New Perspectives on Service Output and Productivity: A Comparison of French and US Productivity in Transport, Communications, Wholesale and Retail Trade

Nanno Mulder*
Groningen Growth and Development Centre
University of Groningen

October 1994

* I am grateful to Bart van Ark, Angus Maddison, Michel Amar, Marc Dupuis, Michael Freudenberg, Michel Fouquin, Remco Kouwenhoven, Gyorgy Szilágyi, Deniz Ünal-Kesenci, and to participants in the workshop "International Comparisons of Price and Productivity Levels" (CEPII, February 1994) and participants of the 23rd General Conference of IARIW (St. Andrews, August 1994) for comments and advice. Michel Amar of the French Ministry of Transport kindly provided unit values and helped me with to interpret French national accounts. For help in gathering and interpreting data I am grateful to Deniz Ünal-Kesenci and INSEE ("division commerce"). Responsibility for remaining errors lies solely with me. This research was supported by the Dutch Foundation for Scientific Research (NWO).

Memorandum from
Institute of Economic Research*
Faculty of Economics
University of Groningen
P.O. Box 800
9700 AV Groningen - The Netherlands
tel. 31-50-633741
fax. 31-50-637337

* Research memoranda of the Groningen Growth and Development Centre are published as a sub-series of the memorandum series of the Institute of Economic Research.

INTRODUCTION

Comparisons of output and productivity have hitherto concentrated on performance in the commodity producing sectors. However, the interest in performance in services is growing rapidly. Services is the sector accounting for the largest share in employment and GDP in industrialised countries[1]. The performance of an economy as a whole is therefore largely dependent on the productivity in services. The branches covered in this study are transport, communications, wholesale and retail trade.

Labour productivity relates value added to labour input. Value added represents the market value contributed by a sector or the income of the factor inputs used. In order to compare France and the USA, value added was converted to a common currency using unit value ratios (UVRs). UVRs are calculated by dividing gross value of output to the number of physical units produced. Ouput of some service industries, like transport and communications, can largely be captured by physical indicators such as tonne or passenger kilometres. For other service industries, like wholesale and retail trade, quantification is much more difficult. If physical output cannot be measured, UVRs cannot be calculated directly. The alternatives are the derivation of UVRs in an implicit way or the use an alternative set of converters.

This study is divided into two parts. The first part deals with transport and communications and the second part with wholesale and retail trade.

1. TRANSPORT AND COMMUNICATIONS

1.1 Key Characteristics of Transport and Communications in France and the USA

Some features of French and US transport are presented in Table 1 to 8. The size of the transport infrastructure is shown in Table 1. The length of the US railway network was 6 times that of France. The USA had 1.4 times more kilometres of rail track per head of population as France. The USA had 26 kilometres of paved roads per capita: 1.8 times the French figure. France had more inland waterways per capita than the USA.

---

[1] The share of services in total employment was 70.4 per cent in the USA and 63.5 per cent in France in 1987 (A. Maddison, 1991, pp. 248-249).

Table 1
Transport Infrastructure in France and the USA, 1987

	USA		France		USA/ France
	Length (km)	Km per capita	Length (km)	Km per capita	(2)/(4)
	(1)	(2)	(3)	(4)	
Railway track	212,787	0.87	34,647	0.62	1.40
Paved roads	6,234,640	25.56	804,890	14.47	1.77
Inland waterways	20,573	0.08	6,384	0.11	0.73

Sources: United Nations, *Annual Bulletin of Transport Statistics for Europe*, 1989, New York.

Table 2 shows the 1987 stock of vehicles. Car ownership was more common in the USA, i.e. namely 0.6 cars per capita in the USA whereas there were only 0.4 cars per head of population in France. The number of trucks (excluding trailers) per capita was the same in both countries. France had 2 times as many busses per capita.

Table 2
Number of Motor Vehicles in Use, France and the USA, 1987

	USA		France		USA/ France
	Total (000s)	Per capita	Total (000s)	Per capita	(2)/(4)
	(1)	(2)	(3)	(4)	
Private automobiles	151,443	0.62	21,970	0.39	1.59
Motorcycles	4,886	0.02	1,704	0.03	0.67
Trucks	14,849	0.06	3,204	0.06	1.00
Busses (linebusses and touringcars)	602	0.002	215	0.004	0.50
TOTAL (All motor vehicles)	171,779	0.704	27,093	0.487	1.45

Sources: USA as for Table 1; France from OEST, *Mémento de Statistiques des Transports, Resultats 1988*, pp. 148-9.

The shares of the different modes of domestic passenger transport are shown in Table 3. Private transport by car accounted for more than 80 per cent of all passenger

movements in both countries. It should be stressed that private car transport is not included as economic activity in the national accounts and is therefore excluded from our analysis of output and productivity. Less than 20 per cent of all passenger movements was by public transport in the two countries. The most important mean of public passenger transport was airways in the USA and railways in France. The share of bus transport was relatively smaller in the USA than in France.

Table 3
Modes of Domestic Passenger Traffic, France and the USA, 1987

	USA		France	
	Passenger km (billion)	Percent distri-bution	Passenger km (billion)	Percent distri-bution
	(1	(2)	(3)	(4)
Private automobile	2,447	80.2	533	81.7
Domestic airway	549	18.0	9	1.4
Bus	37	1.2	42	6.4
Railway	19	0.6	69	10.5
TOTAL (All modes)	3,052	100.0	653	100.0

Sources: USA US Dept. of Commerce, *Statistical Abstract of the United States 1992*, Table 987. France from INSEE/OEST (1993), *Les Transports en 1992, 30eme Rapport de la Commission des Comptes*, p. 16.

Domestic freight transport by various modes is shown in Table 4. Railways were the most important means of freight transport in the USA whereas in France most commodities were transported by road (37 per cent and 60 per cent respectively of total freight traffic). Inland waterways were relatively more important in the USA than in France. Pipelines accounted for 22 per cent of freight traffic in the USA and 13 per cent in France. Pipelines were excluded from the France/USA comparison.

Table 4
Modes of Domestic Freight Traffic, France and the USA, 1987

	USA		France	
	Tonne km (billion)	Percent distri-bution	Tonne km (billion)	Percent distri-bution
	(1)	(2)	(3)	(4)
Railway	1,564	36.8	50	24.4
Truck	1,064	25.0	121	59.6
Inland waterway	661	15.6	7	3.3
Pipeline	944	22.2	26	12.6
Domestic airway	14	0.3	0	0.0
TOTAL (All modes)	4,247	100.0	203	100.0

Sources: From USA Dept. of Commerce, *Statistical Abstract of the United States 1991*, Table 1015. France as for Table 3, p. 14.

Table 5
Communications in France and the USA, 1987

	USA		France		USA/ France
	Number	Number per capita	Number	Number per capita	(2)/(4)
Access lines (thousands)	111,000	0.46	24,642	0.44	1.05
Calls (million)	449,785	1,848	21,282	384	4.81
Items of mail handled (million)	153,931	631	15,456	278	2.27

Sources: France access lines and items of mail handled from INSEE (1988), *Annuaire Statistique de la France 1988, Resultats de 1987*, p. 726 and 729. US access lines and items of mail handled from USA Dept. of Commerce, *Statistical Abstract of the United States 1991*, Table 910 and 917.

Note: The number of calls was estimated by multiplying the number of access lines by the average number of calls per access line as provided by McKinsey (1992, p.5).

Communications

The US standard industrial classification treats radio and television broadcasting as part of communications, whereas this is not the case in France[2]. In this paper I excluded radio and TV broadcasting from communications. Some key characteristics of telecommunications and postal services are shown in Table 6. France and the USA had almost the same number of access lines per capita in 1987. The number of calls made per capita in the USA was five times higher than in France. The number of items of mail handled per capita in the USA was more than twice the French figure.

French and US gross value added in transport and communications are shown in Table 6. Data were taken from the national accounts of both countries. The last two columns show the relative shares of each branch in total transport value added. Road freight transport was the predominant branch in both countries and accounted for more than 43 per cent of transport GDP. Road passenger transport was the second most important branch in France (35.3 per cent of transport GDP) whereas in the USA this branch accounted for only 6.1 per cent. In Table 3 we saw that the share of French bus transport was more than five times that in the USA. The US railways share in total transport GDP was much higher than the French share. Private car transport is not regarded as a market activity, and is therefore excluded from sectoral output. The French share of transport and communications in total GDP was 1.3 percentage points higher than the US share.

Persons engaged and annual hours worked per person in transport and communications are presented in Table 7[3]. Road freight transport was the most important branch also in terms of employment in both countries. Air transport was relatively more important in the USA than in France also in terms of employment: the US share in total

---

[2] Radio and television broadcasting is part of cultural and recreational services (SIC code 86).

