

THE FACTORS, WHICH HAVE INFLUENCE ON FREIGHT FLOWS

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Freight transport is considered as an important condition for successful economies. A well-functioning and low-cost transport system facilitates international trade, which subsequently may increase economic efficiency through gains of trade and specialization. In addition, an efficient transport system allows firms to optimise their production and distribution processes.

Through these and another mechanisms freight transport, and transport in general, accommodates processes that brings positive welfare effects to society.

Keywords: *freight transport, environment, transport system, economic problems*

1. INTRODUCTION

Transport is a growing source of concern since it produces substantial negative social and environmental effects, including air pollution, noise, congestion and traffic victims. In this context, freight transport by road transport (e.g. ton-kilometre) is relatively high, compared to another modes of transportation. Due to its dominant position in total freight transport road transport therefore contributes disproportionately to the above negative effects generated by transport.

Forecasts indicate that the negative effects that are produced by transport will only increase in future, since a substantial growth in European freight transport is envisaged. For instance, long-term modelling studies have shown that between 1995 and 2020, freight transport on some territory, expressed in ton-kilometres, will increase by 80 percent [1]. It's likely that this growth in transport will by far outweigh technological advances that reduce the negative effects of transport, such as more fuel-efficient engine. Both from the policy perspective of public interest and from theoretical, economic perspective, it is felt that the balance between benefits and costs of transport is not optimal.

Moreover, it's considered problematic that those causing them pass on a main part of the negative effects of transport to society, rather than that they are borne. It's mainly for this reason that transport policy in Europe has shifted from a demand-led approach, in which infrastructure was expanded in response to increasing traffic volumes, to a more traffic management-based approach [2]. In many European countries, governments set stricter norms and regulations concerning the environmental performance of transport and strive at a reduction in the growth in traffic, e.g. relative to economic growth [3].

In this context, an increased popularity can be observed in Europe to switch to taxation as means to induce actors that take transport decisions to make a more efficient use of transport resources [6].

In this way a better balance between the social costs and benefits produced by freight transport is strived for.

2. THE ECONOMIC PROBLEM: EXTERNALITIES AND ALLOCATION INEFFICIENCY

The observed problem that transport produces a lot of negative effects, which in addition are not borne by those who cause them but passed on to society, has notably attracted attention from transport economists. For several decades, economists have pleaded for incorporating all costs of transport in transport prices as this would improve efficiency of resource allocation and by that, increase overall social welfare [7]. The argument is that, due to the presence of the so-called negative externalities (i.e. costs that are not incorporated in prices but passed on to other), transport is too cheap and hence consumption is sub-optimal [8]. Shipping firms therefore buy too many transport services compared to

the situation in which prices reflect the true cost of transport. In addition, they may use modes of transportation that are undesirable from a societal perspective. This happens if the magnitude of external costs varies for the different modes. Economists emphasize that to firms, the use of freight transport may be efficient, but not to society as a whole. At the level of society, part of the resources currently used in transport (e.g. transport services themselves, fuel or labour used, land, time lost in congestion, but also clean air) could have yielded more welfare if put to another use. To policy makers, notably emission of the greenhouse gas CO₂ and the acidifying pollutant NO_x are considered problematic. Various estimations have been made regarding the magnitude of external effects produced by freight transport. Considering for instance CO₂ emissions, [5] concludes that road haulage is responsible for 6 percent of total emissions in Europe.

Transport as a whole (including passenger transport) estimated to produce 20-25 percent of all CO₂ emissions globally. Per unit of transport, usually expressed in ton-kilometres, road transport produces most emissions. The contribution of freight transport to congestion is limited. An important reason for the limited contribution of road haulage to congestion is that carriers avoid peak hours in order to minimize time losses.

Multiple efforts have been made to express external effects of freight transport in financial terms, although in literature no consensus exists [8]. Disagreement exists among other things on the way in which effects should be valued (e.g. traffic victims); apart from that, knowledge of particular types of external costs is incomplete. Estimations of congestion costs related to freight transport for instance are problematic. Usually, only time losses of drivers multiplied by a certain value-of-time are incorporated; cost that accrue to shippers such as higher pipeline inventory costs or costs in production due to unreliable deliveries are ignored. Nevertheless scientists agree that in sum transport produces more external costs than what is paid via taxes (see, for instance, Figure 1) [13].

