REGULATION AND DEREGULATION IN INLAND NAVIGATION

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Abstract

Inland navigation in Belgium and the Netherlands has been liberalised since 30 November 1998 in consequence of European Directive 96/75/EC. The purpose of this Directive is, amongst other things, to make the sector more competitive. This paper, which was written before the liberalisation took effect, constitutes a first attempt to model the consequences of deregulation. The first part describes the structure of the inland navigation market and the European situation before deregulation. In the second part, a set of empirical results is presented that helps to clarify the impact of deregulation on inter- as well as intra-modal competition.

INTRODUCTION

Inland navigation in Belgium and the Netherlands has been liberalised since 30 November 1998 in consequence of European Directive 96/75/EC. The purpose of this Directive is, amongst other things, to make the sector more competitive. This paper, which was written before the liberalisation took effect, constitutes a first attempt to model the consequences of deregulation. The first part describes the structure of the inland navigation market and the European situation before deregulation. In the second part, a set of empirical results is presented that helps to clarify the impact of deregulation on inter- as well as intra-modal competition.

REGULATION OF THE INLAND NAVIGATION MARKET

Regulation of the European inland navigation market was largely due to the market's specific structure, and it used to differ considerably from country to country. Therefore, insight is required into the sector as a whole as well as the type of regulation concerned.

The structure of the inland navigation market

Supply and demand on the inland navigation market are structured differently. The bulk of available loading capacity is in the hands of independent bargemen owning just 1 or 2 vessels. In Belgium, for example, no less than 98 percent of operators own either one or two barges. The larger and more modern vessels are owned by shipping companies, while the smaller barges usually belong to independent bargemen.

Besides the large number of suppliers who hardly work together at all, there are large transport companies that form cartels on the domestic market. Under free market conditions, such a situation will lead to fierce competition between suppliers of tonnage, so that freight rates would inevitably decline.

Under normal circumstances, too low a price would result in inefficient ships, i.e. vessels for which the direct costs exceed the rates charged, being pushed out of the market. This would result in a capacity reduction, which in turn could lead to a new equilibrium between supply and demand, whereby freight rates would increase again.

The independent bargeman, however, typically does not adhere to this free market mechanism, as he will tend to try and compensate loss of income by increasing his productivity. Instead of cutting down on tonnage, he will try to sail more frequently, thus increasing capacity rather than reducing it, which in turn may result in even lower freight rates.

Table 1 - Classification of the Belgian Dry Bulk Fleet (31.12.94)

	Number of owners	Number of vessels	Tonnage	Average capacity (in tons)
1 vessel	1,053 90.4 %	1,053 76.7 %	840,145 65.5 %	798
2 vessels	86 7.4 %	172 12.5 %	177,704 13.9 %	1,033
3 vessels	9 0.8 %	27 2.0 %	32,869 2.6 %	1,217
4 of 5 vessels	8 0.7 %	34 2.5 %	74,082 5.8 %	2,179
6 tot 10 vessels	6 0.5 %	46 3.3 %	109,662 8.6 %	2,384
11 tot 24 vessels	3 0.2 %	41 3.0 %	45,835 3.6 %	1,118
25 vessels and more	-	-	-	-
Total	1,165 100 %	1,373 100 %	1,280,297 100 %	932

Source: Dienst voor Regeling van de Binnenvaart, Belgium

In a normal market situation, unprofitable rates will lead to bankruptcies, so that supply will shrink and rates once again reach a level that is profitable. But this reasoning does not apply to inland navigation. As most bargemen do not own a home on land, and are often not qualified for any other profession, they will try and postpone bankruptcy for as long as they possible can. In the short-term, the independent bargeman is likely to take into account the variable cost when calculating the freight rate, while ignoring the interests on invested capital and awarding himself hardly any wages at all (De Ruiter, 1980, p. 27).

Such developments prompted the authorities to regulate in order to get a hold on market mechanisms. The regulation that was thus introduced varied from country to country, and included rotation systems (tour-de-role), minimum rates (Festfrachten), subsidising, etc.

