Explaining the Structure of Foreign Trade: Where Do We Stand?

By

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Contents: I. Introduction. – II. Early Insights. – III. Further Developments. – IV. Recent Advances. – V. Economies of Scale and Product Differentiation. – VI. Conclusions.

I. Introduction

World merchandise exports amounted to 5.3 trillion US dollars in 1997 and exports of commercial services amounted to 1.3 trillion. These are unprecedented volumes that have expanded much faster than income in the post-war period. More than half of the volume of merchandise trade flows amongst developed countries and less than 15 percent flows amongst developing countries. The rest, about one third, represents North-South trade – between developed and developing countries.

What explains these large volumes of trade? Why do some countries export computers while others export footwear? Can exports of airplanes be explained in the same way as exports of paper products? Questions of this type have been examined for many years. In attempting to answer them, economists developed an elaborate analytical apparatus that has been greatly enriched in the last two decades. They have used the insights from trade theory to examine ever richer data sets in order to discover systematic patterns of trade flows and evaluate how well available theories match these data. Nevertheless, although we do have today better answers to some of these questions than our predecessors had forty years ago, the evolving structure of world trade defines simple explanations. I will try to describe in this lecture what we know about foreign trade and in what ways our understanding has improved as a result of the last twenty years of research.

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II. Early Insights

David Ricardo's theory of comparative advantage, developed at the beginning of the 19th century, has played a major role in modern thinking about trade. Its emphasis on labor productivity renders it useful for analyzing a host of issues, such as the effects of technological progress on patterns of specialization and the distribution of gains from trade. But as far as the structure of foreign trade is concerned, and in particular in relation to data analysis, this theory assumes too much exogeneity to be useful. For this reason, empirical studies of trade flows that build only on Ricardo's insights are hardly available. A few of them appeared in the fifties and sixties. As ingenious as they were, it quickly became apparent that they are of limited use because the Ricardian theory is mute on a key ingredient: what causes labor productivity to differ across countries?

One major difficulty encountered by empirical research was the fact that differences in the use of capital provide an important source of variation in labor productivity. Capital-rich countries are able to allocate more capital per worker to all economic activities than capital-poor countries, but they may do so to a different degree in various lines of business. As a result, output per worker (or output per hour) may vary across industries to a different degree in capital-rich and capital-poor countries. This raises the question: What determines the allocation of capital to industries and thereby labor productivity? But once the role of capital is taken seriously it may be best to abandon the focus on labor productivity altogether and think about what determines trade flows amongst countries that have more than labor as an input.

Eli Heckscher and Bertil Ohlin provided a framework for thinking about trade in just this type of situation. Both Heckscher (1919) and Ohlin (1924) emphasized the roles of labor, capital, and land in agriculture and industry, trying to explain how their availability shapes a country's pattern of specialization and trade. For this purpose, technologies are assumed to be the same in all countries. Despite the richness of the approach taken by the founders of the Heckscher-Ohlin theory, Paul Samuelson (1948) and his followers elaborated a two-factor, two-sector version that became the cornerstone of modern trade theory. Samuelson's version is crisp and elegant. Its focus on labor and capital on the one hand and on exporting and import-competing sectors on the other cuts to the heart of much that matters. For this reason it was widely adopted as the workhorse of the profession.

According to the two-factor, two-sector version of the Heckscher-Ohlin theory, a country should export the product that is relatively intensive in the factor with which the country is relatively well endowed. Thinking about labor and capital as the two inputs, it means that a capital-rich country, i.e., a country that has more capital per worker than its trade partners, should export the capital-intensive product.

Leontief (1954) put this prediction to a test. Having worked on US input-output tables, he calculated labor-output and capital-output ratios for a variety of sectors. Matching the sectoral composition of the input-output tables with trade data, he then calculated how much labor and capital are embodied in exports and how much in imports. He then calculated the ratio of capital to labor in US imports and exports. Surprisingly, he found that the capital-labor ratio embodied in imports exceeded the ratio embodied in exports. The surprise emanated from the fact that after the war the US was considered to be the most capital-rich country in the world and the Heckscher-Ohlin theory predicts for such a country a higher capital intensity of exports rather than imports. His finding became known as the "Leontief Paradox."