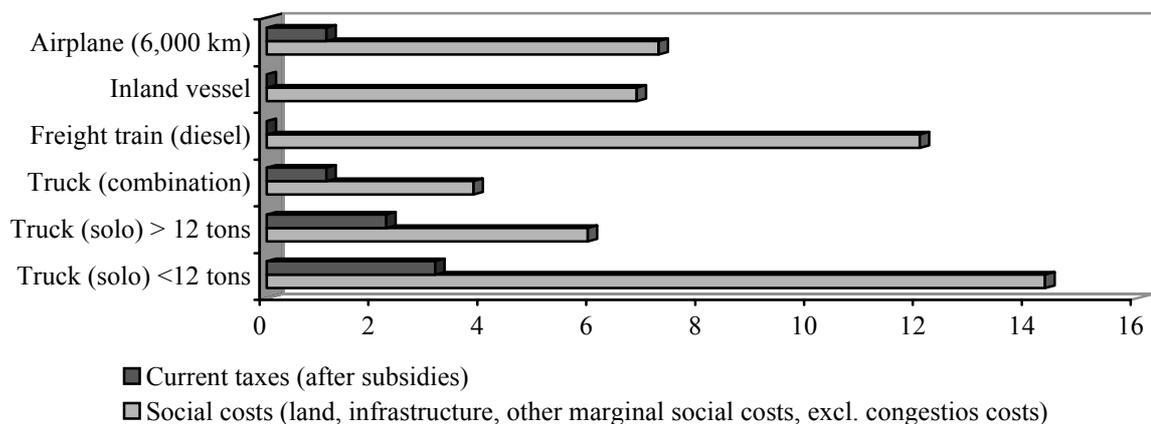


Figure 1. External costs and taxes paid in freight transport (in euro-cent per ton-km) [13]

Thus far much research in transport economics has been conducted on the measurement of external costs, the determination of optimal taxes that incorporate external costs, and implementation issues. Only few studies have been conducted on the effects that internalisation of external costs may bring about in transport and, related to that, the welfare consequences that may be envisaged.

The few estimates of price elasticity of freight transport demand that are available in the literature however usually do not differentiate between types of cargo or other relevant factors. Moreover, price elasticity research commonly provides little insight into the mechanisms that changes in transport cost induce on transport demand. Little is therefore known about inefficiencies in contemporary logistical decision-making and effects that higher transport costs may have on business logistics. Only recently have researchers started to systematically examine the relationship between logistics decision-making, freight transport, and transport costs. The few available studies suggest that logistical cost trade-offs are fairly robust and that very large transport cost increases would be required to induce large changes to logistics structures and practices. An important reason is that transport costs usually represent only a small share in total costs. Nevertheless, a survey in which manufacturers were

asked how they would respond to a hypothetical 50 percent increase in transport cost as a consequence of full internalisation of social and environmental costs, revealed that just over half of the respondents envisaged logistical modifications, including [11]:

- Using alternative transport modes instead of road transport;
- Restructure logistical operations (unspecified);
- Improve efficiency of transport operations;
- Contract out a larger proportion of their transport.

In addition, other studies have demonstrated that many unexploited opportunities exist to reduce the amount of kilometres driven, fuel consumption, or emissions, without affecting total costs or deteriorating performance.

3. THE POLICY PROBLEM: NEGATIVE EFFECTS OF FREIGHT TRANSPORT

The continuous increase in freight transport and the implications for congestion, noise, air pollution, and traffic victims are not only considered problematic from a theoretical perspective, but also from a policy perspective. The developments namely partly contradict transport policy objectives of EU, in particular the goals of improved sustainability of economic activities and improved accessibility of the main transport axes in order to facilitate economic activity. Intermediate goals include:

- A modal shift: stimulate the use of transport modes which cause relatively few negative effects (e.g. rail transport or inland navigation) and discourage use of modes that cause much negative effects (e.g. road haulage and airfreight);
- Reduction in the negative effects per vehicle kilometre or ton-kilometre, e.g. by stimulating technological innovations;
- A higher transport efficiency: increase load factors of trucks and reduce empty hauls;
- A reduction in the growth of freight transport relative to economic growth by among other things “transport conservation”: a less transport-intensive organization of logistical processes of shipping firms.

Governments seek to attain the above intermediate goals through a myriad of instruments, including subsidies (e.g. in infrastructure for modes of transportation that could serve as an alternative to road haulage); research and development (e.g. related to cleaner and less noisy engines); information; regulation (e.g. bans or restrictions on weekend driving or transit traffic); etc. In addition, an increased popularity can be observed among European governments to regulate developments in transport demand through taxation. Various governments for instance recently announced the introduction of new taxes on road transport (e.g. Austria, Germany, the Netherlands). The EC aims at a full internalisation of all external costs produced by transport. Next to these new taxes, several governments plan to restructure existing tax regimes by replacing fixed, annual taxes by taxes that are related more to actual transport use. Due to technical advances, more flexible taxation regimes have become possible at low costs [12].

Contrary to the past, most governments have become reluctant to expand road infrastructure networks, among other things due to high costs and the observation that it usually induces more transport and subsequently leads to more negative effects.

The above policy instruments partly are complementary but partly are contra-productive. For instance, measures that are aimed at improving the utilization of trucks may reduce transport demand, but on the other hand reduce a shipping firm's total transport costs, which subsequently may lead to more use of road transport. Other government policy outside the field of transport (e.g. labour regulation) may affect transport decisions by firms as well and with that, affect the effectiveness of transport policy. The brief discussion of transport policy reveals two differences between policy makers and economists: they have different objectives: economists focus on resource allocation and welfare only, whereas most governments have a broader perspective (including for instance equity concerns); they suggest or employ a different portfolio of instruments: transport policy is not only restricted to taxation, but a wider variety of instruments are used. Taxation plans however are partly based on the welfare economic principles of marginal social cost pricing. The theoretical and the policy perspectives on freight transport have in common the view that all costs caused by transport should be borne by those causing them and that this will have a positive impact on the use of transport resource.