[3] Employment in both countries was derived from the national accounts. At the branch level only total hours worked were given in the French national accounts. Hours per person were estimated by the ratio of total hours worked to total persons engaged. US hours worked were estimated using a method applied by Pilat (1993): Hours worked were estimated separately for paid employees and proprietors. Employees in transport and communications were paid on average 39.2 hours per week in 1987 (BLS, 1991, *Employment, Hours and Earnings, 1909-90*). Hours paid were adjusted for holidays, sickness, strikes, etc. in order to arrive at hours worked. This was done using a ratio of hours worked to hours paid as provided by the BLS, i.e. 0.927 for transport and communications. The procedure for self-employed was similar, except that they worked 1.06 times more hours per week compared to paid employees, as estimated by Becker (1984).

employment in the USA was three times the French share. US persons engaged worked on average more hours than the French in all branches of transport and communications. The transport branch with the most hours worked was road goods transport in both countries, and the branches with the least hours worked were rail and air transport.

Table 6
Gross Value Added in Transport and Communications, France and the USA, Million US$ (Converted by the Exchange Rate), 1987

	Value Added in US$		% Share in Transport	
	France *)	USA	France	USA
Transport:				
1. Railways	4,848	20,438	6.2	22.2
2. Road Passenger Transport	5,955	12,755	35.3	6.1
3. Road Freight Transport	8,349	61,849	43.4	43.7
4. Water Transport	828	7,039	2.7	6.9
5. Air Transport	3,217	30,316	4.7	15.7
6. Transportation Services	10,271	11,667	7.8	5.4
Total (All branches)	33,469	144,064	100.0	100.0
Communications	20,084	109,271		
Transport and Communications	53,553	253,335		
Share of Trans./Comm. GDP in total GDP	6.62 %	5.58 %		

Sources: French GDP in transport from INSEE/OEST (1993), *Les Transports en 1992, 30eme Rapport de la Commission des Comptes*, Paris; US GDP at factor cost was supplied by Robert Parker of the Department of Commerce.

*) GDP figures converted by the exchange rate (i.e. 6.011 francs per US$).

Note: the figures in Table 6 apply only to public transport. Only a small share of consumer expenditure on transport was on public transport, i.e. only 14.5 percent in France (INSEE, *Les Comptes des Transports en 1988*, Table 5.2) and 15.8 per cent in the USA (US Dept. of Commerce, *Statistical Abstract of the United States 1990*, Table 1013). 85.5 Per cent of transport expenditures in France and 84.2 per cent in the USA was on private transport (the purchase of new and used cars, tires and accessories, gasoline, car insurance, etc.). Private car transport is not considered as a market activity.

Table 7
Persons Engaged in Transport and Communications
France and the USA, 1987

	Persons Engaged (thousands)		Average Hours Per Person	
	France	USA	France	USA
Transport:				
1. Railways	128	308	1,633	1,890
2. Road Passenger Transport	188	376	1,763	1,902
3. Road Freight Transport	227	1,760	1,807	1,904
4. Water Transport	20	183	1,741	1,894
5. Air Transport	55	606	1,633	1,890
6. Transportation Services	190	326	1,675	1,896
Total (All branches)	808	3,559	1,725	1,899
Communications	442	972	1,556	1,780
Transport and Communications	1,250	4,531	1,665	1,873

Sources: French persons engaged and total hours worked in transport from INSEE/OEST (1993), *Les Transports en 1992, 30eme Rapport de la Commission des Comptes*, Paris. Average hours worked is ratio of total hours worked to number of persons engaged. Employment and hours worked in communications from INSEE (1990), *Rapport sur les Comptes de la Nation, 1989, Comptes et Indicateurs Economiques*, Paris; US persons engaged from US Dept. of Commerce (1992), *The National Income and Product Accounts of the United States, 1959-88*, Washington DC. US hours worked was estimated as described in text.

1.2 Matching French and US Transport and Communications

Labour productivity was estimated in terms of gross value added per person engaged or per hour worked. In order to compare France and the USA, value added was converted to a common currency. This was done using unit value ratios (UVRs), which represent ratios of unit production values. These were not directly available, but were calculated by the ratio of the gross value of output to the physical output produced. The estimation of the quantities produced and the gross value of output is discussed below.

Table 8
Moving and Terminal Services of Freight and Passengers, France and the USA, 1987

	Quantities Produced (million)						Gross Value of Output	
	Moving services (tonne km or passenger km)			Terminal Services (tonnes or passengers)				
	USA	France	USA/ France	USA	France	USA/ France	France (million francs)	USA (million US$)
Passenger transport:								
- rail	8,637	59,700	0.1	21	781	0.03	35,820	681
- urban transport	n.a.	n.a.		8,806	3,681	2.4	33,400	14,172
- long distance bus	35,237	33,700	1.0	333	280	1.2	12,677	1,717
- air	650,680	44,314	14.7	448	28	16.1	28,804	45,866
Freight transport:								
- rail	1,377,504	49,700	27.7	1,244	142	8.7	18,389	25,797
- road	1,039,066	99,900	10.4	n.a.	1,309		75,449	136,300
- inland water	599,798	4,656	128.8	977	32	30.6	1,462	19,100
- sea	n.a.	n.a.		88	49	1.8	16,555	2,614
- air	14,617	4,145	3.5	n.a.	n.a.		7,212	7,621

Sources: French quantities produced from INSEE (1990), *Annuaire Rétrospective de la France, 1948-88*, Paris, and OEST (1989), *Mémento de Statistiques des Transports, Resultats 1988*, Paris. French Gross values of output were estimated by multiplying the number of passenger km or tonne km by the production unit values as supplied by Michel Amar of the French Ministry of Transport. US quantities produced and gross values of output were from US Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States*, various issues, Washington DC.

Note: French gross values of output correspond to total costs (revenues plus subsidies) of transport activities whereas GVO in the USA refer to gross revenues at market prices.

1.2.1 *Estimation of Quantities Produced and the Gross Value of Output in Transport*

Physical output produced in transport consists essentially of two parts: (a) moving freight or passengers over a certain distance ("moving services"), and (b) loading and unloading ("terminal") services. The first can be measured in numbers of tonne kilometres or passenger kilometres, and the second by the amount of tonnes of freight or number of passengers loaded or unloaded, see Table 8. This table also shows the gross value of output (GVO) for each mode of transport. An important difference between France and the USA is the regulation and subsidisation of the transport sector. In France, major parts are government owned (e.g. railways (SNCF), road passenger transport (RATP, municipal services), and air transport (Air France, Air Inter and UTA)), and are

subsidised to some degree. In the USA, most transport is privately owned and not subsidised. Prices of French publicly owned firms are not market prices, but are regulated and often below cost. Public firms are therefore often subsidised. In the USA, private transport companies are free to set prices which cover total costs. I measured gross value of output in the USA by operating revenues, whereas in France subsidies were added to revenues in order to estimate total costs. My French gross value of output is therefore a cost concept, whereas for the USA I use a revenue concept. The sources of the data for French and US transport and communications were sectoral statistics and national accounts[4].

In most previous international comparisons of output and productivity in transport, only the moving of goods and passengers was considered as output. It was assumed that the proportionate amount of terminal services is the same in each country. As long as this is the case, the passenger and tonne km measures are good proxies of total output. To get some impression of the proportionate amount of terminal work, average distances over which freight and passengers were moved in France and the USA are compared in Table 9.

Table 9
Length of Average Passenger Trip and Average Freight Haul
USA and France, 1987

	USA	France	USA/α France	
	(1)	(2)	(3)	(4)
Passenger transport:				
railways	417	76	5.4	50.82
bus	106	121	0.8	80.12
airways	1,452	1,588	0.9	10.09
Freight transport:				
railways	1,107	349	3.1	70.68
trucks	n.a.	76		
domestic water	614	146	4.2	10.76
airways	n.a.	n.a.		

Source: Tables 8.

Note: α is the weight of terminal services in the composite index of US relative transport output, see text.

[4] In France and the USA there is a transport census for 1987. These sources supply information on revenues, costs and employment, but not on physical quantities produced. These sources could therefore not be used to estimate unit production values. Another reason why other sources were consulted was because of the incomplete census coverage of the transport sector. In the USA, the census only covered road freight transport and warehousing, water transport, and transportation services. In France, railways, a large share of road passenger transport and transportation services were excluded.

The average US rail passenger journey was 5.45 times as long as in France. The distances travelled by bus and aeroplane were rather similar in the two countries. Train and domestic water freight hauls were much longer in the USA. A shorter average haul in French rail freight transport means that France produces comparatively more terminal services than the USA, and needs relatively more labour because it has relatively more loading and unloading work. French output would be underestimated if no allowance were made for these proportionately higher terminal services. There are different ways to impute the varying relative importance of terminal services, see Mulder (1994).