III. Further Developments

The two-factor, two-sector version of the Heckscher-Ohlin theory was extended in the sixties and the seventies. Two types of relationships provide the underpinning for the generalized theory. First comes production, in which sectoral output levels are linearly related to inputs. The second relationship comes from consumption. Consumption is proportional to aggregate world output. They have been used to formulate an empirical specification, which consists of a set of linear equations that relate net exports to factor endowments. Each such relationship, for petroleum products, forest products, machinery or chemical products, can be estimated from cross-country data. We need data on net exports, which are readily available, and factor endowments, which are not readily available in comparable form. Leamer (1984) provided the first estimates of this type. The simple linear specification performed very well on a cross-section of sixty countries in Leamer's data set (with a few exceptions). As expected, availability of oil raises net exports of petroleum products, but it also reduces net exports of machinery (in the 1975 data). And abundance of literate, non-professional workers raises exports of labor-intensive manufactures, such as apparel and footwear. These are just examples of the type of effects that were estimated.

Estimates of the type provided by Leamer are interesting and they have a clear interpretation. But they do not provide a test of the generalized Heckscher-Ohlin theory. The reason is that the theory predicts a relationship between endowments and trade mediated by technology. To test it therefore requires independent information about all three objects: technology, endowments, trade.

Two concepts of trade have surfaced so far: trade in goods and services and the factor content of trade flows. The former is a natural focus of trade theory. But, as explained earlier on, Leontief converted trade in products into factor content. His procedure was generalized by Vanek (1968). With identical technology matrixes in all countries, this procedure is quite simple. It produces linear equations in which the left-hand side provides a measure of the factor content of trade and the right-hand side provides a measure of factor abundance. The two have to be equal. As a result inputs that are in relative abundance are exported while those that are relatively scarce are imported on net.

Vanek's equation was used by Leamer (1980) to point out a shortcoming of Leontief's procedure: whenever there are more than two inputs, a comparison of the ratio of the embodied quantities of two of them in imports and exports does not provide the relevant metric for rejecting the theory. This may sound like a neat resolution of the Leontief Paradox. It is not. As pointed out by Brecher and Chaudhri (1982), the fact that the US was a net exporter of labor services has implications for consumption per worker, which are not borne out by the data. Therefore difficulties remain.

Bowen et al. (1987) performed two types of tests on Vanek's equation. Theirs are the first calculations to build on independent information about endowments, technology and trade. One test compares the rank orders of the expressions on the right-hand and left-hand sides, and examines how well they match. A second test compares the signs of the corresponding expressions on the right-hand and left-hand sides. Both tests point to difficulties. Bowen et al. find violations of the sign test in about one third of the cases and violations of the rank order test in about half the cases. This appears to be bad news for the expanded Heckscher-Ohlin theory. But how bad the news is is hard to gauge, because the theory is not tested against a well-specified alternative. For this reason, it is also possible to take a more positive attitude and to argue that, since these tests were done on data for 12 inputs and 27 countries (for 1967), the theory explains a reasonably large fraction of the variation, across factors and countries, of the factor content of net trade flows.

IV. Recent Advances

Bowen et al. (1987) pointed out difficulties with the Vanek equation, but they did not investigate whether there are systematic deviations of the data from the theoretical predictions. This important task was undertaken by Trefler (1995). He compiled a new data set, for 33 countries, that disaggregates endowments into nine inputs. The countries in the sample accounted for three-quarters of world exports and nearly 80 percent of world income in 1983. In Trefler's data the correlation between the factor content of net exports and the factor abundance measure (taking account of the variation across inputs and countries) equals 0.28, while Vanek's equation predicts a correlation of one. A sign test of the Bowen-Leamer-Sveikauskas type was successful in only about one-half of the cases while Vanek's equation predicts a 100 percent match. It therefore appears that Trefler's data fits the expanded Heckscher-Ohlin theory as well or as badly as Bowen, Leamer and Sveikauskas' data does.

