

Fürstenberg, Reinhard

Working Paper — Digitized Version

A comparative analysis of determinants of West German and Japanese engineering trade patterns

Kiel Working Paper, No. 65

Provided in Cooperation with:

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

Suggested Citation: Fürstenberg, Reinhard (1977) : A comparative analysis of determinants of West German and Japanese engineering trade patterns, Kiel Working Paper, No. 65, Kiel Institute of World Economics (IfW), Kiel

This Version is available at:

<https://hdl.handle.net/10419/46788>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Kieler Arbeitspapiere Kiel Working Papers

Working Paper No. 65

A Comparative Analysis of
Determinants of West German and
Japanese Engineering Trade Patterns

by

Reinhard W. Fürstenberg

A 9 70 78 Weltwirtschaft
Kiel

Institut für Weltwirtschaft an der Universität Kiel

Kiel Institute of World Economics
Department I
2300 Kiel, Düsternbrooker Weg 120

Working Paper No. 65

A Comparative Analysis of
Determinants of West German and
Japanese Engineering Trade Patterns

by

Reinhard W. Fürstenberg

December 1977

Kiel Working Papers are preliminary papers written
by staff members of the Kiel Institute of World
Economics. Responsibility for contents and
distribution rests with the author.

A 9
70 78
Welterirtschaft
Kiel

Introduction

1. Over the last twenty years there have been numerous studies on the determinants of the international division of labour.¹ Among these only a few have tackled the question of intra-industry² international trade, while many studies address themselves to the question whether different endowment with factors of production determines the comparative advantage in international trade. To the extent that a regression analytic approach was chosen, in general, the level of aggregation³ was comparatively high. The evidence produced there does not contradict the a priori expectations, i.e. the relatively heavy employment of the factor(s) in relatively rich supply leads to a relatively high comparative advantage. Due to the large number of such studies the respective hypotheses have come to be widely regarded as an established theory.

2. Similar studies on a lower level of aggregation may not yield the same results due to complementarities between industries in the same sector of the economy. It may well be that such complementarities are so overwhelmingly important for the choice of location by individual industries that all other economic factors are overruled. Nevertheless it would be very desirable to have such results for at least two reasons: first, in order to formulate better suggestions for the conduct of economic policy in particular with respect to the support of structural changes by government action; second, in order to make a contribution to the discussion of the relative importance of intra-industry and inter-industry international trade since the level of aggregation is used as an important argument here.

¹For a recent survey see Stern.

²In the literature one also finds the term "two-way trade" which designates the same phenomenon.

³The level of aggregation is given approximately by the 2 digit SITC groups.

3. Hypotheses for the explanation of inter-industry trade are concerned with the comparative advantage of one subsystem of the economy over another such system in a given location. In many cases the endogenous variable refers to the deviation of exports from imports. The higher this deviation - however measured - in favour of exports the higher is the comparative advantage. The different hypotheses derive their names from the exogenous variables that are used. The endogenous variable for the intra-industry trade also measures the deviation of exports from imports but here the stress is on the similarity of these two figures.¹ A similarly consistent nomenclature like in the case of inter-industry international trade referring to different sets of exogenous variable has not yet been established.²

4. Assume that an economically meaningful definition of an industry³ is given by a 3 digit group of the SITC: International trade theory has to explain the structure of this trade, it has to provide the reasons for why there is trade. In the real world there is intra-industry trade. Among industrialised countries the share of intra-industry trade in the total volume of trade is higher than 50 percent. Everybody can observe intra-industry trade: cars are shipped from France to West Germany and back, watches made in Switzerland are sold in Japan and vice versa. These like many other products fulfil almost identical purposes of usage, the production functions are likely to be very similar. Therefore, it does not make sense for the purpose at hand to try and define them apart.

¹For formulae of measurement concepts see paragraphs 6 and 16, and appendix 1.

²Following Grubel and Lloyd one might speak of the border trade hypothesis, the cycle-goods hypothesis or the re-exporting hypothesis of intra-industry international trade. The analysis by Gray may result in a REPRA-hypothesis of intra-industry trade. (REPRA for Reciprocal Export Price Ranges.)

³The definition should also be acceptable to an economist wishing to test the Heckscher-Ohlin model, i.e. the "industry" produces a single perfectly homogeneous product. In fact even 2 digit SITC groups have been utilised to represent such an "industry" (see paragraph 1).

5. The observation that the intensity of intra-industry trade is reduced as the level of aggregation is lowered further can hardly be seriously interpreted as an argument for the view that intra-industry trade is a phenomenon only due to forming a single industry from what really are several industries¹. Intra-industry hypotheses of international trade should be viewed as an attempt to fill the gap in the explanation of all international trade which is left open after the inter-industry hypotheses have been employed. To move intra-industry trade into the center of attention means no more and no less than to look for variability where the Heckscher-Ohlin model assume constancy and vice versa. Hesse² writes that his "discussion of the most important hypotheses on the determining factors of international trade led to the conclusion that they can be used to explain the observed intra-industry trade and, therefore, no further hypotheses need to be set up. However, relative factor endowment differences which dominate the text books on the pure theory of international trade are not able to substantiate a large part of the intra-industry trade. In contrast, the hypotheses based on product differentiation, technical progress, and economies of scale gain in importance". It cannot be denied that ideas developed elsewhere can be usefully employed for the explanation of intra-industry trade³. But it is an artificial limitation to stop here. On the contrary, explanations that are not or only very indirectly related to traditional hypotheses of international trade have already been advanced⁴. Other such attempts can be expected to follow and produce even better insight into the nature of intra-industry trade.

¹ A different view is expressed by Pomfret.

² H. Hesse; in: "The International Division of Labour-Problems and Perspectives", International Symposium, ed. by Herbert Giersch, Institut für Weltwirtschaft, Kiel, p. 59.

³ The book of Grubel and Lloyd is a good source for this kind of analysis.

⁴ See Grubel and Lloyd on pages 71-81 and the analysis by Gray.

6. The present study contains a test of both the traditional hypotheses of inter-industry and intra-industry international trade for two countries: West Germany and Japan. These are both industrialized countries covering the per capita income range of this group with West Germany at the upper end and Japan at the lower end¹.

Another reason for the inclusion of Japan is that such a study has not been made for this country before. It is of interest to see whether results to be obtained for Japan will reconfirm the hypotheses mentioned above. In addition Japan is a very suitable test case because its factor endowment is likely to differ from both the developing countries and the high per capita income OECD countries. Another reason for the inclusion of West Germany was the availability of a new data base which allows to calculate some exogenous variables on a relatively low level of aggregation.

7. The object of this analysis is the engineering sector. There are several reasons why this part of manufacturing was chosen:

- The engineering sector covers a large volume of trade; it can be expected to find positive entries in the trade statistics for most countries and industries considered.
- The engineering sector is very heterogeneous. Different industries can be expected to have different characteristics and therefore show sufficiently large variability to meaningfully test the above mentioned hypotheses of trade.
- The data base for West Germany is limited to the engineering sector if the low level of aggregation is to be adhered to.

¹The per capita income in 1974 in US dollars of that year was \$ 4 070 for Japan and \$ 6 260 for West Germany. Source: World Bank Atlas, 1976.

