

The Impact of Transport on the EU Economy

by

Achim Diekmann

Universität zu Köln

Draft: 20 July, 2000

This paper has been prepared for presentation to the
13th Input-Output Conference
held at Macerata, Italy, 21-25 August 2000

Contact Author: Professor Dr. Achim Diekmann, D-61 250 Usingen, Hardtstr. 1
Tele: +49 (0)6081 2799; Fax: +49 (0)6081 68 63 23; E-mail: a.dkm@t-online-de

THE IMPACT OF TRANSPORT ON THE EU ECONOMY

1. Introductory remarks

1.1 The role of transport

Transport is a key element in the development of any society. Advances in transport technology have extended the range of markets, enabled new methods of production, fostered specialisation and strengthened social, political and economic ties between countries and major geographic areas. The Single European Market owes much of its impetus, strictly speaking even its existence, to the links provided by a well-established transport network.

Transport is not demanded in its own right. The demand for transport reflects the level of social and economic activities and the benefits it provides in their pursuance. But as these benefits are high, the role of transport has kept growing in production as in everyday life. Growing affluence (one of the causes of which is mobility) and improvements in transport technology have led transport to become a major component of national output and a major user of resources.

Transport includes all activities related directly and indirectly to the use of vehicles, vessels and aircraft and of related structures (highways, inland waterways, railways, pipelines, port facilities, airports, warehouses etc.) for the movement of goods and passengers.¹ In a wider sense, this definition covers the transport system (infrastructure, transport and related equipment), the providers of transport services (modes of transport, agents using or operating the transport system) and the suppliers to the system, its users and operators. This is the definition the present paper is based upon.

1.2 The focus of this paper

For many years, transport has been an engine of growth. Much of this growth was linked to a rising level in car ownership, a disproportionate growth in road haulage and a strong upward trend in air traffic. The use of the combustion engine has allowed transport services and related expenditure to grow faster than GDP. But, although the long-term trend of transport would seem to be for continued expansion, the recent past has witnessed a slowing down in the pace of the overall growth of the sector in many countries.

Table 1 Comparison of Transport and GDP Growth: EU

| Average growth per year | 1961-1970 | 1971-1980 | 1981-1990 | 1991-2000 ¹⁾ |
|--|-----------|-----------|-----------|-------------------------|
| GDP (constant prices) | 4,9 | 3,0 | 2,4 | 2,2 |
| Transport (physical units) ²⁾ | 7,0 | 3,6 | 2,7 | 2,1 |

¹⁾ Estimate

²⁾ Transport units (passenger-km + tonne-km)

This does not yet point towards saturation, particularly not in air traffic, but a more moderate growth might deprive transport of its privileged role as a driving force in economic development. The influence of rail transport has been declining for some time irrespective of whether measured in physical units or in monetary terms. Road transport still has a great potential in emerging economies and will continue to benefit for a while from economic integration within the EU and its expansion towards Central Europe but will eventually loose

¹ Han, X., Fang, B., Lawson A.M., Lum, S.K.S. 1998, U.S. Transportation Satellite Accounts for 1992, *Survey of Current Business*, April 1998, p19.

pace.² At the same time, deregulation and environmental challenges are likely to lead to a more efficient use of human, capital and natural resources in the production of transport services. In combination with the phenomenon of globalisation this will lead to structural change in many sectors related to transport. Advanced information and communication technologies, the growing perception of logistics as an instrument of optimising transport services, a more widespread use of electronic components and new materials in the production of transport equipment as well as in its use will add to the pace of change. In everyday mobility the changes going on may affect the distances we travel and the choice of modes, giving non-motorised forms of mobility a new chance. Changes are also to be expected in the regional pattern of manufacturing and distributing goods and the mix of transport equipment used for these purposes.

Seen against this background, an analysis of Europe's present-day transport system and its contribution to income and employment was thought to be useful. The purpose of this paper is to help to better understand and assess the economic implications of future changes in the volume and quality of transport services, in modal split and in transport-related investment.

The main data sources this paper uses are a set of 1995 I/O tables³ covering the EU both as an aggregate and on a country-by-country basis, national and international statistics on goods and passenger transport⁴ and on trade⁵, a study commissioned by the EU on the economic importance of the transport sector⁶ as well as a number of publications dealing with the role of transport and its measurement⁷.

Transport systems in Europe differ for geographical and historical reasons and are likely to continue to do so. Therefore, this paper looks at transport on a national level first before trying to capture the impact transport-related demand has on the EU as a whole. But before dealing with the diversity of Europe's transport systems, a few remarks on how to measure transport activities may be useful.

1.3 Measuring transport

The importance of transport can be measured in different ways. One obvious way is to look at the physical characteristics of the transport system: the length and quality of the road network, of railway lines and waterways, the number of vehicles, vessels and aircraft in use, the amount of tonnes carried and passengers moved, and the emissions, accidents etc. linked to these movements. This approach yields a number of interesting figures (see table 'Characteristics of the Transport System' in the annex) but does not allow transport to be put in a wider economic context.

An equally obvious alternative is to look at transport in terms of the value it adds to GDP and to use these data with data from the national economic accounts for industrial analysis. But this approach is not without problems either. Advanced societies produce a great variety of transport services. Their abundance makes it difficult to adequately identify and categorise them and to attach a value to them.

Using monetary criteria for measurement also raises the question of the scope to be chosen for the analysis. Transport is a complex system of interlocking elements. Users of the system and operators of different modes of transport depend on an infrastructure designed to fit their needs when moving the transport equipment they use. Both fixed and mobile plant rely on supplies from other branches of the economy including intermediate as well as capital goods. Counting only the resources required for the current output of transport services would fall short of measuring the impact of the system. The technologies embodied in the system are a major factor in

² It is predicted that in passenger transport traffic for work purposes will practically cease to grow, while recreational traffic could still grow in line with income. One factor likely to influence future growth rates in transport is the ageing of Europe's population, which as a whole is not expected to grow significantly over the next 20 years.

³ Eurostat 1999, Input-Output Tables for the European Union (1995)

⁴ European Commission 1999, EU Transport in Figures, *Statistical Pocket Book*.

⁵ Eurostat "Comext"-Datenbank

⁶ Eurogramme 1999, Study on the Economic Importance of the Transport Sector (Final Report).

⁷ Han, X., Fang, B. 1998, Measuring Transportation in the U.S. Economy, *Journal of Transportation and Statistics January 1998*.

Han, X., Fang, B., Lawson A.M., Lum, S.K.S. 1998, U.S. Transportation Satellite Accounts for 1992, *Survey of Current Business, April 1998*.

Dickmann, A. 1999, Verkehr als Wertschöpfungsträger und Nachfragegröße, *Zeitschrift für Verkehrswissenschaft, 70. Jahrgang, Heft 1*.

determining the efficiency with which the system operates, the resources it requires and modal choice. Therefore a measure has to be chosen which is capable of capturing the full effect of the interaction of the elements of the system on income and employment.⁸

Table 2 **Measures of Transport**

| | | |
|--|---|---|
| Measure I (Supply side) | Value added by transport as an industry in the provision of transport services | Measures transport (for-hire and own-account) by the value transport industries add to GDP |
| Measure II (Supply side) | Value added by all domestic producer units in the provision of transport services | Equals measure I but includes the value added by domestic producer units along the supply chain upon which industrial producers of transport services rely |
| Measure III (Supply side) | Value added by all domestic and foreign producer units in the provision of transport services provided by domestic transport industries | Adds to measure II the import requirements of industrial producers of transport services and their suppliers |
| Measure IV (Demand side) | Transport-related final demand | Includes the value of all goods and services delivered to final users for transport purposes regardless of where they are produced. But does not cover transport services consumed as an intermediate demand in response to non-transport-related final demand |
| Measure V (Demand side + supply side) | Transport related Gross Domestic Product (GDP) | Comprehensive measure of the contribution made by transport-related activities to the economy, includes transport activities linked to non-transport-related final demand. |
| Measure VI (Demand side + supply side) | Transport-related Gross Domestic Demand (GDD) | Measures domestic final demand related to transport regardless of who supplies the demand, domestic producers or imports. Includes transport services (and their requirements) as an intermediate product for non-transport-related final demand, but does not include transport-related exports. |

Table 2 lists a number of different measures that could be used, alternatively or in combination, as a measuring rod depending on the purpose of the analysis. Measures I, II and II measure transport from the supply side, putting the emphasis on the production of transport services disregarding the influence emanating from providing and maintaining transport infrastructure, and from the purchase of transport equipment and related capital goods. On the other hand, by looking only at expenditure on roads, railway tracks, harbours, pipelines, airports road vehicles, locomotives, railway wagons, ships, airplanes, office buildings, warehouses, office machinery, telephone networks, computers, and software used in transport (measure IV) we would fail to take account of transport activities not linked to the supply of these products. Depending on how we define transport-related final demand, it would also ignore transport-services produced by private households. It seems logical therefore to combine supply and demand side measures. The final chapter of this paper takes up this issue. It also contains a quantification of each of the measure mentioned for the EU as a whole. But before being able to use these measures in a way that makes sense we will have to redefine transport as an industry.

2. Transport industries

2.1 Traditional transport industries

Taking a formal approach, national accounts and I-O tables identify transport services as a commodity only to the extent these services are rendered against payment of a fee. For-hire transport industries comprise railways and related services, passenger ground transport, motor freight transport and warehousing, water transport, air

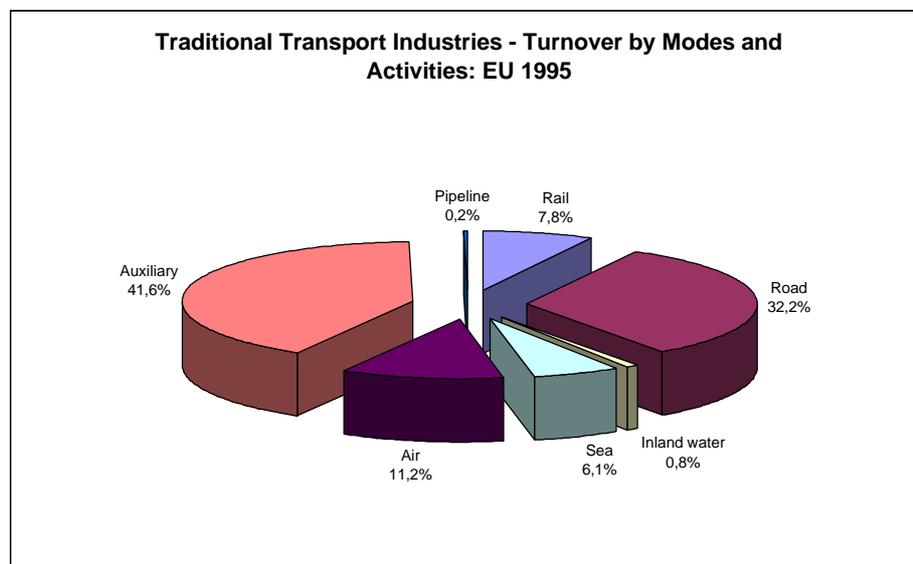
⁸ Detailed comments concerning this issue are to be found in the following publications:

Han, X., Fang, B. 1998, Measuring Transportation in the U.S. Economy, *Journal of Transportation and Statistics* January 1998.

Han, X., Fang, B., Lawson A.M., Lum, S.K.S. 1998, U.S. Transportation Satellite Accounts for 1992, *Survey of Current Business*, April 1998.

transport, pipelines, freight forwarders, state and local government passenger transit and auxiliary services and supporting services, such as those performed by travel agents and other agencies. These industries handle traditionally the movement of goods and people in the form of public transport. In 1995 and according to NACE-classification, their output in the EU totalled 538 billion ECU, of which road transport accounted for 32.2 per cent, air traffic for 11.2 per cent, transport by rail for 7.8 per cent, transport by water for 6.9 per cent and pipelines for 0.2 per cent. 41.6 per cent of the total were contributed by auxiliary and supporting activities.

Figure 1



Source: Eurogramme 1999, Study on the Economic Importance of the Transport Sector (Final Report).

The I-O tables used in this paper group the activities of the established transport industries under three headings: inland transport services, maritime and air transport services and auxiliary transport services.⁹ Transport economists will agree that these combinations are not a very satisfactory way of dealing with the transport sector, because the aggregates formed do not allow to separate the main modes of transport from each other. This, however, is the way in which the tables present the relevant transport data. Trying to re-arrange them to fit them to the requirements of a detailed analysis by modes would be unduly complicated and lead beyond the scope of this paper. Still, a few remarks with regard to the different role the individual modes play in the individual EU countries may be useful.

Looked at on a country-by-country basis, Europe's transport system lacks uniformity. Tailored to national needs and reflecting differences in geography, land use patterns and population density, national transport systems vary a great deal. Still, there are a few trends all of them share.

Relative to the role auxiliary and supporting services play in transport, the physical movement of goods and persons provided by the traditional transport industries is losing in importance, the exception being air transport. But this process is more advanced in some countries than in others, as can be seen from table 3.¹⁰ According to Eurostat I-O tables, the share of auxiliary and supporting services in the total output of the transport sector varies between 18 per cent in Greece and 51 per cent in Germany.¹¹

Another common feature is the dominance of road transport. Although this is camouflaged by the aggregation of all forms of inland transport into one sector, other sources show that as a contributor to traditional transport services road traffic has long outrun transport by rail. Rail transport has not only lost ground to air traffic in passenger travel, but meanwhile runs the risk of losing its leadership in the carriage of bulk goods to intra-EU

⁹ In the I-O tables used in this paper, the three sectors yield a total of 506 bn ECU which is 6 per cent less than indicated by the figures established according NACE-classification. Also there is disagreement in the distribution of the relevant activities, attributing auxiliary services only a share of 32.8 per cent instead of 41.6.

¹⁰ Auxiliary and supporting activities tend to grow with per-capita income and greater sophistication in production. Strategies to optimise supply chains have led logistics to become an increasingly important source of revenue in transport business.

¹¹ According to the Eurogramme study using NACE-classification, these differences are not quite as great. This is not entirely irrelevant with regard to the impact of the transport sector, because input coefficients diverge considerably between the three sub-sectors of the traditional transport sector.

sea transport.¹² But again, depending on geographical location and the relative importance of the modes used, this trend varies in its effect on national transport systems.

