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Transport absorptiveness of Polish foreign trade

Transport absorptiveness is generally understood as the value of transport expenditures linked with producing a utility effect unit within the whole economy or within a certain type of economic activity[1]. While investigating transport absorptiveness one makes use of simple transport absorptiveness ratios, which are the proportions of general transport expenditures (n) to the already mentioned utility effects (e):

$$w = \frac{n}{e} \quad .$$

In relating the discussed notions to the international exchange sphere one should distinguish the transport absorptiveness of goods exchange among two or more countries and the transport absorptiveness of foreign trade carried by particular countries. The transport absorptiveness of exchange among a certain number of

[1] Kuziemkowski R.: Transportochłonność gospodarki narodowej (Transport Absorptiveness of National Economy). Warszawa: WKiŁ 1981.

countries should be understood as the relations of transport expenditures connected with the exchange to the effects of that exchange. The transport absorptiveness of the foreign trade carried by one country is only a relation of the transport expenditures borne by that country to the obtained effects.

The authors of this article are dealing with the problems of transport absorptiveness in Polish foreign trade. They have also established the basic aims of investigating transport absorptiveness in foreign trade and have analysed some methodological problems connected with those investigations. The article also contains a methodological proposal concerning the determination of the influence that some selected factors exert on transport absorptiveness changes. That method has already been used for the analysis of changes that occurred in the transport absorptiveness of Polish foreign trade in the years 1965-1984.

The aims of investigating transport absorptiveness of foreign trade

Since the investigation of transport absorptiveness has only recently started, practical and methodological experience is still being gathered in that field. In concidering transport from the aspect of transport absorptiveness, one must stress the relation between transport expenditures and economic activity effects while at the same time pointing to the necessity to manage transport reserves effectively. Transport absorptiveness investigations can bring some cognitive results with regard to the relations occuring between transport and a selected management area. They can also be helpful in the search for most favourable transport solutions and subserve improvement in the effectiveness of management in transport. However the broad measure of transport absorptiveness cannot be the only criterion for evaluating the effectiveness of managing transport. Such an application of the transport absorptiveness measure would be justified only if over long periods transport contributed to obtaining similar utility effects in the area of its activity. Then the selection of a strategy minimizing transport absorptiveness would result in reducing transport expenditures without the risk of worsening the final outcome in the shape of the already mentioned utility effects. However, if the relation between transport expenditures and their effects is not constant then transport absorptiveness investigations should aim at optimization rather than at minimization of that relation. Thus, one should look for such values of various expenditures, among them being transport expenditures, which would be most favourable with regard to the accepted main function of this aim.

The problem of most favourable transport absorptiveness is especially complicated in the sphere of international turnover. There the main aim function may be the maximization of net profits of all the exchange participants, the maximization of net profits of a certain group of countries, e.g. an economic commonwealth, or the maximization of net profits of a specific country. Each of those aim functions may display a different optimum level of transport absorptiveness. The investigation of the relation occurring between the most favourable transport absorp-

tiveness of exchange for a certain number of countries and the most favourable transport absorptiveness for each of those countries separately might bring some very interesting results. It should also be taken into consideration that the transport services rendered by a given country on the international market are forms of exports (transit services, cross trade and conveyance of exported goods by the exporter's means of transport) or forms of anti-imports activity (conveyance of the pruchased goods by the buyer's means of transport). The whole of transport expenditures connected with foreign trade services in a given country is divided into expenditures born by the country's own transport and expenditures intended for the purchase of foreign transport service. These expenditures have been illustrated in Fig.1. The ABCD field stands for all transport expenditures for exports or imports service. The EF segment divides the field into two areas: one stands for expenditures connected with trade contracts which provide that the seller or buyer of the given country can choose the carrier, and the other for expenditures connected with other contracts. The GH segment, in turn, divides the expenditures borne by domestic (AGHD) and by foreign (GBCH) transporters. Thus, domestic transport expenditures connected with foreign trade service in a given country are illustrated by fields 1 and 3 in export and import (domestic transport) and by fields 2 and 4 in import (spending abroad). In considering the transport absorptiveness of foreign trade one can regard transport expenditures as all the already mentioned types of expenditures or only as domestic transport expenditures. This depends on whether one wants to find out to what degree the results obtained in foreign trade are connected with transport expenditures or if one wishes to examine the importance and contribution of domestic transport in the service of foreign turnover.

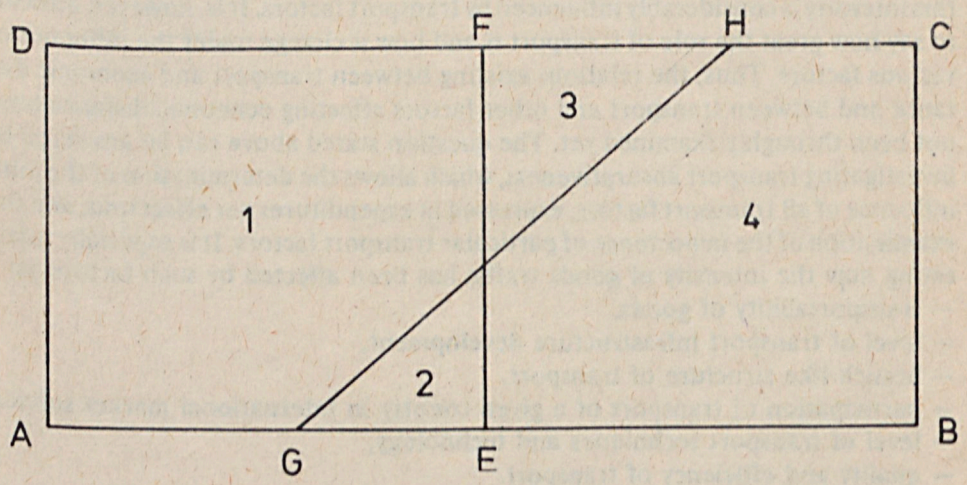


Fig.1. Foreign trade transport costs.