- Within the engineering sector one can expect to find both inter-industry and intra-industry trade.

Trade figures for West Germany and Japan with two regions were used: the OECD countries and the less developed countries. These regions were chosen because relative endowment with factors of production differs substantially. The stage of development of both Japan and West Germany on the one hand and the thirteen remaining richest OECD countries on the other hand is similar enough to find a substantial amount of two-way trade. In order to eliminate deviations due to chance factors in the data averages of 1972 and 1973 were used for all the data on trade and the industrial structure of Japan. The industry data for West Germany are from 1974. That should not introduce any bias into the results because structural changes are very unlikely to have occurred within a year in any sizeable amount.

This set up allows to make a contribution to the discussion mentioned above in that it is possible to simultaneously test both approaches to international trade on identical sectors of the economy. The sources and the preparation of the data that were utilized to calculate the endogenous and the exogenous variables are described in appendix 3.

The Hypotheses

Inter-Industry Trade

8. Balassa has provided the measure for the revealed comparative advantage. In order to better fit the conditions of an endogenous variable that one needs for running regressions a modification of the original

measure is used¹. This is the endogenous variable for the inter-industry hypotheses. The exogenous variables which were used in the regressions are describes in the following paragraphs:

- The Neo-Factor-Proportions Hypothesis

9. The neo-factor-proportions hypothesis of international trade rests on the simple statement that a different endowment with factors of production in different countries leads to different factor price ratios. Since production functions in different countries are assumed to be identical and subject to constant returns to scale, goods to be homogeneous and to be sold in perfectly competitive markets the price is the only criterion for the direction of trade. The factor which figures prominently in the production functions is human capital. If the relative scarcity of the factors in two countries is not very different from one another, it may be difficult to test this hypothesis due to imperfections of the proxies used. This situation can well be expected to govern the situation of highly developed countries. Also it may be that tastes in two countries show differences large enough to invalidate the predictions one would expect on the basis of this hypothesis.
10. The following approach was chosen for the regressions:

$$RCA = f(HCI, PCI)$$

HCI = human capital intensity

PCI = physical capital intensity.

¹Let $X_i(M_i)$ be the exports (imports) of some country for the branch i and let $X(M)$ be exports (imports) of the same country for the manufacturing sector, then the revealed comparative advantage RCA_i is defined as

$$RCA_i = \ln \left[\frac{(X_i : M_i) \cdot (M : X)}{1} \right] .$$

Human capital intensity (HCI) is measured¹ as wages and salaries paid per employee.

There are two commonly used possibilities to measure physical capital intensity - either as value of tangible capital per employee (PCI1) or as non-wage value added per employee (PCI2). Although it was possible to calculate both versions for both countries PCI2 was not used in the regressions for West Germany because of the repeated occurrence of negative values².

- The Skills Hypothesis

11. The relative scarcity of labour is a determinant for the neo-factor-proportions hypothesis. Within this aggregate there are many different skill classes. The relative abundance of people belonging to one skill class relative to those belonging to another is a determinator of international competitiveness³. While proxies for human capital are used for the measurement of relative differences in the factor endowment, relative differences in human skills contribute towards the measurement of productivity differences⁴. This is the skills hypothesis. It could be subsumed under the neo-factor-proportions hypothesis if one would regard different skill classes as proper factors of production. If that is not done it

¹The concepts were originally defined by Fels, Lary and Kenen.

²It was not possible to correct for these apparent inconsistencies (the correctness of the data would imply the companies making losses which does not seem plausible).

³See the studies by Keesing (1965) and (1971), and Kravis.

⁴See H. Hesse, p. 46.

is because of the particular importance that is attached to the availability of people with different levels of education and training for international competitiveness.

12. The following approach was chosen for the regressions:

$$RCA = f(FE, QE)$$

FE = female employees

QE = qualified employees.

For the skills hypothesis and for both countries it was possible to calculate female employees in percent of all employees (FE). This is a commonly used proxy for inter-industry differences in the employment of low skilled labour¹.

Also qualified employees in percent of all employees (QE) were calculated for both countries. For Japan this represents employment in management, office work and engineering, for West Germany the figures refer to employees of the upper level (managers, scientists, engineers and the like).

~~The~~ Neo-Technology-Hypothesis

13. At the heart of this hypothesis² is the notion of an innovation. The differences of countries in such fields as the invention of new processes of production or new products, the ability to produce new scientific knowledge and quickly transform it into new income generating processes is regarded as decisive for international competitiveness here. This hypothesis bears some

¹For West Germany a variable "less qualified employees" (LQE) was calculated in order to test this proposition (compare table 2).

²See the studies by Posner, Gruber (1967) and (1970), and Vernon.

relationship to the skills hypothesis: besides such things as a well functioning administration, social conditions encouraging entrepreneurs to take risks, and availability of venture capital it is the existence of people with specific skills which determines two things:

- whether a country is a producer of innovations;
- whether industries are capable of using innovations that have been made (possible abroad but are now on the market for economic exploitation).

14. The following approach was chosen for the regressions:

$$RCA = f(RD, LP) \quad (\text{West Germany})$$

RD = employees in research and development

LP = length of production runs

$$RCA = f(ES) \quad (\text{Japan})$$

ES = economies of scale.

The number of employees in research and development in percent of all employees (RD) is a variable¹ which really belongs here. It is available for West Germany only. Also for this country another variable was calculated: length of production runs (LR). The production run lengths of the companies in the sample were weighted by turnover to get a production run length for the GSIC² 4 digit groups.

For Japan it was possible to calculate economies of scale (ES) as employees per establishment which has been tested under this hypothesis³ before.

¹From the set of variables which can be calculated from the available data base.

²For definitions see appendix 3.

³This is done for example by Wolter.

Intra-Industry Trade

15. The neo-factor-proportions hypothesis, the skills hypothesis and the neo-technology hypothesis all have a common feature: they are supply conditions oriented and goods in the same industry are assumed to be homogeneous¹. The most important hypothesis for the existence of intra-industry trade in the engineering sector assumes markets to be imperfectly competitive, goods in the same industry in general to be heterogeneous. Two-way trade then is a consequence of the existence of groups of people with tastes different from what most other people prefer. The size of these groups must fall into a product specific interval. They must not be too small in order to warrant the establishment of a marketing organization. They must not be too big either because otherwise new production units could profitably be set up inside the country producing beyond the range of increasing returns to scale².

According to Gray two-way trade is the more likely

- the more differentiated the goods are,
- the more similar the per capita income of two countries is, and
- the smaller transportation costs are.

Other variables explaining intra-industry trade may stem from influences which make medium size groups in one country with tastes of large groups in another country more likely. These variables like a common language, common cultural characteristics or an intensive two-way tourism facilitating learning processes of how other people live could not be taken into account here.

¹Homogeneity here refers to the output. So far as the neo-technology hypothesis is concerned it hardly has any relevance.

²It can be expected that smaller transportation costs would in general favour the domestic producer in addition to his being closer to the market (for earlier and easier detection of changes in tastes), speaking the same language, having easy access to the administration etc.

