

***Quaternarisation of the economy and policy implications for development. The
Monterrey Metropolitan Area (Mexico)***
(Preliminary version)

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Abstract

This is an investigation about whether or not the tertiary revolution in Mexico has been driven by the growth of technology and knowledge-based services as it occurred in developed countries; a process known as quaternarisation. We applied different techniques of regional analysis to the Monterrey Metropolitan Area (MMA), and identified the activities with the best performance (from 1980-2003). The empirical results confirm a structural change from industrial to services as the main source of real value added. Producer services are the branches that have created more value added and employment within the tertiary sector. Cities in the metropolitan area where there is a strong industrial base tend to have the highest coefficients of localisation and specialisation in producer services. The results support the thesis that the quaternarisation process is driven by producer services and depends strongly on the existence of an industrial sector. Policy implications and recommendations are discussed.

1. Introduction

As many other economies in the world where the economic structure has shifted from industrial to tertiary activities, Mexico has experienced a rapid transformation in the last years. Since the early beginning of the economic analysis of society, classical economists such as Adam Smith (1958) considered services as non productive activities because in comparison to manufactures, it was difficult to perceive its value added and contribution to the wealth of nations. Many would argue that the fact that a talented intellectual's work is not tangible should not be less valuable than a farmer's or carpenter's work. Parrinello (2004) proposes to consider services not only as transaction commodities between individuals but also between production processes. This definition encompasses labour services and complex forms such as knowledge and information based services.

The tertiary revolution implies a rise in services and retail trade transactions in detriment of commodity goods production, which has slowly been reducing its share on

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output and employment growth. In developed countries where this process is more evident, the tertiary activities have concentrated on producer services rather than individual consumer services. The evidence supports the thesis that there is a strong link between the industrial and service sectors; the shift from manufactures to tertiary activities is more likely to occur in regions or economies with high industrial content.

Elfring (1989) investigated how and when the shift to services occurred in seven developed nations (USA, UK, Japan, Germany, France, Netherlands and Sweden). Based on historical statistics starting in 1960, Elfring shows that it was not until the middle of the 1970s when these nations services' value added represented more than 50% of the GDP (the average between 1974 and 1979 was 59%). As a result these nations are now labelled as service economies. In terms of employment, data from 1960 shows a strong decline in agriculture and a rise in industrial employment. However in 1984, it was evident that both agriculture and industrial jobs creation had been decreasing rapidly. On the other hand the expansion of services share represented between 53% and 72% of total employment. According to data from the 1970s and 1980s, much of this expansion was explained by the growing service employment in producer services, although in absolute terms, social services had the highest share in total employment.

The heterogeneity of services requires a disaggregated analysis in order to put in context why it has grown rapidly in the last years[†]. For example, in many advanced countries, producer services have driven the entire sector's growth. Cuadrado-Roura *et al.* (1992) mentions four elements that have boosted the growth of producer services: openness to international markets that requires up to date commercialisation strategies, changes in the legislation that requires specialised legal advice, technological advance which implies a higher demand for IT services and the introduction of new organisation methods among the most important. New ways to operate and compete around the world means -at the same time- that the manufacture and agricultural industries are increasing their demand for professional services. Additionally to these industries, there is also a high intra-industry services demand from wholesale and retail trade, hotels, restaurants, etc. The strong link between these industries and services implies that the

[†] In this paper, we distinguish two groups, producer services and consumer services. The first are demanded mainly by enterprises and serve as intermediate and supportive of the production process in other sectors. The second are demanded by individual (final) consumers and add little or no value to the production process. Social services provided by the government, financial services and transportation were excluded from the analysis.

former have become part of the production processes, and for that reason their contribution to value added seem to be growing fast.