In foreign trade theories dealing with the problem of profits resulting form international exchange and the division of those profits, transport is a secondary factor. There is no explicit theoretical basis for the investigation of relations between the profits flowing form international goods exchange and transport expenditures. However, this should not lead one to belive that it is impossible to examine the transport absorptiveness of international goods exchange. The investigation of transport absorptiveness should rather be regarded as an integral element of studies upon the relation between transport and international goods exchange. The examination of transport absorptiveness is a good starting point to determine the role which transport and transport expenditures play in creating international market relations. The transport absorptiveness of goods exchange is influenced by: the degree of specialization of production; the commodity pattern of trade; the location of production and supply and distribution markets; and transport factors, such as: the applied technologies, the branch structure of transport, the level of efficiency of transport production, etc. The investigation of transport absorptiveness can bring many cognitive results, especially in the areas of:

- regularities determining international market and their intensity;
- regularities regarding the value of transport expenditures borne by particular countries participating in the international division of labour.

The importance of studies upon transport absorptiveness carried out in order to discover the factors determining international market relations can be shown in the relations that exist between the concept of economic distance (i.e. trade resistance) and transport absorptiveness. The concept of economic distance includes all natural (i.e. geographical distance, access to the sea, common border, etc.) and artificial (i.e. commercial policy) difficulties and facilities in trade, cultural, psychological and other factors[2]. The concept of economic distance is used to examine the intensity of international market relations. It is unquestionable that this intensity is considerably influenced by transport factors. It is, however, difficult to say how great the role of transport is and how it change under the influence of various factors. Thus, the relations existing between transport and economic distance and between transport and other factors affecting economic distance have not been throughly examined yet. The question stated above can be answered by investigating transport absorptiveness, which allows the determination of the joint influence of all transport factors, expressed in expenditures per effect unit, and the examination of the importance of particular transport factors. It is especially interesting how the intensity of goods traffic has been affected by such factors as:

- transportability of goods,
- level of transport infrastructure development,
- branch-like structure of transport,
- participation of transport of a given country in international market service,
- level of transport techniques and technology,
- quality and efficiency of transport.

[2] Kotyński J.: Struktura handlu międzynarodowego (The Structure of the International Trade), Warszawa, PWE 1979, p. 58.

Analysis of the above stated problems may provide one with certain clues about the stimulating role of transport in the development of foreign trade in a given country.

The methodology of studies on transport absorptiveness in foreign trade

Transport absorptiveness measures are selected according to research aims and methods. The problem resolves itself practically into:

- the way of expressing effects and expenditures and the determination of their scopes;
- logically justified comparison of expenditures and effects.

The social utility effects of foreign trade can be considered with regard to commercial activity itself or combined with other effects in the whole economy. Foreign trade together with production for export represents a subsystem of the economy which aims at obtaining imported goods. If, assuming an equalized exchange balance, one subtracted the material costs of production for export from the values of imports one would obtain a value corresponding to the concept of net output for the production for export and foreign trade. Since production for export and foreign trade are closely connected, foreign trade effects have to be considered together with the effects of production for export. The calculation of so understood a social utility effect, which reflects the contribution of foreign trade and production for export to the generation of national income, is a difficult task. The difficulty is caused not only by the lack of appropriate statistical data but also by the necessity to accept assumptions that are at variance with actual facts. Thus, it seems pointless to use more precise measures than the value of turnover. So the measure of effects resulting from foreign trade activities may be the value of imports expressed in domestic prices or the value of exports expressed in external prices, with the assumption of an equalized exports and imports balance. The total value of exports and imports can also be accepted as the effects measure. This has the advantage of being logically combined with the full range of transport expenditures which are, in the course of transport absorptiveness analysis, dealt with as the sum of transport expenditures for both exports and imports. In case there is a disequilibrium and instability in the exchange balance, neither changes of the exports or imports values nor changes of total sales reflect the changes of the utility effect of foreign trade. In such a situation the relation of transport expenditures to exports, imports or turnover values is no longer the relation of expenditures to effects, but becomes only a standard of value of expenditures per goods traffic unit. It would be reasonable to use the turnover standard expressed in natural units if it were methodologically necessary to eliminate the influence exerted on transport absorptiveness by factors other than the quantities of exported and imported commodities. Using natural standards allows one to evaluate the contribution of domestic transport in satisfying the needs of foreign trade.

Transport absorptiveness is inseparably connected with domestic transport expenditures for imports and exports service. The value of these expenditures

shows how much transport has been involved in goods conveyance in the foreign trade of a given country. Transport services themselves are objects of broadly understood foreign trade. Thus in order to examine the transport absorptiveness of goods traffic exchange, one should isolate the expenditures intended for foreign trade service in a given country and ignore the costs of transit and cross trades. These expenditures can be referred only to the corresponding or total goods traffic. With total goods the transport absorptiveness ratios will reflect the influence of policy concerning transport services and the contribution of domestic carriers to the service of foreign trade. The transport expenditures can include only international traffic or the conveyance of goods within the country (e.g. to and from seaports) and also transport serving production for export.

