Transport and Communication in Mexico and the United States: Value Added, Purchasing Power Parities and Productivity

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INTRODUCTION

This paper is second in a series of Mexico-USA comparisons intended to cover major parts of the service sector. A previous paper by Mulder and Maddison (1993) covered wholesale and retail trade. Transport and communications is another important part of the service sector. The aim of this paper is to compare value added and labour productivity between Mexico and the USA for the period 1950-90.

Comparing transport and communications between two countries with very different levels of real income raises many issues which are of less importance in comparisons between advanced countries. The transport network in the USA is relatively much bigger than in Mexico, and the composition of the transport sector also is very different. Key characteristics of the Mexican and US transport network, vehicle stock, passenger travel and energy use are presented in Tables 1 to 4. The size of the transport network in both countries in 1975 is shown in Table 1. The US rail network was 13 times the Mexican size. When rail facilities are related to population, it becomes clear that the US had 3.7 times more km of rail track per capita compared to Mexico. The USA had 23 km of paved roads per head of population in 1975, which was 14 times the Mexican figure. Another characteristic of Mexican transport is the small share of air traffic compared to the USA (4.7 per cent of transport GDP and 1.6 per cent of transport employment in Mexico compared to 15.7 per cent and 12.9 per cent for the USA). Table 2 shows the 1975 stock of vehicles. Private car ownership was much more common in the USA compared to Mexico, i.e. there were only 0.04 private cars per head of population in Mexico, whereas in the USA there were 12 times as many. There were also many more motorcycles, buses and trucks in the USA compared to Mexico. Table 3 provides an estimate of the total volume of passenger transport and it includes all four major types of transport. Buses were the most important in Mexico, whereas private cars were the predominant mode in the USA (86.5 per cent of all intercity passenger traffic). It should be kept in mind that private car transportation is not regarded as a market activity and does not enter into the national accounts.

Table 1
Transport Infrastructure in Mexico and the USA, 1975

	Mexico		USA	
	Total (000s)	Per capita	Total (000s)	Per capita
Kilometres of railway	24,912	0.41	324,000	1.50
Kilometres of paved roads	124,745	2.07	6,175,664	28.59

Sources: Mexico length of railway track from Nacional Financiera S.A. (1978), *La Economia Mexicana en Cifras*, p. 81; length of paved roads from Wilkie and Perkal (1983), p. 386. USA from Dept. of Commerce, *The Statistical Abstract of the United States*, 1977. Population from Maddison and Associates (1992).

Table 2
Number of Motor Vehicles in Use, Mexico and the USA, 1975

	Mexico		USA	
	Total (000s)	Per capita	Total (000s)	Per capita
Private automobiles	2,401	0.040	106,700	0.494
Motorcycles	247	0.004	4,964	0.023
Trucks	888	0.015	24,800	0.115
Buses	51	0.001	1,400	0.006
TOTAL (All motor vehicles)	3,586	0.060	137,864	0.638

Sources: Mexico from Nacional Financiera S.A. (1978), *La Economia Mexicana en Cifras*, p. 85; USA from Dept. of Commerce, *The Statistical Abstract of the United States 1977*, Table 1002. Population from Maddison and Associates (1992).

Table 3
Estimated Volume of Domestic Intercity of Passenger Traffic, Mexico and the USA, 1975

	Mexico		USA	
	Passenger km (billion)	Percent distri-bution	Passenger km (billion)	Percent distri-bution
Private automobiles	43	30.2	1,892	86.5
Domestic airways	4	2.9	238	10.9
Bus	90	64.1	40	1.8
Railraods	4	2.9	16	0.7
TOTAL (All modes)	141	100.0	2,187	100.0

Sources: Mexico domestic airways and railroads from Nacional Financiera S.A. (1978), *La Economia Mexicana en Cifras*, pp. 81 and 92. Distance travelled by private cars in Mexico was estimated by multiplying the number of Mexican cars by the average passenger km per US car; USA from Department of Commerce, *Statistical Abstract of the United States 1992*, Table 987.

Table 4 shows total energy consumption[1] by the transport sector in 1975. Road transport accounted for 83 per cent of total energy use in the USA and 90 per cent in Mexico. Average energy used per vehicle was 2.98 tons of oil equivalent (TOE) in the USA and 3.67 TOE in Mexico. One reason for this is the higher share of trucks and buses in the total vehicle stock in Mexico compared to the USA (19 per cent and 26 per cent respectively, see Table 2). Another reason is that the average vehicle in Mexico was older and less efficient than the US counterpart. The share of air transport in total US energy consumption was almost twice the Mexican share. US per capita energy use in transport was 28 times that in Mexico.

[1] The different sources of energy are weighted by coefficients of equivalence to arrive at tons of oil equivalent (TOE).

Table 4
Total Energy Consumption in Transport in Mexico and the USA, 1975 (tons of oil equivalent)

	Mexico		USA	
	Total (000s)	tons per capita	Total (000s)	tons per capita
Railways	45	0.001	13,350	0.062
Road transport	13,150	0.219	336,730	1.559
Air transport	1,126	0.019	51,230	0.237
Domestic water transport	353[a]	0.006	6,730	0.031
Total (All modes)	14,674	0.244	408,040	1.889

Sources: Mexico from OECD International Energy Agency (1981), *World Energy Statistics and Balances, 1971/87*, Paris. 4,850,000 tons were "non-specified" in *World Energy Statistics and Balances*. I allocated this amount over the different transport modes using the share of energy used of each mode in the total (excluding non-specified energy used); USA from OECD International Energy Agency (1987), *Energy Balances of OECD Countries, 1970/85*, Paris.

[a] Figure inferred using the ratio of energy used in US domestic water transport to total energy used.

The data for Mexico were derived from the *VIII Censo de Transportes y Comunicaciones* (SPP, 1981). In the USA, there also is a census of transport[2]. This does not give an overview by establishment for output, costs, value added and employment, but it does contain data on the volume and characteristics of passengers and goods transported, an inventory of trucks and their use (in truck miles), information on nonregulated motor carriers and public warehousing. Because the information in the census was not adequate for the purpose of this paper, it was supplemented by other sources.

I reclassified the information for both countries in a standard format for six branches of transport and one for communications. Labour productivity was measured by gross

[2] *The 1977 Census of Transportation* (US Dept. of Commerce, Bureau of the Census, 1979) consists of four surveys: "Truck Inventory and Use Survey" "National Travel Survey" (gives information on volume and characteristics of nonlocal travel by the civilian population); "Commodity Transportation" and "Nonregulated Motor Carriers and Public Warehousing".

value added per person engaged, converted to a common currency using purchasing power parities (PPPs) estimated on the basis of the industry-of-origin approach.

Labour productivity in Mexican transport and communications was 33.5 per cent of the US level. Results by branch of transport differ widely: Mexican labour productivity in rail transport was very low, but in road passenger transport it was over 90 per cent of the US level.

Gross value of output, gross value added and employment in transport as recorded in the Mexican census were only half of the corresponding estimates in the Mexican national accounts, which aim to cover all transport activity. If census and national accounts estimates are compared by branch of transport, very different results emerge. The census and national accounts estimates were rather similar for railways and air transport, but the national accounts estimate of gross value added for road freight transport was six times the census estimate.