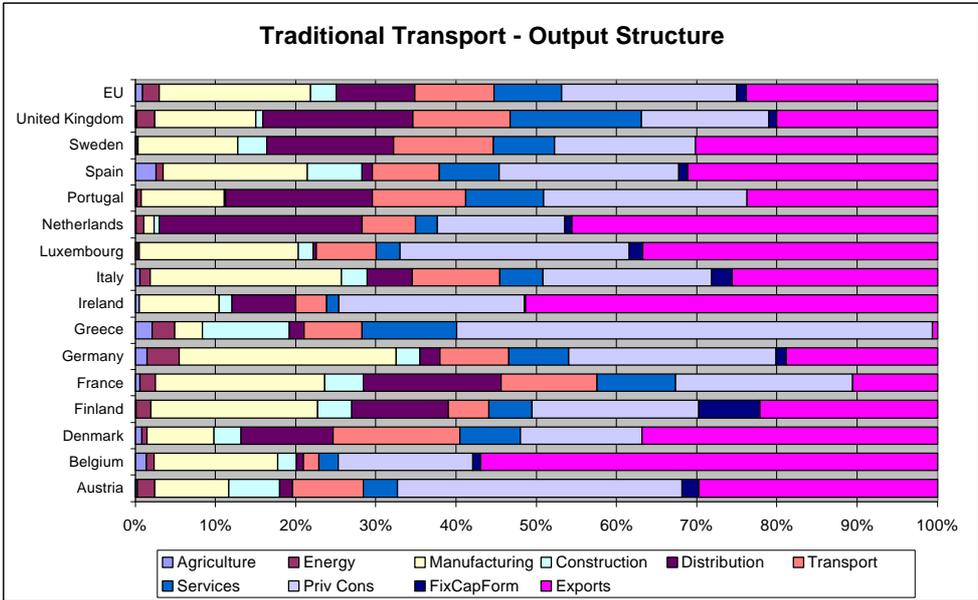
Table 3 Traditional Transport EU 1995 – Output (m ECU)

| Country | Inland transport services (m ECU) | Maritime & air transport services (m ECU) | Auxiliary transport services (m ECU) | Share in total | | |
|----------------|-----------------------------------|---|--------------------------------------|------------------|--------------------------|---------------------|
| | | | | Inland transport | Maritime & air transport | Auxiliary transport |
| Austria | 7.690 | 1.502 | 4.713 | 55 | 11 | 34 |
| Belgium | 7.413 | 2.497 | 8.793 | 40 | 13 | 47 |
| Denmark | 6.723 | 6.839 | 3.498 | 39 | 40 | 21 |
| Finland | 4.690 | 2.571 | 2.045 | 50 | 28 | 22 |
| France | 38.427 | 12.097 | 19.850 | 55 | 17 | 28 |
| Germany | 48.309 | 14.721 | 65.870 | 37 | 11 | 51 |
| Greece | 2.313 | 2.522 | 1.074 | 39 | 43 | 18 |
| Ireland | 1.346 | 1.205 | 651 | 42 | 38 | 20 |
| Italy | 44.826 | 17.659 | 16.010 | 57 | 22 | 20 |
| Luxembourg | 365 | 121 | 437 | 40 | 13 | 47 |
| Netherlands | 11.126 | 8.698 | 6.276 | 43 | 33 | 24 |
| Portugal | 2.383 | 1.206 | 1.561 | 46 | 23 | 30 |
| Spain | 18.522 | 6.566 | 5.854 | 60 | 21 | 19 |
| Sweden | 8.495 | 3.377 | 3.239 | 56 | 22 | 21 |
| United Kingdom | 34.917 | 20.537 | 26.241 | 43 | 25 | 32 |
| EU | 237.545 | 102.117 | 166.114 | 47 | 20 | 33 |

Source: Eurostat, Input-Output tables

There are further reasons for differences in the structure of output of the traditional transport sector. A major reason is that the mix of industrial activities differs between countries. As a result, intermediate purchases of transport services by industries show a different picture between more highly industrialised countries and those relying more strongly on services.

Figure 2

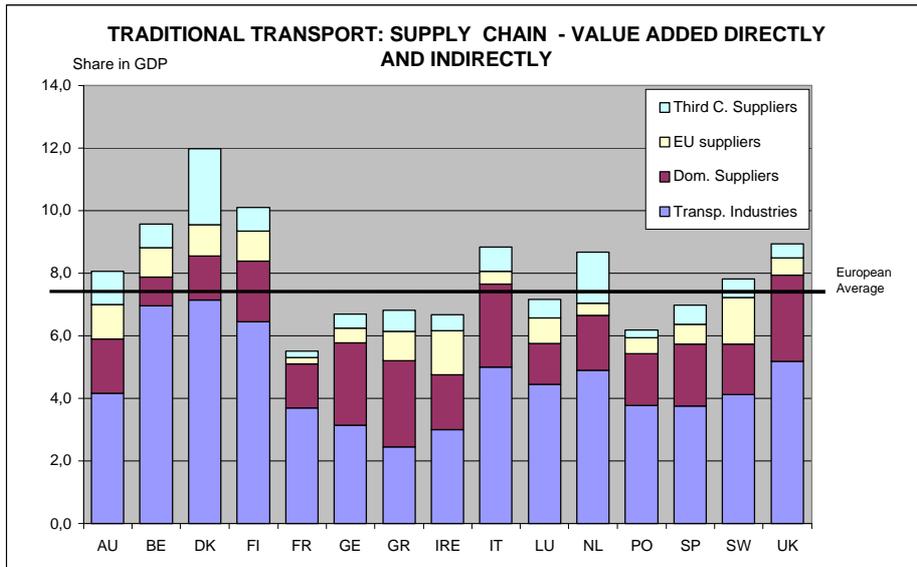


Source: Eurostat

There are also differences attributable to the role played by the export of traditional transport services in relation to inland uses, as figure 2 shows. This mainly concerns the Benelux countries and Ireland where the export share in the traditional transport industries’ output is particularly high.

¹² In physical as well as in value terms the movement of freight by rail tends to become a marginal phenomenon, in spite of the efforts railway companies have undertaken in the past. Losses suffered by and subsidies paid to Europe's ailing railways influence the value inland transport adds to GDP.

Figure 3



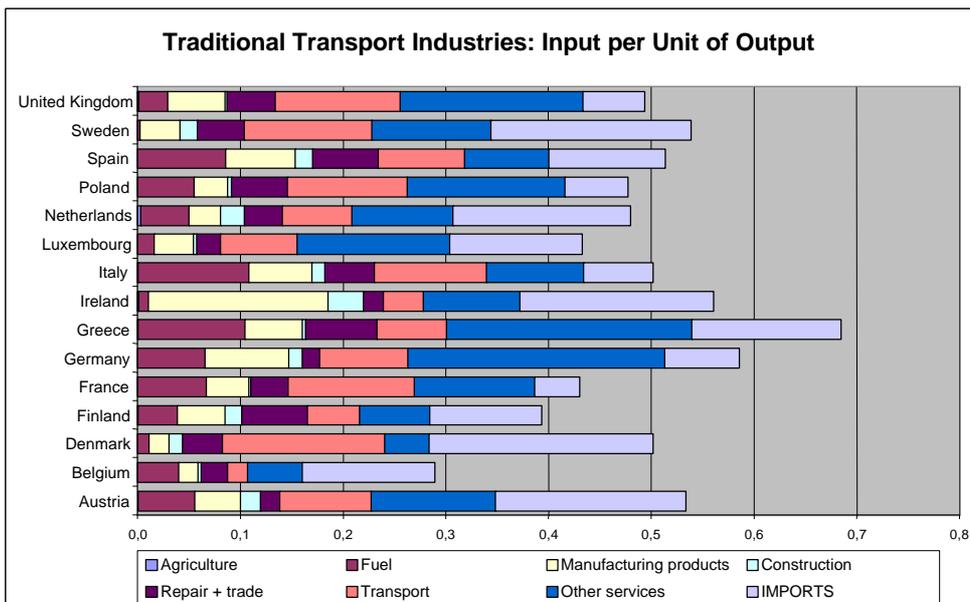
Source: Eurostat

Finally, deregulation is an element of change in all European countries. It forces road hauliers in particular to look for more efficient ways of carrying goods. This has already led to a more economic use of resources and is likely to do so in the future and affects intermediate as well as value-added input of the transport sector. The fact that deregulation is more advanced in some countries than in others is another reason for diverging structures.

Given this diversity in the orientation of output, in the participation of the sub-sectors producing it, in national price levels, in the level of outsourcing, in the reliance on imports and in the efficiency with which the transport system works in the individual countries, it is hardly surprising that there is little agreement in the consolidated input structure of the traditional transport industries between countries.

According to the Eurostat I-O tables, the value-added share in the output of the traditional transport industries (figure 3) seems to be highest in Belgium, whereas Greece ranks last in that respect. There is also an amazing difference in the use of fuel and manufacturing products per unit of output from domestic sources across the EU.

Figure 4



Source: Eurostat; own calculations

The importance of traditional transport as a source of income can be determined by relating the value-added embodied in the transport activities of the traditional transport industries to GDP. Using Measure I (value-added created by the traditional transport industries as an industry in relation to GDP), the share of transport in GDP is between 2.5 per cent in Greece and 6 to 7 per cent in Belgium, Denmark and Finland with an EU average slightly above 4 per cent. Moving to Measures II and III by including the value added by suppliers to the traditional transport industries themselves does not really make much difference, although in the case of some countries, this raises the share of transport services in GDP to 10 per cent (purchases from other EU-countries included). But this still leaves transport as a generator of wealth in a position which hardly corresponds to the general perception of the role transport plays in the economy. There is a very simple reason for this. Except for air transport, the impact of traditional transport services has been greatly reduced since the automobile is within everyone's reach as a comfortable, flexible and personal means of transport, leaving less room to traditional transport, particularly in the field of passenger transport.

But even in its limited role, traditional transport still employs 6.5 million persons in the EU, Germany with well over one million being the largest employer, followed by Italy and the UK. Employment was lower in France with about 850 000 persons. It totalled almost 600 000 persons in Spain and slightly more than 500 000 in the Benelux countries.¹³ This is employment directly attributable to the activities in traditional transport in the EU. As we shall see later, the total number of persons who owe their job to the traditional transport industries in the EU, including those employed by suppliers, is almost one and a half times as high.

2.2 Virtual Transport: Transport activities of non-transport industries

In the introduction to this paper it was said that the economic importance of transport cannot be measured by the physical output it produces, but at least tonne-km worked, passenger-km travelled and the number of vehicles used for this purpose can serve to explain why traditional transport is a poor measuring rod when trying to measure the interdependence of transport and the economy. Taking stock of the share traditional transport has in the physical output of the transport system shows that its operators are in a minority position as producers of transport services, in spite of air traffic and professional road haulage still showing impressive rates of growth. Today, a great part of the transport services required in the production of goods and services and the bulk of passenger transport are produced by business establishments and individuals on own account and for their own use.

In 1995, the number of road vehicles registered in the EU totalled 204 million: 163 million passenger cars, 490,000 buses, 17.9 million light, medium and heavy goods vehicles, and 23.3 million powered two-wheelers. Out of this vehicle stock, less than 1 m passenger cars, approximately 400,000 buses and about 1.5 million goods vehicles were operated by the traditional transport industries - less than 1 1/2 per cent of the total.

In the same year, the physical output of the transport system in the EU was 4.04 billion passenger-km and 1.15 billion tonne-km. Out of these, 3.7 billion passenger-km and 218 m tonne-km would be left unaccounted for, if only for-hire transport activities were regarded.¹⁴ As can be gathered from these figures, the provision of own-account transport services is not only a widespread industrial and social activity but actually dominates the transport scene.

By definition, transport services produced by non-transport industries and private households remain invisible in national accounting. Considered to be an ingredient of the production process or the social activity to which they are linked, they lead but a virtual life. Measured by the resources they consume, however, they not only equal but exceed the traditional transport industries in importance. Ignoring them would consequently lead to an under-representation of transport and to an underestimation of its effects on growth and income.

In order to provide a unified picture of the impact of transport on the economy, we shall consider 'virtual' transport services as a separate commodity to be isolated from the rest of the commodities non-transport industries produce. Virtuality in the statistical sense is almost exclusively a phenomenon of road transport, although own-account activities through modes other than road transport, such as the use of aircraft and vessels

¹³ Using NACE-classification, the total is 5.6 million which, equivalent to 3.8 per cent of total employment in the EU.

¹⁴ Goods transport outside the traditional transport industries is even underestimated by these figures because most goods carried by light-duty vehicles operated on own account are not registered at all by official statistics).

owned by non-transport industries, exist as well. For lack of statistical evidence they shall however be omitted in this paper. Virtual transport performed by private households shall be dealt with later.

Transport activities carried out by non-transport industries can be broadly divided into two categories. The one nearest to the transport services offered by for-hire industries is own-account road haulage by heavy duty vehicles. There can be different reasons for not outsourcing such services.¹⁵ The goods to be carried may require special handling, strict timing, sophisticated transport equipment and/or supporting activities not to be had in the transport market. If available, however, services by professional hauliers may in this case involve transaction costs that would wipe out any cost advantages for-hire transport may offer. As a rule, own-account operators therefore pay a premium in terms of costs for using their own staff and their own equipment and tend to spend more money on activities accompanying and supporting the act of transport.

The second type of transport activity non-transport industries pursue is the use of light commercial vehicles and cars. Most of these vehicles are registered for wholesalers, retailers and different branches of the service industries. The uses these vehicles are put to show a great amount of variety: the grocer carrying goods back home from the market, the salesman visiting his customers, dial-a-pizza or repair services and senior executives driving to board-room meetings. All these users would find it difficult to substitute purchased transport services to the use of their own transport equipment which provides far greater flexibility than any form of public transport. But it is the variety of uses which makes it difficult to put a value to them.

The method this paper uses to solve this problem is based on the assumption that there is a relationship between the number and the category of road vehicles used in virtual transport, the type of activity for which these vehicles are used and the number of persons engaged in their use which allows to estimate the value-added linked to the act of transport performed. This relationship is different in the case of heavy duty vehicles being used in manufacturing or distribution from that of the use of cars or light duty vehicles by the service industries or in agriculture. To take account of these differences, the vehicle:persons ratio serving as a basis for estimating the relevant employment was put at 1:1.4, while in the case of cars and light-duty vehicles, whose use is much less labour-intensive the ratio applied was 1:0.25. What may seem an arbitrary assumption actually finds its justification, at least as far as the use of heavy goods vehicles is concerned, in surveys of employment in own-account road haulage.¹⁶ In the case of cars and light commercial vehicles, the very low ratio of 1:0.25 reflects the lower kilometrage of these vehicles and the fact that a high share of private uses is to be taken into account for at least a part of the vehicle fleet.¹⁷ Both are average ratios to be differentiated according to the industry in which the vehicles concerned are used.¹⁸

To arrive at the database needed for this kind of approach, vehicle stocks have to be broken down by category and attributed to their users on a country-by-country basis. As corresponding data were only available for a few countries, the pattern of use by the rest of them was assumed to be similar. The amount of capital invested in transport equipment by the different sectors as indicated in the Eurostat tables was most helpful as an additional guidance in this context.

Table 4 lists the estimated vehicle stocks in non-transport industries, the estimated volume of virtual transport services (both passengers and goods) in physical units and the employment related to virtual transport activities on a country-by-country basis. The estimates made lead to a total of 6.4 million persons involved in the production of virtual transport services across the EU for 1995.¹⁹

¹⁵ Reasons for the maintenance and use of own-account fleet see also: UK Department of Transport 1979, Road Haulage Operators Licensing (Report of the Independent Committee of Enquiry into Road Haulage Operators' Licensing), London, HMSO.

¹⁶ Bundesamt für Güterverkehr 1996, Struktur der Unternehmen des gewerbliche Straßengüterverkehrs und des Werkfernverkehrs, Band USTAT, Stand: November 1996.

¹⁷ For Germany the share of cars registered for commercial purpose also used for private purposes is put at slightly above 50 per cent. Hautzinger, H., Heidemann, D., Krämer, B., 1996. Inländerfahrleistungen 1993, *Berichte der Bundesanstalt für Straßenwesen, Mensch und Sicherheit, Heft M 61*, Bergisch Gladbach, p. 60.

¹⁸ For further details see: Diekmann, A. 1999, Verkehr als Wertschöpfungssträger und Nachfragegröße, *Zeitschrift für Verkehrswissenschaft, 70. Jahrgang, Heft 1*, pp.43 – 46.

¹⁹ The plausibility of this figure can be tested by assuming that in terms of kilometrage about one-third of the transport services provided by passenger cars and light duty vehicles registered for non-transport industries were of a private rather than commercial nature. The remaining kilometrage would then imply (on average) a 5 hours drive per person employed in pursuance of commercial activities over a distance of about 250 km a day. Considering that part of the workforce performs supporting activities, accompanying the driver on his route, working in the back office, doing maintenance work or planning the logistics of the use the vehicle fleets are put to, the estimate made concerning employment linked to the commercial use of passenger cars might even be too low.