Trefler shows clearly in what ways these data deviate from the theoretical predictions:

- First, the measures of the factor content of net exports are compressed towards zero relative to the factor abundance measures. This compression is striking. It is not unusual in these data for the absolute value of the factor abundance measure to be 10 to 50 times higher than the absolute value of the factor content of trade.
- Second, when sorted by GDP per capita adjusted for purchasing power parity (PPP) poor countries have systematically smaller values of factor content than factor abundance. This means that whenever a poor country exports an input on net, it exports less than predicted by its factor abundance measure. And whenever it imports an input on net, it imports more than predicted by its factor abundance measure. For rich countries the opposite is true.
- Third, poor countries tend to be abundant in more factors than rich countries.

This characterization is of lasting value. We now have a better understanding of the ways in which the data do not match the theory. And it provides a clear theoretical challenge: How should the model be modified to better fit the data?

Trefler (1995) examined how much improvement in fit can be obtained from simple differences in productivity across inputs and countries. Suppose, as suggested by Leontief, that inputs are not equally productive in all countries. If US labor is, for example, two times as productive as labor in Italy, then a thousand hours of US labor services are equivalent to two thousand hours of labor services in Italy. Taking one country as the benchmark, we can then convert the endowment of every country into productivity-adjusted equivalent units of the benchmark country. Using the US as the benchmark country then allows us to derive a new set of equations that contains productivity measures.

Trefler (1993) used the modified equations to calculate labor and capital productivity coefficients for a set of countries relative to the US, under the maintained hypothesis that the equations are precisely satisfied. He then compared them with the wage rate and the return to capital in these countries relative to the US. According to the theory, the relative rewards should equal the relative productivity parameters. And he indeed found the relative factor rewards to be highly correlated with the calculated relative productivity parameters.

In another study Trefler (1995) used two alternatives to estimate the productivity parameters. *First,* suppose that the productivity parameters are only country-specific. Namely, if US labor is twice as productive as Italian labor so is US capital and land. This restriction attributes a single productivity measure to every country, which then represents its common productivity advantage in all lines of business. Trefler's second observation – namely, that poor countries appear to export too little factor content while rich countries export too much – suggests that such productivity differences can help explain these data. *Second,* suppose that countries are divided into two sets: one set – consisting of developed countries – has the same productivity as the benchmark country, while countries in the other set – which are less developed – share the same factor-specific productivity parameters. Trefler examined a nested specification of these models. Against the null of the simple Vanek equation, he examined the Hicks-neutral specification and a combination of the Hicks-neutral and factor-augmented productivity differences between two sets of countries. Using a model-selection criterion he concluded that the Hicks-neutral specification performs best.

Davis, Weinstein, Bradford and Shimpo (1997) (DWBS for short) examined separately the production relationship and the consumption relationship that underlines this theory. They evaluated the production relationship in a cross-section of countries and a cross-section of Japanese regions, using Japan's input-output table. They performed rank order tests of the type introduced by Bowen et al. (1987). Significantly, they found that the equations do not describe well the international data but are remarkably accurate for the Japanese regions.

One possible interpretation of this finding is that techniques of production are very similar in various Japanese regions but differ significantly across countries. The latter is consistent with other pieces of evidence. The interesting finding is therefore that very similar techniques are used all over Japan. On the other hand, failures in the international data can emanate either from lack of factor price equalization (which we know to be true from data on wages) or from differences in technological opportunities (which we also know to be the case). At the moment, there are no estimates of how much should be attributed to each one of these sources of variation.

The consumption relationship was examined for Japanese regions, with great success. It follows that if there are difficulties with Vanek's trade equation in the Japanese data it is not due to lack of proportionality in absorption. And in view of the good fit of the production relationship such difficulties also cannot result from cross-regional differences in techniques of production.

When testing Vanek's equation directly, however, DWBS found that it does not fit well the Japanese data. As in Trefler's data set in this case too there is a "missing trade" phenomenon. Namely, the computed factor content of net exports is much smaller than what is predicted by factor abundance. For example, while net exports of noncollege labor services amount to 3.6 percent of this factor endowment, the factor abundance measure predicts imports of 31 percent of the endowment – a large deviation indeed.