16. For intra-industry trade the measure GL_i suggested by Grubel and Lloyd was used which reads

$$GL_i = (X_i + M_i - |X_i - M_i|) : (X_i + M_i).$$

For any pair (X_i, M_i) the value of the revealed comparative advantage¹ (RCA_i) can be calculated. Given this value one can calculate the value for GL_i without having to refer back to the initial pair (X_i, M_i) ². This is formally presented in appendix 1. Therefore the Grubel-Lloyd measure does not contain any information which was not in the expression for the comparative advantage. It might therefore seem appealing to use the former function for both sets of trade data. This, however, was not done because the additional information whether imports or exports are bigger is unnecessary for the purpose at hand and likely to create estimating problems.

The measure GL_i is equal to one if there is intra-industry trade only with $X_i = M_i$. In case either X_i or M_i is zero then GL_i is zero (provided the other one is not zero, but in the absence of any trade at all there is not much to be explained anyway).

The endogenous variable GL_i was calculated for West Germany and Japan with respect to 14 other OECD countries³ separately which were chosen on the basis of per capita income⁴.

¹ Compare paragraph 6 for the definition of X_i, M_i .

² This relationship was brought to the author's attention in a discussion with Rudolf Loertscher and Frank Wolter.

³ The countries are Canada, United States, Japan, Belgium/Luxembourg, Netherlands, France, West Germany, Italy, United Kingdom, Austria, Denmark, Finland, Norway, Sweden, Switzerland.

⁴ Australia was excluded for lack of trade data.

17. The following approach was chosen for the regressions:

$$GL = f(\text{COV}, \text{SG}, \text{TRA}, \text{INDI}, \text{DIS})$$

COV = degree of product differentiation

SG = degree to which intra-industry trade is a statistical phenomenon

TRA = degree of tradability.

INDI= income differences

DIS = distance between countries.

The variables for the intra-industry hypothesis are in part identical to variables which have been used by other authors¹ to verify the hypothesis advanced by Linder². In order to measure the degree of product differentiation the coefficient of variation (COV) in unit export values was calculated³. A completely homogeneous product is likely to show very little variation, if any. The price of such products is hardly effected at all by demand conditions of any particular country. The price of the differentiated good, however, is. The more differentiated it is the more the price can be expected to vary across countries.

Following Pagoulatos and Sorensen, the number of subgroups (SG) in every 3 digit SITC group⁴ was included in order to have an indicator as to what extent the intra-industry trade is simply due to aggregation and thus reduces to a mere statistical phenomenon.

¹For example by Fortune and Hirsch and Lev.

²Linder postulates that as far as manufactures are concerned international trade was not determined by factor endowments but by similarity of income levels as the major trade creating force and by geographic distance as the main trade breaking force.

³This variable was introduced by Hufbauer.

⁴Within every 3 digit group the 4 digit groups were counted, if no 5 digit groups were mentioned. In the case of the existence of 5 digit groups the number of these groups was added to the remaining 4 digit groups.

A further variable measures the tradability of products (TRA). The further a product is shipped, the less transport costs matter, the higher is the likelihood for two-way trade. The proxy utilized for both countries are figures calculated from a data base provided by Weiss¹. Figures on the average shipment of goods inside the United States of America, classified by industry, are utilized.

Another variable is similarity of per capita income (INDI): The absolute difference of per capita incomes of West Germany or Japan and the trading partners has been calculated². Finally the distance that two countries are away from each other (DIS) was taken into account. The data were taken from Linnemann.

18. In order to run a regression it was necessary to correct for heteroscedasticity because by the very nature of the Grubel-Lloyd measure (GL_i) the values must lie between zero and one. The procedure used is described by Kmenta.

The transformed endogenous variable reads

$$IT_i = \ln \left[GL_i : (1 - GL_i) \right]$$

with GL_i as in paragraph 11.

Also, in order to have less importance attached to observations with only very little trade every observation was multiplied with the volume of trade.

Some of the exogenous variables are constant with respect to different industries (like INDI and DIS) while others vary with industries only and are constant for different countries (like COV, TRA and SG). Therefore a pool was formed over all countries and all industries.

¹ These data are also used by Pagoulatos and Sorensen.

² Source: World Bank Atlas, 1973 and 1974.

The equation for the regression then has the general form¹:

$$IT_i \cdot (X_i + M_i) \cdot [GL_i : (1 - GL_i)]^{0.5} = \sum_j EX_{ij} \cdot (X_i + M_i) \cdot [GL_i : (1 - GL_i)]^{0.5} + \xi_i$$

with X_i (M_i) exports (imports) with i and index for the industries and countries

EX_{ij} j -th exogenous variable of industry/country i

ξ_i error term.

Interpretation of Regression Results

19. All the exogenous variables were introduced also in a logarithmic form. It was revealed that the logarithmic version consistently gave the better results for West Germany, on the contrary the untransformed version is the better one for Japan.

Inter-Industry Trade

20. One of the variables of the neo-factor-proportions hypothesis of trade is physical capital intensity. There are six equations altogether for both countries with this variable but in no case the coefficient is statistically significant². The intensity of the usage of capital goods has no measurable influence

¹ The weights were treated as a further exogenous variable. Referring to Kmenta, the inclusion on an irrelevant variable does not create any difficulties concerning the coefficients of the other variables. The estimates for the regression coefficients remain unbiased but in general will not be efficient.

² The sign of the coefficient for PCI in equations 1 and 2 in table 2 is negative. This is in line with results of Roskamp and McMeekin and Wolter.

on the comparative advantage. In part this may be due to easy availability of capital goods almost anywhere in the world. To the extent that complementary factors become available also it could well be that the coefficients on PCI for West Germany (they have a negative sign) turn significant. This would reconfirm the impression that heavy investment in capital goods goes along with long production runs (PR) which already - as equation 9 in table 2 demonstrates - is a disadvantage in trade with developing countries. The variable human capital intensity (HCI) is just not significant either in the case of West Germany. This variable does carry explanatory power¹ when applied to a higher level of aggregation. It is possible that on this low level the measure is too rough.

21. A detailed breakdown of the employment of different skill groups readily reveals the expected pattern for the trade with both the developing countries and the OECD countries. The less unqualified persons (LQE) and the more qualified persons (QE) are employed, the higher the RCA-value. Female employees (FE) are often regarded as a proxy for low skilled labour². The German data provided a test case of the legitimacy of this substitution, for it was possible to calculate both variables. In equations 5 and 6 of table 2 the regressions with female employees (FE) show the expected signs on the coefficients and are very similar to the corresponding entries for less qualified labour (LQE) in equations 3 and 4 in the same table.

22. For West Germany the neo-technology hypothesis was tested with the research and development intensity (RD) proxy. The coefficients are positive in the trade with both regions and are statistically significant at the 5 percent level. The signs of the coefficients for all the exogenous variables show no differences between the

¹ Compare the results by Wolter.

² Frank D. Weiss calculates coefficients of correlation for these variables and finds them to be highly interdependent.

developing countries and the OECD countries. The structure of comparative advantage of West Germany by and large is the same vis-à-vis these two regions.