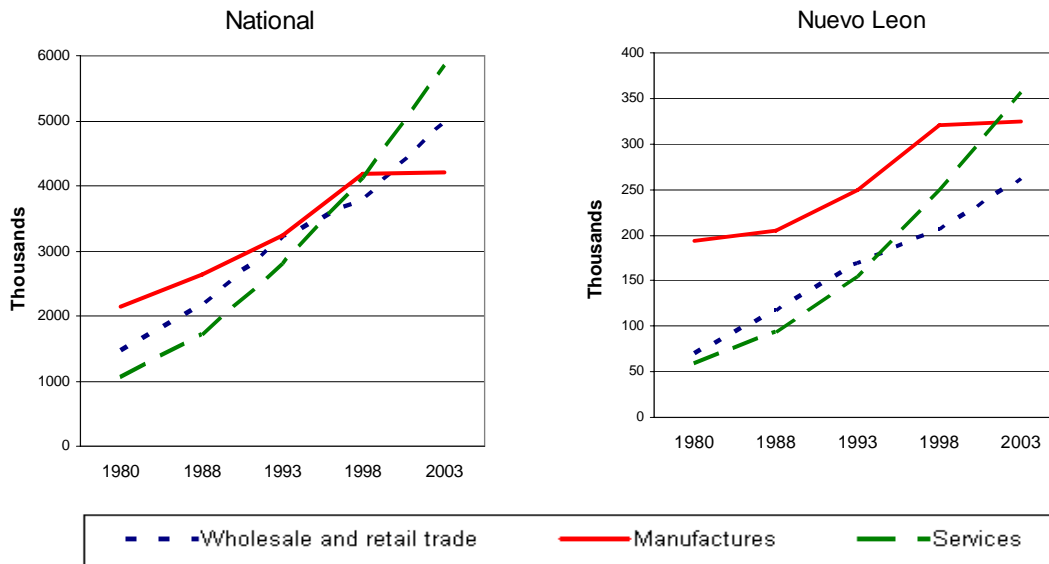
In summary, developed countries have witnessed since the 1970s an important structural change not only in terms of employment but also in terms of valued added from agricultural and industrial activities to services. Among the reasons why the service sector has increased its role in the economy are new organisation techniques, the positive correlation between income per capita and personal services, services are less vulnerable to economic recession, low mobility implies less demand for competition and the transfer of activities that previously were performed by the industrial sector.

The hegemony of services in metropolitan areas in developing countries, the case of Monterrey Metropolitan Area (MMA).

In Mexico, the structural change from the secondary to tertiary sector has occurred as in many other countries. According to data obtained from the economic census collected by the Instituto Nacional de Estadística, Geografía e Informática (INEGI) in 1980, 1988, 1993, 1998 and 2003. Figure 1 illustrates the pattern followed by Nuevo Leon (the state where the MMA is located) and Mexico for the entire period in terms of employment. Until the census data from 1998, at the national level we see a similar amount of jobs created by the three different sectors. However, in the 2003 census, data showed that services have become the main source of employment in Mexico. In Nuevo Leon we do not witness the same pattern because this state has historically represented one of the main industrial locations. For many years, the industrial sector has been the most important source of employment. However the shift to services could also be consequence of the introduction of more technological advanced processes that required less number of workers per unit as well as high levels of specialisation within the industry, leaving indirect activities to other sectors (for example by subcontracting activities that become intermediaries in the production process). It is worth mentioning that this is not exclusive of Nuevo Leon, in fact the industry's delegation of non-related output production activities to the service sector is common. Caselli *et al.* (1991) explain how the Italian industry was forced -during the period 1976 to 1988- to transfer those activities non related directly to physical goods production to the service sector. This strategy was a consequence of two oil crises that

required a more efficient and competitive industry that could remain in adverse economic conditions.