Table 4 Virtual Transport Industries: Vehicle Stocks, Transport Services and Transport-Related Employment

| Country | Vehicle stocks (1000) | | Transport services (bn) | | Employment (1000) related to the use of | | |
|----------------|--------------------------|----------------------|-------------------------|------------------|---|-------|-------|
| | Cars & light commercials | Heavy goods vehicles | Passenger kilometres | Tonne kilometres | Cars and LC | HGV | Total |
| Austria | 786 | 28 | 14,0 | 4,7 | 118 | 37 | 156 |
| Belgium | 507 | 39 | 10,0 | 6,6 | 130 | 53 | 183 |
| Denmark | 268 | 14 | 4,5 | 2,2 | 128 | 19 | 147 |
| Finland | 199 | 13 | 4,7 | 2,2 | 60 | 18 | 78 |
| France | 2.945 | 175 | 62,0 | 29,7 | 639 | 211 | 850 |
| Germany | 5.623 | 426 | 99,0 | 72,1 | 1.480 | 618 | 2.097 |
| Greece | 274 | 17 | 5,5 | 2,8 | 43 | 22 | 65 |
| Ireland | 96 | 10 | 2,3 | 1,6 | 54 | 13 | 67 |
| Italy | 3.186 | 175 | 58,0 | 29,6 | 773 | 227 | 1.000 |
| Luxembourg | 22 | 2 | 0,5 | 0,4 | 10 | 3 | 14 |
| Netherlands | 803 | 37 | 18,0 | 6 | 269 | 51 | 320 |
| Portugal | 246 | 47 | 5,0 | 7,9 | 76 | 63 | 139 |
| Spain | 1.586 | 69 | 31,0 | 11,6 | 456 | 93 | 549 |
| Sweden | 369 | 15 | 8,4 | 2,5 | 103 | 20 | 123 |
| United Kingdom | 2.171 | 226 | 50,0 | 38,2 | 333 | 271 | 604 |
| EU | 19.084 | 1.291 | 372,9 | 218,1 | 4.672 | 1.717 | 6.390 |

Source: European Commission 1999, EU Transport in Figures; estimates

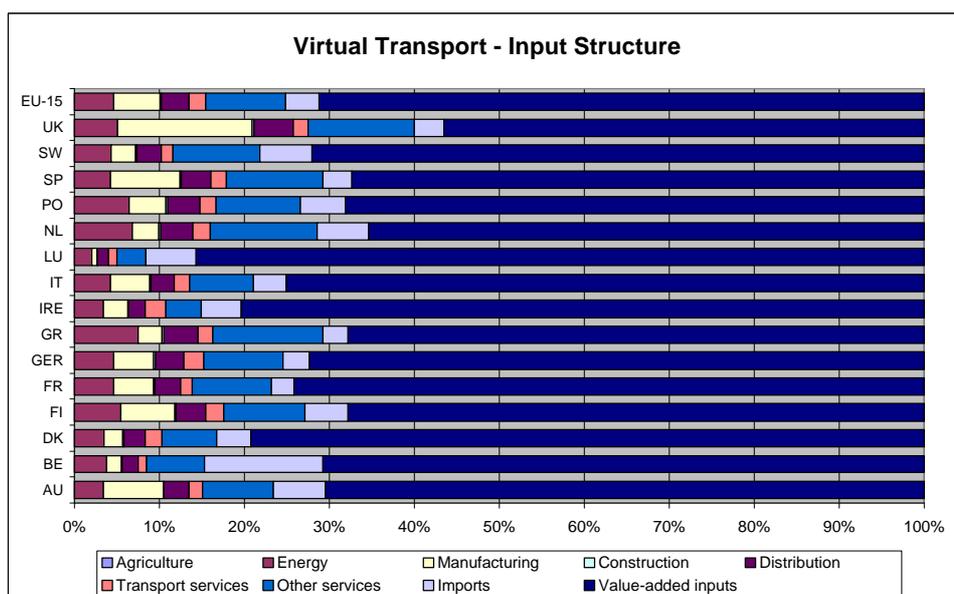
The costs of maintaining and running road vehicles (expenditure on fuel, vehicle parts, tyres, automotive repair, maintenance services, insurance etc.) are well documented for most countries. Data are available from different sources such as automobile clubs, national statistics and international studies. In combination with the physical data indicated above and their distribution between sectors, the intermediate requirements resulting from virtual transport services can be calculated on a country-by-country basis. In these calculations, allowances have to be made for inputs that are not mainly used for transport, such as office supplies, accounting services etc. In that respect the input structure of the traditional transport industries offers some guidance.

This leads us back to value-added inputs where labour compensation and social contributions can be estimated on a pro-rata basis by relating them to the share of transport-related employment in total sector employment. In estimating depreciation, the EU I-O data concerning transport-related fixed capital formation per sector and data concerning the average life of road vehicles were helpful elements of orientation. The crucial issue were the profits to be attributed to the individual sectors' transport activities. There is a widely-held view that estimates of such profits would have to be based on market prices for similar services. Unfortunately, this approach does not seem workable in the present case because for most virtual transport services there are no services of a comparable nature. When business establishments choose to rely on their own transport capabilities this is either because they need highly specialised transport equipment not available on a for-hire basis or because the dependability required in moving their goods prevents them from outsourcing the services they need. Outsourcing in these cases could actually cause high transaction costs outweighing cost advantages offered by professional hauliers. In the case of passenger transport, there is hardly any equivalent to the advantage of having one's own car available at any time. Prestige and comfort also play a role. As in most instances where transport services are provided on own account, the act of transport is closely allied to the rest of activities pursued, there is no reason why transport should not be assigned the same rate of profit as the non-transport activities it is related to. If this view can be agreed upon, it solves the problems of estimating the value-added input coefficient for profits related to transport activities of non-transport industries because it allows total profit of any sector concerned to be split up in proportion to the relative cost of labour transport and non-transport activities entail. This is the line followed in this paper.

2.3 The modified matrix

Having estimated transport-related inputs for each of the non-transport sectors in the 15 member countries of the EU, we can separate them from the inputs for other uses, aggregate them into a single column and thus create a virtual transport sector in its own right. Figure 5 shows in a simplified form the input structure of virtual transport in EU member countries.

Figure 5



Source: estimates

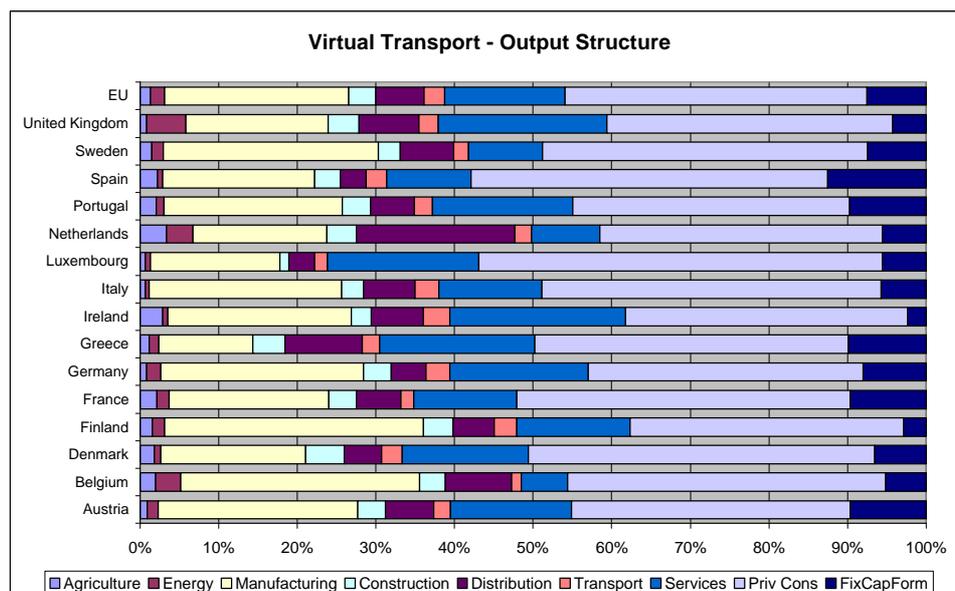
A similar approach was taken to isolate the output of virtual transport services from the rest of the output of the individual sectors and to aggregate the corresponding rows into a single row representing the newly-created sector. Before this could be done, distribution weights had to be developed, indicating the transport content in each sector's sales to other sectors. While the overall volume of these sales is determined by the identity of input and output, its distribution presents a number of problems. They arise from the fact that the output of transport services may not follow the pattern shown by the rest of the output of the sector concerned. For instance, non-transport industries hardly export any transport services. Long-distance, cross-border transports are the domain of professional road hauliers.

On the other hand, a disproportionate part of their services is directed, and often separately billed, to private households. A specific form of 'sales' of transport services to private households is the private use of cars registered for business units. This justifies to give private consumption a more than proportionate weight in distributing the final uses of virtual transport services. Own-account transport is also frequently involved in the building of roads, railway lines, waterways and airports as a part of the formation of fixed capital in infrastructure. In other words, a substantial part of virtual transport services does not show up in the form of intermediate transactions.

Unfortunately, the actual split between the intermediate and the final use portion of virtual transport services is not very well known. In the present analysis, the estimates made are arbitrary to the extent that, as the export of virtual transport services was considered to be zero, the share attributable to private consumption was increased accordingly, while for the rest of intermediate and final uses 'sales' of virtual transport services followed the general pattern of sales by each sector. As a result, the margin of error in estimating the new sector's output coefficients is greater than in the case of determining the composition of its input.

Subtracting the input columns reflecting the transport-related purchases of the non-transport sectors and the rows representing their sales of transport services from the original I-O table leaves us with a residual table into which a new row representing the aggregate of commercially-provided virtual transport services and a new column representing the new sector's input requirements can be inserted resulting in a modified matrix that allows us to identify the role of the new sector in terms of intermediate transactions as well as in terms of its supplies to final uses.

Figure 6



Source: estimates

Introducing the new transport sector almost doubles transport-related employment in most countries and leads to an even greater growth in transport-related value-added. The inclusion of virtual transport services also smooths out part of the differences in the transport sector's contribution to GDP between countries that would have persisted if only traditional transport services had been considered.

Germany, Denmark, Ireland and Luxembourg seem to rely more heavily on virtual transport than other countries. This is not only a matter of physical volume. Costs incurred per unit of output in virtual transport in Germany were almost twice as high as in France and 50 per cent above EU-average. To a certain extent, this may be attributable to a more homogeneous spread of cities and population over the country than in France and the UK which are more centralised in their spatial structure, which implies a higher volume of transport over medium distances and also involves the use of different vehicle fleets. Part of the difference can also be explained by the fact, that in 1995 Germany still lagged behind France and some other countries in the deregulation of the transport market which may have caused the cost level in transport to be higher than in the rest of the Union.

Table 5 Transport Industries – Value Added to GDP: EU 1995

| Country | Value-added by transport services (m ECU) | | | | Share in GDP | | | | |
|----------------|---|----------------|-----------|---------|--------------|----------------|-----------|---------|-------|
| | Inland | Maritime & air | Auxiliary | Virtual | Inland | Maritime & air | Auxiliary | Virtual | Total |
| Austria | 4.645 | 626 | 1.198 | 7.638 | 3,0 | 0,4 | 0,8 | 4,9 | 9,1 |
| Belgium | 4.284 | 620 | 8.392 | 9.533 | 2,2 | 0,3 | 4,4 | 5,0 | 11,9 |
| Denmark | 4.992 | 1.983 | 1.373 | 9.265 | 4,3 | 1,7 | 1,2 | 7,9 | 15,1 |
| Finland | 3.285 | 1.002 | 1.099 | 3.938 | 3,9 | 1,2 | 1,3 | 4,7 | 11,2 |
| France | 22.827 | 3.292 | 14.017 | 42.899 | 2,1 | 0,3 | 1,3 | 3,9 | 7,6 |
| Germany | 30.988 | 7.115 | 15.352 | 139.320 | 1,8 | 0,4 | 0,9 | 8,2 | 11,3 |
| Greece | 892 | 519 | 454 | 2.250 | 1,2 | 0,7 | 0,6 | 3,0 | 5,4 |
| Ireland | 728 | 265 | 343 | 5.204 | 1,6 | 0,6 | 0,8 | 11,7 | 14,7 |
| Italy | 24.063 | 5.294 | 9.814 | 45.756 | 3,1 | 0,7 | 1,3 | 5,9 | 10,9 |
| Luxembourg | 244 | 0 | 280 | 917 | 2,1 | 0,0 | 2,4 | 7,8 | 12,2 |
| Netherlands | 6.702 | 3.036 | 3.864 | 16.275 | 2,4 | 1,1 | 1,4 | 5,9 | 10,8 |
| Portugal | 1.497 | 338 | 861 | 2.266 | 2,1 | 0,5 | 1,2 | 3,2 | 7,0 |
| Spain | 9.054 | 1.804 | 4.202 | 17.248 | 2,3 | 0,4 | 1,0 | 4,3 | 8,1 |
| Sweden | 3.676 | 1.651 | 1.505 | 4.644 | 2,2 | 1,0 | 0,9 | 2,8 | 7,0 |
| United Kingdom | 19.564 | 6.277 | 14.486 | 18.115 | 2,5 | 0,8 | 1,9 | 2,3 | 7,5 |
| EU | 137.442 | 33.821 | 77.240 | 325.267 | 2,3 | 0,6 | 1,3 | 5,5 | 9,7 |

Source: Eurostat; estimates

At this stage of the analysis, it may be of interest to compare the input coefficients of the newly-created transport sector with those of 'in-house' transport in the USA, although the two are not identical in their characteristics..

The US study²⁰ from which these coefficients are derived only looked at goods transport by non-transport industries. Inputs and outputs attributable to own-account passenger transport were not (yet) included. Also, the study mentioned did not quantify and include profits. Still, the overall volume of intermediate purchases per unit of output is about the same and the divergence in input coefficients can to a large extent be explained by differences in the price level of intermediate inputs, and the study's concentration on the movement of goods only.

Table 6 Comparison of Input Coefficients in Virtual Transport

| | EU | US |
|---|---------------|----------------|
| Agriculture, forestry and fishery products | 0,0017 | 0,00034 |
| Fuel and power products | 0,0483 | 0,08453 |
| Ferrous and non-ferrous ores and metals | 0,0018 | . |
| Non-metallic mineral products | 0,0011 | 0,00571 |
| Chemical products | 0,0039 | 0,00388 |
| Metal products except machinery | 0,0014 | 0,00208 |
| Agricultural and industrial machinery | 0,0021 | 0,00063 |
| Office and data processing machines | 0,0004 | 0,00009 |
| Electrical goods | 0,0037 | 0,00222 |
| Transport equipment | 0,0442 | 0,00342 |
| Food, beverages, tobacco | 0,0025 | . |
| Textiles and clothing, leather and footwear | 0,0013 | 0,00006 |
| Paper and printing products | 0,0049 | 0,00121 |
| Rubber and plastic products | 0,0029 | 0,00551 |
| Other manufacturing products | 0,0007 | 0,0005 |
| Building and construction | 0,0016 | . |
| Recovery, repair services, wholesale, retail | 0,0329 | 0,07649 |
| Lodging and catering services | 0,0014 | 0,00885 |
| Transport services | 0,0199 | 0,00789 |
| Communication services | 0,0114 | 0,01279 |
| Services of credit and insurance institutions | 0,0139 | 0,00737 |
| Other market services | 0,0656 | 0,03841 |
| Non-market services | 0,0023 | 0,00353 |
| DOMESTIC GOODS AND SERVICES | 0,2702 | 0,26551 |
| IMPORTS OF GOODS AND SERVICES | 0,0161 | |
| TOTAL INTERMEDIATES | 0,2862 | 0,26551 |
| Labour compensation | 0,3210 | 0,50864 |
| Net operating surplus | 0,2777 | . |
| Consumption of fixed capital | 0,0879 | 0,20247 |
| Taxes linked to production (excluding VAT) | 0,0272 | 0,02339 |
| GROSS VALUE ADDED AT MARKET PRICES | 0,7138 | 0,73449 |
| OUTPUT | 1,0000 | 1,0000 |

3. Transport-related final demand

3.1 Transport services produced by households

We have so far investigated the role of transport as an element of industrial output. In terms of national accounts, transport services produced by industry, even in their virtual form, represent a value and contribute to GDP. This is not the case with transport services private households produce for their own use, although these services account for more than 70 per cent of all passenger-km produced within the EU. The fact that they have no value attached to them, is another reason for the under-representation of transport in national accounting.