23. It is even more interesting to see how the theoretical predictions are established by the data for the case of Japan. In a study into the existence of a "Leontieff Paradox" for Japan, Tatemoto and Ichimura already in 1959 observed that: "... she (Japan) may be expected to have a comparative advantage in labour-intensive goods when trading with the former (advanced countries) and in capital-extensive goods when trading with the latter (underdeveloped countries)"¹. The results for Japan on the inter-industry hypotheses give an answer in the affirmative to this question of "upstream-downstream" trade. For the neo-factor-proportions hypothesis of trade two versions of physical capital intensity (PCI) have been tested. With both definitions the coefficients for physical capital intensity are not significant. The proxy for human capital intensity (HCI) is significant in the case of Japan in the trade with both regions. The sign of the coefficient however is positive downstream and negative upstream. This variable is an example for the duality in Japanese trade and reconfirms the a priori expectations. Further evidence in the same direction will be provided by other exogenous variables.

24. Economies of scale (ES) also has highly significant coefficients, a positive sign in the trade with developing countries and a negative sign in the trade with OECD countries. To the extent that the economies of scale proxy is positively correlated with the ability to develop and use new technologies Japan has an advantage in such activities with respect to the developing countries while the OECD countries have a

¹ Tatemoto and Ichimura have tested their prediction in a limited fashion. They calculated the labour input ratio for Japanese-American trade only.

comparative advantage over her. Similarly female employees (FE), the proxy for low-skilled labour, has a negative coefficient downstream which supports the expectation that unskilled labour is relatively abundant in developing countries. One would also expect that qualified labour (QE) is relatively scarce there or vice versa in relatively rich rupply in Japan and therefore to have a positive coefficient. The coefficient has the expected sign but is not significant. A relatively high employment of qualified labour leads - on the average - to a comparative disadvantage in the upstream trade for it has a statistically highly significant negative sign. Upstream it is low-skilled labour which has no measurable influence.

Summarizing the results for Japan's inter-industry trade one observes that whenever a variable has statistically significant influence the sign in the trade with one region is not repeated in the trade with the other region .

Intra-Industry Trade

25. For the tests of the intra-industry hypothesis of trade two multiple regressions including all the exogenous variables were run, one for each country (see table 3). Because of lack of trade data the regression was run twice for Japan, the second time excluding the critical variable, the coefficient of variation (VAR). When this variable is included either the hypothesis that its coefficient is zero cannot be rejected as in the case of West Germany or the sign does not confirm the a priori expectations.

The number of subgroups (SG) is a proxy for the correctness of the definition of a SITC 3 digit group as an industry¹. It is assumed that a larger number of subgroups indicates

¹ Compare the results by Grubel and Lloyd summarized on page 67.

a relatively higher likelihood for different industries to be within the SITC 3 digit group than one should otherwise expect. Then a large number of subgroups is interpreted as giving rise to a high volume of intra-industry trade due to an aggregation "error". Therefore a positive sign is expected for the variable SG. SG has a coefficient significantly different from zero for both countries. While in the case of Japan in both equations the sign is positive and thus is in line with the expectation this is not the case for West Germany: it has a negative sign. The more subgroups a SITC 3 digit group has - on the average - the less intra-industry trade it carries. This is quite unexpected. More research is asked for an explanation of what appears to be an "oddity".

26. The income differences (INDI) between the country under observation and its trading partners have no measurable influence. The proxy for the distance (DIS) is significant in the case of Japan when the exogenous variable (VAR) is excluded (equation 2 in table 3). Since intra-industry trade is expected to be the more intense the closer the countries are located to one another this variable should have a negative sign. In fact the sign is positive. Transportation cost does not appear to hinder trade. The remaining variable is the tradability proxy (TRA). In all three equations it is highly significant. For both Germany and Japan it carries a positive sign. Also this variable reflects transportation costs. But contrary to DIS it is product specific. Furthermore DIS also represents barriers to trade different from transportation cost such as communication costs and problems due to differences in culture and language; it incorporates difficulties stemming from learning costs with respect to the workings of foreign administrations and banking conventions.

The R^2 value for West Germany in equation 3 of table 3 is 0.33 while for Japan it reaches the extraordinary height of 0.85 considering the large number of observations (equation 2 of table 3). Since all the equations are highly significant the exogenous variables do "explain" a great deal of the total variation of the Grubel-Lloyd measure of intra-industry trade.

Conclusions

27. The empirical evidence allows to give some tentative answer to the problems that were discussed in paragraphs 2 - 4 . The analysis of inter-industry trade for both West Germany and Japan confirms the a priori expectations. Nearly all the equations are statistically significant, many coefficients are as well. In particular the results for the Japanese inter-industry trade are remarkable in that for the coefficients of the trade with the developing world and the OECD it is always true that the former have the opposite sign of the latter whenever they are significant. The explanation of inter-industry trade for West Germany is not that explicit. The results for the developing countries are better which should be expected because factor endowments of West Germany and major OECD countries are probably so close that the proxies used are not sharp enough to detect these differences.

Thus the hypotheses of international trade which were used to explain the structure of inter-industry trade are applicable also to this much lower level of aggregation. Since the level of aggregation is the "correct" level with respect to the SITC groups properly representing industries in an economically meaningful way the results are encouraging: the theoretical concepts appear to be sufficiently powerful in order to be applied to a policy relevant level of aggregation.

28. Intra-industry international trade is a real phenomenon. The version of the intra-industry hypothesis of international trade that was tested here allows this resumé. On exactly the same level of aggregation that was used for this test hypotheses of inter-industry trade were also tested and produced meaningful results. Therefore one is led to the conclusion that these two approaches to international trade should not be regarded as competing with one another. In the present state of development of the wealthiest countries in the world the most adequate view appears to be the following: the trade with developing countries is well explained by the inter-industry hypotheses. Partly, the trade among high per capita income developed countries is also explained by the traditional hypotheses. But there is a large share in the volume of total trade which cannot possibly be captured by these hypotheses due to the very assumptions that they are built on. Here the other hypotheses pertaining to intra-industry trade can fruitfully be employed. It is readily admitted that there is no set of exogenous variables as of yet which would admit an insight into the causes for intra-industry trade qualitatively similar to the understanding of inter-industry trade as it is made possible by the skills hypothesis.

Therefore the task will be to develop refined empirical counterparts of the theoretical constructs in order to gain better insight into the causes that make rich nations trade with one another. The evidence presented here lends support to the expectations that this endeavour will not be in vain.

Table 1 The Structure of Competitiveness in Japan's Engineering,
Regression Results, 1972/3, n = 22

EQUATION No	ENDOGEN. VAR.	CONST	REGRESSION COEFF (T-VALUE)	EXOGEN. VAR. 1	REGRESSION COEFF. (T-VALUE)	EXOGEN. VAR. 2	R ²	F
1	RCA-LDC ^a	= -4.837	+ 5.211 (3.939)***	x HCI ^b	+ 0.521 (0.977)	x PCI1 ^c	0.453	7.867***
2	RCA-OECD ^d	= 3.605	- 3.133 (1.989)**	x "	+ 0.306 (0.483)	x "		
3	RCA-LDC	= -4.058	+ 4.305 (3.034)***	x HCI	+ 0.886 (1.268)	x PCI2 ^e	0.471	8.437***
4	RCA-OECD	= 4.045	- 3.700 (2.168)**	x "	+ 0.562 (0.669)	x "		
5	RCA-LDC	= 3.629	- 6.785 (2.745)***	x FE ^e	+ 3.403 (0.717)	x QE ^f	0.358	5.301***
6	RCA-OECD	= 4.117	+ 1.637 (0.764)	x "	- 14.840 (3.498)***	x "	0.465	8.264***
7	RCA-LDC	= 1.568	+ 0.008 (4.000)***	x ES ^g			0.312	9.089***
8	RCA-OECD	= 1.078	- 0.007 (1.750)**	x "			0.165	3.934**

** statistically significant at 5 % level, *** statistically significant at 1 % level.
For concepts of measurement see paragraphs 8, 10, 12 and 14.