I VALUE ADDED IN TRANSPORT AND COMMUNICATIONS

The Mexican standard industrial classification distinguishes six different branches of transport. Communications are broken down into four branches. The nomenclature of the *Catalogo Mexicano de Actividades Economicas 1976* (SPP, 1981) for transport and communications is presented in Appendix Table A1. For the USA, the *Standard Industrial Classification 1972* (Executive Office of the President, 1972) was used. The matching procedures using the standard industrial classifications are presented in Table A2. For part of the in Table A2 matched transport and communication activities in Mexico[3] and the USA[4], data were not available at the moment on physical output

[3] These modes of transport were: taxis driving a fixed route transporting more than 1 passenger; transport of tourists by car; passenger car transport, regular route, school and sightseeing buses; pipelines; the furnishing of services to foreign registered air carriers; services connected to transport and other transportation services. In communications the miscellaneous telecommunications services could not be matched.

[4] The items which could not be matched were: the railway express service; miscellaneous local passenger transportation; taxicabs; passenger transportation charter service; school buses; pipelines; transportation services and radio and television broad casting.

produced or the gross value of output and these activities were excluded. 39 per cent of the gross value of Mexican output was excluded for this reason, 28.2 per cent of value added and 28.7 per cent of matched employment. For the USA information is not available to estimate the size of the excluded activities.

The Mexican census contains information on gross receipts, costs of inputs, census value added and employment. The census also includes data on physical production of different modes of transport, in terms of vehicle km, and the number of tons or passengers transported. In rail and air transport output is also measured in passenger km and ton km[5]. For some modes of transport, different types of employment are distinguished. In air transport, for example, employment is shown separately for pilots, cabin attendants, maintenance personnel, and other employees.

Table 5 shows how Mexican census value added was adjusted to correspond with the national accounts concept of value added (see Maddison and van Ark 1989). Value added was derived by deducting items 2 a) to 2 j) from the gross value of output. The cost of patents, licenses and rentals was also deducted to arrive at the national accounts concept of value added.

Because the US transport census was inadequate for our purposes (as explained above), I had to rely on other sources: *Transportation Statistics in the United States* (various issues) and *Statistical Abstract of the United States* (various issues). These sources were used to derive measures of total receipts and quantities produced. 1975 Estimates of gross value added at factor cost were supplied by Robert Parker of the US Department of Commerce and employment estimates were taken from *The National Income and Product Accounts of the United States, 1959-88* (US Dept. of Commerce, 1992).

[5] The transport of one ton or one passenger over a distance of one km yields one ton km or passenger km.

Table 5
Procedure Used to Estimate the National Accounts Concept of Gross Value Added (contribution to GDP at Factor Cost) for Establishments covered by the Mexican Census of Transportation and Communication, Mexico, 1975

1) Gross value of output = "Ingresos brutos totales";

2) Mexican census value added ("valor agregado censal bruto") = "Ingresos Brutos Totales" minus:
   a) "Combustibles y lubrificantes" (fuels consumed);
   b) "Llántas y camarás" (tires and tubes);
   c) "Refacciones" (spare parts);
   d) "Pagos a terceros por trabajos de reparación y mantenimiento" (payments for reparations and maintainance);
   e) "Pagos a terceros por servicios de vulcanización de llántas y camarás" (payments for vulcanization of tires and tubes);
   f) "Energia electrica" (electricity consumed);
   g) "Pagos por servicios de propaganda y publicidad" (advertising cost);
   h) "Pagos a terceros por comisiones" (sales commissions);
   i) "Pagos por primas de seguros" (insurance payments);
   j) "Otros bienes y servicios" (other goods and service inputs);

   In order to arrive at the national accounts concept of gross value added, two items have to be deducted:
   a) "Gastos por uso de patentas y marcas, asistencia tecnica y otros pagos por tecnologia" (cost of patents, licences, technical assistance, and technology);
   b) "Gastos por rentas y alquileres" (cost of renting).

Source: SPP (1981), *VIII Censo de Transportes y Comunicaciones 1976, Datos de 1975.*

Mexican and US gross value added in transport and communications are presented in Table 6. Data were taken from the national accounts of both countries. The table also shows the relative shares of each branch in total transport GDP. Road freight transport is the predominant branch in both countries, and accounts for more than 43 per cent of transport GDP. The second most important branch in Mexico is road passenger transport, which accounts for 35.3 per cent, but the proportion is much smaller (6.1 per cent) in the USA where private cars are much more widely available. Private passenger transport is not regarded as a market activity, does not enter as market activity in the national accounts and is therefore not included in the sectoral output[6]. US railways and air

[6] Per capita expenditure on (public and private) passenger transport in 1975 was 1,027 pesos in Mexico and 600 US$ in the USA. Private (mainly car) transport expenditure accounted for 66.5 per cent of the total in Mexico and 93.3 per cent in the USA. The imputed value of private passenger transport was 41,081 million pesos in Mexico 120,901 US$ in the USA (see Kravis, Heston and Summer, 1982, p. 272). Transport GDP was 55,158 million pesos and 57,095 US$

transport account for a much larger share of transport GDP than their Mexican counterparts. Telephone services are in the major part of the communications sector in both countries.

Table 6
Gross Value Added in Transport and Communications, Mexico and the USA, in 1975 millions of National Currencies, with Conversion at Exchange Rate

	Mexico			USA		
	GDP at Factor Cost		Percentage share of	GDP at Factor Cost		Percentage share of
	million pesos	million US$[a]	each branch in transport GDP	million US$	million pesos[a]	each branch in transport GDP
	(1)	(2)	(3)	(4)	(5)	(6)
TRANSPORT:						
1. Railways	3,395	272	6.2	12,737	159,213	22.2
2. Road Passenger Transport	19,455	1,556	35.3	3,476	3,450	6.1
3. Road Freight Transport	23,951	1,916	43.4	25,051 [b]	313,138 [b]	43.7 [b]
4. Water Transport	1,466	117	2.7	3,969	49,613	6.9
5. Air Transport	2,571	206	4.7	8,978	112,225	15.7
6. Transportation Services	4,320	346	7.8	2,884	36,050	5.4
Total (All branches)	55,158	4,413	100.0	57,095	713,688	100.0
COMMUNICATIONS:						
1. Telephone Services	6,027	482	80.9	31,579 [c]	394,738 [c]	91.1 [c]
2. Telegraph Services	418	33	5.6			
3. Postal Services	601	48	8.1	3,085 [d]	38,563 [d]	8.9 [d]
4. Other Communication Services	408	33	5.5			
Total (All branches)	7,454	596	100.0	34,664	433,300	100.0
TOTAL Trans. and Comm.	62,612	5,009		91,759	1,146,988	
Trans./Comm. share in total GDP	5.69			6.68		

Sources: Mexico from SPP (1981), *Cuentas Nacionales de Mexico 1970-78*; USA national accounts value added at factor cost supplied by Robert Parker of the US Deptartment of Commerce.

[a] Conversion with the exchange rate (i.e. 12.5 pesos to 1 US dollar);
[b] Sum of trucking and pipelines;
[c] Sum of telegraph and telephone services;
[d] Sum of postal and other services.

respectively (see Table 6).