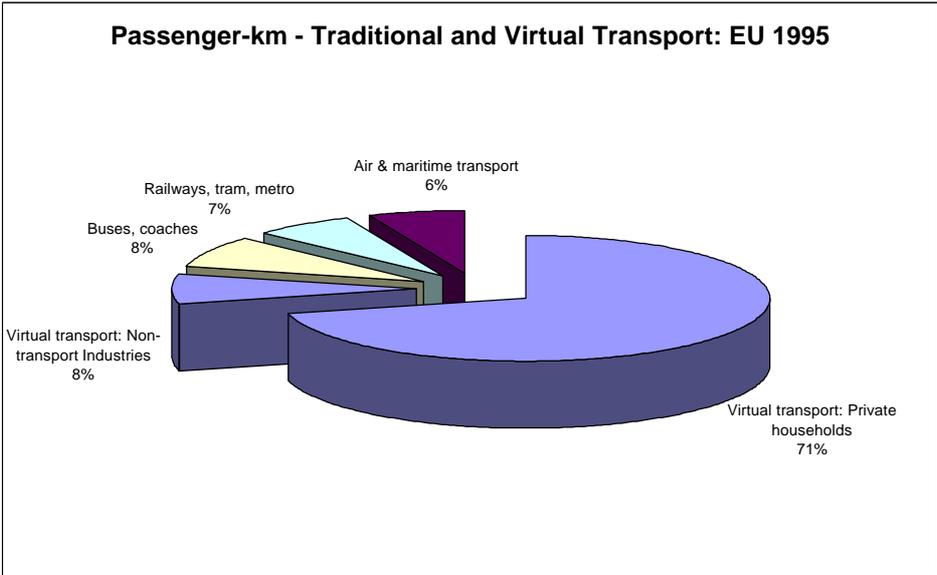
By definition, expenditures on motorisation effected by private households constitute an element of final use. Using the criteria by which we have singled out own-account transport activities as a separate transport industry and given the size of private households' contribution to societal mobility, they might just as well deserve the status of an industry on its own. In many respects there is little difference between the transport activities carried out by private households and those undertaken by non-transport industries. Driving to work, for instance, might well be regarded as a part of the production process. Furthermore, cars registered for private owners can be also used for business trips, though the extent to which this is the case normally escapes statistical surveys. What is left in terms of private consumption is the recreational use of privately-owned motor vehicles. But apart from that, the lines separating private and industrial uses are difficult to draw.²¹

²⁰ U.S. Department of Transportation, Bureau of Transportation Statistics 1999, *Transportation Satellite Accounts: A New Way of Measuring Transportation Services in America*, Washington, D.C.

²¹ It has been rightly pointed out that national accounting does not adequately reflect the economic role of transport in getting people to work or school, in bringing goods home from retail outlets and in supporting social and recreational activities.

There is another instance where the usual pattern of I-O tables and the needs of transport-oriented analyses disagree. The value transport adds to GDP consists of two elements. One is the current production of transport services, the second element covers the aggregate of expenditure directed at providing the infrastructure and the equipment on which the production of transport services is based. While the former covers all current expenditure, the latter consists mainly of investment activities. In terms of their effect on the business cycle and on the long-term growth of the economy a distinction has to be made between the two elements. Investments tend to be a major driving force in the take-off phase of a new technology. They can be put off, at least for a while, when a production system nears completion without putting its basic functions at a risk. In other words, once the system has been established they become more susceptible to fluctuations in the business cycle. If the system is big enough, they can even be their cause.

Figure 7



Source: Eurostat; estimates

Current transport activities, on the other hand, serve basic needs of society. Although every slowing down in economic activities will affect transport demand by industry, the everyday use of transport equipment does not react quickly to changes in the economic climate. When analysing the economic impact of transport, therefore, we are well-advised to distinguish between the two components of transport-related demand. In the case of private consumption this would mean that purchases of motor vehicles and current expenditure on their use would have to be separated. Purchasing motor vehicles, whether done by private households or by business units, is an act of investment. For the purpose of economic analysis it should rather be considered as a form of fixed capital formation.

We shall take up this aspect later. For the time being, however, and in order not to upset the conventional system of national accounting, we shall follow the usual order of analysis by looking at the individual categories of final demand vector by vector, taking private consumption (as an entity) first.

Transport-related private consumption, measured by the amount private households spend on fuel, lubricants, spare parts, repairs, insurance etc. and on the purchase of transport equipment is well-documented across the EU. The same is true of the amount of transport services purchased by private households. In 1995, private households in the EU spent 435 billion ECU on motorisation, of which 158 billion ECU on the purchase of transport equipment. In addition, they bought 121 billion ECU worth of traditional transport services and 163 billion ECU worth of virtual transport services. These figures include VAT and imports both from within the EU and from third countries.

On a country-by-country basis, the share of transport-related private expenditure on motorisation in total private consumption in the EU varies between 9 and 14 per cent. These variations can be explained by different levels in car ownership and car use, motorisation costs, and the availability of public transport services. Difference in geography and land-use patterns are also major factors because they influence the intensity of use of the transport equipment available. Looked at over time, there seems to be a trend for the share in income households set aside for motorisation to converge at around 14 per cent of total private consumption.

It has been pointed out that by using their own cars households do not contribute directly to GDP. But they do so indirectly by the purchases related to this activity. Assigned to the corresponding sectors of supply, their transport-related purchases can be split up between domestic, EU and third country sources. Table 7 shows the use private households make of transport-related domestic supplies across the EU. It also indicates transport-related expenditure by private households on imports from the EU and third countries.

Table 7

| Transport-related Final Uses by Private Households (I) | | | | | | | | |
|--|---------|---------|---------|---------|--------|---------|--------|---------|
| (m ECU) | | | | | | | | |
| | Austria | Belgium | Denmark | Finland | France | Germany | Greece | Ireland |
| Agriculture, forestry and fishery products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fuel and power products | 1.851 | 1.522 | 1.115 | 627 | 10.422 | 18.749 | 926 | 194 |
| Ferrous and non-ferrous ores and metals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-metallic mineral products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chemical products | 6 | 9 | 4 | 7 | 165 | 187 | 7 | 2 |
| Metal products except machinery | 13 | 7 | 10 | 11 | 173 | 162 | 7 | 1 |
| Agricultural and industrial machinery | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Office and data processing machines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electrical goods | 2 | 3 | 3 | 4 | 140 | 115 | 5 | 1 |
| Transport equipment | 1.076 | 417 | 34 | 113 | 20.267 | 50.359 | 897 | 300 |
| Food, beverages, tobacco | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Textiles and clothing, leather and footwear | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paper and printing products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber and plastic products | 3 | 1 | 4 | 4 | 76 | 66 | 4 | 1 |
| Other manufacturing products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Building and construction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Recovery, repair services, wholesale, retail | 2.034 | 1.929 | 1.329 | 755 | 13.734 | 21.566 | 443 | 234 |
| Lodging and catering services | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inland transport services | 1.765 | 2.154 | 1.504 | 798 | 10.084 | 9.657 | 1.109 | 551 |
| Maritime and air transport services | 261 | 87 | 745 | 608 | 2.548 | 440 | 2.008 | 177 |
| Auxiliary transport services | 2.910 | 893 | 333 | 532 | 3.328 | 23.190 | 144 | 11 |
| Virtual transport services | 3.304 | 4.884 | 5.088 | 1.879 | 22.982 | 63.508 | 1.277 | 2.308 |
| Communication services | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Services of credit and insurance institutions | 0 | 1.775 | 627 | 512 | 4.631 | 15.919 | 304 | 310 |
| Other market services | 1.429 | 944 | 639 | 316 | 2.949 | 13.229 | 186 | 9 |
| Non-market services | 80 | 50 | 41 | 18 | 156 | 761 | 10 | 1 |
| Intermediates | 14.736 | 14.675 | 11.475 | 6.183 | 91.654 | 217.907 | 7.327 | 4.100 |
| Imports from EU countries | 1.728 | 2.579 | 420 | 387 | 7.553 | 16.748 | 2.857 | 907 |
| Imports from third countries | 618 | 832 | 290 | 296 | 5.141 | 10.921 | 893 | 1.226 |

Transport-related Final Uses by Private Households (II)
(m ECU)

| | Italy | Luxembourg | Netherlands | Portugal | Spain | Sweden | UK | EU15 |
|---|--------|------------|-------------|----------|--------|--------|--------|---------|
| Agriculture, forestry and fishery products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fuel and power products | 10.397 | 22 | 3.283 | 1.042 | 6.603 | 2.313 | 14.439 | 73.504 |
| Ferrous and non-ferrous ores and metals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-metallic mineral products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Chemical products | 107 | 1 | 16 | 8 | 72 | 15 | 86 | 693 |
| Metal products except machinery | 22 | 10 | 6 | 16 | 30 | 28 | 33 | 529 |
| Agricultural and industrial machinery | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Office and data processing machines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electrical goods | 17 | 6 | 4 | 10 | 10 | 26 | 21 | 365 |
| Transport equipment | 6.631 | 8 | 313 | 861 | 1.953 | 915 | 3.649 | 87.792 |
| Food, beverages, tobacco | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Textiles and clothing, leather and footwear | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Paper and printing products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rubber and plastic products | 9 | 5 | 5 | 5 | 5 | 9 | 23 | 222 |
| Other manufacturing products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Building and construction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Recovery, repair services, wholesale, retail | 8.137 | 112 | 2.499 | 1.397 | 6.971 | 1.646 | 5.753 | 68.537 |
| Lodging and catering services | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inland transport services | 13.024 | 39 | 1.990 | 884 | 5.343 | 1.498 | 7.156 | 57.557 |
| Maritime and air transport services | 1.299 | 33 | 1.267 | 99 | 835 | 577 | 4.162 | 15.149 |
| Auxiliary transport services | 2.153 | 192 | 881 | 332 | 789 | 574 | 1.696 | 37.959 |
| Virtual transport services | 25.931 | 505 | 6.683 | 1.217 | 11.464 | 2.238 | 10.157 | 163.425 |
| Communication services | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Services of credit and insurance institutions | 1.720 | 124 | 1.755 | 599 | 1.080 | 704 | 6.562 | 36.621 |
| Other market services | 1.961 | 36 | 744 | 90 | 2.580 | 357 | 3.376 | 28.845 |
| Non-market services | 119 | 0 | 38 | 6 | 140 | 19 | 168 | 1.607 |
| Intermediates | 71.528 | 1.093 | 19.485 | 6.566 | 37.876 | 10.919 | 57.281 | 572.805 |
| Imports from EU countries | 5.663 | 129 | 3.253 | 1.247 | 5.335 | 1.262 | 9.684 | 59.752 |
| Imports from third countries | 3.428 | 208 | 1.008 | 458 | 1.221 | 510 | 8.019 | 35.070 |

Source: Eurogramme 1999, Study on the Economic Importance of the Transport Sector (Final Report); estimates

3.2 Transport-related contributions by governments

By tradition, governments hold a key position in shaping the transport system. They are the main providers of infrastructure (most of them still own the national railway system), they run the system of inland waterways,

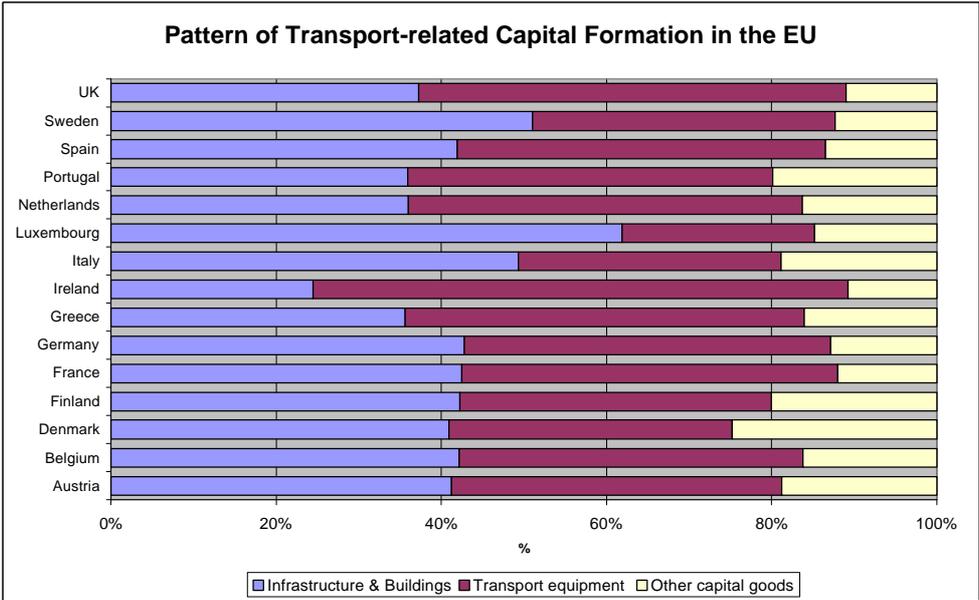
sometimes even ports and airports and in spite of some motorways being privately operated, they continue to be responsible for most of the road network. It is part of their task to supervise and control the flow of traffic. They generate the regulatory framework according to which transport equipment is built and brought into circulation and, at the same time, they are users of the transport system and purchasers of transport equipment. In this paper, government expenditure on infrastructure is classified as fixed capital formation and will be treated accordingly. The government column therefore only contains the consumption activities of governments, both state and local, i.e. it covers the administrative tasks of governments and the labour compensation that arises therefrom as well as government purchases of transport equipment.

Transport-related government consumption is basically domestic in character, i.e. direct imports, which certainly exist to a small extent, can be ignored. The fraction of total transport-related final demand government consumption, as we have defined it, accounts for is small. The EU total amounted to 65.6 billion ECU in 1995.

3.3 Transport-related capital formation

Next to private consumption, transport-related fixed capital formation is the most important category of transport-related final demand. Transport-related capital formation in the EU can be broken down into three major categories: buildings and infrastructure (48 per cent), transport equipment (37 per cent) and other capital goods used in the production of transport services (15 per cent). In absolute figures, transport-related investment in the EU totalled 281.9 billion ECU in 1995. These figures include investments made by business units providing virtual transport services. They do not include purchases of transport equipment made by private households. Figure 8 indicates the relative share of the three components of fixed capital formation for each of the 15 EU countries.

Figure 8



Source: Eurostat

Investment expenditure on infrastructure expanded vigorously throughout the eighties in most EU countries. In total, it was twice the 1980 level in 1990, at current prices. Investments in Europe's railway systems even trebled and in the case of airports they had by 1990 reached four times their 1980 level. But led by road building, the pace of growth in expenditure on infrastructure slowed down in the last decade of the past century. With national road networks nearing completion and railways concentrating their services on the more highly frequented part of their network, there appears to be less need for net investment in transport infrastructure than one or two decades ago when infrastructure had to catch up with the growth of traffic flows. This does not mean that there will be no further expansion, but this will be increasingly selective and capital outlay in this domain will tend to go into repairs and replacement of existing infrastructure rather than in new building activities.

Expenditure on transport equipment, on the contrary, still seems to have preserved some of its dynamics, if looked at in terms of value rather than physical units. Partly because of more stringent legislation, partly because

of more exacting demands by operators and users of transport equipment, there has been a trend for vehicles to become more sophisticated and, as a rule, more expensive. This is certainly the case for motor vehicles where comfort and prestige are additional driving forces in pushing expenditure to a higher level. The fact that 1995 was a year with a low sales record should not lead to wrong conclusions. Trends, however, are far from being uniform in Europe. While some countries have reached a high level of vehicle ownership and rely for further increases on value per unit rather than on sales volume in terms of units, others are still lagging behind. Table 8 gives an overview of transport-related fixed capital formation in the EU in 1995 by categories.