The abbreviations:

- ^a RCA-LDC revealed comparative advantage of trade with developing countries
- ^b HCI human capital intensity
- ^c PCI1 physical capital intensity
- ^d RCA-OECD revealed comparative advantage of trade with OECD countries
- ^e FE female employees
- ^f QE qualified employees
- ^g ES economies of scale

Table 2 The Structure of Competitiveness in West Germany's Engineering,
Regression Results, 1972/3.

EQUATION No	ENDOGEN. VAR.	CONST.	REGRESSION COEFF. (T-VALUE)	EXOGEN. VAR. 1	REGRESSION COEFF. (T-VALUE)	EXOGEN. VAR. 2	R ²	F-Test	n
1	RCA-LDC ^a	= -2.17	+ 1.16 (1.318)	x LN (HCI) ^b	- 1.10 (0.917)	x LN (PCI)	0.09	0.78	18
2	RCA-OECD ^d	= 2.616	- 0.103 (0.341)	x "	- 0.169 (0.761)	x "	0.14	1.22	18
3	RCA-LDC	= 4.552	- 1.093 (2.070)**	x LN (LQE) ^e	+ 0.825 (1.492)*	x LN (QE) ^f	0.239	2.981	22
4	RCA-OECD	= 1.718	- 0.419 (3.521)***	x "	+ 0.159 (1.395)*	x "	0.432	9.231**	22
5	RCA-LDC	= 3.795	- 0.851 (2.051)**	x LN (FE) ^g	-		0.174	4.209**	22
6	RCA-OECD	= 1.022	- 0.227 (2.225)**	x "	-		0.198	4.931**	22
7	RCA-LDC	= 1.590	+ 0.419 (1.806)**	x LN (RD) ^h	-		0.141	3.285	22
8	RCA-OECD	= 0.433	+ 0.109 (1.879)**	x "	-		0.153	3.596**	22
9	RCA-LDC	= 3.609	- 0.301 (2.246)**	x LN (LP) ⁱ	-		0.228	5.023**	19
10	RCA-OECD	= 0.742	- 0.036 (1.241)	x "	-		0.08	1.492	19

* statistically significant at 10 % level, ** statistically significant at 5 % level, *** statistically significant at 1 % level.

For concepts of measurement see paragraphs 8, 10, 12 and 14.

The abbreviations:

- ^a RCA-LDC revealed comparative advantage in trade with developing countries
- ^b HCI human capital intensity
- ^c PCI physical capital intensity
- ^d RCA-OECD revealed comparative advantage in trade with OECD countries
- ^e LQE less qualified employees
- ^f QE qualified employees
- ^g FE female employees
- ^h RD research and development intensity
- ⁱ LP length of production runs

Table 3 - The Structure of Intra-Industry Trade in Japan's (Equation 1, 2) and West Germany's (Equation 3) Engineering

Equat. No.	ENDOP.VAR.CONST. REGRESSION COEFF. (T-VALUE)	EXOGEN.VAR.1	REGRESSION COEFF. (T-VALUE)	EXOGEN.VAR.2	REGRESSION COEFF. (T-VALUE)	EXOGEN.VAR.3	REGRESSION COEFF. (T-VALUE)	EXOGEN.VAR.4	REGRESSION COEFF. (T-VALUE)	EXOGEN.VAR.5	R ²	F-TEST	n
1	IT = - 1.63-0.54 (2.08) **	x COV	+ 0.45 (22.50) ***	x SG	+ 0.0014 (2.80) ***	x TRA	- 0.00013 (0.48)	x INDI	- 0.00014 (0.70)	x DIS	0.76	68.01 ***	136
2	IT = - 1153	(-)	+ 0.16 (17.78) ***	x SG	+ 0.00889 (19.33) ***	x TRA	+ 0.00016 (1.00)	x INDI	+ 0.00034 (1.89) **	x DIS	0.85	333.87 ***	308
3	IT = 0.12-0.46 (0.38)	x COV	- 0.023 (3.29) ***	x SG	+ 0.0022 (2.44) ***	x TRA	+ 0.00003 (0.50)	x INDI	- 0.0005 (0.10)	x DIS	0.33	25.97 ***	321

** Statistically significant at 5 % level; *** statistically significant at 1 % level.

For measurement concepts see paragraphs 16, 17 and 18.

The abbreviations:

IT = Intra-Industry Trade; COV = Product Differentiation; SG = Aggregation Index; TRA = Tradability; INDI = Income Differences; DIS = Distance between Countries.

Appendix 1:

Let $x_i(m_i)$ be exports(imports) of branch i of some country to(from) some region.

The measure for intra-industry trade $\frac{x_i + m_i - |x_i - m_i|}{x_i + m_i}$

and the revealed comparative advantage $\ln\left(\frac{x_i}{m_i}\right)$ can be interpreted as functions, i.e.

$$f: R^+ \times R^+ \longrightarrow R$$

$$(x_i, m_i) \longrightarrow f((x_i, m_i)) = \ln\left(\frac{x_i}{m_i}\right)$$

$$g: R^+ \times R^+ \longrightarrow R^+$$

$$(x_i, m_i) \longrightarrow g((x_i, m_i)) = \frac{x_i + m_i - |x_i - m_i|}{x_i + m_i}$$

If the value of some (x_i, m_i) under f is given, then the value for this argument under g can be obtained. To this end a function

$$\varphi: R \longrightarrow R^+$$

is constructed with the property $\varphi \circ f = g$.

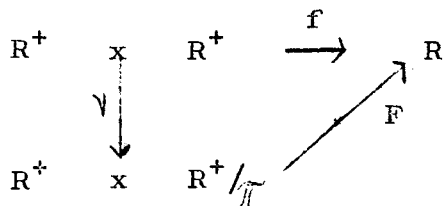
Let $\pi \subset R^+ \times R^+$ be a relation defined by

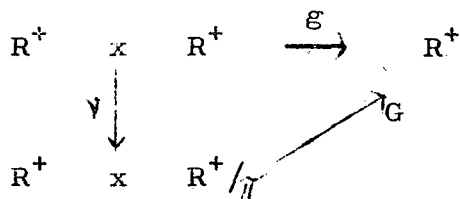
$$(x_1, m_1) \pi (x_2, m_2) \text{ if and only if}$$

$$\text{it exists } r \in R \text{ and } x_1 = rx_2 \text{ and } m_1 = rm_2.$$

Clearly π is an equivalence relation and is compatible with both f and g .