The expenditures considered in the course of the investigation may concern the transport itself, transhipment, storage, forwarding and other transport activities. The transport expenditures should be considered in terms of value. The use of natural units (tons, ton-kilometres) diminishes the advantages of transport absoptiveness ratios, though for various reasons this approach may also be profitable; for example it facilitates the determination of the demand for means of transport production.

The number of transport absorptiveness standards for foreign trade is calculated together with the number of logically justified combinations of particular standards for transport expenditures and social utility effects of foreign trade. Some of the combinations which make up transport absorptiveness ratios and which can be used in practice are presented in Table 1.

Table 1. Selected transport absorptiveness ratios for foreign trade

Effects / Expenditures	Transport expenditures in total or Polish transport expenditures		
	Transport or transhipment t	Cargo handling tkm	Transport costs zl
Total value of sales in zlotys or in foreign currency	$\frac{t}{zl}; \frac{t}{\$}$	$\frac{tkm}{zl}; \frac{tkm}{\$}$	$\frac{zl}{zl}; \frac{zl}{\$}$
Value of imports in zl	$\frac{t}{zl}$	$\frac{tkm}{zl}$	$\frac{zl}{zl}$
Value of exports in foreign currency	$\frac{t}{\$}$	$\frac{tkm}{\$}$	$\frac{zl}{\$}$
Total or part of sales in natural units (t)	$\frac{t}{t}$	$\frac{tkm}{t}$	$\frac{zl}{t}$

In the present article the standard for transport expenditures has been expressed as the value of cargo conveying labour performed by Polish transport in the service of Polish foreign trade divided by the measure of the effects brought by foreign trade, i.e. the total value of sales in exports and imports

$$w = \frac{P}{O} \tag{1}$$

P = cargo conveing labour of Polish transport performed for foreign trade;
O = value of sales in Polish foreign trade.
The transport absorptiveness ratio (1) can be described as:

$$w = \frac{P_e + P_i}{O_e + O_i}, \qquad w = \frac{P_e}{O_e + O_i} + \frac{P_i}{O_e + O_i} \tag{2}$$

where:
P_e = exported cargo conveying labour
P_i = imported cargo conveying labour
O_e = value of sales in exports
O_i = value of sales in imports.
With α standing for the share in exports and with β standing for the share in imports in the total turnover of foreign trade

$$\alpha = \frac{O_e}{O_e + O_i}, \qquad \beta = \frac{O_i}{O_e + O_i}$$

formula (2) can be expressed as:

$$w = \alpha \frac{P_e}{O_e} + \beta \frac{P_i}{O_i} \tag{3}$$

The transport absorptiveness ratio is a sum of the partial imports and exports ratios of transport absorptiveness measured respectively with the shares of exports and imports in foreign trade sales

$$w = \alpha\, w_e + \beta\, w_i \tag{4}$$

The partial transport absorptiveness ratios of exports (w_e) and imports (w_i) can be presented as:

$$w_e = l_e \frac{t_e}{T_e} \frac{1}{S_e}, \qquad w_i = l_i \frac{t_i}{T_i} \frac{1}{S_i}$$

where:
l = the average distance of conveyance in exports (l_e) and imports (l_i)
t = the tonnage of cargo carried in the service of Polish exports (t_e) and imports (t_i)
T = the tonnage of exports (T_e) and imports (T_i)
S = the mean value of 1 ton of exported (S_e) and imported (S_i) goods.

Thus, the transport absorptiveness ratio (4) can be described as:

$$w = \alpha l_e \frac{t_e}{T_e} \frac{1}{S_e} + \beta l_i \frac{t_i}{T_i} \frac{1}{S_i} \qquad (5)$$

In the above formula the relations t_e/T_e and t_i/T_i need explanation. Their values are affected by: multiple conveyance, the range of transport gestion and the difference between the tonnage of cargo transported to foreign carriers and the tonnage of cargo the conveyance of which Polish carriers were charged with by foreign trading partners possessing transport gestion. Multiple conveyance is connected with the delivery of exported commodities and with the carriage of imported commodities to and from seaports and to and from frontier railway stations.

If the multiple conveyance is ignored the „t" in the t/T relation would correspond to the 1 and 3 fields in Fig.1.

Formula 5 can be used in practive only if the value of 1 ton in exports and imports has been provided. Otherwise it is necessary to assume that

$$\frac{t_e}{T_e} \cdot \frac{1}{S_e} = c \; ; \quad \frac{t_i}{T_i} \cdot \frac{1}{S_i} = k$$

and transform formula 5 in the following way:

$$w = \alpha l_e c + \beta l_i k \qquad (6)$$

The changes in transport absorptiveness that occured in Polish foreign trade over the years 1965—1984

The above presented research assumptions and the selected method were used to analyse the changes in transport absorptiveness that occured in the Polish foreign trade over the years 1965—1984. As the standard of transport expenditures the value of conveying labour has been assumed and the effect of foreign trade activity has been expressed with the value of sales. Only the coveying labour performed by the Polish carriers has been considered. In determining how much the Polish transport system is burdened with transport for Polish foreign trade one has to take into account:

- railway traffic, including the transport of cargo sent and received from abroad, together with the transport of exported cargo registered in Poland to seaports and the transport of imported goods shipped by railway from seaports to customers all over the country;
- sea and river transport of cargo for Polish foreign trade;
- transport of petroleum brought by pipeline from abroad to the first customer in the country.