US relative output (Q^{USA}) was estimated by a composite index, in which French output (Q^{Fr}) was set equal to 100. This composite index is the weighted average of i) the relative amount of US freight or passenger moving services compared to France, and ii) the relative amount of US terminal services compared to France, see formula (1). M^{USA} and M^{Fr} represent the movement of freight or passengers in the USA and in France respectively measured by the number of tonne km or passenger km. T^{USA} and T^{Fr} represent terminal services in the USA and in France respectively measured by the amount of tonnes of freight or number of passengers loaded or unloaded. The weights are $(1-\alpha)$ for moving services (i.e. M^{USA}/M^{Fr}) and α for the terminal services (i.e. T^{USA}/T^{Fr}). The weight α is between 0 and 1.

$$Q^{USA} = \left[(1-\alpha)\frac{M^{USA}}{M^{Fr}} + \alpha\frac{T^{USA}}{T^{Fr}}\right] * 100; \quad Q^{Fr} = 100 \qquad (1)$$

The share α is determined by the difference between the French and the US average freight haul or passenger trip, see formula (2a) and (2b). H^{USA} and H^{Fr} represent the average distance over which freight or passengers were transported in 1987 in the USA and in in France respectively (see Table 9). The bigger the difference between H^{USA} and H^{Fr}, the higher α will be (i.e. the bigger the weight of terminal services in the composite index).

$$\alpha = \left(1 - \frac{H^{Fr}}{H^{USA}}\right) \text{ if } H^{Fr} < H^{USA} \qquad (2a)$$

or

$$\alpha = (1 - \frac{H^{USA}}{H^{Fr}}) \; if \; H^{Fr} > H^{USA} \qquad (2b)$$

Below two examples are presented of the derivation of US relative output: rail freight (big difference in average freight haul) and air passenger transport (similar average passenger trip length).

Example 1: rail freight transport

The French average freight haul was shorter than the average US haul: 349 km compared to 1,107 km. French railways produced therefore relatively more terminal services than their US counterpart. This can be seen by the higher relative US output of tonne km of freight moved (M^{USA}/M^{Fr} = 1,377,504/49,700 = 27.7.) compared to the relative US output of freight loaded and unloaded (T^{USA}/T^{Fr} = 1,244/142 = 8.7). French output would be underestimated if only the movement of freight was considered (the ratio "M"). Total transport output was therefore measured by the weighted average of the "M" and "T" ratios. The weight of the terminal services α is determined by formula (2a), because $H^{USA} > H^{Fr}$: α = 1 - 349/1,107 = 0.68. The weight of the moving services is (1 - 0,68) = 0.32. US relative output (France is 100.0) is subsequently derived by formula (1): Q^{USA} = (0.32*27.7 + 0.68*8.7) * 100 = 1,473

Example 2: air passenger transport

The French average air passenger trip was slightly longer than the US trip: 1,588 km compared to 1,452 km. The proportionate amount of terminal services was therefore not very different in the two countries. This can be seen by the similar relative US output of passenger km flown (M^{USA}/M^{Fr} = 650,680/44,314 = 14.7) compared to relative US output of passengers boarded and unboarded (T^{USA}/T^{Fr} = 448/28 = 16.1). The weight of the terminal services α is determined by formula (2b), because $H^{USA} < H^{Fr}$: α = 1 - 1,452/1,588 = 0.09. The weight of the moving services is (1 - 0,09) = 0.91. US relative output (France is 100.0) is subsequently derived by formula (1): Q^{USA} = (0.91*14.7 + 0.09*16.1) * 100 = 1,459.

The first example shows that if the difference between the average distances is big, the proportionate amount of terminal services will be higher in the country with the shorter average haul. Now α will be closer to 1, and US relative output will be mainly determined by the the relative amount of US terminal services (i.e. T^{USA}/T^{Fr}). If the difference in average freight haul or passenger trip length between two countries is small, like we saw in the second example, then the proportionate amount of terminal services is roughly the same in each country. In this case α will be close to 0, and US relative

output will mainly be determined by the relative amount of US moving services (i.e. M^{USA}/M^{Fr}).

1.2.2 Communications

Two branches of communications were considered: telephone and telegraph services, and postal services. Telephone services accounted for approximately 70 per cent of communications GDP in both countries. Physical output of telephone services was measured using a method developed in McKinsey (1992)[5]. Postal services output was measured by the items of mail handled. It was assumed that the composition of the mail handled in both countries was the same. Post offices in both countries also provided financial services. These were excluded from the analysis.

1.3 UVRs, Value Added and Labour Productivity: 1987 and 1970-90

1.3.1 Unit Value Ratios

Physical output and the gross values of output were used to derive production unit values. The ratio of a French to the US unit value is defined as the unit value ratio (UVR). If a UVR is to be calculated for a branch of transport or communications, the specific UVRs had to be weighted. Either French or US produced quantities can be used. A Paasche UVR is derived if the former set of weights is used and a Laspeyres UVR if US weights were used. The geometric average of both is the Fisher UVR. The second step - aggregation from branch to sector level - is made by weighting the branch UVRs by gross value added of each branch, as listed in Table 6 (see van Ark and Kouwenhoven, 1994 and Freudenberg and Ünal-Kesenci, 1994, for a discussion of the derivation of UVRs).

---

[5] McKinsey estimated for five countries (including France and the USA) that 85 per cent of the employees were engaged in installing and maintenance of the network, and 15 per cent in traffic related parts (providing for example directory services) in 1989. McKinsey estimated US relative output by a weighted average of the quantity ratios of the number of access lines (network) and calls (traffic), using employment shares as weights (0.85 for network and 0.15 for calls (notice the similarity with formula (1)). French statistics do not give information on the number of calls in 1987. I estimated the traffic by multiplying the number of access lines by the average number of calls per line in 1989 as provided by McKinsey (1992, p. 5): 870 in France and 3,550 in the USA. The 1987 number of calls per telephone is likely to be same as the 1989 figure, i.e. McKinsey (p. 12) found that the number of calls per access line did not change significantly over time in the USA.

The Paasche, Laspeyres and Fisher UVRs for branches and for total transport and communications are shown in Table 10. No UVRs could be derived for transportation services. It was assumed that these UVRs were equal to the weighted average of the UVRs for other branches, using gross value added data as weights.

Table 10
Paasche and Laspeyres UVRs in Transport and Communications
France and the USA, 1987 (francs per US$)

	With French quantity weights (Paasche UVRs)	With US US quantity (Lapeyres UVRs)	Geometric average
TRANSPORT:			
1. Rail Passenger	2.53	2.53	2.53
Rail Freight	10.50	10.50	10.50
Total Railways	3.41	10.30	5.93
2. Road Passenger	6.11	5.88	5.99
3. Road Freight	5.76	5.76	5.76
4. Water Freight	10.02	5.01	7.09
5. Air passenger	9.16	9.16	9.16
Air freight	3.38	3.38	3.38
Total Airways	6.82	8.34	7.55
6. Transportation Services	6.66	5.90	6.27
Total (All branches)	6.66	5.90	6.27
COMMUNICATIONS:			
1. Postal services	13.26	13.26	13.26
2. Telecommunications	4.19	4.19	4.19
Total (All branches)	5.66	6.27	5.96
TRANSPORT AND COMMUNICATIONS	6.35	5.84	6.09
Exchange rate	6.01	6.01	6.01

Source: UVRs for branches were estimated by using quantities and gross values of output of Table 8, and the average distances over which freight and passengers were moved (Table 9), see text.

Note: The Paasche and Laspeyres UVRs for total transport and were obtained by weighting the UVRs of separate branches. Gross value added data were used as weights. UVRs for transportation services were the same as the average for the other branches, using GVA data as weights.

Low UVRs were found for rail passenger, air freight, inland water transport and telephone services. The UVRs for rail freight, air passenger and postal services were high. The Paasche and Laspeyres UVRs for total railways were very different, because rail freight was the predominant part of railways in the USA (97 per cent of revenues) whereas in France passenger transport was more important (67 per cent of GVO). The Paasche UVR for total transport and communications was 6.35 and the Laspeyres 5.84 francs per US dollar. The geometric average (Fisher) was close to the 1987 exchange rate: 6.09 compared to 6.01 francs per US dollar.

Table 11 compares UVRs estimated by the industry-of-origin approach (ICOP) in this study with those of the expenditure approach as followed by EUROSTAT. Freight transport is an intermediate service and is therefore excluded from the final expenditure approach. The 1987 ICOP UVRs were deflated to 1985 prices using branch GDP data in constant and current prices. The ICOP Fisher UVRs of long distance rail and bus transport and telephone and telegraph services were similar to the EUROSTAT PPPs. The UVRs for air passenger transport and postal services were higher than those of EUROSTAT. This indicates that the French relative consumer price was much lower than the French relative producer costs of these services. This is probably due to the subsidisation of these services.