EMPLOYMENT

Table 7 presents data on persons engaged in transport and communications in both countries. Estimates of employment in Mexican transport in 1975 were of poor quality. The national accounts provides only the number of employees (i.e. excluding selfemployed and family workers) for total transport and communications, without a breakdown by branch. The census does give estimates by branch, but its coverage is very different across branches. A confrontation of census and national accounts estimates of value added indicated that the census covered most air and rail activity, but less than twenty per cent of road freight transport and only half of water transport was included (see Table 19).

Because employment information in the census and national accounts was not adequate, I applied an alternative procedure, using labour productivity levels by branch, to derive employment implicitly. Labour productivity was calculated using census figures for gross value added and employment in those branches or parts of branches which were adequately covered. For example, gross value added per person in road freight transport was 61,531 pesos (see Table 18). I assumed that labour productivity was the same in the uncovered part of road freight transport. Using this assumption, the number of persons engaged in road freight transport is estimated by the ratio of national accounts GDP (23,951 million pesos, see first column Table 6) to labour productivity as estimated on the basis of census data (61,531 pesos). This yields a total of 389 thousand persons engaged.

The figure for total persons engaged was broken down into two classes (paid employees, and proprietors and family workers) using census information. Family workers and proprietors added 27.1 per cent to census paid employees in transport and communications as a whole. My estimate of the number of paid employees (644 thousand) is 1.21 times the national accounts estimate (534 thousand). My total persons engaged estimate (883 thousand) is 2.15 times the census figure of persons engaged (411 thousand).

For the USA, data were taken from *The National Income and Product Accounts of the United States, Volume 2, 1959-88* (Bureau of the Census, 1992). The US data include full time and part time paid employees and self employed. Proprietors added 8.2 per cent to paid employees. The *Labor Force Statistics Derived from the Current Population Survey: A Databook* (Bureau of Labor Statistics, 1982) gives estimates on the number of

unpaid family workers in transport, communications and public utilities. For 1975, it was estimated that family workers represented a 0.23 per cent addition to paid employees. I did not include family workers in the US estimate of persons engaged, because it was not known how the family workers were distributed over the branches. The omission of US family workers does not bias the results significantly, because they form a very small fraction of total persons engaged in transport and communications.

Table 7
Persons Engaged in Transport and Communications, Mexico and the USA, 1975

	Mexico			USA		
	Persons Engaged		Percentage share of	Persons Engaged		Percentage share of
	Total (000s)	Of which: family workers and proprietors (000s)	each branch in transport employment	Total (000s)	Of which: proprietors (000s)	each branch in transport employment
	(1)	(2)	(3)	(4)	(5)	(6)
TRANSPORT:						
1. Railways	89	0	11.0	548	0	19.0
2. Road Passenger Transport	278	86	34.1	307	31	10.6
3. Road Freight Transport	389	163	47.8	1,317 [a]	169 [a]	45.6 [a]
4. Water Transport	9	1	1.1	198	3	6.9
5. Air Transport	13	0	1.6	371	5	12.9
6. Transportation Services	36	1	4.4	146	9	5.1
Total (All branches)	815	171	100.0	2,887	217	100.0
COMMUNICATIONS	68[b]			1,180	2	
TRANSPORT/COMM.	883			4,067	219	
Total Engaged (Whole Economy)	15,870			92,853 [c]		
POPULATION	60,153			215,973		

Sources: persons engaged in Mexican transport were estimated by dividing national accounts gross value added by the estimated GVA per person engaged in pesos (see first column Table 18). Employment in communications was derived from SPP (1981), *Sistema de Cuentas Nacionales de Mexico, 1970-78*, Mexico City; total persons engaged and population from A. Maddison and Associates (1992), *The Political Economy of Poverty, Equity and Growth: Brazil and the USA*, OUP, New York, Tables B-2 and B-5. USA from Dept. of Commerce, *The National Income and Product Accounts of the United States, Volume 2, 1959-88*, Washington DC.

[a] Includes pipelines;
[b] Derived from SPP (1981), *Sistema de Cuentas Nacionales de Mexico, 1970-78*, Mexico DF.;
[c] Refers to full-time and part-time employees plus self-employed.

Road freight transport in Mexico and the USA was the branch with the highest share in total transport employment, see Table 7. The second most important branch was road passenger transport in Mexico and railroads in the USA.

II MATCHING MEXICO AND THE USA: 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[7].

Below I will discuss major characteristics of each branch and explain which measures have been used to estimate physical output.

a) Rail transport

US railways accounted for 22.2 per cent of transport GDP in 1975, as compared with 6.2 per cent in Mexico. In the USA they employed 19.0 per cent of persons engaged in transport and in Mexico 11.0 per cent. Gross revenues from rail freight were 98 per cent of US railway revenues, compared with 94 per cent in Mexico. Passenger transport was clearly a very small part of total railway activity in both countries.

Traditionally[8] output in railways is measured by the volume of freight or number of passengers carried times the distance over which they are moved. The output measures for passenger and freight transport are usually passenger km and ton km. However, we also need to consider the terminal work of loading and unloading. In order to get some impression of the amount of terminal work in Mexico and the USA, average distances over which passengers and freight are moved were compared, see Table 9.

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[7] A complete list of physical output, gross value of output, gross value added, and employment for each transport activity in Mexico is presented in Appendix Tables A3. Similar data for the USA are listed in Appendix Table A4. The product matches between Mexico and the USA are presented in Appendix Table A5.

[8] See Appendix B for a discussion of the measurement of output and productivity in transport and communications in previous studies.

Table 8
Moving and Terminal Services for Freight and Passengers, Mexico and the USA, 1975

	Quantities Produced (million)						Gross Value of Output	
	Moving services (tonne km or passenger km)			Terminal Services (tonnes or passengers)				
	USA	Mexico	USA/ Mexico	USA	Mexico	USA/ Mexico	USA (million US$)	Mexico (million pesos)
Passenger transport:								
- rail	15,985	4,143	3.9	269	25	10.9	297	311
- urban transport:								
- city bus	n.a.	n.a.		5,084	6,146	0.8	1,438	6,227
- subway	n.a.	n.a.		1,673	551	3.0	517	601
- tramway / trolley	n.a.	n.a.		231	243	0.9	32	144
- long distance bus	40,869	n.a.		351	512	0.7	1,172	5,353
- air	261,945	7,239	36.2	205	7	28.3	12,725	4,092
Freight transport:								
- rail	1,093,446	33,393	32.7	1,270	63	20.2	15,390	4,570
- road[a]	664,742	53,158	12.5	1,271	155	8.2	47,400	33,878
- water:								
- rivers/lakes	364,460	n.a.		576	3	172.1	1,631	60
- ocean/coastwise	n.a.	n.a.		964	10	101.3	6,590	1,420
- air	8,646	330	26.2	n.a.	92		1,427	294

Sources: see Table A3 and A4.

[a] The number of tons transported was estimated by dividing the number of tonne km (column 2 and 3), by the average length of haul (see Table 9).

The average freight haul in the US was 870 km and in Mexico 532 km. The average passenger journey had a length of 60 km in the USA and 168 km in Mexico in 1975. Terminal work in freight transport was relatively more important in Mexico compared to the USA, and vice versa for passenger transport. Output in Mexican freight transport would be underestimated if no allowance was made for terminal services, and passenger transport output overstated.

