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HISTORICAL ANALYSIS OF INTERNATIONAL TRADE FLOWS IN FOREST PRODUCTS —A PRELIMINARY PAPER

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FOREWORD

The objective of the Forest Sector Project at IIASA is to study long-term development alternatives for the forest sector on a global basis. The emphasis in the Project is on issues of major relevance to industrial and governmental policy makers in different regions of the world who are responsible for forestry policy, forest industrial strategy, and related trade policies.

The key elements of structural change in the forest industry are related to a variety of issues concerning demand, supply, and international trade of wood products. Such issues include the development of the global economy and population, new wood products and substitution for wood products, future supply of roundwood and alternative fiber sources, technology development for forestry and industry, pollution regulations, cost competitiveness, tariffs and non-tariff trade barriers, etc. The aim of the Project is to analyze the consequences of future expectations and assumptions concerning such substantive issues.

The research program of the Project includes an aggregated analysis of long-term development of international trade in wood products, and thereby analysis of the development of wood resources, forest industrial production and demand in different world regions. The other main research activity is a detailed analysis of the forest sector in individual countries. Research on these mutually supporting topics is carried out simultaneously in collaboration between IIASA and the collaborating institutions of the Project.

In this paper we outline some ideas on how to study the past behavior of the structure and dynamic changes in international flows of wood and wood products. We present some results of a share structure analysis carried out for three products and three years (Sawnwood, Pulp and Newsprint in 1971, 1975, and 1979) based on UN trade matrices as reported by importers. We also comment on the currently available FAO and UN data and their quality. This paper is a prelude to a detailed trade analysis for 13 products over the last two decades, which will be completed in the Forest Sector Project.

Markku Kallio
Project Leader
Forest Sector Project

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HISTORICAL ANALYSIS OF INTERNATIONAL TRADE FLOWS IN FOREST PRODUCTS —A PRELIMINARY PAPER

Ann Francescon

This report consists of three parts; in the first we give a brief introduction to the methodology of international historical trade analysis. We then describe some preliminary results of an analysis for several products in the forest sector, and finally, problems of trade data quality and availability are discussed.

I. METHODOLOGY OF INTERNATIONAL TRADE ANALYSIS*

On the basis of a time series of trade flow matrices of wood products, a number of analyses can be made to reveal the structural characteristics of these flows and their evolution in time, and to study the factors determining or influencing their behavior.

Share Structures

The simplest way to study the *structure* and *dynamics* of trade flows is to compute different trade share indices and to analyze their change in time. Another simple way is to study the growth rates of different flows and to compare them to an average or to each other. Finding certain characteristics both in the share or growth rate system, means that the stability of the tendencies can be analyzed. The existence or lack of stability can be linked to the commodity or market structure of the different regions. However, share structures tell us nothing about why these shares are as they are, or why they are changing.

* The section is based on the work of Andras Nagy (1982), IIASA.

Gravitational Models

A somewhat more developed way of analyzing trade flow systems is to apply *gravitational models* to obtain a better understanding of the factors influencing trade flows. It is assumed that trade flows between countries are functions of their trading capacities and the "resistance" hindering or "attractions" strengthening trade between the given pair of countries. Trading capacities can be represented by the potential supply of exporting and potential demand of the importing country. In the case of forest products, potential supply and demand could be expressed by the total output of the exporter and the total demand of the importing country, and the domestic absorbing capacity of the exporting country could be represented by the domestic input of the given commodity.

The barriers to trade are of two types: a) natural, like distance and b) artificial, like tariffs, quantitative restrictions, etc. These factors are difficult to quantify, although this is slightly easier for the former than the latter. The forest products industry, however, probably has the advantage that these barriers are less important (at least in the primary phase of production) than in more sophisticated manufacturing. The "attraction" factor is at work when political or economic alliances create zones of preference and the trade flows between members of the same preference area are proportionally greater than might have been expected without these effects.

Having chosen the explanatory variables, a gravitational model can be constructed, e.g., in the following way:

$$X_{ijk} = c\frac{S_{ik}^{a_1} D_{jk}^{a_2} P_{ijk}^{a_5}}{d_{ij}^{a_3} t_{ijk}^{a_4} M_{ik}^{a_6}}$$

where X_{ijk} = trade flow of commodity k from country i to country j

S_{ik} = amount of commodity k produced by country i

D_{jk} = amount of commodity k required by country j

d_{ij} = distance from country i to country j

t_{ijk} = tariff (and other trade barriers) imposed by country j on commodity k imported from country i

M_{ik} = amount of commodity k required by country i

P_{ijk} = preference dummy variable for trade in commodity k between countries i and j

$a_1, \ldots, a_6$ = parameters of the explanatory variables.

Some of the variables express more general effects, like the export "push" (S and M), the import "pull" (D), while others represent special relationships influencing bilateral trade relations (d, t, p). We can assume that some of the variables have a positive effect on trade flows (S, D, P) while the influence of others is negative (d, t, M). The parameters of the gravitational equation above can be estimated by regression analysis. There is a high probability that significant relationships can be revealed between the *trade flows as dependent variables* and the

explanatory variables. It is possible to estimate the correlation between variables for all trade flows for a given commodity or for only certain sets of them (e.g., by periods, or by exporting countries). By comparing the estimated parameters of the different explanatory variables, it is possible to draw conclusions about the relative "strength" of export "push" and import "pull" in forest products trade. All previous studies for example showed that the "push" of the exporter had a stronger influence on trade flows than the "pull" of the importer. Similarly, the effects of obstacles to trade and of trade preferences can be measured and their change over time can be observed.

Gravitational analysis reveals generally valid interrelations between trade flows and the factors influencing them, but it cannot be expected to explain them or to forecast individual trade flows with an acceptable level of accuracy, even in the *ex post* case. The major weakness of gravitational analysis is that the special factors influencing bilateral flows are very inadequately represented by the variables d, t, and P. This is the main reason why the multiple correlation coefficient is usually not very high and the relative error is great, i.e., a considerable part of the deviations of the dependent variables remain "unexplained."

Trade Intensity Analysis

As we are interested in the detail of the bilateral trade structures, the "average" effects of exogenous variables cannot satisfy us. *Trade intensity analysis* can be applied in such a case. This analysis is designed to separate and quantify some of the factors determining trade flow structures. The concept of trade intensities is closely related to gravitational analysis in that trade flows depend on two types of factors; (a) the "push" of the exporting country and "pull" of the importing country, and (b) particular factors regulating bilateral relations.

This classification of factors into two categories leads to a method which treats the "volume effects" (the trade potential of the two countries) and the "intensity effects" separately. This is done by firstly computing a hypothetical "normal" flow, taking into account the volume effects, and then comparing this with the actual flow data, thus obtaining the intensity effect as a residual. For the sake of simplicity, we shall introduce exporter's and importer's trade flow shares in the trade in a particular group of commodities:

$$Z_{ijk} = \frac{X_{ijk}}{X_{..k}},$$

where Z_{ijk} = share of world trade in commodity k that is exported from country i to country j

X_{ijk} = trade flow of commodity k from country i to country j

$X_{..k}$ = total world trade in commodity k

and we can obtain "normal" flow shares (denoted by an overbar) by multiplying the exporter's share in total exports by the importer's share in total imports:

$$\bar{Z}_{ijk} = Z_{i.k} \times Z_{.jk}$$

where $\bar{Z}_{ijk}$ = "normal" share of world trade in commodity k that is exported from country i to country j

$Z_{i.k}$ = share of world trade in commodity k that is exported from country i

$Z_{.jk}$ = share of world trade in commodity k that is imported by country j

It must be realized that the idea of "normal" trade flow is an abstraction. Actual bilateral flows would be "normal" only if exporters distributed their exports according to the size of the import markets and importers bought goods according to the shares of the exporters in the overall trade in the given commodity.