Efforts to attain a more stabile market

The striving towards a more stabile market has been an important element in inland navigation policy of the past 30 years. In fact, policy-makers back in the 1930s already worked out various kinds of regulation for the sector because they believed that the market would not attain a satisfactory equilibrium of its own accord.

But even with regulation in place, bargemen continued to complain about a crisis in the inland navigation sector. As it was clear that the situation would not be resolved by fixed freight rates alone - problems had, after all, continued to occur despite the imposition of *Festfrachten* - efforts were made to affect the supply of capacity directly. In the early 1960s, German authorities for example considered introducing a so-called “lay up regulation”. The aim was to reduce overcapacity by taking barges out of service for short periods of time. But, because of doubts about the efficiency of such a measure and resistance against it from independent bargemen, the regulation was never implemented (Wulf, 1988, p. 261). In the Netherlands, Belgium and France there was no need to lay up the fleet, as there was already tour-de-role in place.

In the mid-1960s, overcapacity in Germany was rampant, so that calls for capacity-reducing measures became ever louder. A scrapping campaign was eventually launched in 1969 that resulted in a 2.5 million-tonne capacity reduction by 1987. Yet the effect on the international inland navigation market was modest, especially as other EU member states had not taken a similar course of action (Wulf, 1988, p. 262). Quite the contrary, some countries were actually encouraging a further increase in tonnage. Generally speaking, one could also say that the implementation of tour-de-role stood in the way of freight rate cuts and capacity reduction.

The tour-de-role system works more or less as follows: the country is divided into districts, each of which has a shipping exchange. Charterers within any district are required to request capacity (for domestic transport) from the exchange, where a register is kept of all available barges meeting certain requirements. During the actual exchange, the available freights are offered to the bargemen who have registered for tour-de-role. Whichever carrier has been on the list for the longest period of time is given first choice from the freights on offer. The charterer, for his part, has to accept whichever barge is assigned to his cargo on condition that it meets certain criteria. If the assigned vessel does not meet the requirements or if the freight is rejected by the carrier, the cargo is put on offer for a second time. If after this second call for transport still no carrier is found, the load may be chartered freely, and the carrier and charterer are free to work out the financial and technical details. Bargemen who do not call for cargo retain their position in the rotation system.

If a transport agreement is reached under the tour-de-role system then the carrier and charterer are bound by the legal conditions of carriage; if they fail to adhere the authorities are entitled to refuse to stamp the deal. There are, for example, standard freight tariffs that have to be respected (in Belgium, the Law of 5 May 1936 on river freightage; in France, "*Loi 22 mars 1941*"; and in the Netherlands, the combined regulations of "*Boek 8 N.B.W.*" and "*Bevrachtingsvoorwaarden 1991*"). A government body is responsible for the correct implementation of the regulations, including those regarding freight rates.

The costs associated with the regulated system are passed on to the carriers: they are simply subtracted from the legal freight rate. In case of freighting through the shipping exchange, the carrier is required to pay two commissions: an exchange duty, intended as a contribution towards the costs of the shipping-exchange system, and a broker's commission, which is due to the charterer. The level of these commissions varies from country to country, but it never exceeds the legal maximum of 10 per cent of the freight rate.

In case of chartering on the free market, bargemen are only required to pay a broker's commission. Generally speaking, this commission is higher than that paid under the tour-de-role system (which amounts to between 5 and 10 per cent). In other words, the "costs" of chartering are quite different on the regulated and the free market.

Rules governing access to the market became stricter from 1989 as a result of two EU regulations, one concerning scrapping and one regarding the so-called Old-for-New regulation (Blauwens, 1994). Under the scrapping regulation, a premium is awarded for the scrapping of old vessels. Scrapping premiums are granted according to the means available to the fund and the date of application. The scrapping fund is made up of annual contributions from the bargemen, EU subsidies (ECU 20 million in 1995), and revenues from the Old-for-New regulation.

The Old-for-New regulation prescribes that new tonnage may only come into service if the equivalent is taken out of service. If one purchases either a new or a second-hand vessel from a non-EU country without taking the same amount of tonnage out of service, compensation must be paid into the above-mentioned fund, which will allow other bargemen to have their vessels scrapped. The tonnage of the respective ships is compared by means of an adjustment factor (Blauwens, 1994), (De Decker, 1994), (De Ruiter, 1980).