There are six ways to impute the varying proportionate importance of loading and unloading services: a) If average hauls are similar between countries, one can assume that the proportionate amount of terminal work is the same in each country;

Table 9
Length of Average Passenger Trip and Average Freight Haul
USA and Mexico, 1975

	USA	Mexico	USA/ Mexico	α
	(1)	(2)	(3)	(4)
Passenger transport:				
- rail	60	168	0.35	0.65
- urban transport:				
- city bus	n.a.	n.a.		
- subway	n.a.	n.a.		
- tramway / trolley	n.a.	n.a.		
- long distance bus	116	n.a.		
- air	1,334	999	1.34	0.25
Freight transport:				
- rail	870	532	1.64	0.39
- road[a]	523	343	1.52	0.38
- water:				
- rivers and lakes	633	n.a.		
- ocean and coastwise[b]	2,191	n.a.		
- air	n.a.	3,577		

Source: Tables 8.

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

[a] 1987 estimates from Dept. of Transportation (1994), *North American Transportation*, pp. 48 and 50;
[b] Coastwise only.

b) it may be possible to separate output and employment of a branch into transport and terminal service (for example air transport can be separated into flight and ground services);

c) in some cases (Smith, Hitchens and Davies, 1982), costs can be split into a transport and a terminal component;

d) PPPs may be estimated on the basis of prices in each country which reflect the proportionally higher costs of transporting goods

over shorter distances[9];

e) the physical output measure (i.e. ton km) can be adjusted by the relative costs of operating short and long distance haulage. Smith, Hitchens and Davies (1982) used data on the relative cost per mile to operate motorvehicles to transport freight for average lengths of hauls typical for the UK and the USA;

f) the physical output measure may be adjusted in order to take account of the terminal work. Two indicators may be used: ton km for transport and tons for the terminal work (Paige and Bombach, 1959). A total output index was constructed weighting each component by the shares of transport and terminal cost in total cost.

Average freight hauls were quite different in Mexico and the USA, so it would be unrealistic to assume that the proportionate amount of terminal work is the same in both countries. Data limitations did not permit the use of methods (b) to (e). Method (f) was therefore used to account for terminal work. No data were available on the share of terminal services in total costs. An indirect method was developed in order to estimate the share of terminal and moving services in total output.

US relative output (Q^{USA}) was estimated by a composite index, in which Mexican output (Q^{MX}) 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 Mexico, and ii) the relative amount of US terminal services compared to Mexico, see formula (1). M^{USA} and M^{MX} represent the movement of freight or passengers in the USA and in Mexico respectively measured by the number of tonne km or passenger km. T^{USA} and T^{MX} represent terminal services in the USA and in Mexico 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^{MX}) and α for the terminal services (i.e.

[9] Smith, Hitchens and Davies (1982) cite data from British sample surveys of road goods transport in the mid-sixties to estimate transport charges broken down between a terminal charge and a charge per km of haul: $Y = a + b*X$, in which Y = transport charge per ton, X the length of haul, a is the intercept representing the terminal charge for a specific commodity, and b the increment in cost for each km of haul. Coefficients for different commodity groups were used with data on tons carried and lengths of haul in order to derive a price ratio for the USA/UK. This price ratio was used to convert US output.

T^{USA}/T^{MX}). The weight α is between 0 and 1.

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

The share α is determined by the difference between the Mexican and the US average freight haul or passenger trip, see formula (2a) and (2b). H^{USA} and H^{MX} represent the average distance over which freight or passengers were transported in 1975 in the USA and in in Mexico respectively (see Table 9). The bigger the difference between H^{USA} and H^{MX}, the higher α will be (i.e. the bigger the weight of terminal services in the composite index).

$$\alpha = (1 - \frac{H^{MX}}{H^{USA}}) \; if \; H^{MX} < H^{USA} \qquad (2a)$$

or

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

Below two examples are presented of the derivation of US relative output: rail freight (longer US haul compared to Mexico) and rail passenger transport (Mexican average trip length is longer than US length).

Example 1: rail freight transport

The Mexican average freight haul was shorter than the average US haul: 532 km compared to 870 km. Mexican 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^{MX} = 1,093,446/33,393 = 32.7) compared to the relative US output of freight loaded and unloaded (T^{USA}/T^{MX} = 1,270/63 = 20.2). Mexican 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 $H^{USA} > H^{MX}$: α = 1 - 532/870 = 0.39. The weight of the moving services is (1 - 0,39) = 0.61. US relative output (Mexico is 100.0) is subsequently derived by formula (1): Q^{USA} = (0.61*32.7 + 0.39*20.2) * 100 = 2,783

Example 2: rail passenger transport

The Mexican average rail passenger trip was longer than the US trip: 168 km compared to 60 km. The proportionate amount of terminal services was therefore higher in the USA compared to Mexico. This can be seen by the higher relative US output of passengers loaded and unloaded (T^{USA}/T^{MX} = 269/25 = 10.9) compared to the US relative output of passengers moved (M^{USA}/M^{MX} = 15,985/4,143 = 3.9). The weight of the terminal services α is determined by formula (2b), because $H^{USA} < H^{MX}$: α = 1 - 60/168 = 0.35. The weight of the moving services is (1 - 0.35) = 0.65. US relative output (Mexico is 100.0) is subsequently derived by formula (1): Q^{USA} = (0.65*3.9 + 0.35*10.9) * 100 = 635.

If the difference between 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^{MX}). If the difference in average freight haul or passenger trip length between two countries is small, 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^{MX}).

The quality of Mexican rail passenger transport is inferior to its US counterpart. Mexican trains were more crowded than US trains, measured in terms of passengers per train km. US trains carried on average 0.47 times the number of passengers transported by Mexican trains. This ratio was used to adjust the Mexican weighted output, assuming that this ratio also represented other quality aspects (like differences in comfort, delays, etc.).

b) Road passenger transport

This branch consists of passenger transport by bus (urban and suburban, and long distance), as well as tramway and subway services. School and sightseeing buses and taxis were excluded in both countries. Bus transport was much more important in Mexico than in the USA (35.3 per cent of transport GDP compared with only 6.1 per cent). The difference is due to the much higher use of private automobile transport which does not enter into our accounts.

Statistics on road passenger output in both countries were in terms of the number of passenger journeys and the number of vehicle km. Data on passenger km data were

available only for US intercity bus transport. Output was estimated by the number of passenger journeys. This measure is conceptually almost as suitable as passenger km, if average distances travelled are similar in the two countries. Average journey for travel in urban and suburban areas is probably very similar (see Smith, Hitchens and Davies, 1982). However, the average trip length for intercity buses can be very different. So the bias in the output measured is likely to be concentrated on intercity bus passenger transport.

Quality differences in bus transport are important. Mexican buses are much more crowded than their US counterparts. This can be seen by looking at the number of passengers per vehicle km in both countries (Meyer and Gómez-Ibáñez (1980), p. 315), see Table 10. Mexican buses carried on average 1.74 times as many passengers per vehicle mile than their US counterparts.

Overcrowding is one of the most important aspects of quality, but not the only one. Other aspects of quality are speed of transport, delays, respect of announced schedules, numbers of accidents and frequency of service. Output should be adjusted for these quality differences. I assumed that differences in passenger density were representative for all quality differences. Mexican output was adjusted downwards by the ratio of US to Mexican passengers per vehicle km. Difference in passenger density in all mass transit was used to adjust output in subways.