The intensity of bilateral trade relations is taken to be the factor causing observed bilateral flows to deviate from "normal" behavior. We can calculate a trade intensity coefficient δ_{ijk} as follows:

$$\delta_{ijk} = \frac{\text{actual flow share}}{\text{normal flow share}} = \frac{Z_{ijk}}{\bar{Z}_{ijk}} = \frac{Z_{ijk}}{Z_{i.k} Z_{.jk}}$$

Therefore the trade intensity coefficients reflect all factors affecting trade flows apart from the "volume effects," including distance, trade policy measures, discrimination, integration, historical links, etc. If these factors have little effect on bilateral trade, the value of δ will be one, or thereabouts, while if they increase or reduce the trade flow, the coefficient will be greater or less than unity, respectively.

As the transportation costs of forest products play a significant role in influencing trade flows, the trade intensity coefficient can be divided into two factors, one expressing economic distance and the other representing the effects of trade policy. The trade policy coefficient is a highly general index which summarizes the effects of the very diverse factors influencing trade between pairs of countries. However, it seems likely that this coefficient will show some stability or regularity of change for trade in forest products as has been found for trade in other products in previous studies.

Both intuition and observation of the past behavior of the intensity coefficients suggest that they undergo certain distinct types of change, four of which are discussed below.

(a) "normalization" of international trade relations, meaning liberalization of trade, which reduces the deviation of real from so-called "normal" flows; this is reflected in δ coefficients by a closer approach to unity from either above or below;

(b) integration of certain groups of countries, increasing the intensity coefficients for intra-regional trade to values above unity and decreasing those for extra-regional trade to values below unity;

(c) "flattening out" of the trend, meaning that the rate of change diminishes as the intensity coefficient approaches a certain level (unity, in case (a), or a higher or lower level (in case (b));

(d) in a situation in which the direction of movement of the intensity coefficient is opposite to the trends described in a and b, the trend must finally revert to (a) or (b) over time.

Observation of the past behavior of bilateral trade intensities can be of great help in projecting them for the future, even if it cannot be generally assumed either that they will remain unchanged, or that the direction and rate of change will follow past trends. This kind of analysis can therefore show the inertia or flexibility of trade structures and help to estimate the feasibility of structural change in bilateral trade relations.

II. SOME RESULTS OF TRADE ANALYSIS IN THE FOREST SECTOR

The Forest Sector Project at IIASA has carried out a preliminary share structure analysis of trade flows for three forest products. This analysis is based on UNSO trade flow data between 1971 and 1979. The analysis at this stage is necessarily brief, but already certain patterns are apparent. It is intended over the next few months to complete a detailed analysis for at least thirteen different products and possibly for some years before 1971. The detailed analysis will follow the lines of inquiry described in detail in Section 1 of this report. Below we describe share structure analysis and present the preliminary results for Sawnwood (SITC Rev1 243), Woodpulp (251) and Newsprint (641.1) for the years 1971, 1975 and 1979.

Share Structure Analysis

The basic data for the analysis carried out is a set of trade flow matrices as reported by importers for each product and year. In these the columns represent the origin of imports by one region from the rest of the world, and the rows indicate the allocation of exports from one region to the rest of the world (see Figure 1). The regional grouping is as follows: Africa, North America, Japan, Developing Asia, the Nordic countries, Western Europe, Eastern Europe plus USSR, and Oceania. Note that when we talk about trade between these regions in this analysis, we exclude trade between different countries in the same region.

The row and column totals in Figure 1 show the total exports and imports respectively, of a region (defined as $X_{i.k}$ and $X_{.jk}$ respectively).

These totals, divided by the total world trade in commodity k ($X_{..k}$) show the export and import trade shares respectively. The trends of these shares over 1971 to 1979 are analyzed.

Exporting countries	Importing countries 1	2	...	i	...	n	Total exports
1	X_{11k}	X_{21k}		X_{1jk}		X_{1nk}	$X_{1.k}$
2	X_{21k}	X_{22k}		$X2jk$		X_{2nk}	$X_{2.k}$
.							
.							
.							
j	X_{i1k}	X_{i2k}		X_{ijk}		X_{ink}	$X_{i.k}$
.							
.							
.							
n	X_{1nk}	X_{n2k}		X_{njk}		X_{nnk}	$X_{n.k}$
Total imports	$X_{.1k}$	$X_{.2k}$		$X_{.jk}$		$X_{.nk}$	$X_{..k}$

Figure 1. Table of trade flows among countries for commodity k.

Following this we note which are the major trade flows for each product. This helps to see where the principal exporters send their products to, and for major importing regions, what is the origin of their imports. We can see whether this pattern is changing; for example if the size of individual flows is altering. We can also say whether the bulk of world trade is always concentrated over two or three large trade flows, or whether there are very many smaller flows.

Further information is available in the matrices on the trade of developed and developing regions as a whole; special attention is therefore given to this aspect. Below we firstly give an overview of the results; details for the individual products may be found in the three subsections following.

General Overview of Results

Some general patterns that can be seen from the results are as follows. From the *exporters'* point of view, between 1971 and 1979 there is a trend away from the Nordic countries having the largest share, to North America, for both Sawnwood and Pulp. The trend is reversed for Newsprint. In the case of Sawnwood, North America has overtaken the Nordic countries, and Asia is also increasing its role as an exporter. In the case of Pulp, the Nordic countries is still the major exporter but not by a large amount, and Latin America has started exporting more.

There is also a common changing pattern of *imports* for Sawnwood and Pulp, in that Western Europe's share is declining while Japan's increases. But Japan's share is still much smaller than Western Europe's. For Newsprint the pattern is slightly different; both Western Europe and Japan are importing more Newsprint, but Developing Asia, North and Latin America are importing less.

The number of individual trade flows accounting for either 70% or 85% of world trade in all three products has tended to remain very similar in 1971, 75, and 79, usually only increasing by 1 or 2 flows. Generally, exports from the Nordic countries and North America to Western Europe are the two largest flows, followed by: for Sawnwood, Western Europe imports from Eastern Europe and Asia; for Pulp, North American exports to Japan, Latin America and Asia; and Newsprint also North American exports to Latin America and Asia.

Trade between developed regions accounts for at least 65% of total world trade in all three products, but this is tending to decrease except in the case of Newsprint. The decrease is accounted for by an increasing proportion of exports coming from developing regions (except again in the case of Newsprint where there are virtually no exports from developing regions), but still developing exports appear to be only 23% and 5% in the case of Sawnwood and Pulp respectively.

Developing regions as a group appear to be net exporters of Sawnwood, but net importers of Pulp and Newsprint. Asia is the main exporter of Sawnwood in this group, much of it going to Western Europe, Japan, and North America, and these flows are on the increase. For Pulp there seems to be a trend away from being net importers, as the share of trade from developing to developed regions has more than quadrupled over the nineteen seventies, to a level of 5%. This mainly comes from Latin America. For Newsprint the developed regions' export share to developing regions is around 30%, and this is decreasing. Latin America and Asia receive the bulk of these exports.

It is very noticeable overall that Developing Africa does not appear to figure much in the trade of these three products. This may be due to lack of reporting, but this we cannot be sure of at this stage. In the case of Sawnwood, Developing Africa is the third largest importer (i.e., there are no imports by South Africa in the figures shown in Figure 2(b); its import share appears to have reached a peak of 8% in 1975 and has since been decreasing. The same kind of trend is apparent with its Sawnwood exports; but it is only the sixth largest exporter of the nine regions we have studied, with a share of about 3%. In the case of Pulp, most African exports are from South Africa (see Figure 6(a) and Developing Africa imports in 1979 are only reported as 0.9% of the world trade. There appears to be a small increase in Developing African exports of Newsprint but it still accounts for only 1% of world exports. The import share peaked at 5% in 1975 but has since decreased to 1.1%, below the 1971 level.