Table 8 **Fixed Capital Formation by Categories: EU 1995**
(m ECU)

| | A | B | Dk | FIN | F | D | EI | IRL | IT | L | NL | P | E | S | UK |
|-----------------------|-------|-------|-------|-------|--------|--------|-------|-------|--------|-----|--------|-------|--------|-------|--------|
| Infrastructure | 1.338 | 2.179 | 702 | 515 | 8.784 | 26.586 | 461 | 432 | 12.437 | 183 | 2.328 | 1.148 | 5.406 | 2.460 | 8.779 |
| - railways | 475 | 699 | 150 | 234 | 1.290 | 5.489 | 102 | 7 | 2.123 | 23 | 432 | 109 | 174 | 1.121 | 1.091 |
| - roads | 708 | 1.023 | 361 | 186 | 4.942 | 16.656 | 359 | 356 | 9.207 | 159 | 1.356 | 868 | 4.253 | 1.119 | 4.999 |
| - inland waterways | 13 | 112 | 0 | 9 | 122 | 581 | 0 | 0 | 19 | 0 | 157 | 0 | 0 | 0 | 0 |
| - airports | 128 | 38 | 49 | 39 | 501 | 1.795 | 0 | 45 | 501 | 1 | 174 | 0 | 307 | 63 | 848 |
| - metro, tram, | 14 | 150 | 46 | 14 | 1.626 | 1.550 | 0 | 0 | 215 | 0 | 96 | 110 | 104 | 129 | 1.673 |
| - ports | 0 | 157 | 97 | 34 | 304 | 515 | 0 | 25 | 373 | 0 | 114 | 62 | 568 | 26 | 168 |
| Transport equipment | 2.148 | 2.791 | 1.207 | 656 | 13.229 | 38.338 | 1.836 | 2.569 | 9.849 | 81 | 5.316 | 1.809 | 7.210 | 1.858 | 13.339 |
| - rolling stock | 280 | 276 | 174 | 29 | 830 | 1.641 | 83 | 40 | 537 | 8 | 227 | 133 | 240 | 105 | 64 |
| - road vehicles | 1.868 | 2.474 | 1.033 | 627 | 12.294 | 36.599 | 1.754 | 2.529 | 9.301 | 73 | 4.924 | 1.677 | 6.970 | 1.753 | 13.275 |
| - vessels (inland) | 0 | 41 | 0 | 0 | 105 | 98 | 0 | 0 | 11 | 0 | 166 | 0 | 0 | 0 | 0 |
| - vessels (sea-going) | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| - aircraft | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Other | 2.568 | 2.371 | 2.316 | 800 | 9.291 | 28.651 | 1.903 | 1.143 | 13.275 | 164 | 4.481 | 1.506 | 4.709 | 1.182 | 4.729 |
| - buildings | 1.584 | 1.401 | 1.353 | 469 | 6.438 | 19.291 | 1.302 | 748 | 7.429 | 114 | 2.747 | 657 | 2.793 | 759 | 2.422 |
| - machinery | 984 | 970 | 963 | 332 | 2.853 | 9.360 | 601 | 395 | 5.846 | 51 | 1.734 | 849 | 1.916 | 422 | 2.307 |
| Total | 6.055 | 7.341 | 4.225 | 1.971 | 31.304 | 93.576 | 4.200 | 4.144 | 35.561 | 428 | 12.125 | 4.464 | 17.325 | 5.499 | 26.847 |

Source: Eurogramme 1999, Study on the Economic Importance of the Transport Sector (Final Report); estimates.

Across the EU, the share of transport-related investment in total fixed capital formation was almost 25 per cent.. By far the most important investor was Germany which accounted for 37 per cent of the EU total, with Italy and France ranking second with 13 per cent each, followed by the UK (10 per cent). For two-thirds of transport-related investments in the EU relied on domestic supplies, imports from other EU countries accounted for 1/5 of the total.

3.4 Transport-related exports

While there are fairly reliable data allowing the identification of the transport-related content in each of the components of final demand discussed so far, it is more difficult to quantify transport-related exports. There are, of course, exports whose affinity to transport is obvious, such as the export of transport equipment and of transport services. But beyond these there is a wide range of goods and services used as intermediate products in transport-related production processes down to raw materials which can also be used for the production of non-transport goods. To isolate the transport-related share of such exports at least in intra-EU trade it was found easier to look at imports first. As in intra-EU trade one country's imports must be another EU country's exports, the volume of transport-related exports and their composition by commodities can be derived from the volume and the commodity structure of transport-related imports. What is needed is to link the two sides of the equation in a way that allows to identify the origin of transport-related imports on a commodity-by-commodity basis. To provide this link the assumption had to be made that in those cases where transport shares the use of such commodities with other activities the regional pattern of transport-related trade follows the general pattern of trade flows shown by intra-EU trade statistics. The resulting margin of error concerns about half the intra-EU trade volume related to transport. Transport-related exports to third countries could not be estimated in that way. Except for transport equipment and transport services an identification of transport-related exports was only possible for a few major items so that the volume of transport-related trade may be underestimated in this case.

Transport-related production processes involve supply chains reaching well beyond the boundaries of a country. These linkages reflecting economic integration lead to a network of interdependent sales and purchases between countries comparable to the interdependence of production sectors in the intermediate quarter of the I-O table. Given this interdependence, exports from country A to country B lead to imports from a number of other countries, including imports from country B requiring further exports from country A etc. In intra-EU trade the

final volume of exports resulting from this iterative process is higher than the exports which initiated the process. In other words, there is a multiplier to be taken into account when we try to determine the total transport-related trade volume within the EU. The tools of input-output analysis can solve the problem of calculating this multiplier by linking the total requirements tables of the countries involved with the relevant trade statistics. But again, for the resulting trade flows the assumption has to be made that the regional pattern of transport-related trade corresponds to that of trade in general.

Table 9 **Transport-Related Intra-EU Trade: 1995**

| Supplies from: | Deliveries to | | | | | | | | | | | | | | | |
|----------------|---------------|--------|-------|-------|--------|--------|-------|-------|--------|-------|--------|-------|--------|--------|--------|---------|
| | A | B | DK | FIN | F | D | EL | IRE | I | L | NL | P | E | S | UK | EU-15 |
| A | 0 | 1.252 | 250 | 227 | 1.595 | 5.215 | 105 | 162 | 1.384 | 62 | 1.191 | 117 | 920 | 725 | 1.275 | 14.478 |
| B | 1.898 | 0 | 651 | 713 | 5.268 | 13.890 | 226 | 427 | 3.873 | 494 | 4.511 | 491 | 2.600 | 2.169 | 5.752 | 42.964 |
| DK | 312 | 678 | 0 | 158 | 654 | 1.798 | 69 | 88 | 608 | 72 | 623 | 74 | 376 | 539 | 737 | 6.787 |
| FIN | 475 | 868 | 302 | 0 | 1.021 | 2.404 | 122 | 139 | 811 | 63 | 806 | 126 | 631 | 1.345 | 1.140 | 10.252 |
| F | 1.753 | 5.205 | 694 | 633 | 0 | 11.445 | 283 | 455 | 5.276 | 250 | 2.844 | 716 | 5.457 | 1.709 | 6.541 | 43.261 |
| D | 6.907 | 10.693 | 2.316 | 1.665 | 15.715 | 0 | 1.048 | 1.067 | 11.938 | 308 | 8.433 | 1.211 | 8.196 | 4.942 | 15.369 | 89.809 |
| EL | 69 | 229 | 18 | 30 | 174 | 294 | 0 | 15 | 128 | 21 | 114 | 16 | 78 | 71 | 156 | 1.413 |
| IRE | 174 | 331 | 78 | 83 | 405 | 1.179 | 29 | 0 | 397 | 28 | 304 | 53 | 271 | 163 | 1.320 | 4.815 |
| I | 1.826 | 3.759 | 781 | 606 | 6.649 | 10.189 | 543 | 469 | 0 | 190 | 2.485 | 859 | 3.168 | 1.495 | 4.294 | 37.313 |
| L | 137 | 395 | 28 | 33 | 407 | 457 | 12 | 29 | 244 | 0 | 168 | 26 | 199 | 155 | 240 | 2.529 |
| NL | 1.465 | 5.311 | 706 | 650 | 2.708 | 9.473 | 226 | 400 | 2.482 | 777 | 0 | 395 | 1.803 | 1.563 | 4.044 | 32.002 |
| P | 132 | 290 | 51 | 59 | 491 | 1.112 | 20 | 43 | 305 | 41 | 247 | 0 | 390 | 151 | 502 | 3.833 |
| E | 854 | 1.637 | 289 | 289 | 10.222 | 7.490 | 330 | 294 | 4.103 | 674 | 1.845 | 1.473 | 0 | 722 | 4.147 | 34.370 |
| S | 605 | 3.173 | 680 | 739 | 1.532 | 2.557 | 137 | 161 | 1.092 | 101 | 1.789 | 167 | 725 | 0 | 2.164 | 15.620 |
| UK | 1.806 | 7.042 | 957 | 1.043 | 5.855 | 11.438 | 527 | 1.702 | 5.453 | 425 | 4.366 | 1.025 | 3.953 | 2.203 | 0 | 47.797 |
| EU-15 | 18.723 | 40.573 | 7.753 | 6.828 | 51.678 | 79.591 | 3.628 | 5.137 | 38.119 | 3.488 | 29.786 | 6.507 | 29.307 | 17.572 | 48.555 | 387.244 |

Source: Eurostat; estimates

Being aware of this problem, we can distinguish between primary and secondary transport-related exports. Primary transport-related exports to the EU formed by the first tier of transport-induced import requirements totalled 268 million ECU. Secondary exports accounted for another 119 million ECU, yielding an export multiplier of 1.44 and a total of transport-related intra-EU trade of 387 billion ECU, which is about one-third of the European Union's total internal trade volume. Table 9 shows the interdependence in transport-related trade between the individual EU countries. There are five countries with a surplus in intra-EU transport-related trade: Germany, Spain, Belgium, the Netherlands and Finland. The rest of them runs deficits. But most of these deficits are small. On the whole, transport-related trade within the EU seems to be fairly well balanced.

Table 10 **Components of Transport-Related Final Demand**

| | Private Consumption | Government consumption | Fixed capital formation | Exports to EU | Exports to third C. | Final Uses |
|----------------|---------------------|------------------------|-------------------------|---------------|---------------------|------------|
| Austria | 7,1 | 1,3 | 2,2 | 5,6 | 1,3 | 17,5 |
| Belgium | 5,9 | 1,4 | 1,9 | 11,2 | 1,6 | 22,0 |
| Denmark | 8,3 | 0,9 | 2,5 | 4,0 | 1,7 | 17,4 |
| Finland | 6,0 | 1,2 | 1,7 | 8,4 | 3,6 | 20,8 |
| France | 7,5 | 1,0 | 2,6 | 3,4 | 1,2 | 15,7 |
| Germany | 11,2 | 0,8 | 4,9 | 4,3 | 2,2 | 23,4 |
| Greece | 7,5 | 0,8 | 2,8 | 1,2 | 0,5 | 12,9 |
| Ireland | 7,8 | 1,5 | 3,2 | 6,7 | 2,5 | 21,7 |
| Italy | 8,0 | 1,4 | 3,5 | 3,4 | 2,2 | 18,5 |
| Luxembourg | 7,9 | 3,6 | 2,6 | 8,7 | 0,5 | 23,3 |
| Netherlands | 5,6 | 1,7 | 2,0 | 7,6 | 1,2 | 18,2 |
| Portugal | 7,4 | 1,7 | 3,4 | 4,0 | 0,2 | 16,8 |
| Spain | 8,1 | 0,7 | 2,9 | 6,0 | 1,3 | 18,9 |
| Sweden | 4,8 | 0,9 | 2,2 | 6,1 | 2,9 | 16,8 |
| United Kingdom | 6,3 | 0,7 | 2,0 | 4,6 | 2,5 | 16,1 |
| EU 15 | 8,3 | 1,0 | 3,3 | 4,7 | 1,9 | 19,1 |

Source: Eurostat; estimates

This concludes the review of the components of transport-related final demand on the national level. A final comparison shows that the share of transport-related final demand in GDP in the individual countries oscillates

around an average of about 19 per cent. It ranks highest in Germany, the Benelux countries, Ireland and Finland. Spain holds a position close to the average. Interestingly enough, final demand in France and the UK seems to be less transport-oriented. The share of private consumption as a source of transport-related final demand is much smaller in the two countries mentioned than e.g. in Germany. Also in its weight as a source of demand, fixed capital formation is less important than in Germany where the dynamics of reunification could still be felt strongly in the construction sector in 1995. The comparison also shows that there are considerable differences in export-orientation between countries.

4. Taking a consolidated view

4.1 Measures applied: Value-added embodied in EU transport

This chapter takes the analysis from the national to EU level, using a consolidated I-O table which differs from the original Eurostat table in that it contains an extra row and an extra column for virtual transport services with the cells of non-transport industries containing the residual values remaining after the values of their transport-related transactions had been subtracted (see table 2 in the annex).

The separation of transport from non-transport activities provides us with more comprehensive picture of the transport activities taking place within the EU and puts us in a position to use the measures discussed in the introduction to this paper in order to summarise the influence of transport as a source of demand.

In 1995, transport as an industry (covering both for-hire and own-account transport services) created 574 million ECU worth of value-added in the provision of transport services, equivalent to 9.7 per cent of EU GDP (Measure I). By their purchases of transport services, by the purchase and use of motor vehicles but also by the rest of their consumption activities private households were the dominant source of demand for transport services in the EU. In 1995, directly and indirectly close to two-thirds of the value transport industries add to GDP could be attributed to private consumption.

Table 11 Value-Added (m ECU) Created in the Provision of Transport Services: EU 1995

| Embodied in: | Measure III | | |
|---------------------------------|---------------------------------------|-------------------------------------|----------------------------------|
| | Measure II | | Imports (TI and suppliers) |
| | Measure I | | |
| | VA by Transport industries (TI) | VA by domestic supplies to TI | |
| Transport-related FD | | | |
| - Consumer exp | 208.892 | 86.455 | 17.373 |
| - Government Cons | 12.276 | 3.996 | 691 |
| - Fixed Capital Form | 41.868 | 15.316 | 2.725 |
| - Stocks | 28.810 | 18.300 | 5.578 |
| - Exports | 34.344 | 46.954 | 8.778 |
| Non-transport-related FD | | | |
| - Consumer exp | 135.358 | 57.318 | 10.830 |
| - Government Cons | 29.921 | 12.592 | 2.493 |
| - Fixed Capital Form | 48.235 | 20.368 | 3.799 |
| - Stocks | 420 | 266 | 41 |
| - Exports | 33.645 | 14.331 | 3.213 |
| Total Final Demand | 573.770 | 275.897 | 55.521 |

Source: estimates

Measure II includes the value added by domestic producer units acting as suppliers to the transport industries. It shows that moving along the supply chain raises the transport-related contribution to GDP made in provision of transport services by domestic producer units to 850 m ECU, which is 14.3 per cent of EU GDP.

Moving one step further and including import demand linked directly and indirectly to the provision transport services performed by industry (Measure III) leads us to a total of 905m ECU, which is the gross value of transport services sold by resident producers to final and intermediate users.

Measures I – III measure transport from the production side, but they are an imperfect measure of the impact of transport on the economy, because they only cover a small part of the production activities linked to transport as a whole.