Table 10
Quality of Mexican and US Mass Transit Measured in Terms of Passengers per Vehicle Mile, 1975

	Mexico	USA	Mexico/ USA (%)
Urban and suburban buses	4.11	2.07	1.98
Intercity buses	0.34	0.19	1.74
Tramway and trolley services	7.29	3.59	2.03
TOTAL Mass Transit (except subways)	2.26	1.31	1.73

Sources: Appendix Tables A3 and A4.

c) **Road freight transport**

Road freight transport was the most important transport branch in both countries in terms of its share in transport GDP (see Table 6). However, the Mexican census covered less than 20 per cent of the road freight transport activity shown in the national accounts (see Table 19). Only vehicles which operated with special licenses, transported goods over a fixed route, or special kinds of product without a fixed route, were covered by the census (see Islas, 1992). Road freight transporters without these licenses accounted for the other 80 per cent. Due to the very low coverage, the Mexican census was not suitable for matching road freight transport with the USA. Other sources were used instead[10].

Roads were on average more crowded in Mexico than in the USA in 1975, see Table 11. Congestion was measured by the number of vehicle km per km of road. Congestion

Table 11
Estimated Distance Travelled by Mexican and US Vehicles, Length of Paved and Unpaved Roads and Congestion Measured by Vehicle km per km of Road, 1975

	USA	Mexico	USA/ Mexico (%)
Vehicle km (million):			
Private automobiles and motorcycles	1,673,360	39,674	
Trucks	453,738	16,245	
Buses	9,815	356	
Total (all vehicles)	2,136,913	56,275	
Km of paved and unpaved roads	6,175,664	124,745	
Congestion (veh. km per km of road)	346,022	451,119	0.767

Sources: USA from Department of Commerce, *Statistical Abstract of the United States 1977*, Mexican distances travelled were estimated by multiplying the average US distance travelled by the number of Mexican vehicles as listed in Table 2. Network of paved roads from Table 1.

[10] Islas Rivera (1992, p. 66) gives an estimate of the total moving services of Mexican trucking. The gross value of output was derived from the Mexican national accounts. The average freight haul for Mexico and the USA was derived from US Department of Transportation (1994), *North American Transportation*, pp. 48-50. These estimates were for 1987, but I supposed they also were valid for 1975. The number of tons transported was estimated using the data and tonne km and average freight hauls for both countries.

on US roads was 76.7 per cent of that in Mexico. Quality of road freight transport was partly determined by the congestion, because more road traffic means a lower average vehicle speed, more traffic jams, more accidents, etc. Weighted output in Mexico was adjusted by this ratio, assuming that other quality differences were also accounted for.

d) **Air transport**

The share of airways in US transport GDP was more than 3 times bigger than in Mexico. Passenger transport was the most important air activity. A variety of output measures were available: passengers, passenger km, ton km and aircraft km. Two matches were made: for passenger and for freight transport. The average passenger flight in Mexico was 999 kilometres compared with 1,334 kilometres in the USA in 1975. The proportionate importance of ground services was therefore greater in Mexico. A composite output index was constructed using passenger km as an output indicator for flying activity and passengers as a measure for airport activity (see formula 1). Quality of Mexican air passenger transport was inferior to that in the USA. Delays were more frequent in Mexico, aeroplanes were older, etc. I assumed that the quality of the service was 70 per cent of that in the USA, and adjusted output correspondingly.

No data were available at the moment on tons of freight transported by US air carriers. Average freight haul could therefore not be calculated. Output of air freight transport was therefore estimated by ton km only.

e) **Water transport**

Water services account for only 2.7 percent of Mexican transport GDP. In the USA the share was higher, at 6.9 per cent.

The movement of passengers by ship or boat in both countries could not be matched. Two matches were made for water freight transport. One for sea transport, coastal transport and port activities, and another for freight transport on lakes and rivers. Mexican water freight transport output was measured in tons and ship km. Output of US sea freight transport in the *Statistical Abstract of the United States (various issues)*, which was the main part of water transport, was only in terms of tons. I therefore used tons as output measure, assuming average freight hauls were similar in Mexico and the USA.

f) **General transport services**

These consist of a variety of services to all modes of transport. One important activity is public warehousing. No data were available on physical output produced in both countries.

III MATCHING MEXICO AND THE USA: COMMUNICATIONS

Communications consist of telephone and telegraph services, postal services and miscellaneous communication services.

a) **Telephone and telegraph services**

In both countries telephone and telegraph services accounted for 90 per cent of communications GDP. Some characteristics of Mexican and US telecommunications are shown in Table 12. In the USA were 130 million telephones in 1975, which is 45 times the Mexican figure. Per head of population there were 12 times as many telephones in the USA compared to Mexico. The number of US phone calls per capita was 9 times the Mexican figure.

Table 12
Communications in Mexico and the USA, 1975

	USA		Mexico	
	Total (million)	Per capita	Total (million)	Per capita
Number of telephones	130	0.602	3	0.048
Number of calls	228,917	1,060	7,034	117
Pieces of domestic mail sent	88,334	409	1,026	17

Sources: Appendix Tables A3 and A4.

The Mexican census did not include sufficient data, so I relied on the national accounts to derive data on physical output quantities, gross value of output, value added and employment. Telephone service output was measured using a weighted average of two indicators: the number of telephones in use and the number of phone calls. The weights are based on the allocation of employment in telecommunications as estimated by

McKinsey (1992) for 5 countries in 1989: 85 per cent of the employees were engaged in the installing and maintenance of the network and maintaining the customer relationship; the other 15 per cent worked in traffic related parts (i.e. providing directory services and operating switches). Paige and Bombach (1959) used the same procedure to estimate output of telephone services. Physical output in telegraph services was estimated as the number of messages transmitted.

b) **Postal services**

Postal services include a number of activities. The most important is mail handling, but also banking and miscellaneous services. Terminal work is predominant, comprising sorting, delivery, counter and other handling services. It was estimated that carriage cost are less than ten per cent of the total cost in the UK and USA (Smith, Hitchens and Davies, 1982). I measured output in terms of pieces of mail handled and assumed that the commodity mix, the composition of mail handled, was broadly the same in Mexico and the USA.

IV AGGREGATE RESULTS IN TERMS OF OUTPUT, VALUE ADDED AND PPPs

I have already discussed the measures which were used to estimate the physical output of each branch of transport and communications. The value of production (output) was estimated in terms of total revenue, including subsidies and excluding taxes. Dividing revenue by physical output we can derive an estimate of the value per unit of production (for example pesos or US$ per passenger km or ton km). The ratio of the Mexican unit value to the US unit value is defined as the purchasing power parity (PPP)[11]. If a PPP is to be calculated for a combination of transport activities, the PPPs for specific transport activities have to be weighted. Either Mexican and US produced quantities can be used as weights. If the former set of weights is used, a Paasche PPP is derived and if US weights are used we derive the Laspeyres PPP. The geometric average of both is the Fisher PPP. This aggregation procedure was applied for going from a specific transport activity to the

[11] The USA was the "numéraire" country.

branch level. The second step of aggregation from the branch to the sector level is made by weighting the PPPs for the gross value of output as derived for each branch by the value added of each branch in Mexico or the USA as listed in Table 6.