Area of application of the market regulation system

This market regulation system only applies to a limited area of the inland navigation market. Domestic transport in Germany and international transport to Germany have, for example, been entirely deregulated since the abolition in 1994 of the *Festfrachten*.

Belgium has the highest degree of market regulation, as the tour-de-role system for barge services applies to transport or storage of dry bulk inside Belgium as well as shipment to France, except via the Rhine. For dry-bulk shipment to the Netherlands, there is a so-called "posting obligation", which implies that the shipment has to be registered with the shipping exchange. In reality, however, the bargemen organise an unofficial tour-de-role system amongst themselves. Peer pressure and threats of physical violence have convinced many bargemen to participate in this system. Freighting for domestic tanker traffic is free, but minimum rates, which are reassessed annually, have been applied since 1980 (Blauwens, 1994), (De Decker, 1994, p. 23).

For the various forms of dry bulk shipment (containers, sand and shingle, hazardous cargoes and forward leasing and chartering for successive shipments) there is a more relaxed regime, which allows chartering outside the exchange on certain conditions (De Decker, 1994, p. 23).

The Dutch rotation system (i.e. Proportional Distribution of Freight) applies only to general, irregular domestic transport, including on the Rhine and equivalent tributaries, insofar as it concerns Dutch nationals and legal persons. So-called "horseshoe transport" (i.e. with a provenance and destination in the same country, but a border-crossing route) is regarded as domestic transport and is therefore subject to Proportional Distribution of Freight. Shipment of shingle and sand constitutes an important exception on the Proportional Distribution of Freight. Tanker traffic and shipment for one's own account are also beyond the scope of this regulation (De Decker, 1994, p. 19).

The so-called "Tour-de-role North-South" (Toerbeurt Noord-Zuid) is an unofficial rotation system for shipment of dry bulk to Belgium and France, which became operational in 1980. Again, bargemen are "encouraged" by their colleagues to adhere to the system (Blauwens, 1994).

The French system is the least prescriptive. It applies only to dry bulk, irrespective of whether it concerns domestic or international traffic, except for traffic from France along the Rhine or Moselle. It does not apply to private transport, tanker traffic and traffic on the basis of a time or tonnage chartering agreement. Vessels used for transport on own account, too, are exempt from shipping-exchange regulations, on condition that it does not concern professional transport, unless permission was granted by the V.N.F. (*Voies Navigables de France*) (De Decker, 1994, p. 18).

It follows from the various market regulation systems that the market structures in the countries involved in Rhine navigation are quite diverse. It appears from table 2 that the relative significance of the regulated market and the free market varies from country to country. As data concerning the shares of the different types of market regulation are hard to come by, we had to make use of data for 1988.

Table 2 - Overview of European inland navigation market according to regulation system in 1988 (in million tonnes and percentage)

Domestic Transport		NL	D	B	F	Total
Total		89,70	63,00	22,20	29,50	204,40
Of which free transport		13 %	8 %	28 %	0 %	11 %
Of which transport for own account		41 %	8 %	17 %	37 %	28 %
Transport by third parties		46 %	84 %	55 %	63 %	61 %
Of which :	Tour-de-role barge service	20 %	0 %	49 %	18 %	17 %
	contracts	12 %	0 %	6 %	36 %	11 %
	exceptional permission	10 %	0 %	0 %	0 %	4 %
	Festfrachten	0 %	84 %	0 %	0 %	26 %
	others	3 %	0 %	0 %	9 %	3 %

Source: Verein für Binnenschiffart und Wasserstraßen E.V. (1991), Bedeutung der Binnenschiffart in Europa

MODELLING THE CONSEQUENCES OF DEREGULATION IN THE INLAND NAVIGATION SECTOR

The inland navigation sector is characterised by the coexistence of a regulated and a free market. In the regulated market minimum rates are set and freights distributed on the basis of a tour-de-role system. Deregulation implies that freight rates are determined by the laws of supply and demand, which will inevitably result in lower prices than on the regulated market. It is not clear what the overall effect on freight rates will be, as this depends largely on the shifts that will occur between the formerly regulated market and the free market. Also, deregulation will affect the available capacity, which in turn will have an impact on the price level.