Table 11
Comparison between ICOP Fisher UVRs and Detailed EUROSTAT Binary PPPs in Transport and Communications, France and the USA, 1985
(francs per US$)

	ICOP Fisher estimate	EUROSTAT detailed binary
Passenger Transport:		
1. Long distance bus and rail	4.26	4.51
2. Air Passenger Transport	11.44	6.02
Communications:		
1. Telephone, Telegraph Services	3.85	5.49
2. Postal Services	12.20	9.13

Sources: ICOP Fisher estimates are the geometric average of the Paasche and the Laspeyres estimates of Table B4. Expenditure PPPs were supplied by EUROSTAT.

1.3.2 Levels of Labour Productivity in 1987

The UVRs of Table 10 were used to convert gross value added of Table 7 to common prices. Relative labour productivity levels were calculated by the ratio of gross value added in a common currency to persons engaged or hours worked. This is shown in Table 12. The relative French performance is higher if labour input was measured by hours worked instead of persons engaged. The Paasche and the Laspeyres estimate of relative French productivity was very different in railways and water transport. This is due to the large difference of the Paasche and Laspeyres PPPs for these branches which were used to convert value added[6]. French relative labour productivity (value added per hour worked as a percentage of the USA, Fisher estimate) was low in railways, but above the US level in all other branches of transport except for water transport.

Table 12
Gross Value Added Per Person Engaged and Per Hour Worked in Transport and Communications Converted by Paasche and Laspeyres UVRs, France as a Percentage of the USA, 1987

	Per Person Engaged			Per Hour Worked		
	Paasche UVRs	Laspeyres UVRs	Geometric average	Paasche UVRs	Laspeyres UVRs	Geometric average
TRANSPORT:						
1. Railways	100.5	33.3	57.9	116.3	38.6	67.0
2. Road Passenger Transport	91.7	95.3	93.5	98.9	102.9	100.9
3. Road Freight Transport	109.3	109.3	109.3	115.2	115.2	115.2
4. Water Transport	64.3	128.5	90.9	70.0	139.8	98.9
5. Air Transport	102.8	84.1	93.0	119.0	97.3	107.6
6. Transportation Services	136.6	154.1	145.0	154.5	174.3	164.1
Total (All branches)	103.2	96.0	99.5	113.6	105.7	109.6
COMMUNICATIONS	48.5	43.8	46.1	55.7	50.4	53.0
TRANSPORT AND COMM.	82.9	76.3	79.5	93.4	85.9	89.6

Sources: Gross value added from Table 6 was converted by the UVRs of Table 10, and divided by persons engaged and hours worked of Table 7.

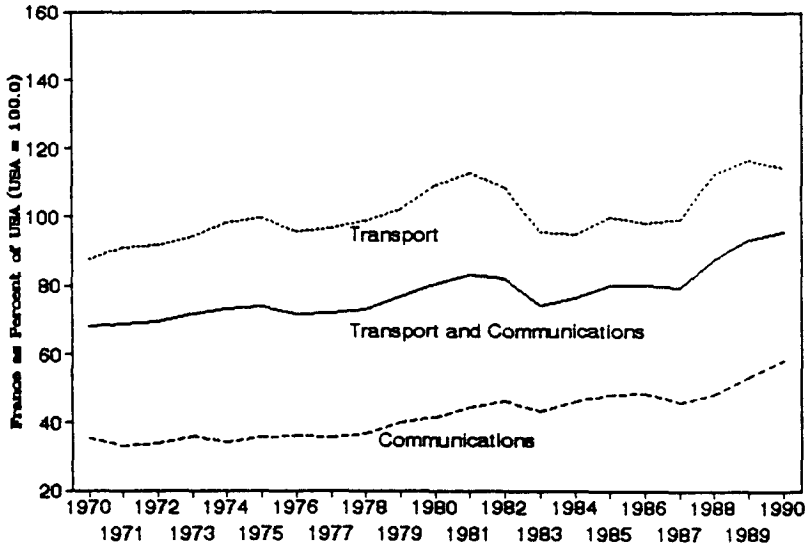
[6] The Paasche and Laspeyres UVRs for rail and water transport were very different due to large differences in i) the UVRs for the "sub-branches" (rail passenger and rail freight, and sea and inland water transport), and ii) the composition of these branches (passenger transport was the predominant activity in French railways, whereas in the USA freight transport was more important; French water transport was dominated by sea transport whereas in the USA inland water transport was the main activity).

Productivity in communications was low compared to the USA. Overall French value added per hour worked was 89.6 per cent of the US level (Fisher estimate).

1.3.3 Changes in Labour Productivity: 1970-90

The 1987 benchmark estimates of value added per person engaged were extrapolated to cover the period 1970-90. This was done using time series of GDP in constant prices and employment. Graph 1 shows French GDP per person as a percentage of the USA. French relative productivity in total transport and communications rose from a level of 65 per cent in 1970 to 98 per cent of the US level in 1990. Transport and communications separately show similar trends.

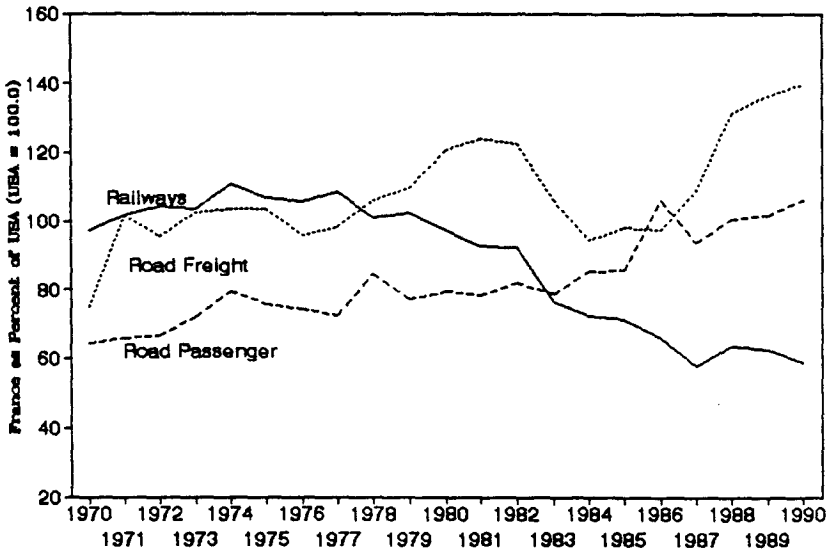
Graph 1
Value Added per Person Engaged in Transport and Communications: France as Percent of USA, 1970-90



Sources: Table 12 and Appendix Tables A1 to A8.

Graph 2 and 3 show French relative labour productivity (value added per person engaged[7]) as per cent of the USA in six branches of transport during the period 1970-90. French relative rail, road freight, and road passenger are presented in Graph 2. French performance in railways worsened relative to the USA, whereas French relative labour productivity in road freight and road passenger transport improved. Graph 3 shows water and air transport and transportation services. Air and water transport show large productivity gains relative to the USA. French productivity in transportation services also rose to almost 160 per cent of the US level in 1990[8].

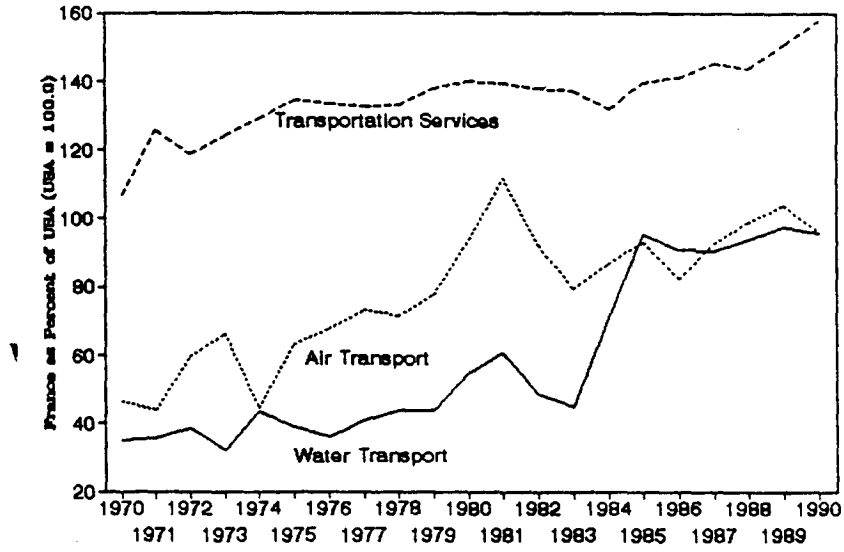
Graph 2
Value Added per Person Engaged in Railways, Road Freight and Road Passenger Transport: France as Percent of USA, 1970-90



[7] The branch results for value added per hour worked of Table 12 could not be extrapolated, because the US national accounts do not provide series of hours worked per branch of transport.