Thus, in the calculation some unimportant road and air transport performed for foreign trade has been neglected. The branch structure of international cargo con-

veyance performed by Polish carriers within the range of Polish foreign trade service for means of transport considered in the calculations for the selected years is presented in Table 2. The value of foreign sales is expressed in US Dollars in fixed prices from 1965[3], which has influenced the value of the transport absorptiveness ratio. Thus the transport absorptiveness ratio is expressed as:

$$W = \frac{P}{O} \left[\frac{tkm}{\$}\right]$$

The data included in Table 3 show how the transport absorptiveness ratio changed in the analysed period. The Table also presents the transport absorptiveness ratios for exports and imports and the data concerning changes in the elements of formula 6. It is worth mentioning that the „c" and „k" values included in Table 3 correspond to transport absorptiveness standards for which the measure of transport expenditures is the transported tonnage and the measure of effect is 1000 U.S. Dollars.

Table 2. The branch structure of international goods conveyance performed by Polish carriers in the service of Polish foreign trade

Years	1965	1968	1971	1974	1977	1980	1984
Transport in total:							
Sea transport	17,3	19,0	20,0	23,3	30,3	32,5	25,7
River transport	0,3	0,4	0,6	0,9	0,7	0,9	1,0
Railway transport	75,9	71,3	68,4	65,0	56,4	52,9	59,3
Pipeline transport	6,5	9,3	11,0	10,8	12,6	13,7	14,0
Imports:							
Sea transport	13,2	11,8	13,9	18,2	25,8	28,2	19,0
River transport	0,2	0,3	0,2	0,6	0,0	0,2	0,1
Railway transport	73,4	70,4	65,6	61,1	51,9	49,3	54,1
Pipeline transport	13,2	17,5	20,3	20,1	22,3	22,3	26,8
Exports:							
Sea transport	21,3	27,1	27,1	29,1	36,1	39,3	33,0
River transport	0,4	0,7	1,2	1,3	1,6	2,0	2,1
Railway transport	78,3	72,2	71,7	69,6	62,3	58,7	64,9

Applies only to the international transport (excluding transport to seaports). Conveyance measured in tons. Source: Statistical Yearbooks of Chief Central Statistical Office for the years 1965–85.

[3] In the analysed period the terms of trade for Polish foreign trade have changed considerably. In consequence of this the exports and imports transport absorptiveness ratios depend on which year is assumed as the base year for determining the sales value in fixed price.

Table 3. The transport absorptiveness ratios of Polish foreign trade and their elements in the years 1965–1984

Specification	Units of measure	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Transport absorptiveness ratio in foreign trade	tkm/U.S.$	11.7	12.1	12.2	13.8	12.5	12.2	12.9	12.4	11.0	11.2	12.8	13.4	15.2	18.1	15.9	15.3	12.6	12.4	11.9	11.7
Transport absorptiveness in imports	tkm/U.S.$	11.7	11.4	10.5	12.3	10.5	10.4	10.5	9.7	8.5	8.2	11.7	12.4	16.8	21.9	20.1	18.6	16.3	15.6	13.9	12.7
Share of imports in sales (b)	–	0.51	0.51	0.52	0.50	0.50	0.51	0.53	0.54	0.57	0.58	0.58	0.59	0.57	0.56	0.53	0.57	0.58	0.54	0.52	0.51
Average distance of transport of imports	thousand kilometers	0.887	0.938	0.930	1.127	0.982	1.040	1.121	1.144	1.144	1.138	1.580	1.700	2.131	2.572	2.316	2.183	1.826	1.746	1.748	1.606
Relation of transport tonnage to the value of imports (k)	thousand of U.S.$	13.2	12.0	11.2	10.8	10.8	10.0	9.2	8.4	7.6	7.2	7.2	7.2	8.0	8.4	8.8	8.4	8.8	8.8	8.0	8.0
Transport absorptiveness in exports	tkm/U.S.$	11.6	13.0	13.9	15.2	14.5	14.2	15.6	15.7	14.3	15.2	14.6	14.8	13.3	13.2	11.2	10.8	7.5	8.9	9.8	10.6
Share of exports in sales (a)	–	0.49	0.49	0.48	0.50	0.50	0.49	0.47	0.46	0.43	0.42	0.42	0.41	0.43	0.44	0.47	0.43	0.42	0.46	0.49	0.49
Average distance of transport of exports	thousand kilometers	0.690	0.768	0.872	1.011	1.071	1.096	1.274	1.357	1.241	1.305	1.282	1.309	1.244	1.264	1.120	1.165	1.163	1.035	1.054	1.032
Relation of transport tonnage to the value of exports (c)	thousand U.S.$	16.8	16.8	16.0	15.2	13.6	12.8	12.5	11.6	11.6	11.5	11.2	11.2	10.7	10.4	10.0	9.2	6.4	8.8	8.2	10.4

Source: authors' own calculations based on Statistical Yearbooks of the Chief Central Statistical Office for the years 1965–1985 and Statistical Yearbooks of Transport for the years 1981 and 1986

The general transport absorptiveness ratio for Polish foreign trade has varied considerably over the examined period of time (form 11 tkm/$ in 1973 to 18.1 tkm/$ in 1978). One can distinguish the following periods of time, characterized by definite tendencies towards changes in transport absorptiveness ratio for Polish foreign trade:

- years 1965–1968; constant rising tendency,
- years 1968–1973; falling tendency,
- years 1973–1978; strongly marked rising tendency,
- years 1978–1984; constant falling tendency.