In general, if we can rely on the data used, it seems that Developing countries have some way to go before playing a major role in world trade of these products. We comment more in the following section on the reliability of the data.

Sawnwood (SITC Rev1 243)

The trade share trends between 1971 and 1979 for the five regions found to have the largest shares in 1971 are shown in Figures 2(a) and (b) overleaf. These deal with export and import trade shares respectively. The clearest trends that we can see from these are: that the Nordic countries and Eastern Europe are the major exporters of Sawnwood (accounting for over 60% of exports up to 1975), but their share seems to be decreasing as North America and Developing Asia take over more of the market. The latter has in fact more than doubled its export share in this period, up to a level of 17% in 1979. the Nordic countries is still however the largest exporter in 1979, with North America a close second. Together with Eastern Europe they cover over 70% of exports.

By far the largest importer of Sawnwood over the last decade, is Western Europe, accounting for nearly 75% on average. This share is dropping slightly as Japan has more than doubled its import share in that time, up to a level of 13% of world trade in 1979. There is no clear trend in the overall level of imports by the third largest importer, Africa, while imports by Oceania and North America seem to be fairly constant.

Looking at the smaller exporters and importers; Figure 3 shows that Japan's exports of Sawnwood (approx. 0.6%) are decreasing, as are Eastern Europe's imports. However the levels for other regions seem to be fluctuating without any clear increasing or decreasing trend.

Figure 4 overleaf shows the major trade flows of Sawnwood in 1971 and 1979. Western Europe's imports from (in decreasing order of size) the Nordic countries, Eastern Europe, North America and Asia account for an average of 68% of world trade. Trends in these flows show that the reason for the Nordic countries' and Eastern Europe's decreasing exports mentioned above, is because Western Europe is decreasing its imports from them in favor of North America and Developing Asia. Other destinations for Developing Asia's increased exports are Japan and North America, although Japan's major (increasing) source of Sawnwood is still North America.

With respect to developing regions in particular; Figure 5 overleaf shows the aggregated trade shares for trade between developed and developing regions. This clearly shows that Sawnwood exports from developing regions are increasing (from 15% to 23%) and they are going to developed regions, but trade between developed regions still accounts for around 70%. We also see that as a group, developing regions are net exporters of Sawnwood. In fact if we make a breakdown of developing regions' exports, those to Western Europe and Japan show the largest increase (from 11 to 17% and from 0.3 to 2.5% of world trade respectively) and they come mainly from Asia.

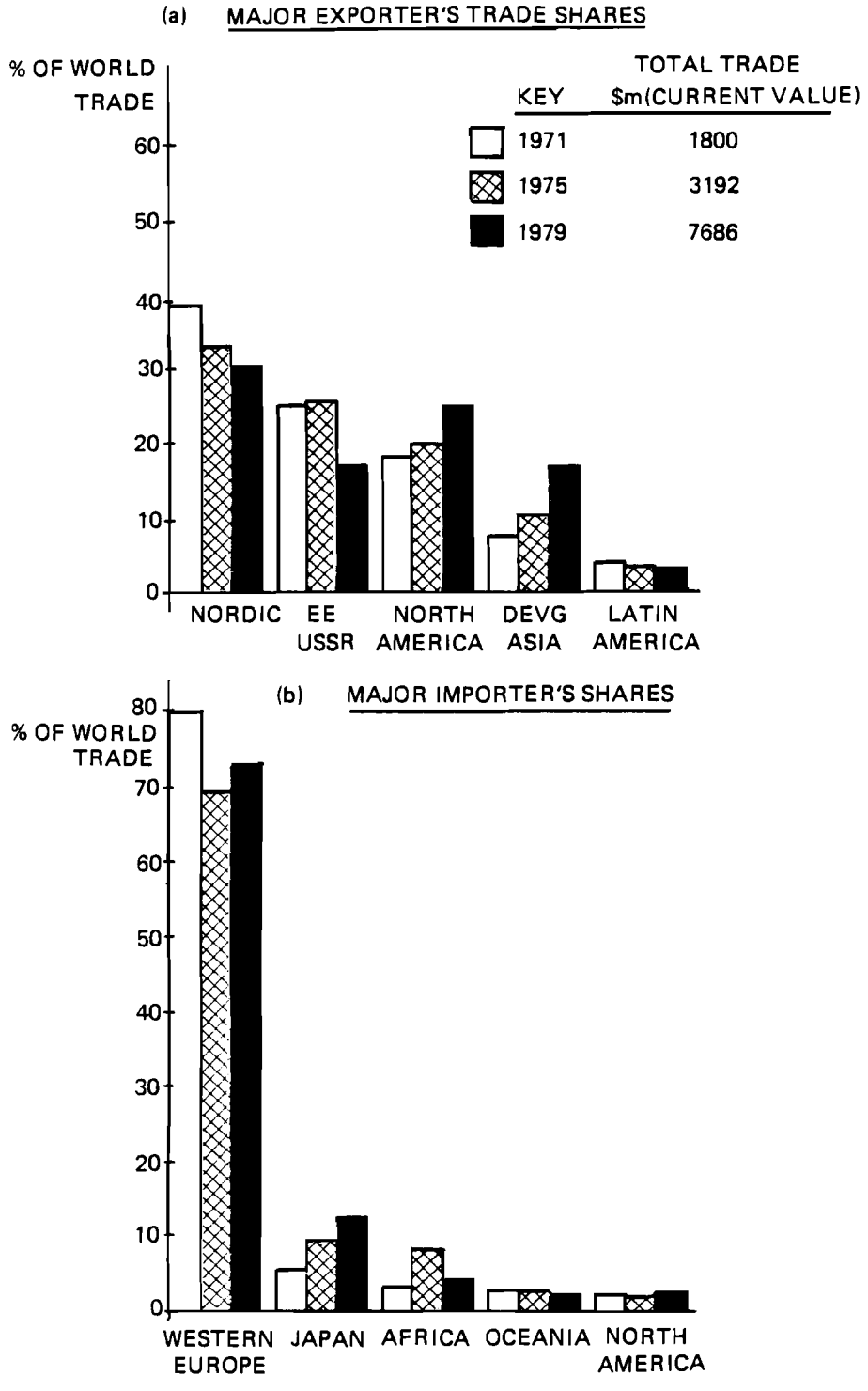

Figure 2. Trade shares of major exporters and importers of Sawnwood.