Table 12 Demand Side Measures (m ECU)

| Measure IV: Transport-related final demand | | | | | |
|--|---------------------------|----------------|--------------------------|------------------------------------|---|
| Embodied in: | Transport-related VA by | | | Tr.related Imports (dir. + indir.) | |
| | Transport industries (TI) | Other sectors | of which: Supplies to TI | | |
| Transport-related FD | | | | | |
| - Consumer exp | 208.892 | 368.709 | 86.455 | 84.678 | 1.281.170 m ECU = 21.6 per cent of GDP |
| - Government Cons | 12.276 | 50.142 | 3.996 | 3.403 | |
| - Fixed Capital Form | 41.868 | 201.774 | 15.316 | 41.610 | |
| - Stocks | 28.810 | 51.970 | 18.300 | 8.650 | |
| - Exports | 34.344 | 110.120 | 46.954 | 33.925 | |
| Total | 326.191 | 782.714 | 171.021 | 172.265 | |
| Measure V: Transport-related Gross Domestic Product (GDP) | | | | | |
| Embodied in: | Transport-related VA by | | | Tr.related Imports (dir. + indir.) | |
| | Transport industries (TI) | Other sectors | of which: Supplies to TI | | |
| Transport-related FD | | | | | |
| - Consumer exp | 208.892 | 368.709 | 86.455 | 84.678 | 1.461.360 m ECU = 24.6 per cent of GDP |
| - Government Cons | 12.276 | 50.142 | 3.996 | 3.403 | |
| - Fixed Capital Form | 41.868 | 201.774 | 15.316 | 41.610 | |
| - Stocks | 28.810 | 51.970 | 18.300 | 8.650 | |
| - Exports | 34.344 | 110.120 | 46.954 | 33.925 | |
| Non-transport-related FD | | | | | |
| - Consumer exp | 135.358 | 57.318 | 57.318 | 10.830 | |
| - Government Cons | 29.921 | 12.592 | 12.592 | 2.493 | |
| - Fixed Capital Form | 48.235 | 20.368 | 20.368 | 3.799 | |
| - Stocks | 420 | 266 | 266 | 41 | |
| - Exports | 33.645 | 14.331 | 14.331 | | |
| Total Final Demand | 573.770 | 887.590 | 275.897 | 155.503 | |
| Measure VI: Transport-related Gross Domestic Demand (GDD) | | | | | |
| Embodied in: | Transport-related VA by | | | Tr.related Imports (dir. + indir.) | |
| | Transport industries (TI) | Other sectors | of which: Supplies to TI | | |
| Transport-related FD | | | | | |
| - Consumer exp | 208.892 | 368.709 | 86.455 | 84.678 | 1.424.424 m ECU = 24.0 per cent of GDP |
| - Government Cons | 12.276 | 50.142 | 3.996 | 3.403 | |
| - Fixed Capital Form | 41.868 | 201.774 | 15.316 | 41.610 | |
| - Stocks | 28.810 | 51.970 | 18.300 | 8.650 | |
| - Exports | | | | | |
| Non-transport-related FD | | | | | |
| - Consumer exp | 135.358 | 57.318 | 57.318 | 10.830 | |
| - Government Cons | 29.921 | 12.592 | 12.592 | 2.493 | |
| - Fixed Capital Form | 48.235 | 20.368 | 20.368 | 3.799 | |
| - Stocks | 420 | 266 | 266 | 41 | |
| - Exports | | | | | |
| Total Final Demand | 505.781 | 763.139 | 214.612 | 155.503 | |

Source: estimates

This gap is filled by the demand-side measures IV – VI. Transport-related final demand (measure IV) measures transport as a component of GDP. It includes the value of all goods and services delivered to final users for transport purposes. But it is not a full indicator of the importance of transport to society because it does not capture transport services consumed as an intermediate demand in supplying non-transport-related goods and services to final users. These are contained in measure V which adds transport embodied in non-transport related final demand to the rest of transport-related activities. Measure V is the most comprehensive measure of transport. It shows that in 1995 almost a quarter of the production of goods and services in the EU was directly or indirectly linked to the transport system, its requirements and the services it produces.

In contrast, measure VI measures domestic final demand related to transport, regardless of who supplies the demand, domestic producers or import. Though similar in scope to measure V, it does not include transport-related exports. It indicates that 24 per cent of total expenditure by business units and individuals in the EU are to be attributed to transport activities.

4.2 Non-transport sectors' dependence on transport

All these measures are useful indicators of the importance of transport, but they are general in character. For a more detailed picture of the linkages that exist between transport and the rest of the economy we have to look at the individual sectors' dependence on transport-driven demand.

Going back to the original I-O table for a moment, the overall importance of transport for each sector's output can be demonstrated by relating both the value of the transport services it provides on own account and the benefits it derives from transport-related demand in the form of sales of transport-related goods and services to its output in order to show the full dimension of transport-related activities it is engaged in.

As can be seen from table 13, dependence on transport-related activities is particularly high in the sectors producing fuel and power products, rubber and plastic products, metals and mineral products, but it is also amazingly high in the service industries. Unsurprisingly, the manufacturers of transport equipment are totally dependent on transport.

The last two rows of the table take a different perspective. They show the amount of transport services each sector consumes directly and indirectly per unit of output supplied to final demand. As far as reliance on transport services is concerned, the sectors producing raw materials and semi-finished goods and the construction sector show a high ranking, but mainly owing to the widespread use of passenger cars as a means of transport, most other sectors as well spend close to 10 per cent of their output directly or indirectly on the purchase of traditional or virtual transport services.

Table 13 Non-Transport Industries – Dependence on and Requirements of Transport

| Non-transport industries | Transport-related output (m ECU) | | | | Transport services required | |
|---|----------------------------------|--|-------------------------|--------------------|---|--------------|
| | Production of transport services | Supply of transport-related goods & services | Dependence on transport | Share in total (%) | per 100 units of output supplied to final demand directly (%) | in total (%) |
| Agriculture, forestry and fishery products | 9.726 | 7.878 | 17.604 | 6,0 | 3,7 | 8,4 |
| Fuel and power products | 15.693 | 234.736 | 250.429 | 41,7 | 3,3 | 6,4 |
| Ferrous and non-ferrous ores and metals | 5.197 | 58.860 | 64.058 | 26,3 | 9,3 | 17,4 |
| Non-metallic mineral products | 11.014 | 28.552 | 39.566 | 22,6 | 8,6 | 14,0 |
| Chemical products | 4.392 | 49.132 | 53.524 | 13,2 | 4,8 | 10,4 |
| Metal products except machinery | 6.322 | 55.744 | 62.067 | 23,6 | 4,3 | 9,9 |
| Agricultural and industrial machinery | 8.784 | 53.201 | 61.985 | 18,5 | 5,5 | 10,9 |
| Office and data processing machines | 3.248 | 10.910 | 14.158 | 14,3 | 5,1 | 9,8 |
| Electrical goods | 9.197 | 46.920 | 56.117 | 18,8 | 5,0 | 9,9 |
| Transport equipment | 10.679 | 431.619 | 442.298 | 100,0 | 4,9 | 11,3 |
| Food, beverages, tobacco | 34.328 | 12.103 | 46.431 | 7,1 | 5,5 | 11,1 |
| Textiles and clothing, leather and footwear | 5.544 | 11.516 | 17.060 | 6,7 | 4,2 | 9,3 |
| Paper and printing products | 5.927 | 42.389 | 48.316 | 15,8 | 4,9 | 9,7 |
| Rubber and plastic products | 3.197 | 43.705 | 46.903 | 31,0 | 4,0 | 9,1 |
| Other manufacturing products | 7.844 | 12.126 | 19.970 | 11,1 | 5,2 | 10,3 |
| Building and construction | 24.077 | 136.644 | 160.721 | 21,3 | 4,3 | 9,4 |
| Recovery, repair services, wholesale, retail | 77.228 | 214.040 | 291.268 | 23,4 | 6,4 | 9,2 |
| Lodging and catering services | 11.923 | 16.474 | 28.398 | 8,3 | 3,4 | 7,4 |
| Communication services | 10.647 | 28.863 | 39.510 | 21,4 | 3,0 | 4,5 |
| Services of credit and insurance institutions | 6.390 | 207.239 | 213.629 | 26,0 | 2,7 | 9,7 |
| Other market services | 154.824 | 305.732 | 460.556 | 21,2 | 2,0 | 3,9 |
| Non-market services | 22.141 | 64.139 | 86.279 | 5,9 | 2,1 | 4,8 |

4.3 Components of transport-related demand

Under functional aspects, transport-related demand can be divided into three components: current transport activities, activities linked to the provision and maintenance of the transport system and transport-related exports. Current transport activities include transport services produced by the transport industries (for-hire and own-account) and current expenditure on motorisation by private households. Activities linked to the provision and maintenance of the transport system include expenditure on infrastructure, transport equipment and other

capital goods required by the users and operators of the transport system in pursuance of their activities. They also include purchases of transport equipment by private households and transport-related government consumption (table 14).

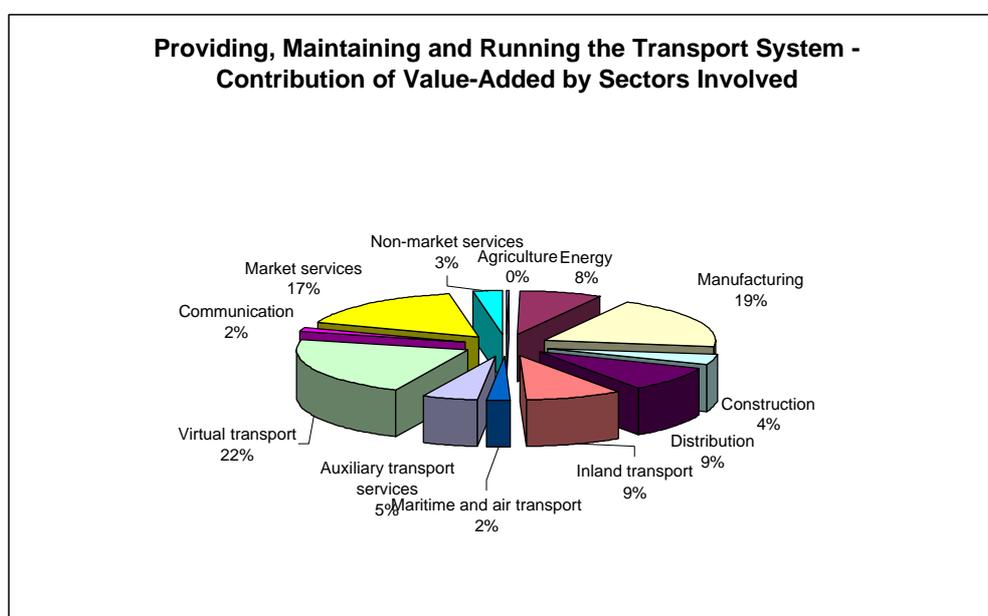
Table 14 Transport - Total Requirements, Value-Added and Use of Resources by Main Transport-Related Activities (m ECU)

| Sectors of output | Current transport services | of which linked to Transport system | Transp. -reltd. exports | Prov. & maint. of the transport system | Transport-related exports | Transp.reltd total w/o double count. | Share in total (%) |
|--------------------------|----------------------------|-------------------------------------|-------------------------|--|---------------------------|--------------------------------------|--------------------|
| Agriculture | 5.268 | 742 | 449 | 2.829 | 972 | 7.878 | 2,8 |
| Energy | 196.353 | 14.760 | 7.681 | 36.961 | 23.863 | 234.736 | 40,2 |
| Manufacturing products | 173.983 | 24.047 | 12.538 | 533.524 | 182.833 | 853.755 | 23,2 |
| Construction | 17.978 | 2.206 | 1.270 | 119.406 | 2.735 | 136.644 | 18,7 |
| Distribution | 125.805 | 7.999 | 3.573 | 84.861 | 14.947 | 214.040 | 18,5 |
| Transport | 970.177 | 159.430 | 77.089 | 159.430 | 77.089 | 970.177 | 100,0 |
| Communication services | 21.830 | 2.854 | 1.548 | 8.663 | 2.773 | 28.863 | 16,6 |
| Market services | 378.976 | 36.279 | 22.207 | 158.281 | 50.674 | 529.445 | 16,7 |
| Non-market services | 14.721 | 1.694 | 1.064 | 49.457 | 2.718 | 64.139 | 4,4 |
| Total requirements (GPV) | 1.905.091 | 250.011 | 127.419 | 1.153.413 | 358.603 | 3.039.678 | 24,9 |
| Value-added | 1.024.078 | 134.306 | 57.030 | 508.421 | 144.463 | 1.461.360 | 24,6 |
| Fixed capital stock | 5.941.822 | 697.922 | 310.700 | 2.070.618 | 661.213 | 7.237.008 | 26,5 |
| Employment (1000) | 21.741 | 2.883 | 1.211 | 11.604 | 2.983 | 31.603 | 22,0 |

Source: estimates

Useful as this distinction may be for purposes of industrial analysis, it has to be realised that it leads to double counting, because final uses including current expenditure on motorisation by private households require transport services as an intermediate input. It has also to be noted that transport industries internally rely on inputs from each other, which is another cause for double counting. Table 16 therefore shows in two separate columns to what extent supply side measures and demand side measures overlap. It also lists value-added, the use of fixed capital and employment as indicators of the economic importance of the main categories of transport-related activities.

Figure 9



Bearing in mind the qualifications that have been made, it can still be seen that in 1995 the impact of the provision of transport services on the economy was at least twice as great as that of system-related demand, and about seven times as great as the importance of transport-related exports. These ratios could change in the future because the three components of transport-related demand follow different trends. Improved technologies in transport and rationalisation might lower the use of resources required for current transport services but might

imply higher expenditure on the capital goods the system uses. Also transport-related exports might expand more heavily than transport-related domestic demand which will be moving closer to saturation.²² Depending on which course future development takes the effects on the sectors involved in producing transport-related output will be different. Their present share in providing, maintaining and running the EU transport system, i.e. in producing the transport services required by society at large, is illustrated by figure 9.

5. Summary and Conclusions

5.1 Summary

1. The definitions used in national accounting cause transport to be underrepresented as a source of income and employment
2. The ubiquity of the motor vehicle and the flexibility it affords have led to a shift in the centre of gravity of transport away from the traditional for-hire transport industries (formally identified as such) to transport activities conducted by business establishments and individuals on own account (invisible as such in national accounting).
3. The value these 'virtual' transport activities add to GDP in the EU is more than twice as high as the value contributed by the 'traditional' transport industries.
4. In the interest of greater transparency and to allow the influence transport on the economy to become fully visible, it makes sense therefore to consider virtual transport services as a separate commodity to be isolated from the rest of the output of non-transport industries.
5. For the services they produce, transport users and operators rely on a complex system of infrastructure (usually made available by governments), on transport and related equipment (they purchase on their own) and on different kinds of structures (ranging from office buildings to warehouses) which also form part of their investment. Expenditure on these items forms an important part of transport-related demand.
6. The value-added created in the provision of transport services therefore reflects only part of the impact transport has on the economy. Any useful measure of transport would have to include final demand related to transport. Transport related final demand is essentially composed of three elements: expenditure on transport by private households, provision and maintenance of the transport system and transport-related exports.
7. As a major component of transport-related final demand, transport services produced by private households are of particular interest. Over the past years, households in the EU have spent an increasing share of their income on the purchase of transport equipment and its use. They are also major purchasers of transport services.
8. Although national accounting attaches no value to transport activities of private households, they contribute to transport-related value-added by purchasing transport equipment and by current expenditure on its use.
9. For the purpose of industrial analysis, there might even be a case for considering part of their transport activities as an intermediate product, while, strictly speaking, their purchases of transport equipment are an element of fixed capital formation rather than consumption.
10. Next to transport-related activities conducted by private households, expenditure incurred in the provision and maintenance of the transport system is an important source of transport-related final demand. It includes investment in transport infrastructure, the purchase of transport equipment and expenditure on other capital goods required in the context of transport. It also includes government consumption to the extent it serves to provide the administrative framework of transport, the policing of traffic and the maintenance activities required to keep roads and other transport facilities in good order.
11. Transport-related exports are the third element of final demand to be taken into account when measuring the role of transport as a source of income and employment. Transport-related linkages across the boundaries of a country have become an increasingly important component of final demand reflecting economic integration, covering a wide range of goods and services.
12. The various forms of transport-related activities reviewed in the preceding analysis add almost a quarter to EU GDP and are responsible for more than 31 million jobs. Transport, being an important enabling technology which affords considerable benefits, therefore can rightly be considered as a cornerstone of the Union's economic and societal life.