The changes in transport absorptiveness that occured in those periods of time were analysed by the pro rata apportionment method. In that method the effect of the product factors (formula 6) describes the share which the relative change of a given factor has in the number of relative changes occuring in all factors. For instance, the change of transport absorptiveness ratio in exports caused by the change of average distance of transport in exports (w_e) has been fixed as:

$$\Delta w_e' = \Delta w_e \frac{\frac{\Delta l_e}{l_e}}{\frac{\Delta a}{a} + \frac{\Delta l_e}{l_e} + \frac{\Delta c}{c}}$$

where:

Δw_e – total alteration of the transport absorptiveness ratio in exports

The way of calculating the effect which changes of particular elements of formula 6 exert on changes of the transport absorptiveness ratio is presented in Table 4. The final results of the calculations for the years 1965–1984, expressed in absolute values have been gathered in Table 5 and their percentage is given in Table 6.

In analysing the data included in Tables 5 and 6, it should be noted that the transport absorptiveness of Polish foreign trade in the examined period also varied under the influence of some proportional changes concerning the service performed for trade by Polish and foreign carriers. The most important of these are proportions occurring in sea transport. In sea exports they varied slightly. In the years 1965–1984 the share of the Polish fleet in exports service varied from 41 to 51% – while in imports service it was higher and showed greater changes. The share of the Polish fleet in the service of imports rose from 1965 to 1978 and then fell to 1980. A sudden rise of the ratio in 1982–1983 was followed by its fall in 1984. Generally speaking, the share of our fleet in the service of imports in the examined period showed a rising tendency.

In the years 1965–1968 the general transport absorptiveness ratio rose by 18%. In that period the transport absorptiveness of exports rose steadily and the transport absorptiveness of imports fell except for the last year, when it rose suddenly. Over the whole examined period, i.e. in the years 1965–1984, the changes in the distance of transport, including, first of all, the variations of the average distance o

Source: authors' own calculations based on Statistical Yearbooks of the Chief Central Statistical Office for the years 1965–1985 and Statistical Yearbooks of Transport for the years 1981 and 1986

Table 4. The effect of alterations of elements on the transport absorptiveness ratio in Polish foreign trade in the years 1965–1968

Formula elements	elements values		Size of the alteration	Size of the alteration in %		Pro rata apportionment		Alterations of transport absorptiveness ratio	
	1965	1968		export	import	export	import	export	import
1	2	3	4	5	6	7	8	9	10
a	0.49	0.50	0.01	2.04		5.23		0.1	
l_e	0.690	1.011	0.321	46.52		119.16		2.29	
c	16.8	15.2	-1.6	-9.52		-24.39		-0.47	
b	0.51	0.50	-0.01		-1.96		-28.32		-0.05
l_i	0.887	1.127	0.240		27.06		391.04		0.70
k	13.2	10.8	-2.4		-18.8		-262.72		-0.47
Total	x	x	x	39.04	6.92	100	100	1.92	0.18

Source: authors' own calculations based on Table 3

Comments on the calculation method:

column 4 = column 3 - column 2

$$\text{column 5 and 6} = \frac{\text{column 4}}{\text{column 2}} \times 100$$

$$\text{column 7} = \frac{\text{column 5}}{\Sigma\text{column 5}} \times 100$$

$$\text{column 8} = \frac{\text{column 6}}{\Sigma\text{column 6}} \times 100$$

Σcolumn 9 and Σcolumn 10 based on the table

$$\text{column 9} = \frac{(\Sigma\text{column 9}) \times \text{column 7}}{100}$$

$$\text{column 10} = \frac{(\Sigma\text{column 10}) \times \text{column 8}}{100}$$

sea transport, had the greatest influence on transport absorptiveness in Polish foreign trade. In the years 1965–1968 transport absorptiveness was affected mostly by the extension of the average transport distance of exports. The extension of this distance was caused mainly by the development of sea traffic with Asian countries (Iran, Japan, Viet-Nam, Korea, Pakistan), Brazil and to a certain degree, with the U.S.A. The increase in sales resulted, first of all, from the increase in Polish exports. Poland started to supply coal (1 mln t in 1968) and pig iron (0.5 mln t in 1968) to Japan and rails to Brazil. Despite the increase in the sales of raw materials and semi-finished products, the mean value of 1-ton of sales in exports and imports rose, inhibiting the rise in the transport absorptiveness ratio.

In the years 1968–1973 the general transport absorptiveness ratio showed a falling tendency. It dropped by 20% in 1973, reaching its minimum for the whole 1965–1984 period. In the years 1968–1973 the transport absorptiveness of imports decreased considerably and the transport absorptiveness of exports varied slightly. The average transport distance in exports has been growing since 1965. This growth was the consequence of extending the distances of sea transport of

Table 5. Alterations of the transport absorptiveness ratio of Polish foreign trade as a result of alterations of selected factors

Formula elements	1965–1968 export	1965–1968 import	1965–1968 total	1968–1973 export	1968–1973 import	1968–1973 total	1973–1978 export	1973–1978 import	1973–1978 total	1978–1984 export	1978–1984 import	1978–1984 total
α	0.1			-1.41			0.13			0.99		
β		-0.05			1.29			-0.10			-1.0	
total changes of the structure			0.05			-0.12			0.03			-0.01
l_e	2.29			2.29			0.10			-1.60		
l_i		0.70			0.14			6.94			-4.24	
total distance alterations			2.99			2.43			7.04			-5.84
c	-0.47			-2.38			-0.57			0		
k		-0.47			-2.73			0.58			-0.55	
total: c+k			-0.94			-5.11			0.01			-0.55
Total	1.92	0.18	2.1	-1.5	-1.3	-2.8	-0.34	7.42	7.08	-0.61	-5.79	-6.4

Source: authors' own calculations based on Table 3.