To study the effect of deregulation in inland navigation, we shall take a four-stage approach. In the first stage we shall take a closer look at the relation between the level of demand for freight transport by inland waterways and economic activity. This will give us an idea of the opportunities that exist for the sector all other factors being equal.

In the second stage we will study the effect of prices on the modal choice. It is clear that if prices have no impact on the modal choice, then nor will deregulation. If, on the other hand, prices do have an impact, deregulation of inland navigation may be expected to result in a modal shift.

In the third stage we shall focus on the sector itself and try to establish what relation exists between the regulated and the free market. It is not unthinkable that long waiting times in the regulated market might encourage some bargemen to turn to the free market, or that considerable cuts in freight rates on the free market might result in an increased supply on the regulated market. If these spillovers exist, the consequences of deregulation might be less severe.

In the fourth stage we shall consider the cost structure and the productivity of different types of suppliers of inland navigation services. The purpose is to find indicators that enable us to identify which operators are already shifting regularly between the regulated and free market and which ones are not. The latter group in particular should be interesting, as it will consist of operators that are most vulnerable to deregulation.

Demand models: the relation between inland navigation and economic activity

In Meersman & Van de Voorde (1997b) an error correction model is used to study the relation between demand for freight transport and economic activity. This model consists in a long-term 'equilibrium' relation between demand for freight transport in tonne-kilometres (tkm) and an indicator for economic activity, in this case industrial production (IP):

$$\ln tkm_t = a_0 + a_1 \ln IP_t + resid_t$$

and a dynamic adjustment or error correction

$$\Delta \ln tkm_t = b_0 \Delta \ln IP_t + b_1 resid_{t-1} \qquad \text{with } b_1 < 0$$

In this model b_0 and a_1 represent respectively the short and the long-run elasticity of freight demand in relation to industrial production. Table 3 provides an overview of the elasticities for Belgium, France, Germany and the Netherlands for inland navigation.

In both Germany and the Netherlands, demand for freight transport by inland waterways correlates closely with the growth in industrial production. In Belgium, the short term effect of industrial growth is much stronger than the long-term effect, but also in Germany the short-term elasticity is slightly greater than the long-term elasticity. This indicates that, in the long run, a shift might occur towards other transport modes. This is confirmed by the figures in Table 4, which is an overview of the respective elasticity of road and rail freight transport. It is clear that, in the long run, freight transport by road will benefit most substantially from industrial growth.

The negative elasticity in France is due to the fact that its inland navigation sector is restricted by the limited number of waterways and the concentration of this mode of transport in the northern part of the country. Therefore, an indicator for regional industrial production would provide better insight into the relation between inland navigation and economic activity in France.

Despite differences between individual countries, the above findings allow one to conclude that inland navigation may enjoy some short-term benefits from an increase in industrial output, but that road transport will be the major beneficiary in the long run.

Table 3 - Elasticities of the demand for freight transport by inland navigation w.r.t. industrial production

Country	Elasticities	
	Short run	Long run
Belgium	0.64	0.13
France	-2.14	-2.19
Germany	0.93	0.89
The Netherlands	0.73	0.97

Source: Meersman & Van de Voorde (1997b)

Table 4 - Elasticities of the demand for freight transport by road and rail with respect to industrial production

Country	ROAD Elasticities		RAIL Elasticities	
	Short run	Long run	Short run	Long run
Belgium	0.89	2.38	1.45	0.45
France	2.15	1.81	2.94	-1.96
Germany	1.12	-	1.3	-
The Netherlands	0.13	1.87	-0.53	-0.106

Source: Meersman & Van de Voorde (1997b)

The lack of long-term elasticities for road and rail transport in Germany is due to the fact that the long-term relation was not stationary in the error correction model.

Inland navigation in competition with road and rail transport

One way in which the inland navigation sector can strengthen its long-term position is by attracting freight from the other transport modes. It is clear that the modal choice depends largely on the generalised costs of each of the means of transport. The freight rates charged by the various modes may be one of the important components of the generalised cost. If this is indeed the case, the inland navigation sector might benefit from lower rates.