So how can these different findings be reconciled? Why do the production and consumption equations fit the Japanese data while Vanek's equation does not?

DWBS propose a partial resolution to this puzzle by observing that Vanek's equation is strictly correct only when all countries use the same techniques of production. If, however, Japan uses techniques of production that differ from other countries, then, using its technology matrix, we can obtain a modified Vanek-type equation that calculates a more accurate measure of the factor content of consumption. As expected, this modified equation fits the Japanese data much better than Vanek's equation, substantially reducing the puzzle of the "missing trade."

Evidently, we now know much more about the gaps between theory and data. Trefler uncovered patterns of deviation. Technological differences between countries help to explain them. The work by Davis et al. (1997) supports this emphasis. But we still do not have a good handle on why techniques of production differ between countries and whether it is possible to explain the data with systematic differences in techniques of production that are driven by a small number of country-specific characteristics. Clearly, every pattern of trade can be explained with arbitrary differences in techniques of production. This is therefore not a useful approach. The challenge is to find key features of countries that produce differences in techniques of production that fit the data well.

To give an example of what type of country differences matters – which appears to be consistent with the just reported analysis of the Japanese data – consider a world in which differences in factor composition are wide and therefore there is no factor price equalization. It is possible to show that the standard procedure to calculate factor content vectors produces in this case "missing trade." A similar point is made by Hakura (1997). She also shows that in data for five of the original EU countries, the fraction of observations that pass the Bowen-Leamer-Sveikauskas sign test of Vanek's equation rises markedly when the equation is modified to admit cross-country differences in techniques of production. She finds that the sign pattern of the original Vanek equation is correct in about one-half of the observations. But this fraction rises to 70–80 percent when each country's techniques of production are used instead of a common technology matrix. And this fraction rises even further when allowance is made for nontraded intermediate inputs. Evidently, allowing for differences in techniques of production dramatically improves the fit of factor content equations.

Gabaix (1997) uses regression analysis to examine a variant of the productivity-augmented Vanek equation, of the type studied by Trefler (1993, 1995). His results are mostly negative. They underscore the extent of the "missing trade."

At this point, one should note that things look better when attention is focused on the pattern of international specialization. Reeve (1998) estimated a relationship between outputs and inputs for a sample of 20 OECD countries, using data on 15 sectors and five types of inputs: capital, three grades of labor, and arable land. He found that cross-country variations in factor endowments explain over 40 percent of the variation in output levels. Importantly, when allowing for cross-country differences in Hicks-neutral productivity levels the fit improves significantly and an additional 7 percent of the variation in output levels is explained. And decomposing output changes from 1970 to 1985 he finds that shifts in factor endowments and the techniques of production explain over 80 percent of the changes in the sectoral output levels. But significantly, changing factor endowments contribute about twice as much to this explanation as changing techniques of production.

All this suggests that as imperfect as the theory is, some of its components fair well empirically. My conclusion from the evidence is that we need to model more carefully the cross-country differences in techniques of production that are driven by both, technological differences and differences in factor rewards, in order to close the gap between the theory and the data.

V. Economies of Scale and Product Differentiation

Concurrent with the refinement of the Heckscher-Ohlin trade theory and the development of its empirical implications for the factor content of net trade flows, a new theory that emphasizes economies of scale and product differentiation emerged in the 1980s. At the early stages of its development, the new theory seemed to threaten the Heckscher-Ohlin orthodoxy.[1] But soon it became clear that explanations of trade provided by economies of scale and product differentiations complement the explanations provided by factor endowments. This called for an integrative view of foreign trade that would allow for an interplay between economies of scale, product differentiation, and factor proportions. Helpman and Krugman (1985) developed such an approach, making allowance for sectors that differ in their sources of scale economies, in conduct, and in market structure.

Much of this research was originally motivated by the observation that large volumes of trade flow between countries with similar factor proportions and that significant trade overlap exists within industries. These facts have not changed. In 1996, the 15 countries of the European Union exported a little over two trillion dollars-worth of merchandise and imported a similar amount. About 65 percent of this trade was within the EU. At the same time, their imports from Japan exceeded their imports from *all* of Africa and were more than twice as high as their imports from *all* of the Middle East (see Table A10 in WTO 1997). Evidently, the EU countries trade with countries that are similar to themselves more than they trade with the very different economies of Africa and the Middle East. More broadly, the industrial countries trade with each other much more than they trade with less-developed countries.