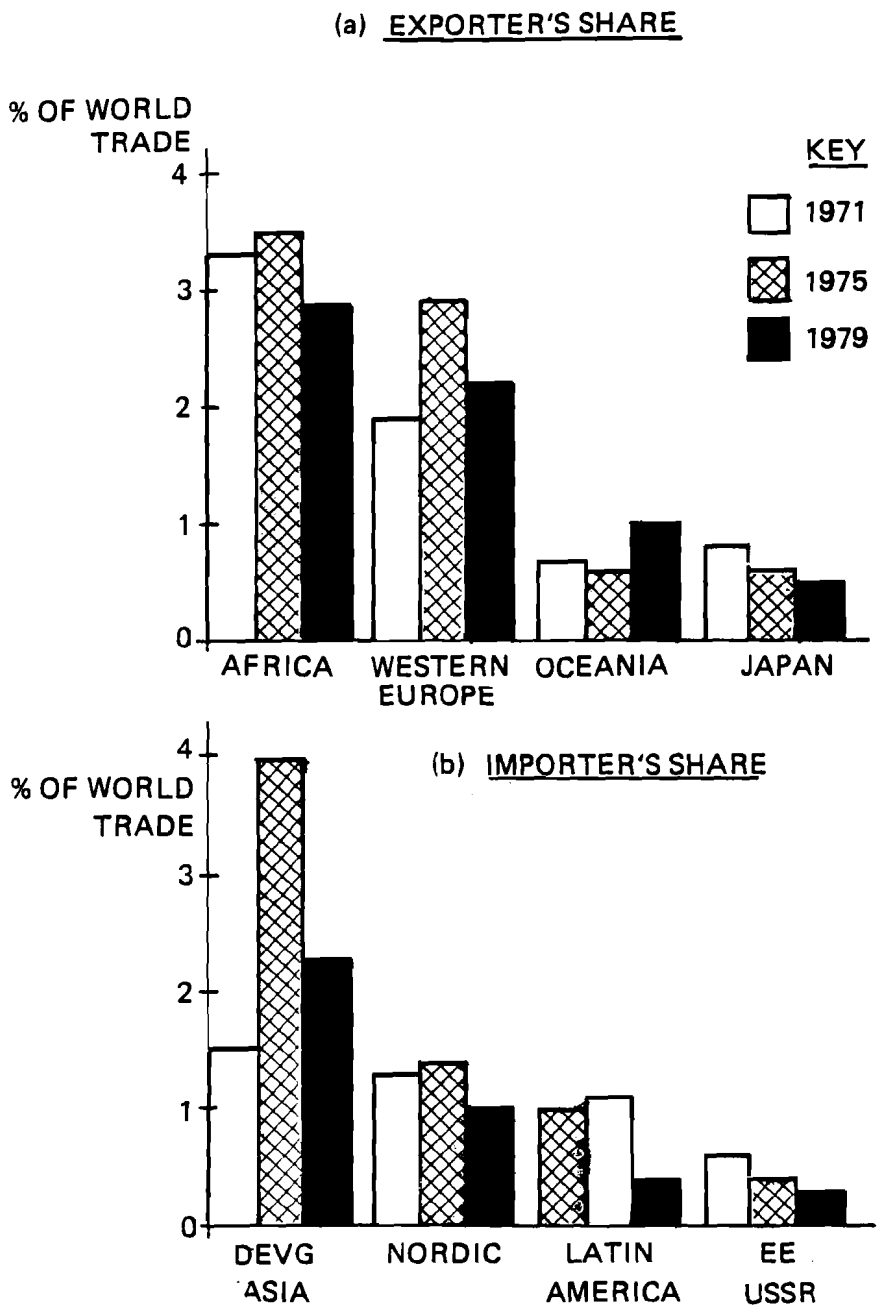

Figure 3. Trade shares of other exporters and importers of Sawnwood.

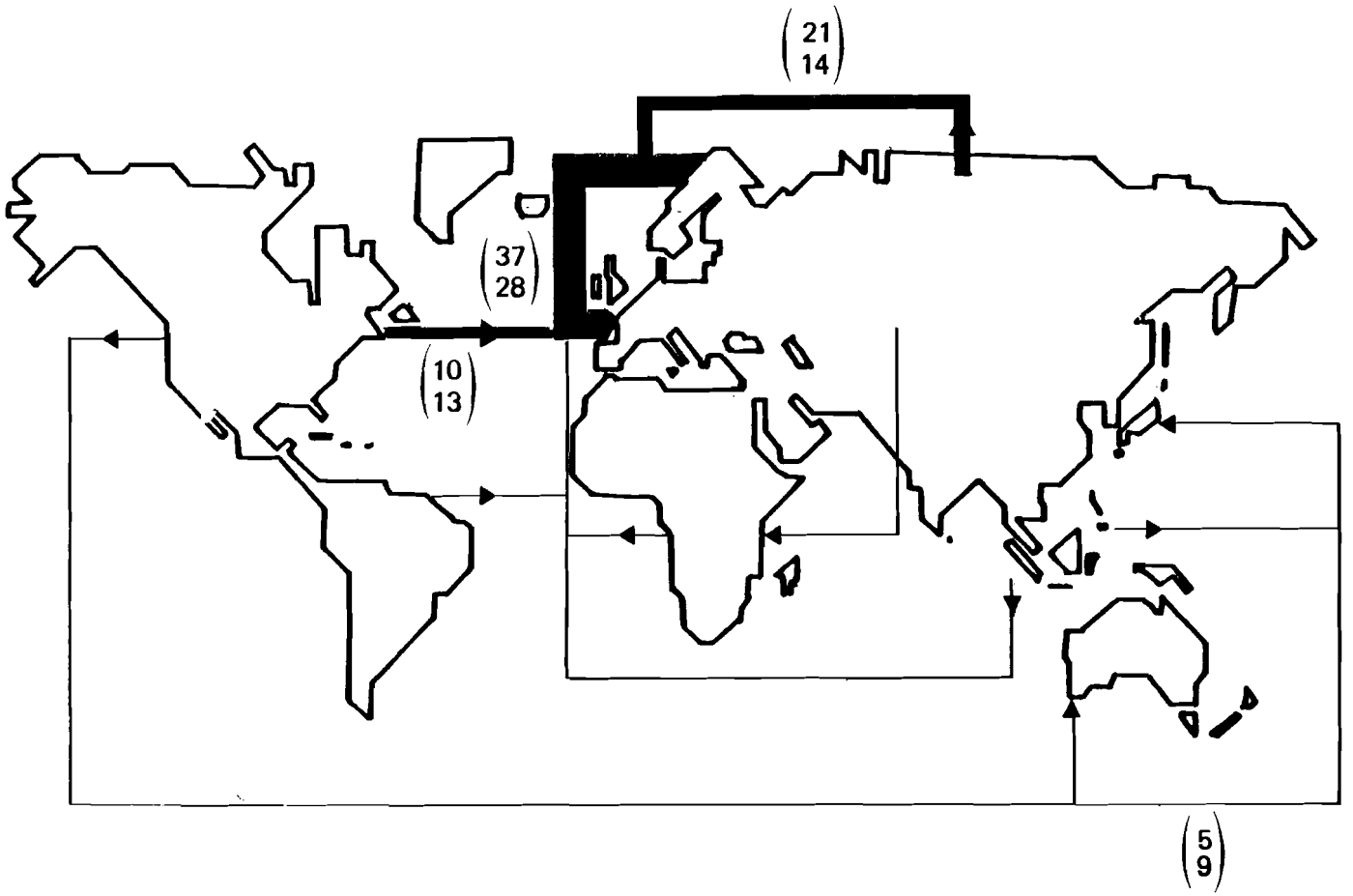

Figure 4. Trade flows of Sawnwood greater than 1.5% of world trade in 1979, with ($\frac{1971}{1979}$) shares shown.