In Meersman & Van de Voorde (1997a) the modal choice is modelled for Belgium by means of a translog specification. From the Full Information Maximum Likelihood (FIML) estimates of the coefficients of this model, it is possible to calculate the elasticity of both substitution and price. They are represented in table 5.

One of the main conclusions is that there are considerable differences between the goods categories under consideration. The demand for freight transport by inland waterways is elastic for all goods categories. As a consequence, price reductions in the inland navigation sector will result in a significant increase in demand for transport by inland waterways. With respect to prices of the competing modes, inland navigation is complementary (but inelastic) to rail transport for the goods categories 'chemicals' and 'machinery and others'.

As with the 3-modal cases, the elasticities on transport links where only two modes are available varies according to the goods categories. For the majority of categories, inland navigation and road transport are substitutes. Lower prices in inland navigation will result in an increase of traffic partly because there will be some substitution from road transport to transport by inland waterways.

In general we may conclude that lower freight rates in the inland navigation sector will make it more attractive, resulting in an increase of demand for transport by inland waterways.

Elasticities based on FIML estimates of the bimodal model are presented in table 6.

Table 5 - Elasticities of substitution and price elasticities for inland navigation vs. road and rail for 3-mode relations (Belgium)

	All categories	Metal (cat. 5)	Chemicals (cat. 8)	Machines a.o. (cat. 9)
Elasticities of Substitution				
ROAD/INLAND NAVIGATION	-0.4343	2.5445	0.4954	1.0967
RAIL/INLAND NAVIGATION	25.853	4.8701	-38.0369	-23.8850
Price elasticities of INL.NAV. w.r.t. the price of				
road	-0.401	1.8163	0.4879	1.0464
rail	1.593	1.1700	-0.4201	-0.8166
inland navigation	-1.191	-4.0475	-1.0635	-1.281

Source: Meersman & Van de Voorde (1997a)

Table 6 - Elasticities of substitution and price elasticities for bimodal situations (based on translog estimations) for Belgian freight transport (road/inland navigation)

	Agricultural Products	Petroleum & Derivatives	Metal	Raw Minerals	Chemicals	Machines a.o.
Elasticities of Substitution	0.6949	0.6022	1.5080	-0.3988	0.4597	1.2007
Price-elasticities of INL. NAVIG. w.r.t. price of						
ROAD	0.6384	0.5637	1.2821	-0.3542	0.3868	1.1448
INLAND NAVIG.	-0.6384	-0.5637	-1.2821	0.3542	-0.3868	-1.1448

Source: Meersman & Van de Voorde (1997a)

Inland navigation: a relation between the regulated and the free market?

The relation between the regulated and the free market can be expressed by a set of equations. For the free market, the price and the quantity transacted can be determined by equating the supply and demand function. For the regulated market the quantity transacted will be equal to the quantity demanded at the given price level P_R. As the price level in the regulated market is higher than the equilibrium price level in this market, there will be an excess supply, which in turn will result in a waiting time. This can be expressed by the following model :

- for the free market:

$D_F = f_{DF}(P_F, P_{RAIL}, P_{ROAD}, \text{Economic Activity}, \ldots)$ Demand equation

$S_F = f_{SF}(P_F, P_R, WT_R, \text{depth, number of Rhine patents}, \ldots)$ Supply equation

$Q_F = S_F = D_F$ Market equilibrium

- for the regulated market the following set of equations holds:

$D_R = f_{DR}(P_R, P_{RAIL}, P_{ROAD}, \text{Economic Activity}, \ldots)$	Demand equation
$S_R = f_{SR}(P_F, P_R, WT_R, \ldots)$	Supply equation
$Q_R = D_R$	Realised transactions
$WT_R = \frac{S_R - D_R}{D_R}$	Waiting time

in which the endogeneous variables P_F, Q_F, Q_R and WT_R represent the price in the free market, the quantity transacted in the free market, the quantity transacted in the regulated market and the waiting time in the regulated market. The exogeneous variables are the price in the regulated inland navigation market denoted by P_R, the price of rail transport P_{RAIL}, the price of road transport P_{ROAD} and economic activity.