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[1] See Helpman (1984) for a review of the literature on trade with economies of scale and Krugman (1995) for a review of the literature on trade with monopolistic competition.

Measures of trade overlap within industries have remained high. To take a couple of examples, the share of intra-industry trade in the UK was 53.2 percent in 1970, it increased to 74.4 percent in 1980 and to 84.6 percent in 1990. In Germany it increased from 55.8 percent in 1970 to 56.6 percent in 1980 and to 72.2 percent in 1990 (see Table 1.8 in OECD 1996).[2] And these two countries represent a general trend of rising shares of intra-industry trade.

Helpman and Krugman (1985) have shown that economies of scale, product differentiation, and various forms of conduct are compatible with factor price equalization and, as a consequence, with Vanek-type equations for the factor content of trade. For this reason, the empirical evidence that I reviewed so far is also relevant for the richer theory developed in the eighties.[3]

Although factor price equalization and the employment of identical techniques of production in all countries can take place with economies of scale, their presence makes this less likely. Scale economies drive countries to specialize in different products, which enhances the motives for foreign trade. For this reason, they help to explain large trade volumes between similar countries. At the same time, economies of scale make it more likely that countries will employ different techniques of production. This is especially so when there are dynamic economies of scale, be they driven by learning-by-doing or investment in research and development. Both benefit companies by giving them access to technologies that are not available to rivals.[4] Since the empirical evidence does not appear to be consistent with the use of identical techniques of production worldwide, or even within groups of relatively homogeneous countries, the study of country-specific technological developments becomes all the more important for the understanding of international trade.

1. Intra-Industry Trade

Grubel and Lloyd (1975) provided the first comprehensive study of the extent of trade overlap. They devised an index to measure this overlap

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[2] Declines in this index are rare, but it happened in Norway.

[3] Grossman and Helpman (1991) show conditions under which they also remain valid in economies that invest in R & D. Such economies enjoy more or improved products over time.

[4] Such advantages exist at least temporarily, as is evident from a variety of technological races in the electronics and pharmaceutical industries. See Grossman and Helpman (1995) for a review of the literature on the links between trade and technology.

as a fraction of total trade. They showed that this index was high for many countries. And before the theory of intra-industry trade was properly developed, Loertscher and Wolter (1980) established some stylized facts about partial correlations between country and industry characteristics on the one hand and the extent of trade overlap on the other. They found that the share of intra-industry trade is high when the trading partners are highly developed and do not differ much in their level of development, and when they are large and they do not differ too much in size.

To explain large shares of intra-industry trade, sectors with product differentiation were introduced into the theory. There are many products that are differentiated by brand: some are simple, such as breakfast cereal, tooth paste or clothing, while others are sophisticated, such as cars, computers or MRI machines. Some are consumer goods. Many, however, are producer goods, including capital goods such as drilling machines and intermediate inputs such as microprocessors. The theory applies to all of them. It starts by noting that product differentiation typically involves economies of scale. A brand has to be developed, such as a lightweight laptop. Or it has to be designed, such as a dress fashion. In either case, once the nature of the product has been established, manufacturing costs determine the profitability of its production. The company that developed such a product gains some monopoly power, because the market does not provide a perfect substitute for its unique brand. Moreover, companies are driven to differentiate their creations from the brands of rivals.

Economies of scale limit the range of products that are profitably supported by the market; the smaller the economies of scale, the more brands become available. With international trade, countries specialize in different brands. When every country demands a wide spectrum of varieties, international trade leads naturally to trade overlap: brand-specific economies of scale lead to intra-industry trade.