Table 6. Alterations of the transport absorptiveness ratio of Polish foreign trade in percentages

Formula elements	1965–1968 export	1965–1968 import	1965–1968 total	1968–1973 export	1968–1973 import	1968–1973 total	1973–1978 export	1973–1978 import	1973–1978 total	1978–1984 export	1978–1984 import	1978–1984 total
α	0.9			-10.2			1.2			5.4		
β		-0.5			9.3			-0.9			-5.5	
total changes of the structure			0.4			-0.9			0.3			-0.1
l_e	19.6			16.6			0.9			-8.8		
l_i		6.0			1.0			63.1			-23.4	
total distance alterations			25.6			17.6			64.0			32.2
c	-4.0			-17.2			-5.2			0		
k		-4.0			-19.8			5.3			-3.0	
total: c+k			-8.0			-37.0			0.1			-3.0
Total	16.5	1.5	18.0	-10.8	-9.5	-20.3	-3.1	67.5	64.4	-3.4	-31.9	-35.3

Source: authors' own calculations based on the data included in Table 5.

exports and of a slight increase in the share of sea transport in the service of exports. On the other hand, the average sea transport distance in imports shrinked from 7670 km to 5910 km. The routes of sea imports changed. Imports from the USA, Japan and Australia increased, while the sea-imports from Asia decreased. However, at the same time the share of sea transport in the service of imports grew

considerably, which made up for the influence of limiting sea transport on the average transport distance in imports. Thus, only the alterations of the average transport distance in exports influenced the changes of the transport absorptiveness ratio. However, this was not a decisive factor. The alteration of transport absorptiveness ratios was affected mainly by the increase in the value of 1 ton of imports and exports, which was caused by the lowering of the share of fuel and energy in sales and by the rise of the share of the electroengineering industry in both exports and imports.

In the period 1973—1978 the average transport distance of imports grew considerably. This phenomenon effected the transport absorptiveness ratio, which rose by 65% and which in 1978, reached the maximum value for the whole examined period. As in the preceding period alterations of the general ratio resulted, first of all, from the considerable growth of the imports transport absorptiveness ratio. The transport absorptiveness of exports varied slightly in that period. The average distance of sea-transport of imports grew from 5910 km to 9552 km as a result of the increase in imports form America (the USA, Canada, Brazil) and Asia (China, Japan, Iran and Iraq). The increase in the imports of petroleum from the Persian Gulf countries was of great importance. Generally, the share of fuel and energy in imports grew from 5.7% to 12.9% and the value of 1 ton of sales in imports dropped, which made transport absorptiveness growth faster. In sea export similar changes occured as in imports in the years 1968—1973. The average sea transport distance was shortened from 5410 km to 4310 km, but the share of sea sales grew considerably, which resulted in maintaining the level of average transport distance for the total export. Thus, the trend to direct Polish sea exports to nearer merkets that was popular in the years 1968—1978 was not reflected in alterations of the transport absorptiveness ratios. It is easy to notice how transport absorptiveness was affected by the efforts undertaken to change the structure of exports, i.e. to increase the share of processed goods. The opposite occurred in imports.

The fall in imports from the USA, Canada, Japan and Iraq that occurred in the years 1978—1984 was not compensated for even by the increase in sea-imports from India, China and Argentina. The average transport distance for sea-imports was shortened from 9552 km to 8111 km. The simultaneous drop in the sea transport contribution to the service of imports caused a considerable shortening of the average transport distance in Polish import. The decline of the transport absorptiveness ratio in import resulting from the above described phenomena was intensified by the rise of the value of 1 ton import sales. The latter was a consequence of decreasing the share of fuels and agricultural products in imports. Exports to distant countries declined as well. Exports the USA, Brazil and Iraq decreased but generally exports to Asian countries slightly increased. Finally, the average transport distance in exports was shortened, which intensified the general tendency showed by transport absorptiveness in exports. The general transport absorptiveness ratio dropped in that period by 35%, in 1984 reaching the value of 11.7 tkm/$, i.e. equal to the value for 1965.