% OF WORLD 1971 1975 1979		EXPORT DD	EXPORT DG
IMPORT	DD	78.9 69.1 69.4	14.9 17.2 23.4
	DG	6.0 13.2 7.0	0.2 0.5 0.2

SAWNWOOD

% OF WORLD 1971 1975 1979		EXPORT DD	EXPORT DG
IMPORT	DD	86.9 85.4 84.0	0.9 1.8 5.1
	DG	11.7 12.8 10.3	0.5 0.04 0.6

PULP

% OF WORLD 1971 1975 1979		EXPORT DD	EXPORT DG
IMPORT	DD	65.6 63.9 77.1	NEGLIGIBLE NEGLIGIBLE NEGLIGIBLE
	DG	34.4 36.0 22.8	NEGLIGIBLE NEGLIGIBLE NEGLIGIBLE

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DD ≡DEVELOPED

DG ≡DEVELOPING

Figure 5. Trade between developed and developing Regions

Woodpulp (SITC Rev1 251)

As in the case of Sawnwood, the Nordic countries and North America are the main exporters of Pulp each accounting for nearly 45% of world exports on average (see Figure 6(a)). The latter has become more important than the former by 1979, having an export share of 47%. Other main Pulp exporters (each with less than 5% trade shares) are Africa (of which around 80% is from South Africa) and Eastern and Western Europe. The most noticeable change in the smaller exporters' shares is the jump from zero to 4.7% of world exports by Latin America between 1971 and 1979, making it the third largest exporter in 1979 (Figures 6(a) and 7).

Western Europe imports around 70% of world pulp exports, but is gradually decreasing it's share (see Figure 6(b)). Three other regions account for approximately 25% of pulp imports; these being Japan, Latin America, and Developing Asia. Japan's import share has increased by 75% over the last decade. Developing Asia also seems to have increased its import share by about 60%.

Only two or three trade flows account for over 70% of world pulp trade; these are imports by Western Europe from the Nordic countries and North America, and Japanese imports from North America. The relative size of these can be seen from their average shares of world trade of 39%, 27%, and 9% respectively (see Figure 8). However the flow from the Nordic countries to Western Europe has decreased from 46 to 35% of world trade, while that from North America to Japan has increased from 8 to 11%.

Other main trade flows are from North America to Latin America and Asia (each around 4%), while the former's jump in exports is a result of a change from zero Pulp exports in 1971 to 2.3%, 0.7%, 0.6%, and 0.8% of world trade with Western Europe, the Nordic countries, Asia, and Japan, respectively, in 1979.

Referring back to Figure 5, we can see that the *share* of Developing regions' exports of pulp to Developed regions has more than quadrupled over the last ten years, while developed regions' exports have marginally decreased. Still, trade between developed regions is over 80% of world trade. The main developing regions exporter is Latin America, as mentioned above. However, the table also shows that developing regions are net importers of pulp; this seems to be decreasing slightly.

Newsprint (SITC Rev1 641.1)

The two main exporters of Newsprint are the Nordic countries and North America with export shares of approximately 60% and 30% respectively (see Figure 9). The former has shown an increase of 20% between 1971 and 1979, while the latter has decreased by 30%. In 1971, Eastern Europe, Western Europe and Japan were the next largest exporters, but each with only 2 or 3% shares. The exports from Eastern Europe appear to have decreased. There were virtually no exports from the other four regions, and this picture has changed little apart from a small increase in exports by Oceania and Africa to shares of 1% and 1.2% in 1979 (Figure 10(a)).

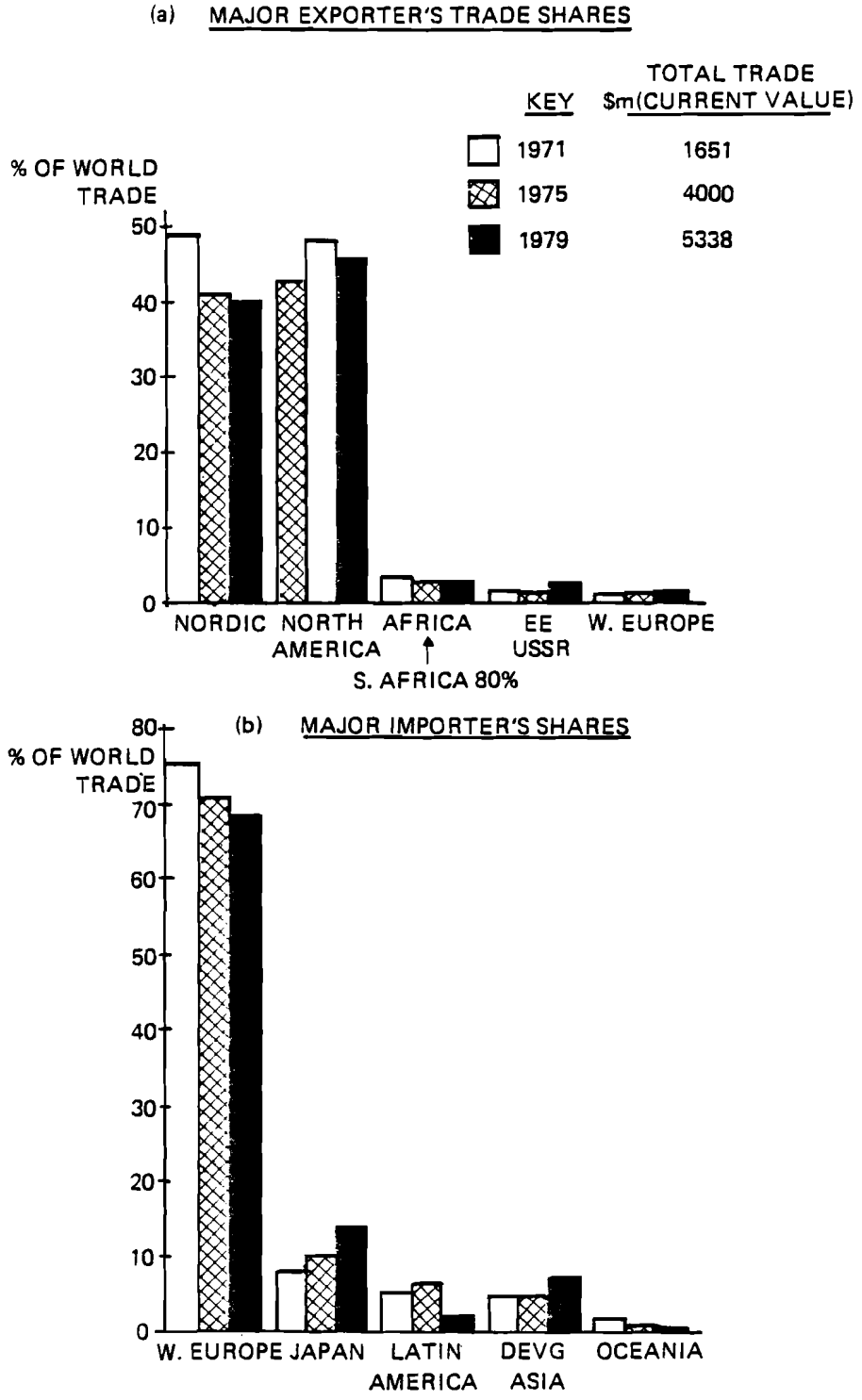

Figure 6. Trade shares of major exporters and importers of Pulp.