Using this theory, Helpman (1987) formulated an empirical equation for a cross-section of countries that focused on the link between the share of intra-industry trade in bilateral trade flows and a small number of key variables that describe the characteristics of the trade partners. According to the theory, the share of intra-industry trade is larger between countries that are similar both in composition of factor endowments and in size. To measure the former he used the absolute difference in GDP per capita. For the latter he used the GDP level of the larger country as one variable and the GDP of the smaller one as a separate variable. For a sample of 14 industrial countries he estimated this relationship and found that the partial correlations had the predicted signs for most of the years between 1970 and 1981. That is, the extent of trade overlap was larger, the more similar the countries' income per capita were, the smaller the larger country was, and the larger the smaller country was. But these relationships weakened over time.

These findings, however, do not appear to be robust. Hummels and Levinsohn (1995) confirmed them for alternative measures of similarity in factor composition. Replacing income per capita with income per worker, for example, had little effect on the results. And by using the absolute differences in capital-labor and land-labor ratios as measures of factor similarity, they confirmed that countries with more dissimilar endowment compositions engage in less intra-industry trade. But when they employed panel techniques to estimate these relationships, the results changed dramatically. Now it appeared that most of the variation in the share of intra-industry trade could be explained by country-pair dummies. That is, unspecified characteristics of country pairs explain more than the variables emphasized by the theory. Why this should be so is not understood at this point. But this finding raises an obvious need to broaden the theory in order to arrive at a better empirical specification.

2. Volume of Trade

Specialization encourages international trade while economies of scale and product differentiation strengthen the tendency to specialize. As a result, economies of scale and product differentiation lead to large volumes of trade.

To see how trade volumes are determined by specialization, consider an extreme case in which every country is completely specialized in a subset of products. This leads to a gravity equation. It implies that in a cross-section of countries, the logarithm of the bilateral volume of trade rises one for one with the logarithm of each country's GDP. Equations of this type – aggregated in various ways – have been estimated time and again, providing a good fit to many data sets. Helpman (1987) used it to calculate the volume of trade amongst 14 industrial countries as a fraction of their aggregate income. According to the theory, this fraction is larger, the more similar the countries' income levels are, as measured by a suitable similarity index. He found that between 1956 and 1981 this index increased and the fraction of income traded within the group increased as well. This comovement is consistent with models of product differentiation in which specialization in production is driven by brand proliferation.

Hummels and Levinsohn (1995) reexamined this evidence. They confirmed Helpman's finding for a group of industrial countries. But they also applied the same equation to a group of mixed countries – some developed, others less developed – arguing that if product differentiation is the main reason for the good fit, the equation should not perform well in the mixed sample. Although the equation did not fit the mixed sample as well as it did the homogeneous sample, it was remarkably good nevertheless. From this, they concluded that the evidence does not lend support to the view that product differentiation is the key to the gravity equation.

Evenett and Keller (1998) developed an estimation procedure that sheds more direct light on the link between product differentiation and the gravity equation. Recall that product differentiation leads to intra-industry trade in addition to specialization. Therefore, they argued, if the gravity equation is driven in large measure by brand proliferation, it should perform better for pairs of countries with large shares of intra-industry trade.

Using a mixed sample of countries, similar to Hummels and Levinsohn, they divided the observations of country pairs into those that have less than five percent of intra-industry trade according to the Grubel-Lloyd index and those that have more. They treated the former as country pairs whose trade is dominated by factor proportions. The latter pairs they further divide into five classes that differed in the degree of intra-industry trade. They then estimated a version of the gravity equation, conditioning its coefficients on the group to which the countries belong in terms of their share of intra-industry trade. The results were that the coefficient was closer to its theoretical value, the larger the share of intra-industry trade was.

This evidence lends support to the view that economies of scale with product differentiation are valuable components in the explanation of trade flows. It still leaves room for factor endowments to play a role. But it adds an important layer to the determinants of trade flows.

3. Economies of Scale

Modern trade theory places significant weight on economies of scale and product differentiation in explaining the structure of foreign trade. Its usefulness has been gauged by a variety of implications that help to interpret some stylized facts, and by the moderate fit of some of its correlates in various data sets. As useful as the research along these lines has been, however, it provides no direct evidence on the extent of economies of scale. In fact, most of the implications that have been examined do not depend on the *degree* of economies of scale, just on their existence. Although this is good enough for many purposes, for a variety of welfare-related questions it is quite important to have a sense of how large the economies of scale are. Some micro-production studies find economies of scale. But such studies, which are confined to single-country data sets, cannot provide estimates of economies of scale at the sectoral level and may, therefore, underestimate the size of scale effects.

