05354 | 0.02506 |
| 37: | 0.00953 | 0.00528 | 0.02350 | 0.00838 |
| 38: | 0.00075 | 0.00263 | 0.00113 | 0.00102 |
| 39: | 0.01214 | 0.00197 | 0.00889 | 0.00459 |
| 40: | 0.00178 | 0.00183 | 0.00111 | 0.00204 |
| 41: | 0.00116 | 0.00271 | 0.00085 | 0.00182 |
| 42: | 0.00080 | 0.00172 | 0.00118 | 0.00141 |
| 43: | 0.06222 | 0.01014 | 0.06090 | 0.01914 |
| 44: | 0.00129 | 0.02114 | 0.00114 | 0.01514 |
| 45: | 0.00253 | 0.00458 | 0.00297 | 0.00351 |
| 46: | 0.01101 | 0.03784 | 0.01429 | 0.04353 |
| 47: | 0.00000 | 0.00411 | 0.00000 | 0.00283 |
| 48: | 0.00558 | 0.00868 | 0.00551 | 0.00738 |
| 49: | 0.01285 | 0.03168 | 0.01000 | 0.02497 |
| 50: | 0.01349 | 0.01684 | 0.02064 | 0.01835 |
| 51: | 0.00272 | 0.00208 | 0.00264 | 0.00179 |
| 52: | 0.00423 | 0.00677 | 0.00306 | 0.00789 |
| 53: | 0.00000 | 0.00238 | 0.00000 | 0.00144 |
| 54: | 0.15791 | 0.03781 | 0.16441 | 0.04457 |
| 55: | 0.00748 | 0.00439 | 0.01059 | 0.00179 |
| 56: | 0.00000 | 0.00000 | 0.00000 | 0.00000 |

Table 5 a)

Trade effect[3)]

| | | | |
|---|---|---|---|
| Total | - 0.043427 | - 0.001494 | + 0.008121 |
| 1 | - 0.070271 | - 0.007622 | - 0.001888 |
| 2 | 0.000096 | 0.000205 | 0.000102 |
| 3 | 0.000134 | 0.000117 | 0.000009 |
| 4 | 0.003703 | 0.001260 | 0.002433 |
| 5 | - 0.002644 | - 0.000892 | 0.000000 |
| 6 | 0.000152 | 0.000094 | 0.000147 |
| 7 | 0.000429 | 0.000762 | 0.000377 |
| 8 | - 0.000965 | - 0.000208 | - 0.000010 |
| 9 | 0.000174 | 0.000063 | 0.000094 |
| 10 | 0.004234 | 0.001448 | 0.002837 |
| 11 | 0.000089 | 0.000021 | 0.000054 |
| 12 | 0.000884 | 0.000343 | 0.000410 |
| 13 | - 0.001106 | - 0.000295 | - 0.000522 |
| 14 | 0.001465 | 0.000624 | 0.001078 |
| 15 | 0.000052 | 0.000054 | 0.000051 |
| 16 | 0.000226 | 0.000034 | 0.000093 |
| 17 | - 0.000869 | - 0.000217 | - 0.000188 |
| 18 | - 0.000760 | - 0.000325 | - 0.000416 |
| 19 | 0.000730 | 0.000089 | 0.000374 |
| 20 | - 0.000140 | - 0.000020 | - 0.000068 |
| 21 | - 0.003247 | - 0.000999 | - 0.001785 |
| 22 | 0.000839 | 0.000069 | - 0.000611 |
| 23 | 0.002360 | 0.000549 | 0.000665 |
| 24 | 0.003214 | 0.000401 | 0.001008 |
| 25 | 0.002459 | 0.000335 | 0.000528 |
| 26 | 0.000631 | 0.000097 | 0.000228 |
| 27 | 0.002320 | 0.000338 | 0.000697 |
| 28 | 0.001301 | 0.000236 | 0.000188 |
| 29 | 0.001103 | 0.000201 | 0.000335 |
| 30 | 0.000438 | 0.000046 | 0.000093 |
| 31 | 0.001276 | 0.000097 | 0.000228 |
| 32 | 0.000075 | 0.000008 | 0.000010 |
| 33 | - 0.000059 | - 0.000009 | - 0.000021 |
| 34 | - 0.000452 | 0.000056 | - 0.000089 |
| 35 | 0.001723 | 0.000153 | 0.000178 |
| 36 | 0.001611 | 0.000277 | 0.000210 |
| 37 | 0.002656 | 0.000167 | 0.000000 |
| 38 | 0.000052 | 0.000030 | 0.000027 |
| 39 | - 0.000447 | - 0.000145 | - 0.000265 |
| 40 | - 0.000081 | - 0.000064 | - 0.000069 |
| 41 | 0.000067 | 0.000037 | 0.000036 |
| 42 | 0.000037 | 0.000007 | 0.000009 |
| 43 | - 0.001692 | - 0.000530 | - 0.000398 |
| 44 | 0.000511 | 0.000060 | 0.000000 |
| 45 | 0.000396 | 0.000043 | 0.000124 |
| 46 | - 0.000086 | - 0.000009 | 0.000016 |
| 47 | 0.000424 | 0.000043 | 0.000000 |
| 48 | 0.000838 | 0.000383 | 0.000379 |
| 49 | 0.000644 | 0.000482 | 0.000429 |
| 50 | 0.001350 | 0.000532 | 0.000686 |
| 51 | 0.000182 | 0.000052 | 0.000054 |
| 52 | - 0.001173 | - 0.000167 | - 0.000665 |
| 53 | 0.000014 | 0.000286 | 0.000000 |
| 54 | 0.000254 | 0.000024 | 0.000000 |
| 55 | 0.001417 | 0.000135 | 0.000961 |
| 56 | 0.000000 | 0.000000 | 0.000000 |