As we do not have all the relevant variables at our disposal, we shall consider a simplified version of the model (semi-reduced form):

$$\ln P_{F,t} = \alpha_0 + \alpha_1 \ln WT_t + \alpha_2 \ln IP_t + u_{1,t}$$

$$\ln WT_t = \beta_0 + \beta_1 \ln P_{F,t} + \beta_2 \ln P_{R,t} + \beta_3 \ln IP_t + u_{2,t}$$

where the industrial production IP_t represents the economic activity.

For the estimation, we used monthly data for Belgium (Jan.1993 to Feb.1997). Rates in the free market are based on the rates for different commodities on different relations (Upper Rhine, Middle Rhine, Rhur). These rates are available on a quarterly basis. In order to have sufficient degrees of freedom, monthly series were constructed using an adapted method of Boot, Feibes & Lisman (1967).

The first equation was estimated by means of a Two Stage Least Squares (2SLS)-method which yielded the following result (t-values between brackets):

$$\ln P_{F,t} = \underset{(1.80)}{0.17} - \underset{(-2.05)}{0.027} \ln WT_t - \underset{(-1.84)}{0.025} \ln IP_t + \underset{(23.8)}{2.89} \ln P_{F,t-1} - \underset{(-8.85)}{3.43} \ln P_{F,t-2} + \underset{(1.92)}{1.22} \ln P_{F,t-3}$$

$$+ \underset{(2.35)}{1.53} \ln P_{F,t-4} - \underset{(-4.71)}{2.00} \ln P_{F,t-5} + \underset{(5.75)}{0.78} \ln P_{F,t-6}$$

Adjusted $R^2 = .996$ DW = 1.75 Sum squared resid. = .00167

Instruments: constant, $\ln P_{R,t}$, $\ln IP_t$, $\ln P_{F,t-j}$ $(j = 1,\ldots,6)$

Increasing waiting times in the regulated market will encourage some baregmen to shift to the free market. The increased supply will put a downward pressure on prices in this market. The significant negative coefficient of lnWT suggests that there is a spillover effect from the regulated to the free market.

An increase in industrial production will result in a greater demand for freight transport by inland waterways, which in turn will push prices up. If there is indeed a spillover, the higher prices will attract bargemen from the regulated market, resulting in a greater supply and therefore lower prices. Consequently, the effect of changes in industrial production on the price level in the free market is not clear-cut. The dynamics in the free market are captured by introducing lagged price levels (up to six months).

The equation determining the waiting time is estimated with OLS, giving the following result (t-values between brackets):

$$\ln WT_t = 6.37 + 1.07 \ln P_{R,t} - 0.77 \ln IP_t - 0.61 \ln P_{F,t}$$
$$(4.20) \quad (1.17) \quad (-2.68) \quad (-1.50)$$

Adjusted R^2 = 0.34 DW = 1.61 Sum squared res. = 2.108

An increase in industrial production will generate greater demand for freight transport and will absorb part of the excess capacity. This should will result in reduced waiting times, as is confirmed by the estimation results.

An increase of the minimum price level in the regulated market will attract some bargemen from the free market, leading to a higher supply level and creating surplus capacity which will be translated in a longer waiting time. This effect is confirmed by the estimation for the period under consideration, although it is apparently not very significant.

Likewise, higher prices in the free market may attract bargemen from the regulated market. This would cause supply in the regulated market will drop, which in turn would result in shorter waiting times. This is also confirmed by the estimations.

The impact of deregulation on costs, revenues and profits in the inland navigation sector

The most important consequence of deregulation of the inland navigation market will undoubtedly be the abolition of minimum prices. In order to assess the impact of regulation on costs and productivity in the inland navigation sector, detailed information on costs, revenues and activities of the different bargemen and shipping companies is required. As this information was not readily available, we were obliged to conduct a survey.

Due to the low response, however, the results of the survey cannot be used for an estimation of very complex translog cost and production functions. However, some information on revenue, costs and profits can be derived from the answers to the survey questions. Some indications of the impact of deregulation in the inland navigation sector in Belgium were obtained by running some very simple regressions. The results are shown in Table 7.