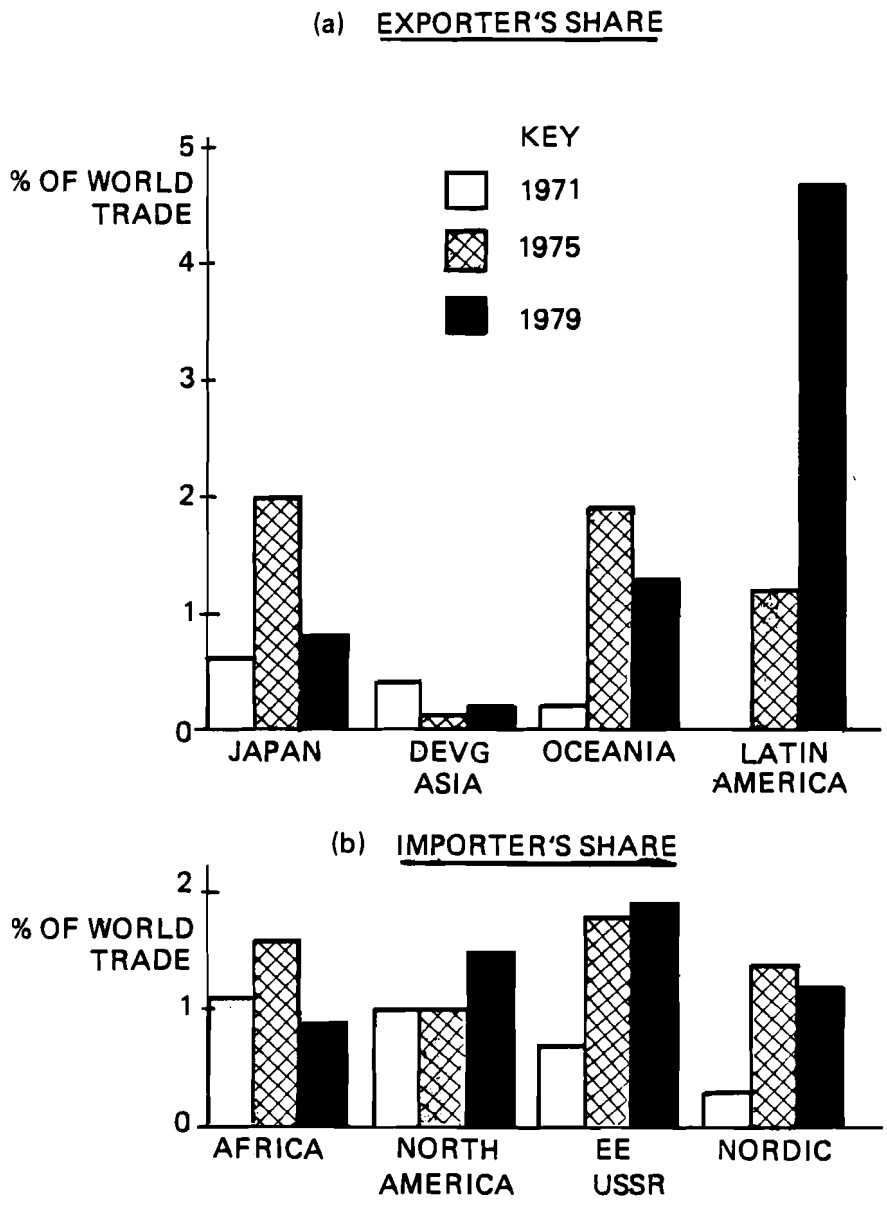

Figure 7. Trade shares of other exporters and importers of Pulp.

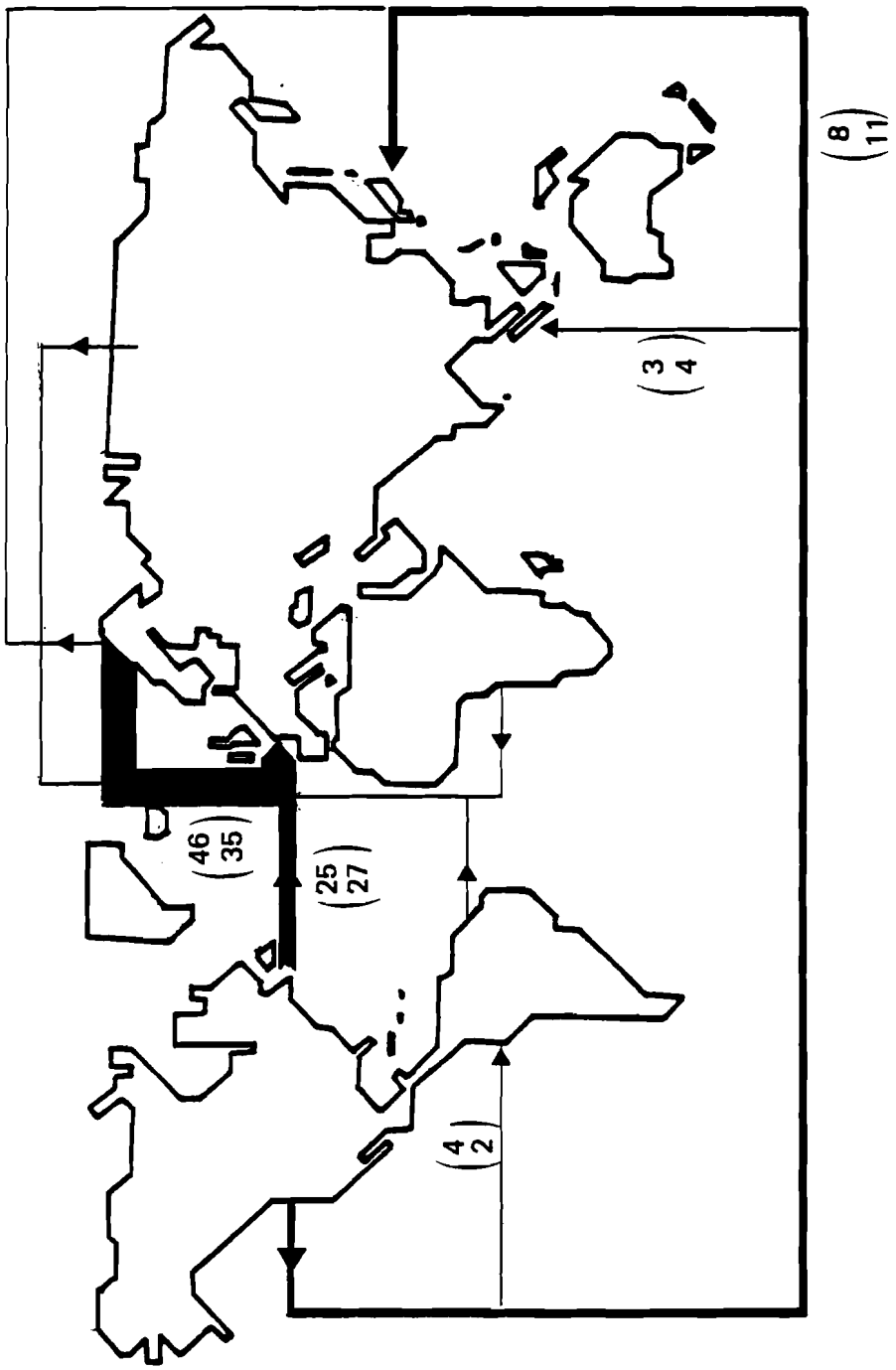

Figure 8. Trade flows of pulp greater than 1.5% world trade in 1979 with ($^{1971}_{1979}$) shares shown.