²² Actually, transport-related exports to third countries have increased by more than 60 per cent over the period 1995-2000.

5.2 Conclusions

Given the importance of transport as a source of income and employment, changes in the technologies it relies upon, in the economic trends underlying its development and in the preferences of transport users can have a huge impact on the industries depending on transport-related demand.

There is no reason to believe that industry and society will forego the benefits of transport in the future. The movement of goods and persons will continue to be an indispensable element in the life of advanced societies for many years to come. But will transport continue to be a major driving force in economic development? The answer probably is 'no'. Employment in the transport industries is shrinking. It is barely stable in the industries involved in manufacturing transport equipment. Investments in transport infrastructure tend to fall in constant prices. Private motorisation has reached a high level in most European countries and is increasingly dominated by replacement demand. Still, the picture is not entirely bleak. Operators and users of the transport system will benefit from new technologies. The transport equipment they use in the future will be less pollutant, less noisy and less demanding in terms of energy use. The share advanced information and communication technologies contribute to the value transport adds to GDP is on the rise. New systems of propulsion are becoming feasible and new, lighter materials may take the place of iron and steel. The world of transport is not static, but it is well worth being watched carefully because many of the new technologies transport is going to use will affect the supply chains it relies upon. Input-output analysis is an extremely useful instrument to capture these changes, but to derive the full benefit from the possibilities this instrument offers, a number of requirements will have to be met:

1. The Eurostat I-O tables used in this paper are, for a part at least, based on estimates. They have been most useful in helping to demonstrate the possibilities of transport-related analysis but for definitive and reliable results a set of I-O tables will be needed that is confirmed by official statistics and provides a more detailed presentation of transport as an industry.
2. There is a deplorable lack of information on how motor vehicles are used within the EU and by whom. Filling this gap of information would greatly contribute to reduce the margin of error implied in the estimates that had to be used for this paper.
3. Following the example of US satellite accounts, a systematic effort should be made to develop a more comprehensive picture of own-account transport in the EU which is likely to remain an important element in the provision of transport services.
4. Finally, as there is less certainty than ever in extrapolating past trends in transport with key technologies on the verge of changing, it would be most helpful if arrangements in national accounting would allow these trends and the structural changes they are bound to cause to become visible in an early phase. There are parallels between transport and IT in the way they change the economy and influence its growth, but in both cases there is a lack of visibility as far as the underlying mechanism is concerned.

References

- Bundesamt für Güterverkehr 1996, *Struktur der Unternehmen des gewerblichen Straßengüterverkehrs und des Werkfernverkehrs*, Band USTAT, Stand: November 1996.
- Bureau of Transportation Statistics, U.S. Department of Transportation 1998, *Transportation Statistics Annual Report 1998*.
- Bureau of Transportation Statistics, U.S. Department of Transportation 1998, *Transportation Statistics Annual Report 1999*.
- Diekmann, A. 1999, Verkehr als Wertschöpfungsträger und Nachfragegröße, *Zeitschrift für Verkehrswissenschaft*, 70. Jahrgang, Heft 1.
- Diekmann, A. 1998, The Cost of Mobility, *Paper presented at the 12th Input-Output Conference, New York*.
- Diekmann, A. 1999, Verkehrsabhängige Wachstums- und Struktureffekte, *Internationales Verkehrswesen* (51) 12/99.
- Eurogramme 1999, Study on the Economic Importance of the Transport Sector (Final Report).
- European Commission 1999, EU Transport in Figures, *Statistical Pocket Book*.
- Eurostat "Comext"-Datenbank .
- Eurostat 1999, Input-Output Tables for the European Union (1995).
- Han, X., Fang, B. 1998, Measuring Transportation in the U.S. Economy, *Journal of Transportation and Statistics January 1998*.
- Han, X., Fang, B., Lawson A.M., Lum, S.K.S. 1998, U.S. Transportation Satellite Accounts for 1992, *Survey of Current Business, April 1998*.
- Hautzinger, H., Heidemann, D., Krämer, B., 1996. Inländerfahrleistungen 1993, *Berichte der Bundesanstalt für Straßenwesen, Mensch und Sicherheit, Heft M 61*, Bergisch Gladbach 1996
- Scharf, M.C., Smolders, W. 1998, Own account Transport of Goods by Road in the European Union (Final Report).
- UK Department of Transport 1979, Road Haulage Operators Licensing (*Report of the Independent Committee of Enquiry into Road Haulage Operators' Licensing*), London, HMSO.
- U.S. Department of Transportation, Bureau of Transportation Statistics 1999, *Transportation Satellite Accounts: A New Way of Measuring Transportation Services in America*, Washington, D.C.

ANNEX

Table 1 Physical Characteristics of the Transport System

EU 1995 - Physical Characteristics of the Transport System

| | A | B | Dk | FIN | F | D | EL | IRL | I | L | NL | E | P | S | UK | EU |
|---|--------|--------|--------|--------|--------|--------|--------|-------|---------|-----|--------|---------|--------|--------|--------|---------|
| Number of Enterprises | | | | | | | | | | | | | | | | |
| - Railways | 21 | 11 | 14 | 2 | 27 | 99 | 1 | 2 | 29 | 1 | 1 | 49 | 1 | 11 | 114 | 383 |
| - Other land transport | 11.255 | 12.322 | 11.887 | 19.286 | 81.662 | 89.317 | 20.000 | 2.252 | 102.165 | 505 | 10.949 | 185.332 | 13.566 | 22.918 | 48.078 | 631.494 |
| - Water transport | 110 | 2.415 | 876 | 290 | 2.010 | 2.413 | 175 | 43 | 565 | 39 | 4.870 | 379 | 70 | 318 | 1.194 | 15.767 |
| - Air transport | 112 | 197 | 169 | 78 | 575 | 408 | 57 | 38 | 164 | 6 | 65 | 194 | 15 | 91 | 1.083 | 3.252 |
| - Auxiliary transport services | 2.419 | 4.344 | 2.894 | 1.287 | 11.620 | 33.511 | 5.157 | 752 | 19.201 | 136 | 4.740 | 16.833 | 1.552 | 2.210 | 10.581 | 117.237 |
| Infrastructure (length of lines; km) | | | | | | | | | | | | | | | | |
| - Railways | 5672 | 3368 | 2349 | 5880 | 31039 | 41719 | 2474 | 1947 | 15998 | 275 | 2739 | 12280 | 28850 | 9782 | 16999 | 156271 |
| - Urban rail | 310 | 336 | 0 | 32 | 418 | 3181 | 26 | 0 | 555 | 0 | 490 | 536 | 102 | 258 | 599 | 6903 |
| - Roads (1000 km) | 129,9 | 144,1 | 71,7 | 77,7 | 971,1 | 660,7 | 115,2 | 91,5 | 312,2 | 5,3 | 127,1 | 164,6 | 118,9 | 139,2 | 392,9 | 3.310,0 |
| - Pipelines | 777 | 294 | 409 | 0 | 4.830 | 3.318 | 0 | 0 | 4.235 | 0 | 391 | 3.691 | 0 | 0 | 2.602 | 20.547 |
| - Inland Waterways | 351 | 1.531 | 0 | 6.245 | 5.962 | 7.343 | 0 | 0 | 1.466 | 37 | 5.046 | 0 | 0 | 0 | 2.353 | 30.334 |
| Transport equipment | | | | | | | | | | | | | | | | |
| - Rail: passenger transport veh. | 3.287 | 3.271 | 1.534 | 947 | 15.764 | 18.163 | 869 | 334 | 13.068 | 146 | 2.691 | 4.448 | 1.394 | 1.589 | 8.000 | 75.505 |
| - Rail: goods transport wagons (1000) | 27,1 | 19,6 | 4,1 | 13,7 | 112,2 | 240,5 | 11,1 | 1,6 | 80,6 | 2,3 | 5,8 | 28,7 | 4,2 | 19,9 | 14,0 | 585,3 |
| - Passenger cars (m) | 3,6 | 4,3 | 1,7 | 1,9 | 27,8 | 40,4 | 2,2 | 1,0 | 31,7 | 0,2 | 5,6 | 14,2 | 2,6 | 3,6 | 21,9 | 162,7 |
| - Light goods vehicles (1000) | 90 | 247 | 180 | 220 | 3.409 | 1.250 | 708 | 60 | 1.905 | 5 | 5 | 2.348 | 331 | 242 | 2.072 | 13.072 |
| - Heavy goods vehicles (1000) | 213 | 178 | 140 | 43 | 765 | 1.030 | 178 | 87 | 1.152 | 18 | 595 | 459 | 298 | 72 | 519 | 5.643 |
| - Buses and coaches (1000) | 9,8 | 14,6 | 13,5 | 8,1 | 80,0 | 86,3 | 24,6 | 0,4 | 77,2 | 0,8 | 12,0 | 47,4 | 15,0 | 14,6 | 80,0 | 490,0 |
| Transport services | | | | | | | | | | | | | | | | |
| - Passenger-kilometres (pkm) | | | | | | | | | | | | | | | | |
| - Passenger cars | 68,1 | 91,2 | 61,0 | 50,1 | 664,5 | 730,8 | 58,8 | 42,4 | 614,5 | 4,7 | 146,8 | 99,5 | 328,3 | 87,0 | 609,0 | 3.656,1 |
| - PTW | 1,3 | 1,4 | 0,6 | 1,0 | 16,7 | 12,8 | 8,6 | 0,3 | 53,1 | 0,0 | 2,8 | 4,0 | 13,7 | 0,7 | 4,4 | 121,3 |
| - Buses and coaches | 10,5 | 12,5 | 10,6 | 8,0 | 41,0 | 68,5 | 20,2 | 5,2 | 85,9 | 0,4 | 14,5 | 13,1 | 40,2 | 8,8 | 44,3 | 383,6 |
| - Tram and Metro | 1,5 | 0,8 | 0,0 | 0,4 | 9,0 | 8,5 | 0,7 | 0,0 | 5,2 | 0,0 | 1,4 | 0,5 | 4,3 | 1,4 | 6,8 | 40,6 |
| - Railways | 9,8 | 6,8 | 5,0 | 3,2 | 55,3 | 63,5 | 1,6 | 1,3 | 52,4 | 0,3 | 14,0 | 4,8 | 16,0 | 6,2 | 30,2 | 270,3 |
| - Waterborne | 0,0 | 0,4 | 1,8 | 2,9 | 2,0 | 1,1 | 4,8 | 1,1 | 3,5 | 0,0 | 0,4 | 0,1 | 0,2 | 4,5 | 4,5 | 27,3 |
| - Bicycle | 1,2 | 3,3 | 4,7 | 1,3 | 4,4 | 23,5 | 0,3 | 0,7 | 9,0 | 0,0 | 13,3 | 0,3 | 0,8 | 2,4 | 4,5 | 69,6 |
| - Air (Intra-EU) | 6,9 | 9,8 | 7,9 | 4,0 | 24,5 | 43,2 | 13,1 | 9,6 | 10,9 | 1,0 | 14,9 | 8,5 | 48,2 | 8,7 | 61,6 | 282,5 |
| - Total | 99,3 | 126,2 | 91,6 | 70,8 | 817,4 | 951,9 | 108,1 | 60,5 | 834,6 | 6,5 | 208,0 | 130,8 | 451,6 | 119,7 | 765,3 | 4.851,3 |
| - Tonne-kilometres (tkm) | | | | | | | | | | | | | | | | |
| - Haulage on national territory | 14,9 | 36,6 | 14,7 | 23,2 | 232,8 | 279,7 | 14,8 | 5,4 | 194,8 | 1,9 | 42,2 | 13,0 | 94,6 | 29,3 | 146,7 | 1.144,6 |
| - National haulage by vehicles registered in th | 11,3 | 19,0 | 9,3 | 21,3 | 135,3 | 201,3 | 12,4 | 4,5 | 162,4 | 0,5 | 27,0 | 11,1 | 78,7 | 27,8 | 143,7 | 865,6 |
| - International haulage by vehicles registered | 15,5 | 24,1 | 12,4 | 2,3 | 21,8 | 34,6 | 0,9 | 0,2 | 12,0 | 3,3 | 38,7 | 1,9 | 23,1 | 2,0 | 14,4 | 207,4 |
| - Railways | 13,2 | 7,6 | 2,0 | 9,6 | 48,1 | 68,8 | 0,3 | 0,6 | 21,7 | 0,5 | 3,1 | 2,0 | 10,4 | 19,4 | 13,3 | 220,6 |
| - Inland waterways | 2,0 | 5,8 | 0,0 | 0,4 | 5,9 | 64,0 | 0,0 | 0,0 | 0,1 | 0,3 | 35,5 | 0,0 | 0,0 | 0,0 | 0,2 | 114,3 |
| - Pipelines | 6,8 | 1,4 | 2,9 | 0,0 | 22,2 | 16,6 | 0,0 | 0,0 | 12,8 | 0,0 | 5,3 | 0,0 | 5,9 | 0,0 | 11,1 | 84,9 |
| - Sea (Domestic) | 0,0 | 0,1 | 2,3 | 2,6 | 6,2 | 0,8 | 7,1 | 0,3 | 35,3 | 0,0 | 0,0 | 1,4 | 37,2 | 7,9 | 52,5 | 153,7 |
| - Sea (Intra-EU) | 0,0 | 57,6 | 18,1 | 98,6 | 86,1 | 83,8 | 56,0 | 11,3 | 132,5 | 0,0 | 89,1 | 27,1 | 76,6 | 21,7 | 158,1 | 914,0 |
| - Total | 48,8 | 115,6 | 47,0 | 134,8 | 325,6 | 469,9 | 76,7 | 16,9 | 376,8 | 4,6 | 198,7 | 43,5 | 231,9 | 78,8 | 393,3 | 2.560,5 |

Source: European Commission 1999, EU Transport in Figures, *Statistical Pocket Book*

Table 2 Input-Output Tables for the EU (modified version)