Profits increase with distance and maximum capacity. This can be considered as a rough indication of economies of scale. Indeed, the size of the vessel (highger capacity) affects the overall revenue but has no significant impact on the overall cost. The distance covered annually, on the other hand, affects both revenues and costs positively, although again the impact on the former is more notable.

Bargemen specialising in dry bulk are able to make more substantial profits, due to higher revenues. Operating in the regulated market increases revenues and profits.

However, due to the limited degrees of freedom, our findings should be interpreted with care, and certainly generalisations are hard to make. With these reservations in mind, we can conclude that deregulation will reduce revenues and profits of the bargemen who are predominantly active in the regulated market. As most of these bargemen operate small vessels and cover shorter distances, they have an additional handicap.

Table 7 - Factors affecting profits, revenues and costs of Belgian inland navigation carriers

Explanatory variables	Endogenous variables lnPROFIT	lnREVENUE	lnCOST
Constant	-19,6 [-1,12]*	-14,82 [-1,57]	8,41 [4,73]
LnTON			0,368 [3,14]
LnDIST	0,839 [1,506]	0,738 [2,68]	0,279 [2,00]
LnMAXCAP	3,23 [1,73]	3,033 [3,01]	
CONT		-0,454 [-1,46]	-0,38 [-1,11]
DRY	2,84 [2,9]	1,56 [2,65]	
REGUL	0,025 [0,97]	0,025 [1,97]	
R^2_c	0,5	0,75	0,42
St.Err.R	0,97	0,45	0,62
#OBS	13	13	14

(* Numbers between brackets are *t*-values)

In which TON denotes the tonnage transported, DIST the distance travelled and MAXCAP the maximum capacity of the ship measured in tonnage. DRY and CONT are dummy variables that equal 1 if the ship is transporting dry bulk or containers. The percentage of revenue generated in the regulated market is contained in REGUL.

CONCLUSIONS

The inland navigation sector is characterised by a large number of independent bargemen operating on a system of waterways with variable gauges and locks to overcome differences in water levels. These often constitute a barrier for certain types of vessels and they prevent full capacity utilisation.

For a number of other reasons, the sector used to be (and still is to some extent) confronted with surplus capacity. As this puts dangerous downward pressure on prices, authorities intervened by imposing minimum rates on some sections of the system and for some types of goods. This regulation is due to be abolished under EU-directive 96/75/EC. The immediate consequence will be price reductions, which in turn will necessitate a reduction of surplus capacity.

Deregulation will have consequences in terms of revenues and profits realised by carriers operating in the regulated market segment. Both will decline, threatening the survival of the small, single-vessel companies. An additional problem is that the vessels of the carriers operating in the regulated market are small and usually cover short distances. Both these factors have a further negative impact on revenues and profits. The possibility of compensating for these negative effects with higher freight rates will disappear with deregulation. Operators will either be pushed out of the market, or they will have to look out for other, more lucrative, business opportunities that could help them to survive.

The lower prices which will inevitably result from deregulation may improve the competitive position of the inland navigation sector in relation to rail and road freight transport. Empirical studies suggest that the impact will vary considerably according to the goods categories and that, in any case, it will be rather modest (usually inelastic).

Economic growth will have a positive impact on inland navigation for those countries with a waterways system that is adapted to large vessels (the Netherlands, Germany and to a lesser extent Belgium). But in order to induce shifts from road and rail transport towards inland navigation, price deregulation will probably not suffice.

The survival of the inland navigation sector will depend largely on its ability to find new market niches and become an important partner in the logistics chains, which will come to dominate the European transport sector in the future. This can only be achieved if intermodality is encouraged and each mode of transportation is used optimally within the logistics chain.

ACKNOWLEDGEMENTS

This paper is to a large extent the result of research conducted within the project *Strategic Organisation and Regulation in Transport* (SORT-IT) financed by the European Commission. The authors would like to thank Dr. Ir. A. Weeren for his assistance in developing a computer program to perform some of the necessary calculations.

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