*Footnote 3 see p. 32*

Table 5 b)

Factor effect[3)]

| | | | |
|---|---|---|---|
| Total | - 0.024915 | 0.005165 | 0.008071 |
| 1: | - 0.021799 | 0.006442 | 0.007606 |
| 2: | 0.000000 | 0.000001 | 0.000000 |
| 3: | 0.000084 | - 0.000185 | 0.000098 |
| 4: | 0.000990 | 0.000812 | 0.000415 |
| 5: | - 0.002215 | - 0.000647 | 0.002351 |
| 6: | 0.000042 | 0.000027 | 0.000158 |
| 7: | - 0.000020 | 0.004264 | 0.005358 |
| 8: | - 0.000955 | - 0.000053 | 0.001435 |
| 9: | - 0.000126 | 0.000068 | 0.000000 |
| 10: | 0.000625 | - 0.003157 | - 0.000106 |
| 11: | - 0.000364 | - 0.000390 | 0.000032 |
| 12: | 0.000114 | 0.000004 | 0.000009 |
| 13: | 0.000368 | 0.000153 | 0.000064 |
| 14: | 0.000196 | - 0.001275 | - 0.000653 |
| 15: | - 0.000037 | 0.000146 | 0.000138 |
| 16: | - 0.000247 | - 0.000186 | - 0.000275 |
| 17: | - 0.000257 | 0.000322 | 0.000264 |
| 18: | - 0.000029 | 0.000565 | 0.000295 |
| 19: | 0.000244 | - 0.000046 | - 0.000301 |
| 20: | 0.000238 | - 0.000948 | - 0.003163 |
| 21: | - 0.001748 | - 0.001392 | - 0.002907 |
| 22: | 0.001o22 | 0.000620 | 0.000407 |
| 23: | 0.000405 | 0.000148 | - 0.000703 |
| 24: | 0.001519 | - 0.000273 | - 0.001913 |
| 25: | 0.000714 | - 0.000043 | - 0.000199 |
| 26: | - 0.000241 | - 0.000148 | - 0.000453 |
| 27: | 0.000129 | - 0.000300 | - 0.000465 |
| 28: | 0.000155 | - 0.000055 | - 0.000337 |
| 29: | 0.000157 | - 0.000085 | - 0,000177 |
| 30: | 0.000046 | - 0.000007 | - 0.000030 |
| 31: | 0.000006 | - 0.000034 | 0.000008 |
| 32: | 0.000011 | - 0.000019 | - 0.000036 |
| 33: | - 0.000002 | 0.000016 | 0.000055 |
| 34: | 0.000057 | - 0.000052 | - 0.000058 |
| 35: | 0.000041 | 0.000061 | 0.000011 |
| 36: | 0.00005,7 | 0.000703 | 0.000325 |
| 37: | 0.000088 | 0.000045 | 0.000000 |
| 38: | 0.000002 | 0.000001 | 0.000002 |
| 39: | - 0.000025 | - 0.000028 | 0.000275 |
| 40: | 0.000023 | 0.000037 | - 0.000010 |
| 41: | - 0.000004 | 0.000090 | 0.000059 |
| 42: | - 0.000023 | 0.000006 | 0.000007 |
| 43: | 0.000446 | 0.000441 | 0.000813 |
| 44: | - 0.000186 | - 0.000034 | 0.000000 |
| 45: | 0.000039 | - 0.000005 | - 0.000027 |
| 46: | 0.000052 | - 0.000462 | - 0.001473 |
| 47: | - 0.000121 | - 0.000034 | - 0.000124 |
| 48: | - 0.000288 | 0.000137 | - 0.000912 |
| 49: | - 0.000547 | - 0.001147 | 0.000887 |
| 50: | 0.000069 | - 0.000129 | 0.000001 |
| 51: | - 0.000048 | 0.000010 | 0.000045 |
| 52: | - 0.000008 | 0.000020 | 0.000111 |
| 53: | 0.000008 | 0.000059 | 0.000000 |
| 54: | 0.003965 | 0.000940 | 0.000000 |
| 55: | 0.001213 | 0.000161 | 0.001164 |
| 56: | 0.000000 | 0.000000 | 0.000000 |

*Footnote 3 see p. 32*

Table 5 c)