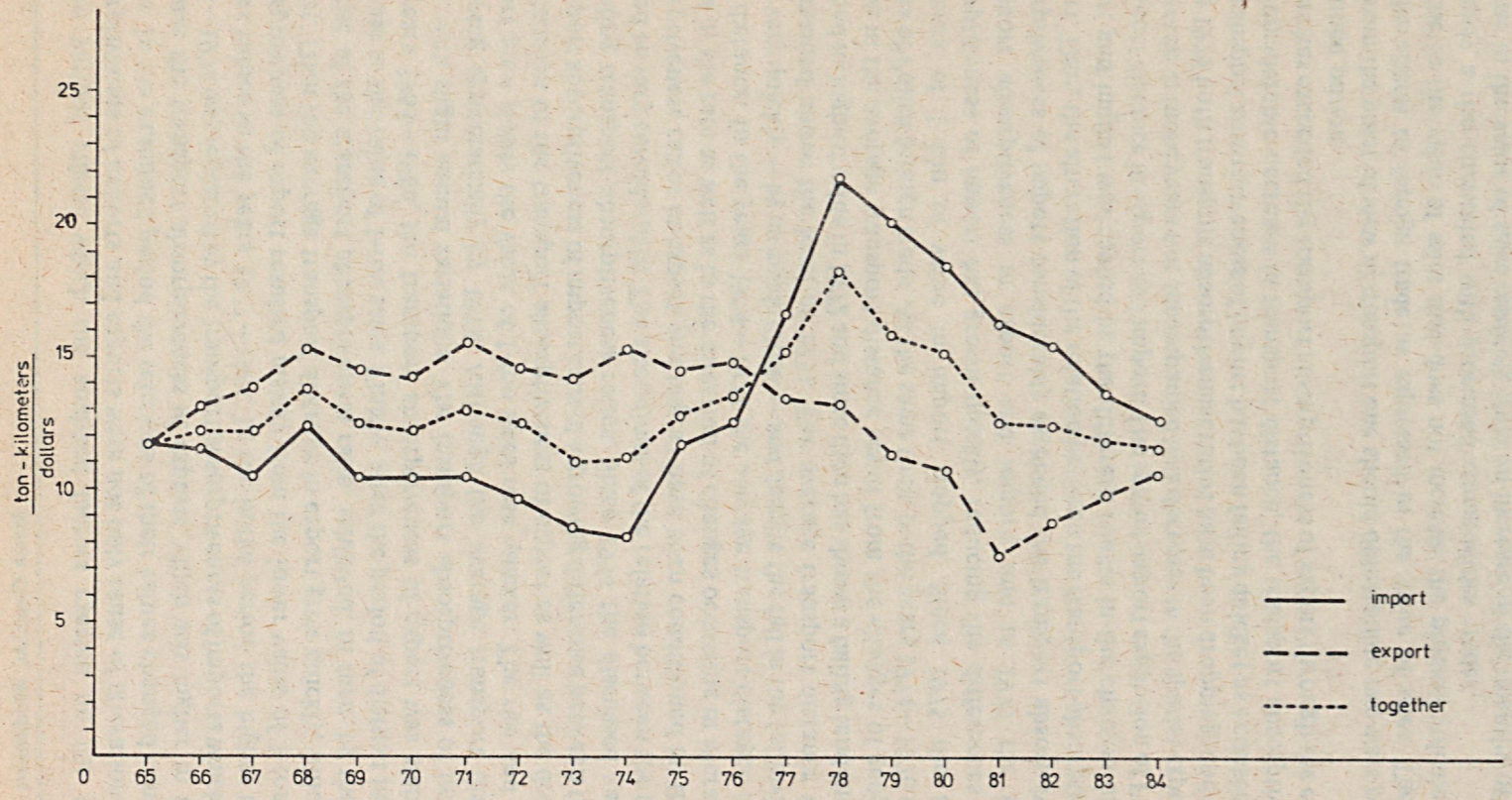


Fig.2. The transport absorptiveness of the Polish exports and imports in the years 1965 – 1984.

Source: authors' own calculations based on Statistical Yearbooks of GUS for years 1965 – 1985.

The various effects which the analysed factors exerted on the transport absorptiveness of imports and exports were not only cause of alterations of both ratios. In the examined period the relations of their values changed considerably because the transport absorptiveness of exports which was higher in the years 1966—1976 was replaced by the transport absorptiveness of imports which reached higher values in the years 1977—1984. In the initial period the higher transport absorptiveness of export resulted mainly from the lower value of 1-ton sales in export. Then the average transport distance in export grew quickly, which caused the rise of the transport absorptiveness ratio, inhibited, in turn, by the distinct increase in the value of 1-ton sales. Finally, after the period of distinct increase in the years 1965—1986, the transport absorptiveness of export was stabilized by 1974, with slight annual variations. The transport absorptiveness of import was dropping systematically by 1974. Although the average transport distance in import grew slowly the value of 1-ton sales rose quicker. The rise and then the stabilization of the transport absorptiveness of export as well as the drop of the transport absorptiveness of import caused a growing difference between the corresponding transport absorptiveness ratios. Since 1974 the discussed value have tended to vary considerably. The alterations of the relation between the transport absorptiveness ratios in export and import have been conditioned by the differences in the rate as well as in the direction of changes occurring in average transport distance. In the years 1974—1978 the average transport distance in import grew very quickly — by as much 126% — and despite the fall in the following years, it remained above the level of 1974. The average transport distance in export reached its highest value in 1972 and since then has shown a falling tendency. Alterations in the average transport distance result from the changes of geographical routes of Polish foreign trade. At the same time, in the years 1974—1976 the rising tendency of 1 ton of value in import stopped. Since 1975 the transport absorptiveness of import has grown quickly, reducing the differences between transport absorptiveness in export and import; and in 1977 the transport absorptiveness of import considerably exceeded the transport absorptiveness of export. Thus, the alteration of the relation between the transport absorptiveness of export and import was caused by the different routes in the changes of average transport distance in export and import. The spatial import expansion of Polish foreign trade in those years was accompanied by a decrease in the spatial export range. Since 1979 both transport absorptiveness ratios have been dropping, and although the transport absorptiveness of import has been falling quicker as a consequence of the considerable decrease in transport distance, the transport absorptiveness of import has exceeded the transport absorptiveness of export through the end of the examined period.

From the point of view of transport one should differentiate two ways of increasing the effects of foreign trade as expressed in the value of sales. There are:

—a rise in the value of sales that does not increase the physical volume of sales, namely a rise connected with processed commodities trade;

—a rise in the value of sales resulting from an increase in the quantity of exported and imported commodities.