Domestic Production 1995 (modified matrix)

| At producers' prices (net of all VAT) Mio. ECU | Agriculture, forestry and fishery products | Fuel and power products | Ferrous and non-ferrous ores and metals | Non-metallic mineral products | Chemical products | Metal products except machinery | Agricultural and industrial machinery | Office and data processing machines | Electrical goods | Transport equipment |
|---|--|-------------------------|---|-------------------------------|-------------------|---------------------------------|---------------------------------------|-------------------------------------|------------------|---------------------|
| Agriculture, forestry and fishery products | 34.785 | 175 | 21 | 102 | 683 | 20 | 42 | 10 | 35 | 43 |
| Fuel and power products | 11.251 | 138.421 | 22.530 | 10.995 | 26.075 | 5.333 | 4.331 | 921 | 3.402 | 5.638 |
| Ferrous and non-ferrous ores and metals | 667 | 5.501 | 54.416 | 2.216 | 2.388 | 34.363 | 19.987 | 1.999 | 10.752 | 19.534 |
| Non-metallic mineral products | 788 | 2.175 | 4.401 | 22.526 | 4.830 | 3.614 | 1.697 | 538 | 4.655 | 4.560 |
| Chemical products | 15.480 | 4.619 | 5.748 | 4.717 | 100.383 | 4.830 | 2.802 | 992 | 5.528 | 5.526 |
| Metal products except machinery | 1.282 | 2.384 | 6.046 | 1.518 | 5.638 | 22.519 | 23.287 | 2.032 | 12.565 | 26.920 |
| Agricultural and industrial machinery | 3.371 | 5.422 | 3.702 | 2.050 | 2.818 | 4.462 | 33.024 | 788 | 5.146 | 12.221 |
| Office and data processing machines | 88 | 407 | 190 | 139 | 322 | 279 | 1.408 | 8.228 | 2.193 | 1.924 |
| Electrical goods | 253 | 5.141 | 2.120 | 567 | 1.006 | 2.461 | 13.958 | 7.224 | 31.691 | 19.092 |
| Transport equipment | 102 | 64 | 121 | 129 | 162 | 78 | 700 | 14 | 95 | 67.248 |
| Food, beverages, tobacco | 32.539 | 425 | 229 | 79 | 5.744 | 88 | 169 | 42 | 142 | 184 |
| Textiles and clothing, leather and footwear | 585 | 87 | 144 | 291 | 797 | 600 | 375 | 201 | 431 | 3.008 |
| Paper and printing products | 947 | 1.468 | 860 | 3.118 | 8.389 | 2.390 | 2.790 | 2.015 | 3.945 | 1.979 |
| Rubber and plastic products | 1.028 | 1.036 | 734 | 1.387 | 7.144 | 3.878 | 5.266 | 2.220 | 11.229 | 21.112 |
| Other manufacturing products | 535 | 321 | 553 | 931 | 508 | 1.261 | 1.072 | 422 | 1.016 | 1.693 |
| Building and construction | 2.076 | 7.505 | 1.419 | 1.018 | 1.247 | 935 | 1.113 | 479 | 774 | 1.321 |
| Recovery, repair services, wholesale, retail | 14.995 | 7.392 | 19.894 | 9.476 | 14.899 | 11.960 | 13.977 | 5.416 | 13.384 | 19.625 |
| Lodging and catering services | 217 | 2.036 | 832 | 747 | 1.627 | 1.066 | 2.213 | 434 | 1.679 | 1.452 |
| Inland transport services | 3.146 | 6.489 | 12.359 | 6.176 | 6.754 | 3.708 | 3.784 | 941 | 3.196 | 5.321 |
| Maritime and air transport services | 102 | 2.106 | 725 | 669 | 1.106 | 499 | 488 | 285 | 643 | 614 |
| Auxiliary transport services | 1.269 | 3.107 | 1.862 | 1.938 | 2.818 | 1.583 | 1.855 | 385 | 1.486 | 2.110 |
| Virtual transport services | 6.322 | 8.252 | 7.661 | 6.252 | 8.607 | 5.456 | 12.077 | 3.422 | 9.439 | 13.818 |
| Communication services | 527 | 1.626 | 1.173 | 693 | 2.306 | 1.620 | 2.483 | 1.031 | 1.485 | 1.464 |
| Services of credit and insurance institutions | 3.459 | 6.077 | 2.486 | 1.600 | 5.197 | 2.539 | 4.065 | 893 | 3.779 | 5.090 |
| Other market services | 7.470 | 26.228 | 17.902 | 11.795 | 32.952 | 13.263 | 33.284 | 13.246 | 28.054 | 43.536 |
| Non-market services | 1.841 | 3.389 | 2.626 | 680 | 3.282 | 565 | 3.155 | 532 | 1.522 | 2.831 |
| DOMESTIC GOODS AND SERVICES | 145.125 | 241.833 | 170.753 | 91.789 | 247.784 | 129.369 | 189.389 | 54.700 | 158.265 | 287.864 |
| IMPORTS OF GOODS AND SERVICES | 8.246 | 61.367 | 21.267 | 6.919 | 26.622 | 12.035 | 16.472 | 7.694 | 18.059 | 27.229 |
| TOTAL INTERMEDIATES/FINAL DEMAND | 153.370 | 303.200 | 192.020 | 98.708 | 274.406 | 141.404 | 205.871 | 62.394 | 176.324 | 315.094 |
| Gross wages and salaries | 33.364 | 65.303 | 27.288 | 33.103 | 69.259 | 69.336 | 83.071 | 21.371 | 77.807 | 85.358 |
| Employers' social contributions | 2.964 | 9.898 | 4.352 | 4.916 | 8.855 | 8.243 | 8.222 | 1.928 | 8.589 | 9.948 |
| Net operating surplus | 81.463 | 85.095 | 7.366 | 17.145 | 30.730 | 26.336 | 17.455 | 8.782 | 21.673 | 14.831 |
| Net value added at factor cost | 117.791 | 160.285 | 39.005 | 55.163 | 108.843 | 103.915 | 108.748 | 32.081 | 108.070 | 110.138 |
| Consumption of fixed capital | 21.992 | 45.170 | 7.444 | 8.352 | 15.627 | 9.135 | 9.190 | 3.145 | 9.871 | 15.263 |
| Gross value added at factor cost | 139.783 | 205.455 | 46.449 | 63.515 | 124.471 | 113.050 | 117.939 | 35.226 | 117.941 | 125.401 |
| Taxes linked to production (excluding VAT) | 786 | 79.274 | 740 | 1.002 | 3.558 | 1.756 | 1.809 | 1.688 | 3.257 | 3.976 |
| Taxes on products | 1.182 | 77.120 | 290 | 456 | 2.284 | 920 | 1.043 | 1.448 | 2.356 | 2.874 |
| Other taxes linked to production | -395 | 2.154 | 450 | 546 | 1.275 | 836 | 767 | 240 | 901 | 1.102 |
| Production subsidies | 8.719 | 5.929 | 649 | 258 | 1.596 | 488 | 495 | 512 | 1.080 | 1.876 |
| Net taxes linked to production (excluding VAT) | -7.933 | 73.344 | 91 | 745 | 1.962 | 1.268 | 1.314 | 1.176 | 2.177 | 2.100 |
| Net value added at market prices | 109.858 | 233.629 | 39.096 | 55.908 | 110.806 | 105.183 | 110.063 | 33.257 | 110.247 | 112.238 |
| GROSS VALUE ADDED AT MARKET PRICES | 131.851 | 278.799 | 46.539 | 64.260 | 126.433 | 114.318 | 119.253 | 36.401 | 120.118 | 127.501 |
| Non-deductible VAT | 38 | 132 | 2 | 9 | 16 | 17 | 33 | 4 | 14 | 25 |
| ACTUAL OUTPUT | 285.259 | 582.131 | 238.561 | 162.977 | 400.855 | 255.740 | 325.158 | 98.800 | 296.455 | 442.619 |
| Transfers of ordinary by-products | -4.790 | 1.120 | -789 | 252 | -225 | 135 | -867 | -2.405 | -1.364 | -488 |
| Transfers of incidental sales | 1.119 | 799 | 75 | 303 | -682 | -17 | -93 | -796 | -6.219 | -10.512 |
| Total transfers at basic prices | -3.671 | 1.919 | -714 | 555 | -907 | 118 | -960 | -3.201 | -7.582 | -11.000 |
| DISTRIBUTED OUTPUT | 281.588 | 584.049 | 237.847 | 163.532 | 399.947 | 255.857 | 324.198 | 95.599 | 288.873 | 431.619 |

Domestic Production 1995 (modified matrix)

| At producers' prices (net of all VAT) Mio. ECU | Inland transport services | Maritime and air transport services | Auxiliary transport services | Virtual transport services | Communication services | Services of credit and insurance institutions | Other market services | Non-market services | Total inter-mediate/primary inputs | Final consumption of households |
|---|---------------------------|-------------------------------------|------------------------------|----------------------------|------------------------|---|-----------------------|---------------------|------------------------------------|---------------------------------|
| Agriculture, forestry and fishery products | 54 | 144 | 36 | 810 | 12 | 128 | 3.349 | 3.134 | 213.352 | 67.052 |
| Fuel and power products | 20.768 | 6.600 | 6.514 | 22.362 | 1.733 | 5.064 | 16.014 | 22.131 | 410.946 | 182.931 |
| Ferrous and non-ferrous ores and metals | 2.396 | 44 | 226 | 840 | 68 | 32 | 869 | 510 | 181.153 | 454 |
| Non-metallic mineral products | 346 | 50 | 104 | 522 | 88 | 26 | 1.457 | 1.917 | 136.532 | 8.289 |
| Chemical products | 506 | 396 | 439 | 1.792 | 133 | 1.241 | 12.281 | 21.762 | 268.043 | 67.923 |
| Metal products except machinery | 618 | 178 | 1.023 | 670 | 162 | 1.053 | 3.354 | 4.751 | 173.605 | 17.124 |
| Agricultural and industrial machinery | 726 | 117 | 508 | 973 | 305 | 715 | 1.406 | 8.225 | 109.345 | 2.333 |
| Office and data processing machines | 161 | 62 | 86 | 200 | 168 | 1.469 | 5.720 | 5.346 | 31.536 | 10.452 |
| Electrical goods | 1.120 | 192 | 102 | 1.717 | 2.568 | 2.012 | 6.312 | 9.292 | 132.451 | 43.346 |
| Transport equipment | 4.047 | 4.825 | 3.238 | 20.472 | 45 | 18 | 268 | 17.211 | 123.634 | 135.590 |
| Food, beverages, tobacco | 230 | 779 | 418 | 1.165 | 196 | 602 | 5.400 | 12.779 | 206.944 | 378.913 |
| Textiles and clothing, leather and footwear | 486 | 170 | 152 | 604 | 268 | 797 | 2.871 | 3.618 | 86.631 | 132.484 |
| Paper and printing products | 2.029 | 615 | 2.948 | 2.254 | 1.451 | 16.238 | 47.663 | 15.955 | 236.669 | 39.359 |
| Rubber and plastic products | 3.616 | 273 | 550 | 1.337 | 625 | 594 | 2.153 | 2.204 | 115.480 | 17.764 |
| Other manufacturing products | 288 | 99 | 230 | 319 | 193 | 2.437 | 3.337 | 5.353 | 69.451 | 72.228 |
| Building and construction | 2.873 | 385 | 1.816 | 742 | 3.124 | 7.709 | 45.979 | 32.952 | 170.719 | 21.139 |
| Recovery, repair services, wholesale, retail | 12.596 | 2.217 | 2.837 | 15.240 | 1.454 | 3.696 | 20.756 | 21.811 | 394.907 | 598.431 |
| Lodging and catering services | 1.118 | 1.183 | 3.900 | 658 | 491 | 3.403 | 10.930 | 5.188 | 57.274 | 266.085 |
| Inland transport services | 4.046 | 820 | 6.014 | 3.570 | 2.815 | 2.359 | 4.788 | 7.087 | 149.891 | 58.640 |
| Maritime and air transport services | 735 | 8.177 | 3.770 | 53 | 715 | 1.097 | 2.873 | 2.108 | 32.524 | 18.958 |
| Auxiliary transport services | 11.136 | 11.593 | 12.051 | 71 | 557 | 3.989 | 6.742 | 4.018 | 102.535 | 38.939 |
| Virtual transport services | 2.980 | 873 | 2.759 | 5.534 | 1.531 | 14.675 | 29.442 | 18.018 | 250.422 | 165.918 |
| Communication services | 1.727 | 964 | 2.867 | 5.275 | 6.341 | 22.341 | 16.350 | 12.433 | 109.985 | 60.592 |
| Services of credit and insurance institutions | 4.205 | 3.379 | 9.728 | 6.450 | 1.526 | 452.870 | 66.968 | 44.708 | 677.932 | 122.116 |
| Other market services | 15.640 | 8.311 | 18.017 | 30.368 | 8.307 | 127.886 | 222.945 | 124.015 | 1.105.571 | 808.451 |
| Non-market services | 617 | 338 | 2.802 | 1.043 | 643 | 4.414 | 28.075 | 126.323 | 200.442 | 166.338 |
| DOMESTIC GOODS AND SERVICES | 95.063 | 52.574 | 83.135 | 125.040 | 35.519 | 676.865 | 568.304 | 532.848 | 5.749.975 | 3.501.848 |
| IMPORTS OF GOODS AND SERVICES | 4.832 | 15.460 | 4.438 | 7.435 | 2.628 | 10.193 | 17.317 | 16.240 | 417.758 | 163.597 |
| TOTAL INTERMEDIATES/FINAL DEMAND | 99.895 | 68.034 | 87.573 | 132.475 | 38.147 | 687.057 | 585.621 | 549.088 | 6.167.732 | 3.665.445 |
| Gross wages and salaries | 116.612 | 18.799 | 33.160 | 133.169 | 60.682 | 253.276 | 340.112 | 744.948 | 3.062.957 | 0 |
| Employers' social contributions | 13.891 | 2.360 | 4.047 | 15.413 | 10.771 | 20.354 | 45.218 | 124.485 | 410.980 | 0 |
| Net operating surplus | -12.557 | 4.740 | 28.807 | 128.525 | 41.124 | -207.456 | 703.412 | -20.862 | 1.585.060 | 0 |
| Net value added at factor cost | 117.946 | 25.899 | 66.014 | 277.107 | 112.576 | 66.174 | 1.088.742 | 848.571 | 5.058.998 | 0 |
| Consumption of fixed capital | 42.261 | 8.429 | 10.891 | 40.675 | 23.743 | 28.299 | 233.333 | 64.450 | 720.831 | 0 |
| Gross value added at factor cost | 160.207 | 34.327 | 76.905 | 317.782 | 136.320 | 94.472 | 1.322.075 | 913.021 | 5.779.829 | 0 |
| Taxes linked to production (excluding VAT) | 1.701 | 604 | 1.149 | 10.546 | 1.299 | 15.362 | 39.917 | 11.475 | 252.899 | 0 |
| Taxes on products | 1.078 | 202 | 539 | 8.819 | 1.208 | 12.638 | 31.244 | 11.247 | 219.163 | 0 |
| Other taxes linked to production | 624 | 402 | 610 | 1.726 | 91 | 2.724 | 8.673 | 228 | 33.737 | 0 |
| Production subsidies | 24.465 | 1.110 | 814 | 3.061 | 3.713 | 2.067 | 11.968 | 620 | 93.133 | 0 |
| Net taxes linked to production (excluding VAT) | -22.764 | -506 | 335 | 7.485 | -2.414 | 13.295 | 27.949 | 10.856 | 159.766 | 0 |
| Net value added at market prices | 95.181 | 25.392 | 66.348 | 284.592 | 110.162 | 79.469 | 1.116.691 | 859.427 | 5.218.764 | 0 |
| GROSS VALUE ADDED AT MARKET PRICES | 137.442 | 33.821 | 77.240 | 325.267 | 133.905 | 107.768 | 1.350.024 | 923.876 | 5.939.595 | 0 |
| Non-deductible VAT | 207 | 262 | 1.302 | 2.888 | 2.341 | 18.927 | 19.740 | 29.764 | 76.648 | 306.584 |
| ACTUAL OUTPUT | 237.545 | 102.117 | 166.114 | 460.630 | 174.394 | 813.752 | 1.955.385 | 1.502.728 | 12.183.975 | 3.972.029 |
| Transfers of ordinary by-products | -239 | -176 | -54 | 137 | -69 | 511 | 6.671 | -84 | 0 | 0 |
| Transfers of incidental sales | 481 | 53 | 1.493 | 2.076 | -41 | 265 | 57.314 | -60.022 | 0 | 0 |
| Total transfers at basic prices | 242 | -123 | 1.439 | 2.213 | -110 | 776 | 63.986 | -60.106 | 0 | 0 |
| DISTRIBUTED OUTPUT | 237.787 | 101.994 | 167.553 | 462.843 | 174.284 | 814.528 | 2.019.371 | 1.442.623 | 12.183.975 | 3.972.029 |