[8] See also Appendix Table B5: value added per person engaged in transport, communications, wholesale and retail trade.

Graph 3
Value Added per Person Engaged in Water Transport, Air Transport, and Transportation Services: France as Percent of USA, 1970-90



Sources: Table 12 and Appendix Tables A1 to A8.

2. Wholesale and Retail Trade

2.1 Wholesale and Retail Trade in France and the USA

The Place of Distribution in the Economy

Distribution accounts for the biggest share in service employment and GDP in France and the USA. National accounts data are not directly comparable between France and the USA, because the US accounts include eating and drinking places in distribution, whereas in France this is not so. Dupuis et Maricourt (1989) adjusted the national accounts employment to a comparable basis for 1985 and concluded that employment in wholesale and retail trade accounted for 14.2 per cent of total employment in France and for 17.9 per cent in the USA. During the 1970-90 period, a decrease in the GDP share and an increase in the employment share in both countries was observed. Regarding the composition of the distribution sector in France, i.e. the share of wholesale and retail trade in total distribution, an increase was observed of the wholesale share, and a slight decrease of the retail share in both GDP and employment (see Messerlin 1993, p. 29). In the USA, The same compositional changes took place.

The French and US Distribution System Compared

Information on French distribution was drawn from INSEE (1990), *Enquête Annuelle d'Entreprise dans la Commerce: Principaux Resultats Relatifs à 1987.* This source supplied all the necessary information for firms, but did not list the number of establishments. These were drawn from *Système Informatique pour le Répertoire des Entreprises et des Établissements* (SIRENE), published annually by INSEE. The number of distribution firms included in SIRENE was 17 per cent higher than the number of firms listed in the census.

Data on US distribution were taken from the *1987 Census of Retail Trade*, *1987 Census of Wholesale Trade* (Bureau of the Census, 1989), and unpublished government sources for figures on wholesale establishments without a payroll on the aggregate level[9].

---

[9] Data on sales and paid employees were provided both for establishments and firms. The retail census included establishment with and without a payroll, i.e. outlets which had or not had paid employees. The wholesale trade census excluded nonemployer establishments. Unpublished goverment sources provided estimates of the number of establishments, the legal form of organisation (i.e. proprietorships, partnerships or corporations), and sales for the total of nonemployer wholesalers.

The tables in the text will show data for total wholesale trade, in and excluding wholesalers without a payroll. Nonemployer wholesalers were excluded from the productivity analysis.

US gross margins and value added were derived from other census publications[10]. In wholesale trade, margins and value added data were supplied only for merchant wholesalers. Nonmerchant wholesalers (i.e. mainly branches that manufacture and sell goods themselves) were excluded from the analysis of value added and labour productivity. Some characteristics of merchant wholesalers are shown in Appendix Table 1: they accounted for 58 of total wholesale sales and for 76 per cent of total wholesale employment.

French and US retail and wholesale trades were matched at the most detailed level (i.e. 4 digit level), see Appendix Table C1. Eating and drinking places were excluded from US distribution. For France, the reparation et sale of cars was included in distribution, as were bakeries ("boulangeries et patisseries"). These were subsequently allocated over two product groups: durables and nondurables (see Appendix Tables C2 and C3). In the case of nondurables, food products was distinguished as a separate sub-group.

Some characteristics of French and US distribution are presented in Table 13 to 16. Table 13 shows the number of establishments in wholesale and retail trade, and the density of establishments measured by the number of outlets per 100,000 inhabitants. Density or proximity to clients is an important aspect of the distributive services. There were relatively more retail outlets in France compared to the USA[11]. The accessibility of location (density) of the nondurables sector was less than the durables sector of wholesale trade in the two countries. There were even less wholesalers selling food products per head of population. There were more retail than wholesale establishments per capita in both countries. In French and US retail trade over half of the outlets sold nondurables. In France there were more distributive establishments per 100,000 inhabitants than in the

---

[10] Bureau of the Census (1990), *1987 Census of Retail Trade Subject Series: Measures of Value Produced, Capital Expenditures, Depreciable Assets, and Operating Expenses*, and *1987 Census of Wholesale Trade Subject Series: Measures of Value Produced, Capital Expenditures, Depreciable Assets, and Operating Expenses*, Washington DC.

[11] Retail establishments accounted for 80 per cent of all establishments in French distribution and for 69 per cent in the US distribution, see Table 13.

USA. In the retail trade of food products there were 3.4 times as many stores per capita in France than in the USA. France had less wholesale establishments per capita than the USA, and 1.7 times as many retail outlets per head of population.

Table 13
Number of Establishments in French and US Wholesale and Retail Trade, 1987

	Number of Establishments		Number of Establishments per 100,000 inhabitants		
	France	USA	France	USA	France/USA
Wholesale Trade:					
Durables	79,904	273,153	144	112	1.3
Nondurables	70,728	172,247	127	71	1.8
Food	24,692	42,075	44	17	2.6
Total, unadjusted		445,400		183	
adjusted a)	150,632	776,176	271	318	0.9
Retail Trade:					
Durables	264,834	819,599	476	336	1.4
Nondurables	430,612	929,756	774	381	2.0
Food	226,112	290,245	406	119	3.4
Total (all branches)	695,446	1,749,355	1,250	717	1.7
Distribution, unadjusted		2,194,755		900	
adjusted a)	846,078	2,525,531	1,521	1,035	1.5

Sources: Data on French establishments were derived from INSEE, *Système Informatique pour le Répertoire des Entreprises et des Établissements* (SIRENE), Paris. Number of US establishments from US Bureau of the Census, *1987 Census of Wholesale Trade* and *1987 Census of Retail Trade*, Washington DC. French and US population in 1987 was from Maddison, 1991, pp. 237-239.

a) Unadjusted total excludes US wholesale establishments which did not have a payroll in 1987. These were mainly agents and brokers. The adjusted total includes them.

Table 14 shows sales, value added, and ratios of gross margins and input costs to sales in French and the US distribution. French sales and value added were converted to US dollars with the exchange rate (i.e. 6.01 francs per US$)[12]. Nondurable goods accounted for more than half of the total sales and value added. Food retailers were more important

[12] The gross margin is defined as sales minus purchases of goods destined for resale and changes in the value of inventories. Input costs is the sum of expenditures on advertising, communications, electricity, fuels, stationary, etc. The gross margin minus input costs is equal to gross value added.

in France compared to the USA accounting for 42 per cent of total sales in the former country and 23 per cent in the latter.

Table 14
Sales, Value Added, Ratio of Gross Margin to Sales and Ratio of Inputs to Sales in Wholesale and Retail Trade, France and the USA, 1987 (million US$, with francs converted by the exchange rate)

	Sales		Value Added		Ratio of gross margin to sales		Ratio of inputs to sales (excl. purchases)	
	France	USA b)	France	USA c)	France	USA c)	France	USA c)
Wholesale Trade:								
Durables	104,898	1,218,628	20,709	136,092	32.0	24.1	12.2	4.4
Nondurables	177,398	1,245,926	16,295	99,353	17.7	16.4	8.5	2.9
Food	67,774	380,945	6,030	28,132	16.9	15.2	8.0	2.5
Total, unadjusted		2,464,554		235,445		20.1		3.6
adjusted a)	282,297	2,512,756	37,005	235,776	23.0		9.9	
Retail Trade:								
Durables	91,162	561,816	17,650	121,517	30.5	27.1	11.2	5.5
Nondurables	163,377	797,050	32,547	186,061	30.6	29.9	10.7	6.5
Food	107,887	309,460	18,562	61,268	27.1	25.7	9.9	5.9
Total (all branches)	254,539	1,358,866	50,197	307,578	30.6	28.7	10.8	6.1
Distribution, unadjusted		3,823,419		543,023		24.3		4.8
adjusted a)	536,836	3,871,621	87,202		26.6		10.3	

Sources: France from INSEE (1989): *Enquête Annuelle d'Entreprise dans la Commerce*; USA: neither of the censuses of wholesale and retail trade contained data on gross margins or value added. The Bureau of the Census (1991) supplied data in *Measures of Value Produced, Capital Expenditures, Depreciable Assets, and Operating Expenses* (which is part of the 1977 Census of Wholesale and 1977 of Retail Trade) on gross margins and value added on a more aggregated (3-digit) level. It was assumed that ratios of gross margins and value added to sales were valid also for industries at the 4-digit level.

a) Unadjusted total exludes nonemployer wholesalers, whereas they were included in the adjusted total;
b) Includes all types of wholesalers;
c) Excludes nonmerchant wholesalers.