The Paasche, Laspeyres and Fisher PPPs by branches and for total transport and communications are shown in Table 13. No PPPs could be derived for transport and communication services. The PPPs for transport and communication services were assumed to be equal to the weighted average of the PPPs for the other branches, using gross value added as the weight. Low PPPs in transport were estimated for road

Table 13
Paasche, Laspeyres and Fisher PPPs for Transport and Communications, Mexico and the USA, 1975

	With Mexican quantity weights (Paasche PPPs)	With US quantity weights (Laspeyres PPPs)	Geometric average (Fisher)
TRANSPORT:			
1. Railways	8.58	8.48	8.53
2. Road Passenger Transport	6.84	6.77	6.80
3. Road Freight Transport	10.12	10.12	10.12
4. Water Transport	19.79	18.69	19.23
5. Air Transport	14.15	14.73	14.44
6. Transportation Services	8.67	10.91	9.73
Total (All branches)	8.67	10.91	9.73
COMMUNICATIONS:			
1. Telephone Services	9.76	9.76	9.76
2. Postal Services	2.52	2.52	2.52
3. Telegraph Services	7.22	7.22	7.22
4. Other Communication Services	8.26	9.10	8.67
Total (All branches)	8.26	9.10	8.67
TRANSPORT/COMMUNICATIONS	8.62	10.22	9.39
Exchange rate	12.50	12.50	12.50

Sources: Appendix Table A5.

Notes: The Paasche and Laspeyres PPPs for total transport and communications were obtained by weighting the PPPs of separate branches. Gross value added was used as weight.

PPPs for transportation and communication services were assumed to be the same as the average for the other branches.

passenger transport and high PPPs for water and air transport. The Paasche PPP for total transport was 8.67 and the Laspeyres PPP was 10.91. For communications, low PPPs were found for postal services and high PPPs for telephone services. The Paasche PPP for communications was 8.26 and the Laspeyres PPP was 9.10.

Comparison of ICOP and ICP PPPs for Transport and Communications

From an expenditure point of view, freight transport is an intermediate service. Transport of passengers is a final product and part of consumer expenditures, which figures explicitly in the International Comparisons Project (ICP). In Table 14, PPPs from Table 13 for different modes of passenger transport, and for two communication services are compared with those from ICP for 1975. ICP binary PPPs for all items were much lower than the ICOP Fisher PPPs, except for postal services.

Table 14
Comparison of ICP and ICOP: ICOP Fisher PPPs and Detailed Binary PPPs in Transport and Communications, Mexico and the USA, 1975 (pesos per US$)

	ICOP Fisher estimate	ICP detailed binary
Transport:		
1. Rail Passenger Transport	18.66	1.01
2. Road Passenger Transport	6.80	1.83
3. Air Passenger Transport	15.72	5.20
Communications:		
1. Telephone, Telegraph Services	9.01	1.05
2. Postal Services	2.52	9.92

Sources: ICOP Fisher estimates are the geometric average of the Paasche and Laspeyres estimates of Table A5. Unpublished ICP detailed binary PPPs supplied by Alan Heston (worksheets from Kravis, Heston and Summers, 1982).

Value Added in Comparable "Prices" in Transport and Communications

In Table 15 gross value added in national currencies is converted using the Paasche and the Laspeyres PPPs of Table 13.

Table 15
Gross Value Added in Transport and Communications with ICOP PPPs
Mexico and the USA, 1975

	at Mexican "Prices"[a]			at US "Prices"[b]			Fisher Geometric average[c]
	Mexico	USA	Mexico/ USA	Mexico	USA	Mexico/ USA	
	(million pesos)		(%)	(million US$)		(%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TRANSPORT:							
1. Railways	3,395	107,949	3.1	396	12,737	3.1	3.1
2. Road Passenger Transport	19,455	23,525	82.7	2,845	3,476	81.9	82.3
3. Road Freight Transport	23,951	253,480	9.4	2,367	25,051	9.4	9.4
4. Water Transport	1,466	74,188	2.0	74	3,969	1.9	1.9
5. Air Transport	2,571	132,242	1.9	182	8,978	2.0	2.0
6. Transportation Services	4,320	31,461	13.7	498	2,884	17.3	15.4
TOTAL (All branches)	55,158	622,847	8.9	6,362	57,095	11.1	9.9
COMMUNICATIONS	7,454	315,388	2.4	902	34,664	2.6	2.5
TRANSPORT/COMM.	62,612	938,235	6.7	7,264	91,759	7.9	7.3

Sources: Gross value added from Table 6; PPP converters from Table 13.

[a] US gross value added converted to pesos with Laspeyres PPPs;
[b] Mexican gross value added converted with Paasche PPPs;
[c] Geometric average of column 3 and 6.

Mexican gross value added per head of population as a percentage of the US is shown in Table 16. Gross value added was converted by the exchange rate and by the PPP converters of Table 13. Mexican per capita gross value added was almost 3 times the US figure for road passenger transport, using the Fisher PPPs as currency converters. Mexican GVA per capita for total transport and communications was 20 per cent using the exchange rate and 26 per cent using Fisher PPPs.

Table 16
Gross Value Added in Transport and Communications per Head of Population, Mexico and the USA, 1975

	Using ICOP PPPs Converters			Exchange rate conversion
	At Mexican "prices"	At US "prices"	Geometric average	
	(1)	(2)	(3)	(4)
TRANSPORT:				
1. Railways	11.3	11.1	11.2	7.7
2. Road Passenger Transport	296.9	293.9	295.4	160.8
3. Road Freight Transport	33.9	33.9	33.9	27.5
4. Water Transport	7.1	6.7	6.9	10.6
5. Air Transport	7.0	7.3	7.1	8.2
6. Transportation Services	49.3	62.0	55.3	43.0
Total (All branches)	31.8	40.0	35.7	27.7
COMMUNICATIONS	8.5	9.3	8.9	6.2
TRANSPORT/COMM.	24.0	28.4	26.1	19.6

Sources: Gross value added from Table 15, Population from Table 7.

V LABOUR PRODUCTIVITY

a) Levels in 1975

Table 17 shows labour productivity in Mexican and US transport and communications in national currencies in 1975. Mexican productivity was relatively low in railways and high in air transport. In the USA, low relative productivity was found in road passenger transport and high relative productivity in air transport. Labour productivity across branches of transport diverged much more in Mexico than in the USA (the ratio of the highest to the lowest gross value added per person engaged was 2.1 for the USA and 5.0 for Mexico). The last column shows Mexican labour productivity as a percentage of the USA, converting Mexican gross value added per person engaged by the exchange rate (12.5 pesos to the US dollar). Mexican labour productivity was very low compared to the USA in rail transport, and over 60 per cent of the US level in air and water transport.

Table 17
Gross Value Added per Person Engaged (in National Currencies) in Transport and Communications, Mexico and the USA, 1975

	Mexican gross value added per person engaged (1975 pesos)	Mexican gross value per person engaged as as % of the average	US gross value added per person engaged (1975 US$)	Mexican gross value per person engaged as as % of the average	Mexican value added per person engaged (converted at the exchange rate) as a % of US productivity
TRANSPORT:					
1. Railways	37,961	36.7	23,243	117.5	13.1
2. Road Passenger Transport	70,070	67.8	11,322	57.3	49.5
3. Road Freight Transport	61,531	59.5	19,021	96.2	25.9
4. Water Transport	159,798	154.6	20,045	101.4	63.8
5. Air Transport	191,458	185.3	24,199	122.4	63.3
6. Transportation Services	120,812	116.9	19,753	99.9	48.9
Total (All branches)	103,334	100.0	19,777	100.0	41.8
COMMUNICATIONS	109,365		29,376		29.8
TRANSPORT/COMM.	104,017		22,562		36.9

Sources: Gross value added data from Table 15; employment from Table 7.