## Inter-industry effect[3]

| Total | | | |
|---|---|---|---|
| | - 0.002958 | + 0.000807 | + 0.003002 |
| 1: | - 0.006004 | - 0.000651 | - 0.000161 |
| 2: | 0.000137 | 0.000294 | 0.000149 |
| 3: | 0.000084 | 0.000074 | 0.000006 |
| 4: | 0.000541 | 0.000185 | 0.000355 |
| 5: | 0.000842 | 0.000284 | 0.000000 |
| 6: | - 0.000212 | - 0.000130 | 0.000204 |
| 7: | 0.000076 | - 0.000136 | 0.000068 |
| 8: | 0.000201 | - 0.000009 | 0.000002 |
| 9: | 0.000244 | 0.000088 | 0.000132 |
| 10: | 0.002097 | 0.000718 | 0.001405 |
| 11: | 0.001166 | 0.000227 | 0.000591 |
| 12: | 0.000160 | 0.000062 | 0.000074 |
| 13: | 0.000513 | 0.000131 | 0.000234 |
| 14: | - 0.000191 | - 0.000081 | - 0.000141 |
| 15: | 0.000020 | 0.000019 | - 0.000028 |
| 16: | 0.000121 | 0.000018 | 0.000050 |
| 17: | - 0.000006 | - 0.000001 | - 0.000001 |
| 18: | 0.000102 | 0.000044 | - 0.000056 |
| 19: | 0.000841 | 0.000079 | 0.000331 |
| 20: | 0.000447 | 0.000065 | 0.000213 |
| 21: | - 0.000239 | - 0.000074 | - 0.000132 |
| 22: | - 0.000128 | - 0.000007 | - 0.000058 |
| 23: | 0.000040 | 0.000009 | 0.000011 |
| 24: | - 0.000310 | - 0.000039 | - 0.000099 |
| 25: | - 0.000298 | - 0.000040 | - 0.000064 |
| 26: | 0.000190 | 0.000029 | 0.000068 |
| 27: | 0.000515 | 0.000075 | 0.000155 |
| 28: | 0.000054 | 0.000010 | 0.000008 |
| 29: | - 0.000110 | - 0.000020 | - 0.000033 |
| 30: | 0.000245 | 0.000026 | 0.000052 |
| 31: | 0.000020 | 0.000001 | 0.000003 |
| 32: | - 0.000005 | 0.000000 | - 0.000001 |
| 33: | - 0.000273 | - 0.000045 | - 0.000098 |
| 34: | - 0.000248 | - 0.000031 | - 0.000049 |
| 35: | - 0.000078 | - 0.000007 | - 0.000008 |
| 36: | - 0.000475 | - 0.000082 | - 0.000062 |
| 37: | - 0.000102 | - 0.000006 | 0.000000 |
| 38: | - 0.000042 | - 0.000026 | - 0.000022 |
| 39: | - 0.000065 | - 0.000022 | - 0.000039 |
| 40: | - 0.000048 | - 0.000038 | - 0.000041 |
| 41: | - 0.000049 | 0.000027 | 0.000027 |
| 42: | - 0.000012 | - 0.000002 | - 0.000002 |
| 43: | 0.000193 | 0.000010 | 0.000045 |
| 44: | - 0.000636 | - 0.000075 | 0.000000 |
| 45: | - 0.000149 | - 0.000016 | - 0.000047 |
| 46: | 0.000352 | 0.000037 | 0.000062 |
| 47: | 0.000051 | 0.000006 | 0.000000 |
| 48: | 0.000301 | 0.000138 | 0.000136 |
| 49: | 0.000078 | 0.000058 | 0.000051 |
| 50: | 0.000069 | 0.000027 | 0.000035 |
| 51: | - 0.000392 | - 0.000111 | - 0.000117 |
| 52: | 0.000420 | 0.000066 | 0.000238 |
| 53: | 0.000000 | - 0.000001 | 0.000000 |
| 54: | - 0.002797 | - 0.000270 | 0.000000 |
| 55: | 0.000147 | 0.000014 | 0.000100 |
| 56: | 0.000000 | 0,000000 | 0.000000 |

*Footnote 3 see p. 32*

## Footnotes for tables 2, 3 and 5

### Footnote 1) for Table 2

Spearman rank-correlation coefficients between net exports per unit of output and physical and human capital were computed for 1962 and 1972.

| | 1962 | | 1972 | |
|---|---|---|---|---|
| | $K/_L$ | $H/_L$ | $K/_L$ | $H/_L$ |
| $\frac{X-M}{Q}$ | - 0.0435 | 0.0332 | - 0.0588 | 0.2067 |
| Significance | 0.403 | 0.426 | 0.371 | 0.120 |

Ranking of physical capital is negatively correlated, and ranking of human capital is positively correlated with net exports. These results confirm those discussed in the text. In both cases the correlation is, however, weak and statistically not significant.

### Footnote 2) for Table 3

Since imports and subsidies are primary factors in the input-output sense, their neglect in our computations explains why sums do not add up to zero.

### Footnote 3) for Table 5

A negative sign has to be interpreted as a reduction in net factor imports (or an increase in net factor exports) between 1962 and 1972.