Ratios of gross margin to sales in wholesale and retail trade were higher in France compared to the USA. Retail margins were higher than wholesale margins in France and the USA. Gross margins are the price of distributive services, as argued by Nooteboom

(1982). The last two columns of Table 14 show the ratio of inputs (excluding purchases of goods for resale and changes in the value of inventories) to sales[13]. The ratio of French input costs to sales was 2 to 3 times the US ratio, indicating higher relative costs in France.

Ratios of input costs to sales in retail trade were only slightly higher than in wholesale trade in France, whereas in the USA relative costs in retail trade were almost twice as high as in wholesale trade. Differences in gross margins and input costs can be explained by differences in the amount of distributive services provided and by economies of scale.

Table 15
Inventories as a Percentage of Sales in Wholesale and Retail Trade, France and the USA, 1987

	France	USA a)
Wholesale Trade:		
Durables	14.0	14.1
Nondurables	7.1	7.4
Food	4.1	5.4
Total (All branches)	9.7	10.7
Retail Trade:		
Durables	15.2	16.2
Nondurables	9.6	11.6
Food	6.1	6.5
Total (all branches)	11.6	13.5
Wholesale & Retail Trade	10.6	12.0

Sources: French and US sales from Tables 3. The value of inventories was estimated by the average of the 31 December 1986 value and the 31 December 1987 value, as derived from the distribution censuses described in Table 14.

a) Excludes nonmerchant wholesalers.

Two indicators of distributive services are discussed here (see also Betancourt, 1993, pp.

[13] The value of inputs is equal to the gross margin minus value added.

40-41): the number of outlets as an indicator of accessibility of location and the ratio of inventories to sales as an indicator of the assurance of product delivery. Table 13 showed that there were more establishments per capita in France than in the USA, indicating a relatively better accessibility in France than in the USA.In the latter country costs of access have been shifted partly to consumers. Table 2 showed that in the USA there were 1.6 times as many cars per capita as in France in 1987, indicating that US citizens were more mobile than the French. In France and the USA there were more retail than wholesale establishments, indicating a relatively better accessibility of retail establishments in both countries.

The second type of distributive services is the assurance of product delivery, measured by the ratio of inventories to sales, see Table 15. The assurance of product delivery was on average greater in wholesale trade than in retail trade in each country, and on average greater in the USA than in France. However, the differences between the countries are not very pronounced. A higher ratio of inventories to sales can also be due to a wider range of products sold in the USA compared to France in some branches of distribution[14]. This factor does therefore explain part of difference in wholesale and retail margins, but does not contribute much to the explanation of differences in distribution margin and cost between France and the USA.

Both aspects of distributive services contribute to the explanation of differences in margins and relative costs in wholesale and retail trade. However, only the density of establishments but not the inventory/sales ratio does contribute to the explanation of the observed differences between France and the USA.

If we compare the ratios of the gross margin and input cost to sales (see Table 14) and the size (measured by sales) of establishment (see Table 19), there is a strong indication that the realisation of economies of scale leads to lower margins and inputs cost. Wholesale margins (input cost) were lower than retail margins (input cost) in both countries, and US margins (input cost) were lower than French margins (input cost). This corresponds to the observation that wholesale establishments were larger than retail establishments in both countries, and that US establishments were larger than French

---

[14] For instance, French supermarkets have an average of 5,000 products, whereas their US counterparts have an average of 10,000 products (Dupuis and Maricourt, 1989, p.76).

establishments[15].

Other factors do also play a role in explaining costs differences, like competitive pressures and the legal environment. These factors will not be discussed here.

Employment in wholesale and retail trade is presented in Table 16[16].

Table 16
Persons Engaged (Paid Employees and Proprietors), Share of Proprietors and Hours Worked in Wholesale and Retail Trade, France and the USA, 1987

	Persons Engaged (thousands)		Of which: Proprietors (%)		Annual Hours Worked per Person	
	France	USA	France	USA	France	USA
Wholesale Trade:						
Durables	508	3,182	3.9	1.2		1,866
Nondurables	428	2,295	6.0	1.4		1,810
Food	175	771	6.0	1.1		1,830
Total, unadjusted		5,477		1.2		1,843
adjusted a)	937	5,758	4.9	6.1		1,851
Retail Trade:						
Durables	697	4,014	19.2	13.3		1,716
Nondurables	1,392	8,415	23.1	6.5		1,470
Food	817	3,047	20.3	6.3		1,495
Total (all branches)	2,089	12,429	21.8	8.7		1,549
Distribution, unadjusted		17,906		6.4		1,639
adjusted a)	3,026	18,187	16.6	7.9	1,590	1,645

Sources: Censuses of distribution as described in Table 14. The number of proprietors and hours worked in US wholesale and retail trade was estimated as described in text.

a) Unadjusted total exludes US nonemployer wholesalers, whereas they were included in the adjusted total.

[15] The largest establishments in wholesale and retail trade in both countries were outlets selling food products. These establishments also had the lowest ratios of gross margins and input cost to sales (see Tables 14 and 19).

[16] French paid employees and proprietors were drawn from the *Enquête Annuelle d'Entreprise dans le Commerce* (INSEE, 1989). US paid employees were also taken from the censuses on wholesale and retail trade. These sources did however not supply figures on the number of proprietors. Data on the legal form of organisation of establishments enabled the estimation of this part of employment. The number of proprietors was estimated by the number of individual proprietorships plus 2 times the number of partnerships. Most wholesale proprietors were found in establishments without a payroll which were excluded from the census. Unpublished sources on nonemployer wholesalers however provided the necesarry information on the aggregate level. Family workers were excluded from the analysis. Hours worked in French distribution were taken from the national accounts, because the census data on hours are not suitable for the analysis of productivity. The French distribution census supplies information on hours paid, unadjusted for holidays, sickness, strikes, etc. These data overestimate the real amount of hours worked. The national accounts do not provide a breakdown for distribution. Hours worked in the USA were estimated as for transport and communications, see p. 6.

Employment in the wholesale trade of durables accounted for more than half of total employment in both countries. In French retail trade over half of the persons engaged were found in nondurables, whereas in the USA the durables part of retail trade was more important. Retail stores selling food products absorbed 39 per cent of retail employment in France and for 25 per cent in the USA. Table 16 shows that the share of proprietors in total persons engaged in 1987 was much higher in France than in the USA. Proprietors were relatively more important in retail than in wholesale trade. The share of proprietors in total persons engaged in wholesale trade was higher in the USA compared to France, whereas the French share of proprietors in retail trade was almost 3 times the US share in retail trade. The final 2 columns of Table 16 show annual hours worked per person in 1987. French hours worked were available only for total distribution. The French worked on average less hours than their US collegues. Persons engaged in US wholesale trade worked more hours on average than in retail trade. Hours worked in the retail trade of food products were less in other parts of retail trade. Hours worked in distribution were lower than in manufacturing in both countries, because of the higher share of part-time employees in total employment. Part-time employees also were relatively more important in retail than in wholesale trade.

2.2 Gross Value Added, PPPs and Labour Productivity

Characteristics of French and US wholesale and retail trade were presented in the previous section. Gross output of distribution outlets or the price of distributive services was defined as the gross margin. Deducting inputs costs from the gross margin yields value added. As for transport and communications, the contribution to GDP is the best proxy of the real output of distributive services.

Value added has to be expressed in a common currency: francs or US dollars. The exchange rate was used to convert sales and gross value added to US dollars in Table 14. The exchange rate is however not a good proxy of the relative price of distributive services, because most distributive trades are non-traded, and because the exchange rate is subject to capital flows and monetary policy. Value added should be expressed in a common currency using Unit Value Ratios (UVRs). These UVRs can be estimated either for the gross value of output (i.e. gross margin), as was done for transport and

communications, or the value added of distributive services. The estimation of UVRs for the gross value of output is however not feasible, because distributive services are very difficult to measure in physical terms, making it impossible to derive unit production values necessary for the calculation of the UVRs.

The UVRs for value added can be derived in an implicit way by using a method of double deflation, as developed by Mulder and Maddison (1993). The first step in the double deflation approach is the conversion of sales by final expenditure PPPs. The second step is the conversion of purchases of goods destined for resale and other input costs (such as electricity, fuels, stationary, etc.) by UVRs derived from the industry-of-origin approach. Deducting purchases and input costs from sales yields value added in the opposite currency. An implicit UVR for distributive services is obtained by dividing value added in francs by value added in US dollars. This approach was applied in two previous binary comparisons between Brazil/USA and Mexico/USA for 1975 (Mulder, 1993 and Mulder and Maddison, 1993). The resulting implicit UVRs for value added showed various outliers at the detailed level, but the aggregate results were plausible. The double deflation approach has not been applied in this study, because of the wide variation of the detailed implicit UVRs.