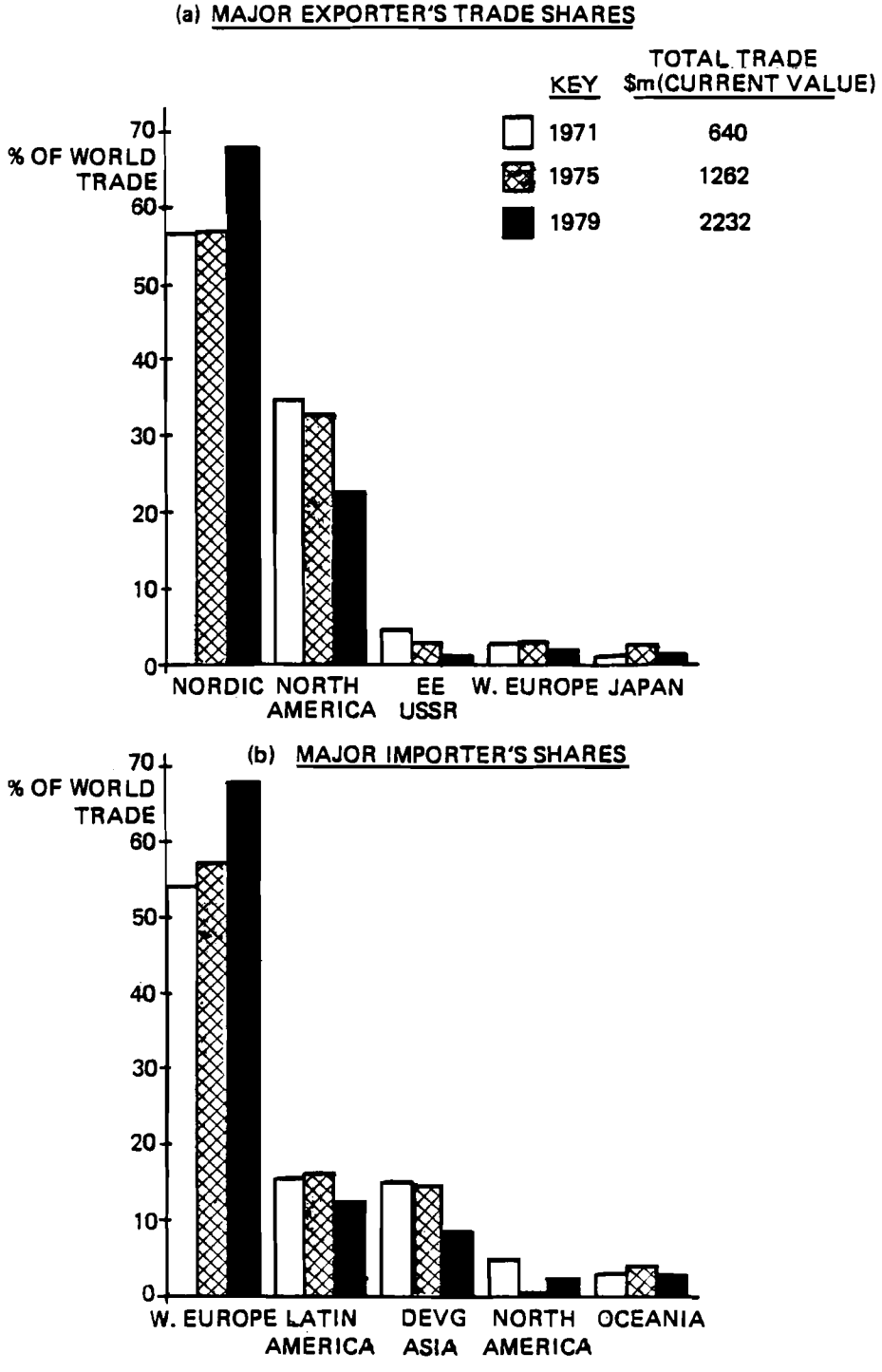

Figure 9. Trade shares of major exporters and importers of Newsprint.

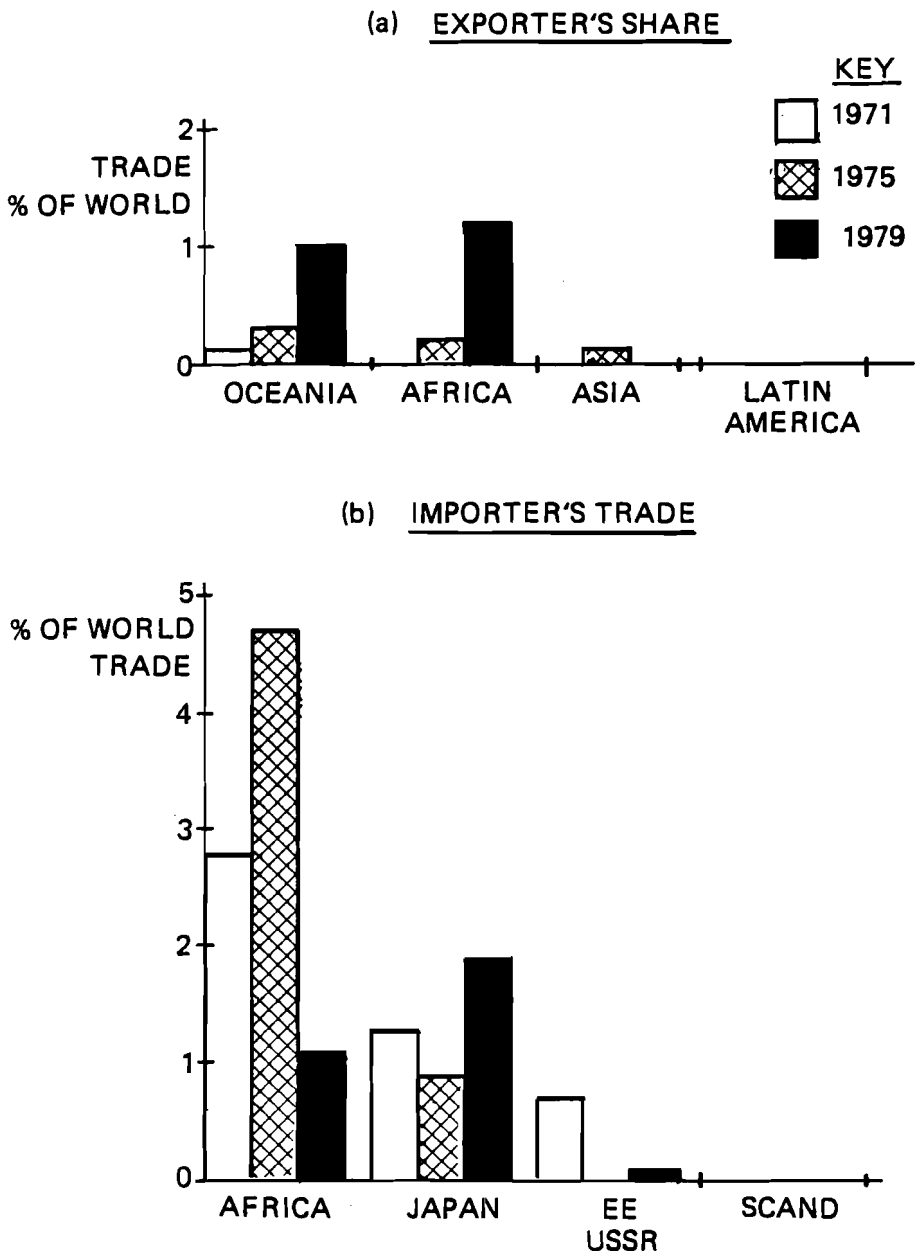

Figure 10. Trade shares of other exporters and importers of Newsprint.

Figure 9(b) shows that Western Europe imports by far the largest share of Newsprint (60% on average) followed by Latin America and Asia (15% and 13% on average). Western Europe's share has increased by 25% over the last decade while the shares of most other regions have tended to decline, that is, apart from Japan. Africa also increased its share by nearly 70% between 1971 and 1975 (up to a level of 4.7%) but since then the share has dropped to 1.1%, i.e., below the 1971 level (Figure 10(b)).

The major trade flows of Newsprint, shown in Figure 11 overleaf, are Western Europe imports from the Nordic countries and North America and North American exports to Latin America and Asia, accounting altogether for more than 70% of trade. Trends in these flows show that the reason why the Nordic countries' exports are increasing is because they are sending more to Western Europe (and to Developing Asia as well). North American exports are decreasing overall because of lower trade with Latin America and Asia, but they have slightly increased exports to Western Europe.