Thus there exist functions F and G and commutative diagrams

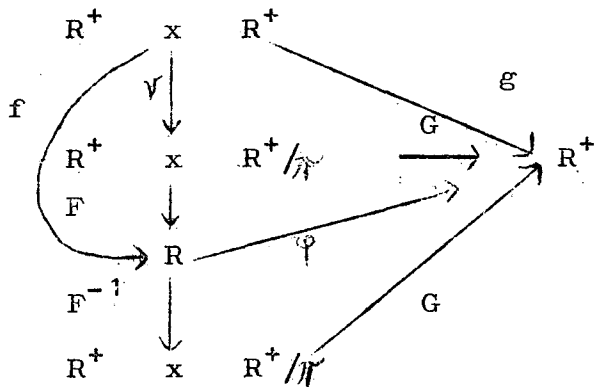




Since f is surjective and F is injective F is also bijective and has an inverse

$$F^{-1}: \begin{array}{ccc} R & \longrightarrow & R^+ \times R^+ \\ x & \longmapsto & F^{-1}(x) = \left[e^x, 1 \right] \end{array}$$

The following commutative diagram yields $\varphi = G \circ F^{-1}$



Appendix 2:

- 691 Finished Structural Parts and Structures, n.e.s.
- 692 Metal Containers for Storage and Transport
- 693 Wire Products (excluding electric) and Fencing Grills
- 694 Nails, Screws, Nuts, Bolts, Rivets and Similar Articles of Iron, Steel or of Copper
- 695 Tools for Use in the Hand or in Machines
- 696 Cutlery
- 697 Household Equipment of Base Metals
- 698 Manufactures of Metal, n.e.s.

- 711 Power Generating Machinery, Other Than Electric
- 712 Agricultural Machinery and Implements
- 714 Office Machines
- 715 Metalworking Machinery
- 717 Textile and Leather Machinery
- 718 Machines for Special Industries
- 719 Machinery and Appliances (Other Than Electrical) and Machine Parts, n.e.s.

- 722 Electric Power Machinery and Switchgear
- 723 Equipment for Distributing Electricity
- 724 Telecommunications Apparatus
- 725 Domestic Electrical Equipment
- 726 Electric Apparatus for Medical Purposes and Radiological Apparatus

- 729 Other Electrical Machinery and Apparatus Batteries and Accumulators

- 731 Railway Vehicles
- 732 Road Motor Vehicles
- 733 Road Vehicles other than Motor Vehicles
- 734 Aircraft
- 735 Ships and Boats

Appendix 3:

The trade data all come from the OECD¹ statistics. The level of aggregation as defined by the 3 digit SITC² groups (listed in appendix 2) was taken as the common measuring rod for the calculations of both Japan and West Germany.

The industry data were transformed to this end.

The Japanese industry data were selected from the Census of Manufactures³.

The data are classified according to the Standard Industrial Classification for Japan (JSIC).

It is possible to use a formal procedure to arrive at a correspondance between the SITC and the JSIC. In spite of the adopted selection mechanism⁴ this comparison of the classifications apparently did not recognize sufficiently that ISIC groups contribute in various degrees to different SITC groups, and correspondingly the results were not very convincing.

¹ OECD-Trade-Statistics; Series B, C, 1972, 1973.

² SITC = Standard International Trade Classification.

³ Census of Manufactures, Reports by Industries; MITI, Tokyo/Japan.

⁴ Two correspondances were merged: the comparison of ISIC (International Standard Industrial Classification) with JSIC and the Classification of Commodities by Industrial Origin (United Nations, 1971) which is a SITC-ISIC correspondance. The SITC-ISIC comparison was transformed. For any 3 digit SITC group those 4 digit ISIC groups were selected which were mentioned more often than ten percent of the total number of ISIC groups. To these remaining ISIC groups the JSIC groups were taken from the other comparison. Thus a selection of JSIC groups for every SITC 3 digit group is defined.

Therefore another correspondance was made. It was based on the difinitions of the 3 digit groups in the JSIC and the SITC and on intuitive judgement as to which JSIC 3 digit groups can be expected to produce predominantly for a given SITC 3 digit group. This comparison was used for the aggregation of Japanese industry data to make them consistent with the SITC classification.

The statistics for West Germany on structural data for the industry are published on a higher level of aggregation than is used here. With a few exceptions¹ there are no such data on the 4 digit level of the WI² except for production³.

This variable was utilized to transform a comparison of the SITC and the GSIC⁴ (which also contains many 6 digit groups) to get 4 digit GSIC groups⁵ only.

With these correspondances it was possible to do the calculations on exactly the same level of aggregation for both countries.

¹For example for fabricated metal products, GSIC No. 38.

²WI = Warenverzeichnis für die Industriestatistik, the German Standard Industrial Classification, henceforth referred to as GSIC.

³Statistisches Bundesamt, Fachserie 4, Reihe 3: Produktion im Produzierenden Gewerbe.

⁴Gegenüberstellung der SITC mit dem WI; Statistisches Bundesamt, 1972.

The exogenous variables for West Germany, though, which ideally should be as close as possible to the Japanese variables were taken from a survey¹. This sample covers only 377 companies while the Japanese data cover every establishment with more than twenty employees. Also it was not possible to calculate exactly the same variables as in the Japanese case².

¹ Survey on the engineering sector of West German industry organized by the SFB 86 IH a research group of the Institute of World Economies, Kiel, in 1975.

² The extensive data base resulting from the survey had to be given the shape of a matrix with a meaningful entry for every index pair. In order to achieve this goal it was necessary to clear the data of errors of omission and commission. Then an aggregation from firm to 4 digit GSIC level was carried out. The data were thereafter transformed into proxies and/or further aggregated to the 3 digit SITC level.

Bibliography:

Balassa, Bela A., "Trade Liberalisation and 'Revealed' comparative Advantage", The Manchester School of Economic and Social Studies, Vol. 33, Manchester, 1965, pp. 99-123.

Burenstam-Linder, Staffan, "An Essay on Trade and Transformation", Stockholm, 1961.

Fels, Gerhard, "The Choice of Industry Mix in the Division of Labour between Developed and Developing Countries", Weltwirtschaftliches Archiv, Vol. 108, No. 1, Kiel, 1971, pp. 71-121.

Fortune, J. Neill, "Some Determinants of Trade in Finished Manufactures", The Swedish Journal of Economics, Vol. 73, Uppsala, 1971, pp. 311-317.

Gray, H. Peter, "Two-Way International Trade in Manufactures: A Theoretical Underpinning", Weltwirtschaftliches Archiv, Vol. 109, No. 1, Kiel, 1973, pp. 19 sqq.

Grubel, Herbert G., P.J. Lloyd, "Intra-Industry Trade, The Theory and Measurement of International Trade in Differentiated Products", London, 1975.

Gruber, William H. and Raymond Vernon, "The Technology Factor in a World Trade Matrix", in: Raymond Vernon (Ed.), The Technology Factor in International Trade, Universities-National Bureau (Committee for Economic Research) Conference Series, 22, New York, London, 1970, pp. 233 sqq.

Gruber, William H., Dileep Mehta, Raymond Vernon, "The R&D Factor in International Trade and International Investment of United States Industries", The Journal of Political Economy, Vol. 75, Chicago, Ill., 1967, pp. 20 sqq.