Table 18 gives gross value added per person engaged, using ICOP Paasche and Laspeyres converters. Relative Mexican productivity was very low in railways. High relative Mexican productivity was found in road passenger transport, and in air transport and transport services. Overall Mexican labour productivity in transport and communications was 30.7 per cent of the US level at Mexican "prices" and 36.5 per cent at US "prices". The geometric average of both results was 33.5 per cent of the US level.

Table 18
Gross Value Added in Transport and Communications per Person Engaged, Converted with ICOP PPPs, Mexico and the USA, 1975

	at Mexican "Prices"[a]			at US "Prices"[b]			Fisher Geometric average[c]
	Mexico	USA	Mexico/ USA	Mexico	USA	Mexico/ USA	
	(million pesos)		(%)	(million US$)		(%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TRANSPORT:							
1. Railways	37,961	196,988	19.3	4,423	23,243	19.0	19.1
2. Road Passenger Transport	70,070	76,630	91.4	10,247	11,322	90.5	91.0
3. Road Freight Transport	61,531	192,468	32.0	6,081	19,021	32.0	32.0
4. Water Transport	159,798	374,689	42.6	8,074	20,045	40.3	41.4
5. Air Transport	191,458	356,449	53.7	13,528	24,199	55.9	54.8
6. Transportation Services	120,812	215,489	56.1	13,934	19,753	70.5	62.9
Total (All branches)[c]	67,703	215,742	31.4	7,809	19,777	39.5	35.2
COMMUNICATIONS[c]	109,365	267,278	40.9	13,235	29,376	45.1	42.9
TRANSPORT/COMM.[c]	70,920	230,695	30.7	8,228	22,562	36.5	33.5

Sources: National accounts value added from Table 20; employment from Table 7.

[a] US gross value added converted to pesos with Laspeyres PPPs;
[b] Mexican gross value added converted with Paasche PPPs;
[c] Labour productivity of total transport and communications was estimated using national accounts estimates of value added and employment.

Note: The Mexican national accounts do not give a breakdown of employment in transport and communications. Productivity per branch of transport was calculated using census estimates of value added and employment.

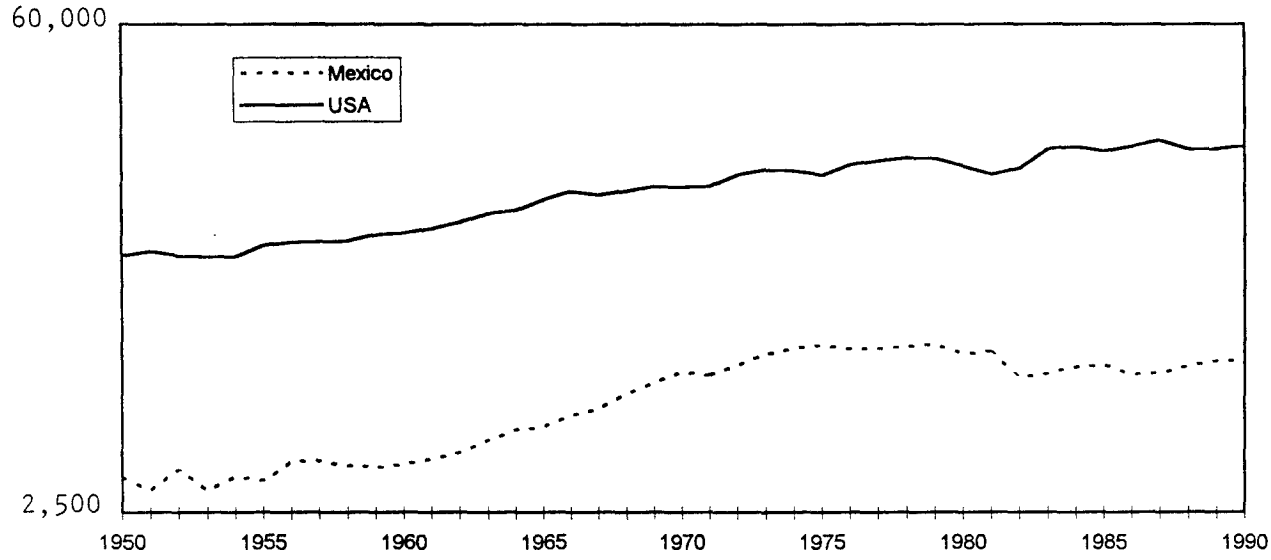
b) Changes in Labour Productivity: 1950-90

Using time series on GDP and employment for Mexico and the USA, I extrapolated the 1975 results for total transport and communications to cover the period 1950-90 (see Appendix A6 and A7 for the derivation of GDP at constant prices and employment).

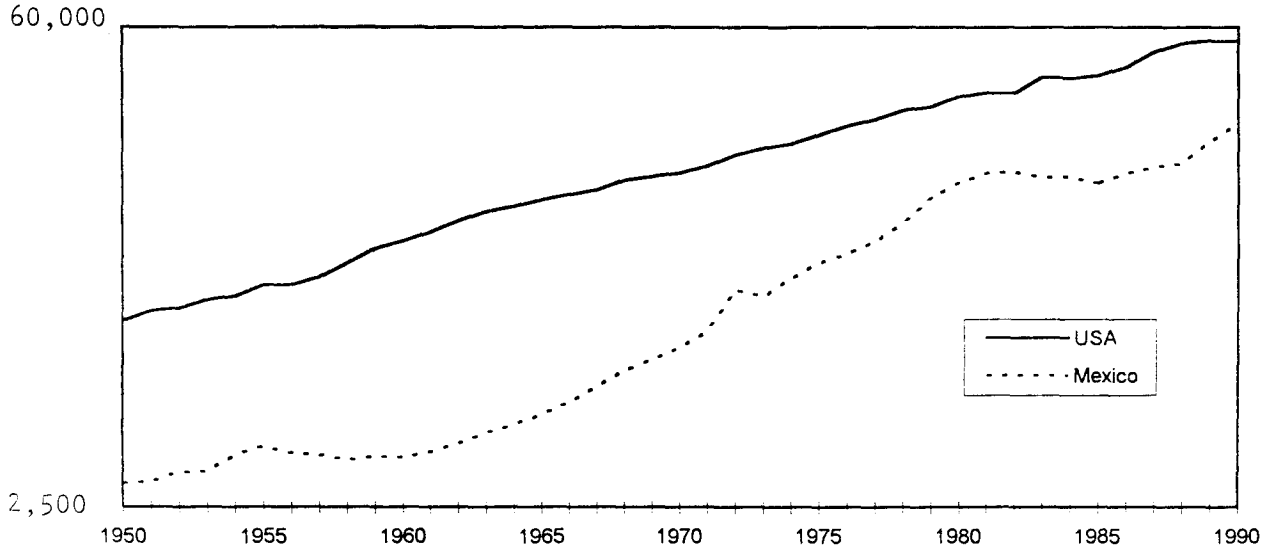
Results are shown in Graph 1 and 2. Graph 1 shows levels of GDP per person engaged in 1975 US$ on a semi-logarithmic scale in transport, and Graph 2 in communications. Mexican GDP per person engaged in 1975 pesos was converted using the Fisher PPP for total transport and communications. Mexican GDP per person rose up

to 1979, after which a downward trend was observed till 1982. GDP per person remained constant untill 1987, after which the level increased slightly. An upward trend was observed for US GDP per person for the whole period. Graph 2 shows a rising trend in productivity in communications. The productivity gap between Mexico and the USA is becoming smaller in this period.