Instead of the double deflation method, the single deflation approach was applied here: the conversion of value added by final expenditure PPPs. Although these PPPs are suitable converters for retail sales (which are conceptually the same as final expenditures), they are not based on prices of purchased goods or inputs to retailers, or wholesale prices. Final expenditure PPPs were in this paper however also used for these input and expenditure categories. This second-best approach was also adopted in previous international comparisons, see Hall, Knapp and Winsten (1961) and Smith and Hitchens (1985). The results of this approach are more robust than those of the double deflation mehtod.

Expenditure PPPs were available for detailed product categories[17]. If a PPP had to be calculated for a group of expenditure categories, the specific PPPs had to be weighted.

---

[17] The expenditure PPPs were supplied by EUROSTAT and final expenditure weights in national currencies were supplied by Alan Heston (University of Pennsylvania). The 1985 PPPs were updated to 1987 prices using ratios of price indexes of specific expenditure categories in France and the USA. The calculation of Paasche and Laspeyres PPPs for wholesalers and retailers at the 4 digit level using expenditure PPPs is shown in Appendix Tables C6 and C7.

Two sets of weights are used: French final expenditure weights (obtaining a Paasche PPP) or US final expenditure weights (obtaining a Laspeyres PPP). The Paasche, Laspeyres and Fisher PPPs are presented in Table 17. PPPs for total wholesale trade were higher than PPPs for total retail trade. PPPs for durables were above the PPPs for nondurables, and food product PPPs were below those for the total nondurables in wholesale an retail trade. This indicates a higher relative price in France of durables compared to the relative prive of nondurables, and a lower relative price of food products compared to total nondurables. The Fisher PPP for total distribution was 7.80 francs per US$, which is above the exchange rate (e.g. 6.01 francs per US$).

Table 17
ICP Reweighted Paasche, Laspeyres and Fisher PPPs for Gross Value Added, Wholesale and Retail Trade, France and the USA, 1987

	Paasche PPPs (i.e. at French quantity weights) (2)	Laspeyres PPPs (i.e. US quantity weights) (3)	Fisher PPPs (geometric average of column 1 and 2)
Wholesale Trade:			
Durables	8.88	8.92	8.90
Nondurables	6.13	9.45	7.61
Food	6.31	7.31	6.79
Total (all branches)	7.42	9.14	8.23
Retail Trade:			
Durables	9.09	9.22	9.15
Nondurables	5.47	8.66	6.88
Food	6.67	7.07	6.87
Total (all branches)	6.36	8.88	7.52
Wholesale & Retail Trade	6.77	8.99	7.80

Sources: 1985 Expenditure PPPs supplied by EUROSTAT. These were updated to 1987 prices using French and US product specific price indexes. PPPs were subsequently weighted by consumer expenditures supplied by Alan Heston.

Note: PPPs for total wholesale and retail trade were estimated by weighting the branch PPPs by gross value added.

The PPPs of Table 17 were used to convert value added of Table 14 to a set of common prices: French francs or US dollars. Labour productivity was subsequently derived by dividing value added by the number of persons engaged or hours worked, see Table 16. High French value added per person engaged as a percentage of the USA was found in the wholesale and retail trade of food products. French relative performance in the trade of nondurables was above that in durables. Relative labour productivity of French retailers was 24 percentage points higher than that of French wholesalers. The highest relative French performance was found in the retail trade of food products. French value added per person for total distribution was 69 per cent of the US level (Fisher estimate). French relative productivity in terms of value added per hour was slightly higher, i.e. 70 per cent.

Table 18
Gross Value Added per Person Engaged and Hour Worked in Wholesale and Retail Trade, France as Percent of USA, 1987

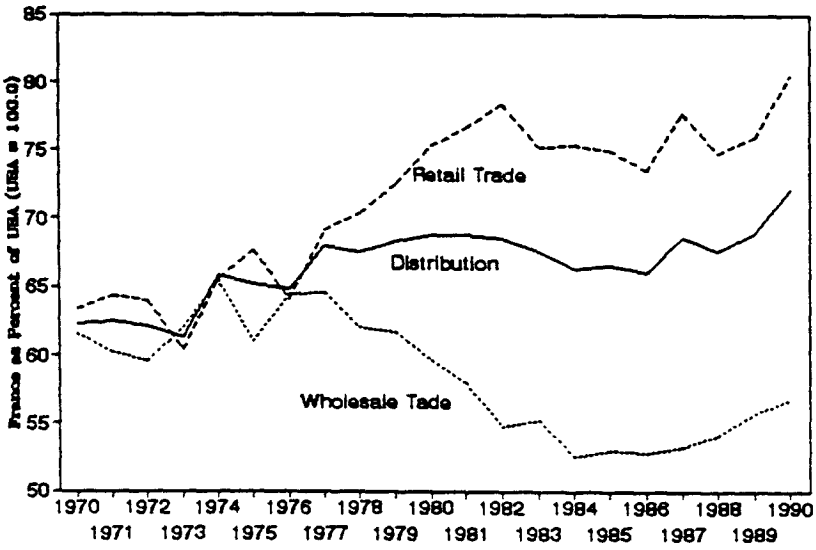
	Per Person Engaged			Per Hour Worked		
	Paasche PPPs	Laspeyres PPPs	Geometric average	Paasche PPPs	Laspeyres PPPs	Geometric average
Wholesale Trade:						
Durables	51.7	51.9	51.8			
Nondurables	43.6	67.3	54.2			
Food	57.7	66.9	62.1			
Total (All branches)	48.0	59.2	53.3			
Retail Trade:						
Durables	54.5	55.3	54.9			
Nondurables	73.4	116.1	92.3			
Food	96.1	101.8	98.9			
Total (all branches)	65.7	91.7	77.6			
Wholesale & Retail Trade	59.6	79.1	68.6	60.9	80.8	70.1

Sources: Tables 14, 16 and 17.

Note: nonmerchant wholesalers were excluded.

The 1987 benchmark levels of value added per person were extrapolated to the period 1970-90 using time series of GDP in constant prices and employment. Graph 4 shows

Graph 4
Value Added Per Person in Wholesale and Retail Trade:
France as Percent of the USA, 1970-90



Sources: Table 18 and Appendix Tables A1 to A8.

French value added per person as a percent of the US level in distribution, and wholesale and retail trade separately. Wholesale and retail trade show two diverging trends: the relative French performance of retail trade compared to the USA improved whereas wholesale trade value added per person as percent of the USA decreased during the period 1976-84, and improved afterwards. Overall French performance in distribution showed a slowly rising trend from 62 per cent of the US level in 1970 to 73 per cent in 1990. The declining trend of wholesale trend in the period 1976 to 1984 is due to rising US value added per person and declining French value added per person. French and US value added per person in retailing showed a converging trend.

2.3 Explaining Differences Labour Productivity Levels

The Effect of Structure

Low relative productivity performance of the French distribution sector can be due to the relatively high concentration of employment in branches characterised by a low performance. This effect of stuctural differences of sector composition can be removed by weighting each country's branch labour productivity (value added per person) by the labour input shares of one of the two countries. Four calculations can be made: French and US value added per hour in francs weighted by French and US labour input weights, and French and US value per person engaged in US$ weighted by French and US labour input weights (see van Ark, 1993, p. 135). Structural differences do affect significantly the French relative performance: French value added per person engaged as a percent of the US level (geometric average) rose with 6.2 percentage points after the adjustment for structural differences.

The Effect of Size

Table 19 shows the average size of establishments in French and US distribution, measured by sales per establishments and number of persons engaged per establishments. French sales were converted to US dollars using the Fisher PPPs of Table 17. US establishments were bigger is all trades. Size differences are more pronounced if size was measured by sales instead of persons engaged per establishments.

Economies of scale are important in wholesale and retail trade, see Nooteboom (1982). Average costs decline with an increase in size, because the cost of fixed investments can be spread over more persons and more sales. The lower average cost of the USA compared to French establishments can be seen in Table 14. Because of data limitations, the size effect could not be calculated for establishments but only for firms, and only for the retail branch of distribution[18]. This was done using a method as explained in van Ark (1993, pp. 137-41). This method is similar to the method used to

[18] For the USA no data were available on employment in different size categories of firms in wholesale trade. The French distribution census did not include data on establishments, i.e. infomation was only available for size categories of firms.

calculate the effect of structure. Seven size categories of distributive firms were distinguished. Comparative productivity (sales per employee) was calculated for each size category and subsequently weighted by the labour input shares (number of paid employees)[19]. Differences in size do explain part of the observed productivity gap between France and the USA: French retail labour productivity rose 7.2 percentage points to 84.9 per cent of the US level after the adjustement for size differences.