Hesse, Helmut, "Hypotheses for the Explanation of Trade Between Industrial Countries, 1953-1970"; in: Giersch, Herbert, "The International Division of Labour - Problems and Perspectives", 1974, Tübingen, pp. 39-58.

Hirsch, Seev and Baruch Lev, "Trade and Per Capita Income Differentials: A Test of the Burenstam-Linder Hypothesis", World Development, Vol. 1, Oxford, 1973, No. 9, pp. 11 sqq.

Hufbauer, Gary C., "The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods", in: Raymond Vernon: "The Technology Factor in International Trade, Universities - National Bureau (Committee for Economic Research) Conference Series, 22, New York, London, 1970, pp. 145-231.

Keesing, Donald B., "Labour Skills and International Trade: Evaluating Many Trade Flows with a Single Measuring Device", The Review of Economics and Statistics, Vol. 47, Cambridge/Mass., 1965, pp. 287 sqq.

Keesing, Donald B., "Different Countries Labour Skill Coefficients and the Skill Intensity of International Trade Flows", *Journal of International Economics*, Amsterdam, 1971, pp. 443 sqq.

Kenen, Peter B., "Nature, Capital and Trade", *The Journal of Political Economy*, Vol. 73, Chicago/Ill., 1965, pp. 456 sqq.

Kmenta, Jan, "Elements of Econometrics", New York, London, 1971.

Kravis, Irving B., "Wages and Foreign Trade", *The Review of Economics and Statistics*, Vol. 38, Cambridge/Mass., 1956, pp. 14 sqq.

Lary, Hal B., "Imports of Manufactures from Less Developed Countries", *National Bureau of Economic Research, Studies in International Economic Relations*, No. 4, New York, 1968.

Linnemann, Hans, "An Econometric Study of International Trade Flows", Amsterdam, 1966.

Pagoulatos, Emilio and Robert Sorensen, "Two-Way International Trade: An Econometric Analysis", *Weltwirtschaftliches Archiv*, Vol. 111, No. 3, Kiel, 1975, pp. 454-465.

Pomfret, Richard, "Intra-Industry Trade in Israel - Level, Explanation and Implications". Working Paper No. 40, Kiel Institute of World Economics.

Posner, Michael V., "International Trade and Technical Change", *Oxford Economic Papers*, N.S., Vol. 13, Oxford, 1961, pp. 323-341.

Roskamp, Karl W. and Gordon C. McMeekin, "Factor Proportions, Human Capital and Foreign Trade: The Case of West Germany Reconsidered", *The Quarterly Journal of Economics*, Vol. 82, Cambridge/Mass., 1968, pp. 152 sqq.

Stern, Robert M., "Testing Trade Theories", in: Peter B. Kenen, *International Trade and Finance-Frontiers for Research*, Cambridge, London, New York, Melbourne, 1975, pp. 3 sqq.

Tatemoto, Masahiro and Shinichi Ichimura, "Factor Proportions and Foreign Trade", *The Review of Economics and Statistics*, Cambridge/Mass., 1959, pp. 442-446.

Vernon, Raymond, "International Investment and International Trade in the Product Cycle", *The Quarterly Journal of Economics*, Vol. 80, Cambridge/Mass., 1966, pp. 190-207.

Weiss, Frank D., "Electrical Engineering Competition from Less Developed Countries in Germany, Sweden and the United States", Kiel, 1977, manuscript.

Weiss, Leonard W., "The Geographic Size of Markets in Manufacturing", The Review of Economics and Statistics, Vol. 54, Cambridge/Mass., 1972, pp. 245 sqq.

Wolter, Frank, "Factor Proportions, Technology and West German Industry's International Trade Pattern", Weltwirtschaftliches Archiv, Vol. 113, No. 2, Kiel, 1977, pp. 250 sqq.

Kieler Arbeitspapiere - (Kiel Working Papers):

1. M. Girgis, Labor Absorptive Capacity of Export Expansion and Import Substitution in Egypt, 1954 to 1970. Kiel, July 1973, 32 pp.
2. A.D. Neu, Adjustment in the Textile and Clothing Industry. The Case of West Germany. Kiel, November 1973, 32 pp.
3. W. Koschorreck, Antidumpingrecht im Bereich der Bundesrepublik Deutschland. Kiel, November 1973, 26 S.
4. H.R. Krämer, The Changing Principles of International Trade Policy. Kiel, November 1973, 17 pp.
5. S. Heldt, Exportförderung in Lateinamerika, insbesondere in den Andenländern. Eine Bestandsaufnahme. Kiel, November 1973, 31 S.
6. U. Hiemenz and K. v. Rabenau, Effective Protection of West German Industry. Kiel, December 1973, 47 pp.
7. W. Koschorreck, Die paratarifären Handelshemmnisse bei Einfuhr in die Bundesrepublik. Kiel, Dezember 1973, 24 S.
8. H.R. Krämer, "Technische Hemmnisse" bei Einfuhren in die Bundesrepublik Deutschland. Gesundheitsschutzbestimmungen, Sicherheitsvorschriften, Normen und Maßnahmen zum Schutz der Umwelt. Kiel, Dezember 1973, 44 S.
9. R.J. Langhammer, Der Integrationsprozeß in Zentralafrika. Kiel, Dezember 1973, 31 S.
10. J.B. Donges, The Economic Integration of Spain with the E.E.C. - Problems and Prospects. Kiel, December 1973, 28 pp.
11. W. Koschorreck, Nichttarifäre Handelshemmnisse durch Prämien, Subventionen und Ausgleichszölle. Kiel, Januar 1974, 32 S.
12. R.J. Langhammer, Common Industrialization Policy in Small Integration Schemes. The Central African Approach. Kiel, February 1974, 34 pp.
13. K. Bieda, Export Performance and Potential of Singapore. Kiel, March 1974, 78 pp.
14. G. Fels, Assistance to Industry in West Germany. Kiel, March 1974, 42 pp.

15. H.R. Krämer, Nichttarifäre Handelsschranken im öffentlichen Auftragswesen der Bundesrepublik Deutschland. Kiel, März 1974, 48 S.
16. A.D. Neu, Ökonomische Implikationen einer Reform des Strafvollzuges. Kiel, April 1974, 27 S.
17. S. Heldt, Die zentralamerikanische Integrationsbewegung, ein Erfolg? Kiel, Mai 1974, 40 S.
18. R.J. Langhammer, Probleme und Perspektiven von Gemeinschaftsunternehmen im Rahmen einer regionalen Integration von "least developed countries". Kiel, Mai 1974, 29 S.
19. S. Heldt, Zur Messung von Integrationseffekten im zentralamerikanischen gemeinsamen Markt. Kiel, Juni 1974, 40 S.
20. J. Riedel, Factor Proportions, Linkage and the Open Development Economy. Kiel, July 1974, 20 pp.
21. H.R. Krämer, The Principle of Non-Discrimination in International Commercial Policy. Kiel, July 1974, 68 pp.
22. R. Pomfret, Israeli Policies Towards Manufactured Goods. Kiel, August 1974, 70 pp.
23. F. Weiss, F. Wolter, Machinery in the United States, Sweden and Germany - An Assessment of Changes in Comparative Advantage. Kiel, September 1974, 56 pp.
24. J.B. Donges, R. Banerji, The Domestic Resource Cost Concept - Theory and an Empirical Application to the Case of Spain. Kiel, November 1974, 38 pp.
25. H. Vögele, Die Entwicklung der Wirtschaftsstruktur und des Arbeitsplätzeangebots in den Ländern der Bundesrepublik Deutschland bis 1985. Kiel, Januar 1975, 78 S.
26. C.R. Chittle, The Industrialization of Yugoslavia under the Worker's Self-Management System: Institutional Change and Rapid Growth. Kiel, January 1975, 71 pp.
27. R.W.T. Pomfret, Export Policies and Performance in Israel. Kiel, February 1975, 88 pp.
28. C.R. Chittle, Yugoslavia under the Worker's Self-Management System: Growth and Structural Change in the External Sector. Kiel, March 1975, 59 pp.
29. F. Wolter, Engineering Exports of Less Developed Countries. Kiel, March 1975, 50 pp.