Asia and Latin America's import shares have tended to decline also because the former receives less from Eastern Europe, and the latter imports less from the Nordic countries.

There is a negligible level of exports of Newsprint from developing regions. However their import share from developed regions is about 37%, and this appears to be decreasing slightly (see Figure 5). As mentioned above, the major developing importers are Latin America and Asia.

III. DATA QUALITY AND AVAILABILITY

There are two main sources of data for world trade analysis of forestry products; namely the direction of trade tables in FAO yearbooks from 1953 onwards, and UNSO computerized trade matrices from 1961 onwards. The former only has information on volumes traded, and after 1977 only includes countries that have export shares of more than 1%. It has also recently stopped printing the complete reports by both importers and exporters, although the raw data may still be available. It seems likely that the quality of this data may be reasonable because some effort is devoted to checking the data received and inserting estimates if necessary. Unfortunately it has the disadvantage of not yet being computerized; we hope to see this as one of the outcomes of the IIASA Forest Sector Project (FSP).

The UNSO trade matrices contain both volume and value figures country by country, but aggregation to regional data such as we have used is very difficult for the volume figures due to the variety of units of measurement used by reporting countries (We have therefore analyzed the *value* of trade.) The matrices contain both the exporters' and importers' reports —i.e., for a given trade flow there are two reported figures — one according to the exporter and one according to the importer (we have used the latter for our analysis). Very often there are large discrepancies between the two; there are even flows reported by the exporter but not stated as imports by the importer —or vice versa.

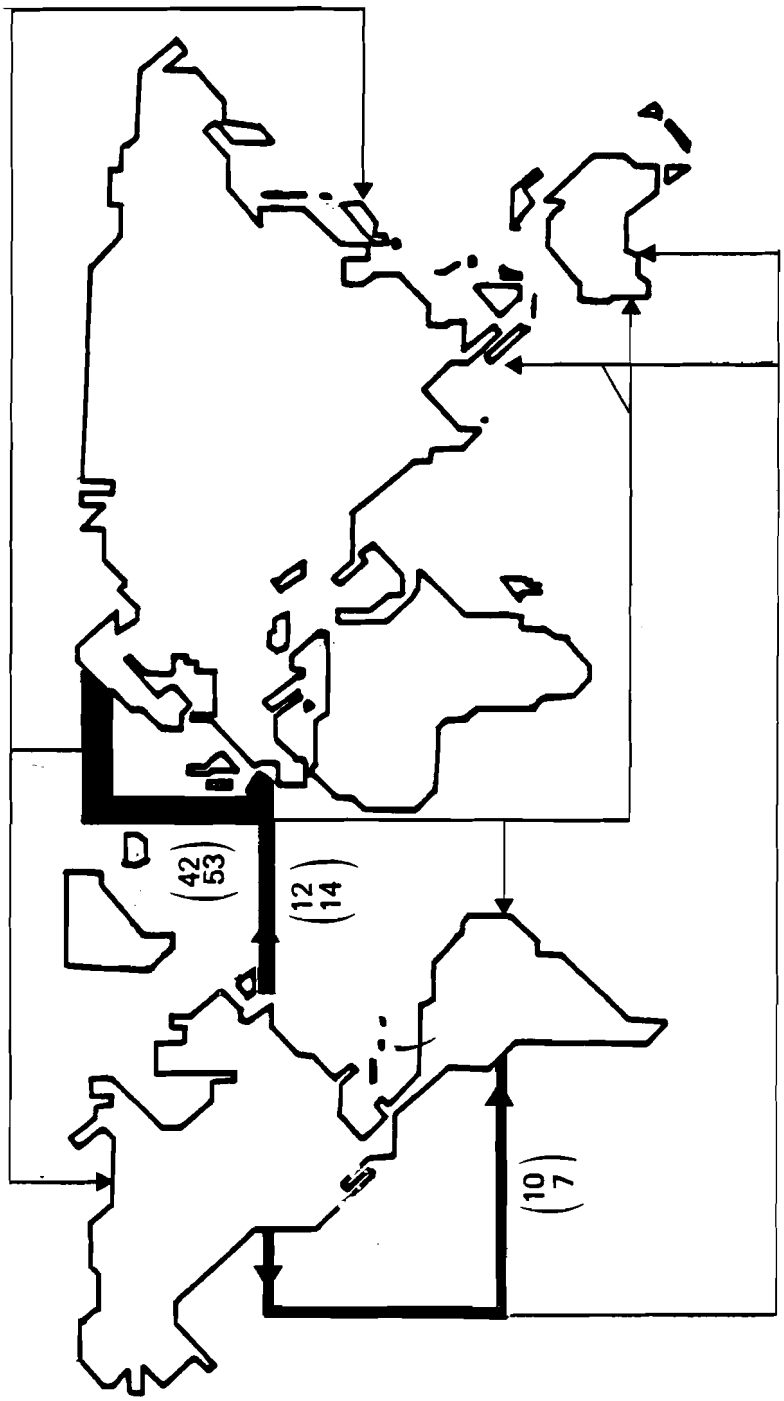

Figure 11. Trade flows of Newsprint greater than 1.5% of world trade in 1979 with ($^{1971}_{1979}$) shares shown.

Thus we can clearly see that the quality of reporting is rather low for some countries. We have not yet been able to study this in detail, but by (a) comparing FAO and UNSO reports, and (b) comparing UNSO exporters' and importers' reports we hope to find out where improvements in the quality of the data can be made. Early comparison of FAO and UNSO matrices shows little discrepancy between them for North America, Western Europe, Japan and Oceania. But UNSO has no data for China or much of Eastern Europe (including USSR), whereas FAO does have data, or at least estimates. Also for all the developing regions there are extremely variable discrepancies between the two; sometimes neither have data, or only one has data, or the UNSO figure is enormously higher/lower than the FAO figure. This shows that we must be very careful when interpreting the results from analysis of UNSO data, and more integration of the two sets of information is vital to improve data quality. We hope to make progress on this in the IIASA FSP project. Figure 12 overleaf shows the trade data at the four and three digit SITC level which is available in the UNSO computer tapes for Forest Products.

IIASA AGGREGATED PRODUCTS	4 DIGIT SITC REV1		3 DIGIT SITC REV1
1. CONIFEROUS LOGS	242.2	Sawlogs + Veneer logs - conifer	
2. NONCONIFEROUS LOGS	242.3	Sawlogs + Veneer logs (NC)	242
	242.4	Pitprops (C + NC)	
	242.9	Other industrial roundwood (C + NC)	
3. PULPWOOD	242.1	Pulpwood (C + NC)	
4. FUELWOOD	241.1	Fuelwood+Wood residues	241
	241.2	Wood Charcoal	
5. CONIFEROUS SAWNWOOD	243.2		
6. NON-CONIF. SAWNWOOD	243.3		243
	243.1	Sleepers	
7. PANELS	631.1	Veneer sheets	631
	631.2	Plywood	
	631.42	Particle boards	
	641.6	fibreboards+other build boards	
8. PULP	251.2	Mechanical	251
	251.9	Semi-chemical	
	251.7	Sulphate	
	251.8	Sulphite	
	251.6	Dissolving grades	
	251.5	other wood pulp	
9. NEWSPRINT	641.1		
10. OTHER PRINTING & WRITING	641.2		
11. OTHER PAPER & BOARD	641.3	Kraft paper & paperboard	641
	641.4	Cigarette paper	
	641.5	Machine-made paper	
	641.7	Hand-made paper	
	641.9	Rolls/sheets	
Other Products			
12. BOXES, etc.		SITC 632	
13. FURNITURE		SITC 821.0	

Figure 12. Forest products rade data available in the UNSO computer tapes.

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