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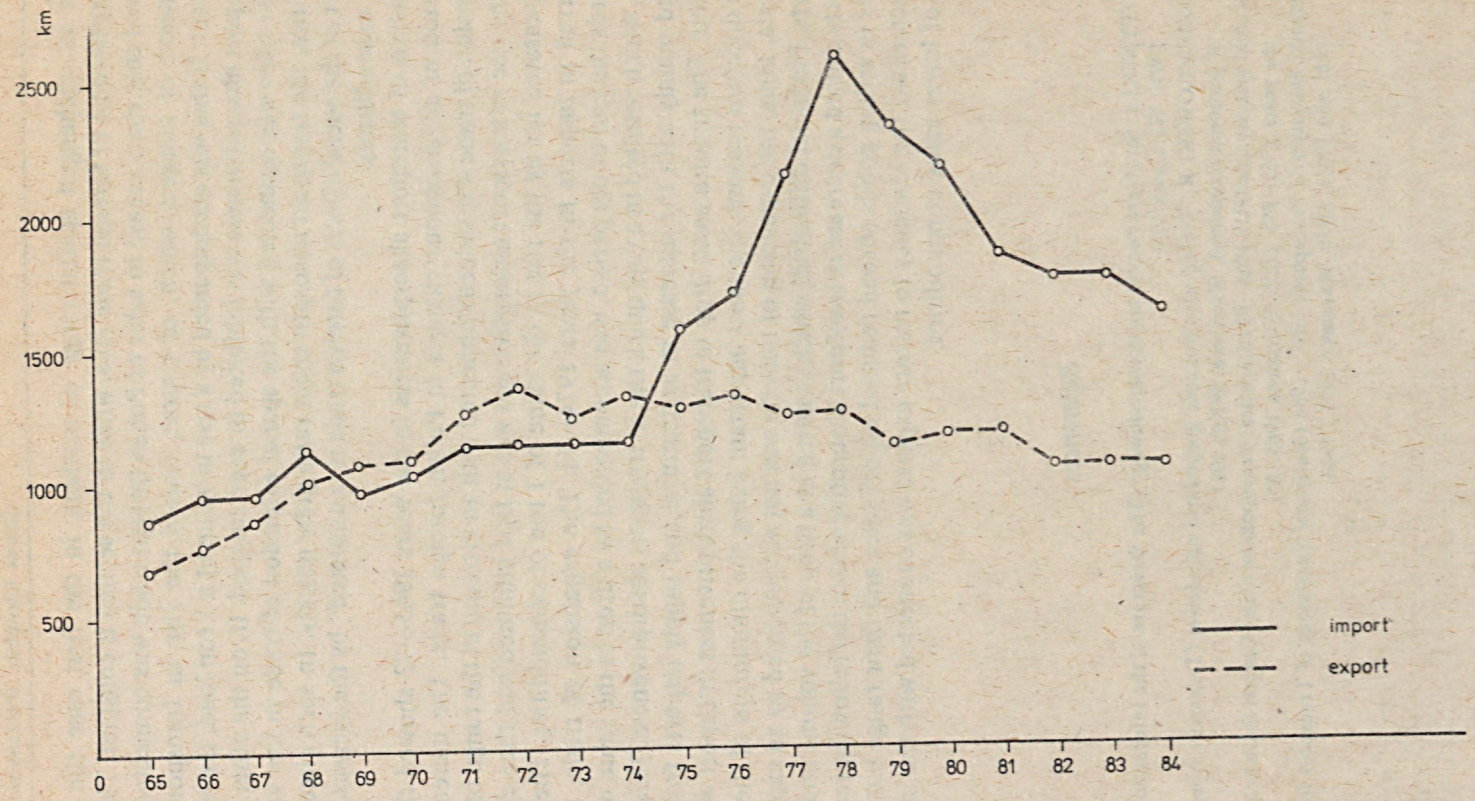


Fig.3. Average distance of transport in Polish exports and imports handled by Polish transport

Source: authors' own calculations based on Statistical Yearbooks of GUS for years 1965 – 1985.

With an unchanged spatial range of markets, in the first case the transport absorptiveness of foreign trade falls, while in the second is constant. The analysis showed that the increase in sales of Polish foreign trade was connected with the extension of markets which, of course, caused the rise in transport absorptiveness. If this was accompanied by a rise in value of a 1 ton load, the increase in transport absorptiveness was inhibited or even stopped. If, on the other hand, the rise in sales was connected with the spatial extension of trade in low value commodities, the transport absorptiveness ratio grew quickly. In such circumstances a part of the social effects of foreign trade is „consumed" by the increase in transport expenditures.

Analysis of transport absorptiveness in the years 1965—73 showed that it was a period of advantageous changes in Polish foreign trade. The increase in the expansion of trade was indeed connected with an increase in the range of markets, but the rise in transport absorptiveness was at first inhibited and then excessively compensated for by the rise in the value of 1 ton of commodities. The opposite occurred in imports in the years 1974—78. The expansion of trade, especially towards the end of the period, was accompanied by a drop in the value of 1 ton of sales, which resulted in a very quick rise in transport absorptiveness. This was connected mainly with the increase in agricultural and supply imports from distant markets. The simultaneous drop in transport absorptiveness in export was due to quite different reasons, the most important being the diminution of the range of markets. Thus, the expansion of imports was not accompanied by an expansion of exports. Financial difficulties which resulted in a drop of the volume and range of imports caused a decrease in transport absorptiveness in the following years. Difficulties in selling goods abroad reduced export sales and their range but, which is characteristic, the tendency to restore exports was connected with the increase in sales of lower value commodities.

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