30. R. Vaubel, Neglected Aspects of the Parallel-Currency Approach to European Monetary Unification. Kiel, March 1975, 66 pp.
31. J.P. Wogart, Import Substitution and Export Diversification in Colombia. Kiel, April 1975, 83 pp.
32. R.J. Langhammer, "Ungleich" verteilte Kosten und Nutzen aus der regionalen Integration zwischen Entwicklungsländern. Erscheinungsbild und Bewältigungsversuche dargestellt am Beispiel der Zentralafrikanischen Zoll- und Wirtschaftsunion (UDEAC). Kiel, April 1975, 38 pp.
33. S. Heldt, Gemeinschaftliche Industrialisierungspolitik als Instrument des Ausgleichs von Nutzen und Kosten in Integrationsgemeinschaften zwischen Entwicklungsländern: Die Erfahrung des Zentralamerikanischen Gemeinsamen Marktes (CACM). Kiel, Juni 1975, 30 S.
34. S. Nehring, Zur theoretischen Einordnung impliziter Handestransfers. Kiel, September 1975, 71 S.
35. G.B.S. Mujahid, Export Behaviour of Pakistani Firms - An Evaluation of Interviews. Kiel, September 1975, 55 pp.
36. S. Nehring, Theoretisch-empirische Probleme der Berechnung von internationalen impliziten Transfers. Kiel, September 1975, 36 S.
37. S. Heldt, Gemeinschaftliche Regelungen für ausländische Investitionen im Rahmen des Andenpaktes. Kiel, Oktober 1975, 45 S.
38. U. Hiemenz, K.-W. Schatz, Employment Creation in Less Developed Countries - A Cross Section Analysis. Kiel, December 1975, 47 pp.
39. R. Vaubel, Real Exchange-Rate Changes in the European Community: The Empirical Evidence and Its Implications for European Currency Unification. Kiel, January 1976, 31 pp.
40. R. Pomfret, Intra-Industry Trade in Israel: Level, Explanation and Implication. Kiel, January 1976, 14 pp.
41. J. Riedel, Tariff Concessions in the Kennedy Round and the Structure of Protection in West Germany: An Econometric Assessment. Kiel, March 1976, 14 pp.
42. S. Heldt, Förderung der internationalen Arbeitsteilung mittels regionaler Zusammenschlüsse? Das Beispiel des CACM. Kiel, April 1976, 21 S.
43. J. Roth, Internationale Konjunkturübertragungen und nationale Stabilisierungspolitiken bei flexiblen Wechselkursen - Ein Zwei-Länder-Totalmodell. Kiel, April 1976, 32 S.

44. R. Dick, Maschinenbau unter Wettbewerbsdruck aus Entwicklungsländern? - Ergebnisse einer Befragung westdeutscher Maschinenbauunternehmen. Kiel, Mai 1976, 37 S.
45. J.B. Donges, Zur Neuordnung des Rohstoffhandels zwischen Entwicklungs- und Industrieländern. Kiel, Mai 1976, 38 S.
46. H. Lehment, Die kompensatorische Finanzierung von Exporterlösschwankungen - Eine Kritik bestehender Systeme. Kiel, Juni 1976, 11 S.
47. S. Nehring, Einige Rahmenüberlegungen zum internationalen Ressourcentransfer - Dargestellt an Thesen zum "integrierten Rohstoffprogramm". Kiel, Juli 1976, 15 S.
48. S. Nehring, R. Soltwedel, Probleme der Beschäftigungspolitik. Kiel, Juli 1976, 30 S.
49. J.B. Donges, J. Riedel, The Expansion of Manufactured Exports in Developing Countries: An Empirical Assessment of Supply and Demand Issues. Kiel, June 1976, 58 pp.
50. R. Banerji, Technology, Economies of Scale and Average Size of Industrial Plants: Some Further Cross-Country Evidence. Kiel, July 1976, 28 pp.
51. R. Pomfret, The Consequences of Free Trade in Manufactures between Israel and the EEC. Kiel, July 1976, 11 pp.
52. J.P. Agarwal, Reflections on Foreign Investment in Natural Resources of Developing Countries. Kiel, August 1976, 25 pp.
53. F. Wolter, Factor Proportions, Technology and West German Industry's International Trade Patterns - Worldwide and Regional. Kiel, September 1976, 42 pp.
54. R.J. Langhammer, Estimating the Stock of Foreign Direct Investments in the Manufacturing Sector of Francophone Subsaharian African Countries, 1963-1975. Kiel, February 1977, 23 pp.
55. H.R. Krämer, Europäische Integration. Ein Überblick. Kiel, Februar 1977, 20 S.
56. H.H. Glismann, H. Rodemer, Bufferstocks als Mittel zur Stabilisierung konjunkturbedingter Preisschwankungen auf den Weltrohstoffmärkten. Kiel, März 1977, 20 S.
57. S. Heldt, Towards the Attainment of Self-Sustaining Growth: Ghana and the Ivory Coast. Kiel, April 1977, 30 pp.
58. M. Bruch, Die regionale Struktur der verarbeitenden Industrie in Brasilien und Mexiko. Kiel, Juli 1977, 44 S.

59. B. Lehbert, Untersuchungen der kurz- und langfristigen Elastizitäten der Energienachfrage in bezug auf die Energiepreise in der Bundesrepublik Deutschland. Kiel, September 1977, 104 S.
60. F. Wolter, Perspectives for the International Location of the Steel Industry. Kiel, October 1977, 30 pp.
61. R. Banerji, Growth Patterns of Small Scale Plants in Manufacturing Industries: A Cross-Country Analysis. Kiel, October 1977, 18 pp.
62. R. Langhammer, On Determinants of Foreign Investments in Franco-phone African Manufacturing - Some Cross Country Regression Results. Kiel, November 1977, 29 pp.
63. R. Banerji, J. Riedel, Industrial Employment Expansion under Alternative Development Strategies: Some Empirical Evidence. Kiel, November 1977, 16 pp.
64. R. Banerji, Employment and Growth Potential of Rural Industries; Small-Scale Industries and Medium and Large-Scale Industries in India: A Comparative Overview. Kiel, November 1977, 27 pp.
65. R. Fürstenberg, A Comparative Analysis of Determinants of West German and Japanese Engineering Trade Patterns. Kiel, December 1977.