Graph 1
GDP per Person Engaged in Transport, Mexico and the USA in 1975 US$, 1950-90 (semi-logarithmic scale)

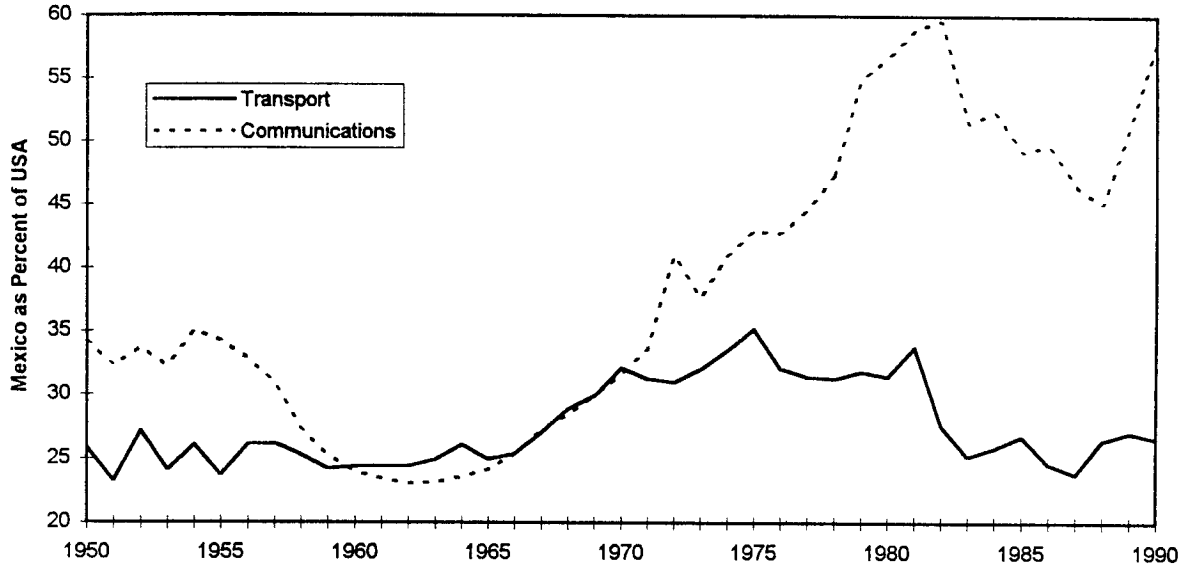


Graph 2
GDP per Person Engaged in Communications, Mexico and the USA in 1975 US$, 1950-90 (semi-logarithmic scale)



Mexican labour productivity as a percent of the USA is shown in Graph 3. In 1950, relative productivity of communications was higher than that of transport. Relative productivity of both branches was similar in the 1966-70 period. In the 1970-90 period, however, an upward trend was observed for Mexican relative productivity in communications and a worsening relative performance in transport.

Graph 3
Labour Productivity in Transport and Communications: Mexico as Percent of USA, 1950-90



VI COMPARING THE MEXICAN CENSUS AND NATIONAL ACCOUNTS

Census and national accounts estimates of gross value added and employment in transport and communications are compared for Mexico in Table 19. The US census of transport did not give any estimate of value added or employment (see p. 1). In rail and air transport, census value added was not too different from national accounts value added, see Table 19. Road passenger and water transport value added were about sixty per cent of the national accounts estimate. Road freight transport value added in the national accounts was more than six times the census estimate. National accounts value added for total transport was more than two times the census estimate.

Table 19
Confrontation of Mexican Census and National Accounts Estimates for Transport and Communications, 1975 (million pesos and number of paid employees)

	Gross Value of Output			Gross Value Added			Paid Employees		
	Census	National Accounts	Ratio of census to national accounts	Census	National Accounts	Ratio of census to national accounts	Census (000s)	National Accounts (000s)	Ratio of census to national accounts
TRANSPORT:									
1. Railways	5,598	6,367	0.88	3,752	3,395	1.11	99		
2. Road Passenger Transport	18,028	28,703	0.63	11,734	19,455	0.60	115		
3. Road Freight Transport	6,163	33,878	0.18	3,817	23,951	0.16	36		
4. Water Transport	1,791	3,443	0.52	896	1,466	0.61	5		
5. Air Transport	5,572	5,412	1.03	3,489	2,571	1.36	18		
6. Transportation Services	4,613	6,291	0.73	3,218	4,320	0.74	26		
TOTAL (All branches)	41,765	84,093	0.50	26,906	55,158	0.49	299	534	0.56
COMMUNICATIONS	5,296	9,058	0.58	3,076	7,454	0.41	22	68	0.32
TRANSPORT/COMM.	47,061	93,151	0.51	29,982	62,612	0.48	321	602	0.53
Labour Productivity:									
- Transport	100.0	112.9		100.0	115.0				
- Communications	100.0	54.1		100.0	76.7				
Transport/Comm.	100.0	105.5		100.0	111.3				

Sources: census estimates from SPP (1981), *Censo de Transportes y Comunicaciones 1975*; national accounts estimates from SPP (1981), *Sistema de Cuentas Nacionales de Mexico, 1970-78*, Mexico-City.

Note: the Mexican census only covered telephone services in communications.

The national accounts estimated that 888 thousand motor vehicles were engaged in the transport of goods (SPP, 1981a), of which only 48 thousand were included in the census. The census included only vehicles which operated with special permits, transporting goods over a fixed route or special kinds of products without a fixed route (see Islas Rivera, p. 59). The higher value added of the national accounts compared to the census in the case of water transport was mainly due to the exclusion of the activities of PEMEX (oil company) fleet from the census.

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APPENDIX

(available upon request from the author)

APPENDIX A

Table A1 : Mexican Standard Industrial Classification and Glossary for Transport and Communications;

Table A2 : Matching Procedures for Transport and Communications, Mexico and the USA, 1975;

Table A3 : Basic Mexican Census Listing for Transport and Communications, Mexico, 1975;

Table A4 : Basic US Listing for Transport and Communications, USA, 1975;

Table A5 : Matching of Product Items, USA and Mexico, Transport and Communications, 1975;

Table A6 : GDP at Constant Prices in Transport and Communications, Mexico and the USA, 1950-1990

Table A7 : Employment in Transport and Communications, Mexico and the USA, 1950-1990

APPENDIX B

Previous International and Intertemporal Comparisons of Productivity in Transport and Communications

Papers issued in the sub-series of the Groningen Growth and Development Centre:

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579 (GD-18) Mulder, Nanno, (1994), Transport and Communication in Mexico and the United States: Value Added, Purchasing Power Parities and Productivity (1994)