Recently Antweiler and Trefler (1997) developed a methodology for estimating returns to scale at the sectoral level from international data. They constructed a data set for 71 countries, with 37 industries and 11 factors, spanning a twenty-year period from 1972 to 1992. These data provide rich variations that are most suitable for this purpose.

The key theoretical observation that enables them to estimate the degree of economies of scale is that a variant of the Vanek equation holds even when countries use different techniques of production. Their results are revealing. Productivity is higher, the higher the level of output is. Costs fall on average by about 0.15 to 0.20 percent when output rises by 1 percent. Allowing for non-homotheticity in production, the estimates imply that output expansion leads to shifts in the techniques of production that raise the demand for skilled relatively to unskilled workers.

Another inquiry into economies of scale, based on international data, is provided by Davis and Weinstein (1998). Their point of departure is Krugman's (1980) home-market effect. Krugman introduced transport costs for varieties of a differentiated product that are produced with economies of scale. In a simple two-country model with one input (labor) and two sectors, one differentiated, the other homogeneous, he showed that the larger country exports differentiated products on net.

More generally, in economies with such features biases in demand towards a country's products have a disproportionately large effect on its output. In pure Heckscher-Ohlin type economies, with no transport costs, such effects are nil, while in Heckscher-Ohlin type economies, with transport costs, they are less than proportional. It is therefore possible to discriminate between these alternative models from estimates of the effects of demand on output.

Davis and Weinstein found in a sample of OECD countries that a 1 percent increase in demand raises local output of specific products by 1.6 percent, which is significantly larger than one. This provides evidence in favor of scale effects. Performing the same estimation for every industry separately, they obtain less accurate estimates. Nevertheless, in 11 out of the 25 sectors the coefficients are significantly larger than one, confirming the presence of economies of scale. Similar effects were found in various regions of Japan.

VI. Conclusions

We now have a rich theory of international trade that emphasizes economies of scale, product differentiation, and differences in factor composition as key determinants of the structure of world trade. In combination, they explain significant parts of specialization patterns, volumes of trade, factor content of trade, and the broad patterns of trade across regions. But despite the massive research effort in the last twenty years, these explanations are still incomplete. This is partly the result of the fact that we are shooting at a moving target, because the nature of world trade is changing at a fast pace. Technological change has modified the patterns of specialization, has reduced trading costs and encouraged larger trade volumes, new countries have joined the trading system, and multinational corporations have spread their net more than ever before. In the new economy, there is plenty of man-made comparative advantage, which is occasionally short-lived as are many modern product cycles. All this means that we need a more technologically oriented trade theory and more emphasis on dynamics in order to understand these developments. Although such theories have been developed in the 1990s, they have so far had little effect on empirical research. This is the area in which success will pay off the most.

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Abstract: Explaining the Structure of Foreign Trade: Where Do We Stand? – During the last two decades, new research has greatly advanced our understanding of the structure of world trade. This article reviews the empirical literature that grew out of this effort and the theoretical developments that have been relevant for the empirical studies. But despite this research effort, explanations of foreign trade are still incomplete. We need a more technologically oriented trade theory and more emphasis on dynamics in order to understand the developments in international trade. JEL no F1, F14

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Zusammenfassung: Wo stehen wir bei der Erklärung der Struktur des Außenhandels? – Neue Forschungen haben in den letzten Jahrzehnten das Verständnis der Struktur des Welthandels stark gefördert. Der Verfasser läßt die empirische Literatur Revue passieren, die aus diesen Bemühungen erwuchs, und die theoretischen Entwicklungen, die für die empirischen Untersuchungen relevant waren. Aber trotz der Forschungsanstrengungen der letzten Jahrzehnte sind die Erklärungen des Außenhandels immer noch unvollständig. Um die Entwicklungen des internationalen Handels besser zu verstehen, ist eine mehr technologisch orientierte Handelstheorie sowie eine stärkere Betonung der Dynamik erforderlich.