4. OPPOSITE TRENDS IN PRACTICE: A TRANSPORT EXPLOSION?

The observed and expected continuation in the growth in freight transport is caused by a number of factors. One, freight transport growth reflects economic growth: the production of more goods simply implies that more goods have to be transported. Yet, economic growth appears to be not the only explanatory factor. For decades, economic growth and transport growth were closely related, at least with respect to road freight transport, although a scientific explanation is largely lacking [7].

For example, since 10 or 15 years ago, in some European countries among which the Netherlands, growth rates of GDP and road transport have diverged, due to a faster growth of transport. The main reason is the average distance over which goods are moved has increased significantly.

Empirical studies have demonstrated that increased average transport distances have emerged from a restructuring of production and distribution processes, including [7]:

- A spatial concentration of production and inventories (i.e. centralization);
- Vertical disintegration of firms; more activities are outsourced or relocated to low-cost countries; A wider geographical sourcing of supplies;
- A wider distribution of finished products.

Apart from that, transport demand has increased due to the application of time-compression principles in manufacturing and retail, leading to more frequent deliveries of smaller shipments. Although there are also trends leading to a lower transport-intensity of the economy, such as dematerialization of products and the use of lighter materials, the dominant trend is that production and distribution as a whole have become more transport-intensive. Many goods are sent over larger distances, but changes in the management of transport operations have provided some compensation for the increased transport demand.

In practice therefore the de-coupling of freight transport growth from economic growth, as desired by policy makers, has not occurred; rather the trend is in the opposite direction. Modelling studies [1] as well as survey among European shippers and carriers indicate that the growth in freight transport will only increase in future. An important reason is that the trend toward increasingly transport-intensive production and distribution is expected to continue. In addition, it's expected that the share of road haulage in total transport will only increase in future. Thus, a reduction in the negative effects of transport by lower transport volumes will not emerge from market forces.

But where does the increased transport-intensity of economic activities originate?

Clearly not from transport in itself; freight transport does not have a utility of its own but creates utility via the activities it enables. Therefore, the demand for transport typically is a derived one [14].

In this context, Kuipers [10] suggests that there are three types of factors that, in mutual interaction, contribute to changes in the transport-intensity of production and distribution activities: driving forces: factors that generate transport demand; enablers of increased transport use, e.g. the quality and cost of transport systems; barriers to transport use, e.g. trade barriers or congestion. In the literature, several factors are generally listed as key factors that have contributed to the observed increase in transport-intensity.

Usually, increased competition is regarded as the main driving force, forcing firms to reduce costs where possible and to broaden product assortments. Cost reductions are for instance achieved by relocating production activities to low cost countries and by outsourcing or non-core activities. The latter has obviously created a transport need that did not exist before. Another effect of increased competition is that firms compete more and more on logistical customer service: the speed and reliability with which they deliver their products. This has created increased time pressure on production and distribution activities, which is regarded to lead to lower transport efficiency.

Exist four factors that have enabled more transport-intensive operation:

- Lower trade barriers that have made larger geographical areas accessible for purchase and sale;
- Technological innovations; Internet and e-commerce have lowered transaction cost and have made large geographical areas accessible;
- Falling absolute transport costs (i.e. kilometre or per haul);

- Falling relative transport costs: despite the increased transport-intensity of many sectors, the share of transport costs in total costs or turnover has fallen. Their share in total logistics costs however has remained fairly constant (40-50 percent). The falling share of transport costs indicate that other production factors have increased in value (e.g. labour and capital costs).

Since relatively and absolutely low transport costs have been an important enable of a more transport-intensive organization of economic activities, policy interventions that aim to raise transport costs may make shipping firms more aware of transport costs. Higher transport costs could change this and could provide incentives for a less transport-intensive organization of production and distribution. Obviously it will not be the intention of policy makers to deteriorate the competitive position of firms by for instance reducing their export.

The main objective of a less intensive and more efficient use of transport resources is to reduce the negative effects produced by transport.

5. CONCLUSION

1. Freight transport is considered an important condition for successful economies. A well-functioning and low-cost transport system facilitates international trade, which subsequently may increase economic efficiency through gains of trade and specialization.

2. Transport at the same time is a growing source of concern since it produces substantial negative social and environmental effects, including air pollution, noise, congestion and traffic victims.

3. Forecasts indicate that the negative effects that are produced by transport will only increase in future, since a substantial growth in European freight transport is envisaged. For instance, long-term modelling studies have shown that between 1995 and 2020, freight transport on some territory, expressed in ton-kilometres, will increase by 80 percent.

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