Table 19
Average Size of Establishment in Wholesale and Retail Trade Measured by Sales and Number of Persons Engaged per Establishment, France and the USA, 1987

	Sales per Establishment (thousand 1987 US$)			Persons Engaged per Establishment		
	USA	France	USA/ France	USA	France	USA/ France
Wholesale Trade:						
Durables	4,461	886	5.0	11.6	6.4	1.8
Nondurables	7,233	1,980	3.7	13.3	6.1	2.2
Food	9,054	2,429	3.7	18.3	7.1	2.6
Total, unadjusted	5,533			12.3		
adjusted a)	3,237	1,368	2.4	7.4	6.2	1.2
Retail Trade:						
Durables	685	226	3.0	4.9	2.6	1.9
Nondurables	857	331	2.6	9.1	3.2	2.8
Food	1,066	417	2.6	10.5	3.6	2.9
Total (all branches)	777	293	2.7	7.1	3.0	2.4
Distribution, unadjusted	1,742			8.2		
adjusted a)	1,533	489	3.1	7.2	3.6	2.0

Sources: Table 14 and 15, and 17. French sales were converted to US$ by the Fisher PPPs of Table 17.

a) Unadjusted total exludes US nonemployer wholesalers, whereas they were included in the adjusted total.

[19] Sales and paid employees were used instead of value added and total persons engaged, because the US censuses do not supply data on value added and persons engaged per size category. Nonmerchant wholesalers were excluded from the analysis.

Capital Intensity

One indicator of capital intensity is the investment/labour ratio. More investments per person engaged indicates a more capital intensive production process, assuming that levels of investment do not change significantly within short time periods. Table 20 presents data on capital expenditures per person engaged in distribution.

US distributors invested on average more than 3 times per person than the French. This difference is even more pronounced if capital expenditures per person are compared between wholesale and retail trade separately. US merchant wholesalers invested more than 6 times as much as French wholesalers, whereas US retailers invested almost 3 times as much as French retailers. US distribution was much more capital intensive than French distribution. This is a likely to be another important factor contributing to the large difference in the relative performance of French and US wholesalers. In order to ascertain the capital intensity and capital productivity in distribution, a capital stock has to be estimated. This is however beyond the scope of this paper.

Table 20
Capital Expenditures (Excluding Land) Per Person Engaged in Wholesale and Retail Trade, France and the USA, 1987 (1987 US$)

	France	USA a)
Wholesale Trade:		
Durables	3.4	13.4
Nondurables	4.3	23.7
Food	3.4	23.9
Total (All branches)	3.8	17.7
Retail Trade:		
Durables	2.9	7.0
Nondurables	2.6	7.8
Food	3.1	8.9
Total (all branches)	2.7	7.6
Wholesale & Retail Trade	3.1	10.2

Sources: Capital expenditures from censuses of wholesale and retail trade as described in Table 14.

Note: French capital expenditures were converted to US with the exchange rate.

References

Ark, B. van (1993), *International Comparisons of Output and Productivity - Manufacturing Productivity Performance of Ten Countries from 1950 to 1990*, Groningen Growth and Development Centre, Monograph Series, No. 1, Groningen.

--- and R. Kouwenhoven (1994), "La productivité de l'industrie Française: une perspective internationale comparative", *Economie Internationale*,

Becker, E.H. (1984), Self-Employed Workers, An Update to 1983, *Monthly Labor Review*, pp. 14-18.

Betancourt, R.R. (1993), "An Analysis of the US Distribution System", *OECD Economics Department Working Papers*, No. 135, Paris.

Dupuis, M. and R. de Maricourt (1989), "France/Etats-Unis/Japon: Trois Mondes, Trois Distributions, *Les Cahiers de Recherche*, No. 89-81, École Supérieure de Commerce de Paris.

Freudenberg, M. and D. Ünal-Kesenci (1994), "une comparaison internationale France-Allemagne des productivités", *Economie Internationale*, September issue.

Hall, M., J. Knapp and C. Winsten (1961), *Distribution in Great Britain and in North America*, Oxford University Press, Oxford.

Maddison, A. (1991), *Dynamic Forces in Capitalist Development*, Oxford University Press, Oxford.

McKinsey Global Institute (1992), *Service Sector Productivity*, Washington DC.

Messerlin, P.A. (1993), "The French Distribution Industry and the Openness of the French Economy", *OECD Economics Department Working Papers*, No. 138, Paris.

Mulder, N. (1993), "International Comparisons in Distribution: Value Added, Labour Productivity and Purchasing Power Parities in Brazilian and US Wholesale and Retail Trade", paper presented at VIIth International Conference on the Research in the Distributive Trades, Stirling.

--- (1994), "Transport and Communications in Mexico and the United States: Value Added, Purchasing Power Parities and Labour Productivity, 1970-90", Groningen Growth and Development Centre, forthcoming.

--- and A. Maddison (1993), "The International Comparison of Performance in Distribution: Value Added, Labour Productivity and PPPs in Mexican and US Wholesale and Retail Trade", *Research Memorandum 537 (GD-2)*, Groningen Growth and Development Centre, Groningen.

Nooteboom, B. (1982), "A New Theory of Retailing Cost", *European Economic Review*, 17, pp. 163-186.

Pilat, D. (1993), *The Economics of Catch-Up: The Experience of Japan and Korea*, Groningen Growth and Development Centre, Monograph Series, No. 2, Groningen.

Smith, A.D. and D.M.W.N. Hitchens (1985), *Productivity in the Distributive Trades: A Comparison of Britain, America and Germany*, NIESR, Cambridge University Press, London.

APPENDIX TABLES

Appendix A: Time Series of GDP and Employment

Appendix B: Transport and Communications

Appendix C: Wholesale and Retail Trade

Appendix Table 1
Matching of Transport Activities, France and the USA, 1987

a) **Rail transport.** Gross revenues from freight transport acconted for 97 per cent of US rail revenues. In France, fr transport represented 33 per cent of the GVO (including subsidies) in France. Railways was a relatively more important mea passenger travel in France compared to the USA (see Table 3). The average passenger journey and freight haul in the USA longer than in France, indicating a bigger proportionate amount of terminal services in France. I accounted for this usin procedure outlined above.

b) **Road passenger transport.** This branch consists of urban and long distance bus transport. Output in urban and suburba transport was measured by the number of passenger journeys. This measure is almost as suitable as passenger km, be distances travelled in urban areas are similar across countries. Long distance bus output was measured by the composite o index of moving and terminal services. Because the length of the average passenger journey was not very different bet France and the USA (see Table 9), the weight of terminal services in the composite index was small, i.e. 0.12.

c) **Road freight transport.** For France a breakdown was available for short distance (less than 50 km), medium (between 5 150 km) and long distance (more than 150 km) transport. Charges per tonne km increased with shorter hauls, indicati increasing proportionate amount of terminal services. No such breakdown was available for US trucking. Data on US o were in tonne km, information on tonnes of freight transported or freight hauls was not available. Terminal services accounted for only in the case of France, by giving are larger weight to tonne km performed by short distance transporters.

d) **Water freight transport.** Water passenger transport was excluded because no data were available on this type of trans Water freight transport consists of domestic water transport (i.e. on canals, rivers, lakes, and coastal waters) and sea tran (mainly international). Table 9 showed that the US freight haul of domestic water transport was more than 4 times the F distance. The higher proportion of terminal services in French output was accounted for as explained in the text. Outp international shipping was measured in terms of tonnes carried. Information on the distance over which the freight was m was lacking, but average freight hauls are probably not very different across countries in this part of shipping.

e) **Air transport.** The most important part of this branch is the movement of passengers (including luggage), i.e. air f transport is a small part of the total activity. The length of passenger journeys was rather similar in France and the USA Table 9), therefore the weight attached to the handling of passengers at airports in the composite index was only 0.08. Be no data were available on the average freight haul in air transport, output of air freight transport was measured by kilometres.

f) **Transportation services.** These are services to all other branches of transport, such as public warehousing and agencies. No data were available on the physical output produced in both countries.

Appendix Table 2
Number of Establishments, Sales, Persons Engaged and Annual Hours Worked in US Merchant Wholesale Trade

	Number of Establishments	Sales (million US$)	Persons Engaged (1000s)	Annual hours worked per person
Wholesale Trade:				
Durables	227,870	690,735	2,561	1,866
Nondurables	141,043	734,207	1,793	1,808
Food	32,466	223,020	572	1,830
TOTAL (All branches)	368,913	1,424,942	4,354	1,842
As Percent of the Total	47.5	57.8	75.6	

Sources: US Bureau of the Census, *1987 Census of Wholesale Trade: Establishment and Firm Size (including legal form of organisation)*. Total number of establishments in wholesale trade from Table 13; Total sales from Table 14 and total wholesale employment from Table 16.