Figure 1
Mexico and Nuevo Leon state: employment by economic sector, 1980-2003



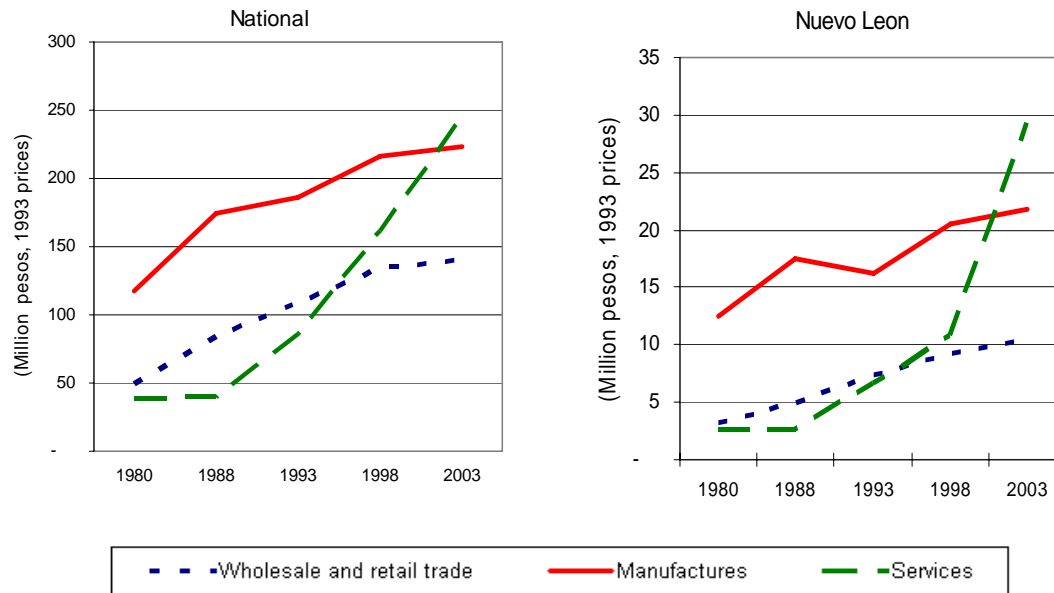
Source: Censos Económicos, INEGI.

In terms of real value added, we can see an evident shift towards services in Figure 2. In comparison to other countries, in Mexico the shift has occurred very recently, most precisely in 2003. Although manufactures has been one of the most important sources of GDP for many years, especially since economic liberalisation in the mid 1980s, the tertiary sector has grown dramatically in the last years. As a result we witness a higher contribution of services in 2003. Manufactures' share on GDP seems to have remained constant since 1998. Basically, based on the empirical data, we confirm that the Mexican economy has become a tertiary economy. The goal is to investigate the pattern followed by this structural change.

According to Elfring (1989) it is necessary to distinguish among the heterogeneous subsectors to identify the activities responsible for the prevalence of services over the industry and agriculture. In this context, we have distinguished two types of subsectors: producer services and consumer services, and we have left aside social services attributed to the government and non profit organisations.

Figure 2

Mexico and Nuevo Leon state: real value added by economic sector, 1980-2003



Source: Censos Económicos, INEGI. Values were deflated by implicit price index, the base year was 1993.

Nuevo Leon is one of the most important states for the Mexican economy. According to national statistics in 2005, Mexico's real GDP was equal to \$1,613 billion pesos, Nuevo Leon was the second state with the highest contribution (7.4%) after the Federal District (20.4%). Although Nuevo Leon has 51 municipalities, most of its 4.2 million people live in the MMA, which represents 87.2% of the total population. The attractions of the metropolitan area are the high level of industrialisation, the location of big international corporations such as Cemex (cement export company), Cervezeria Cuauhtemoc (beer brewers of Sol, Tecate, XX), Vitro (glass) and the opportunities to enter the labour market easily. Only 9 cities are part of the metropolitan area, these are: Monterrey (with the highest population proportion 27%), Guadalupe, Apodaca, San Pedro Garza Garcia, San Nicolas de los Garza, Garcia, Escobedo, Juarez and Santa Catarina.

Monterrey is the capital and biggest city of the state of Nuevo Leon (in the North East of Mexico). Most of the main administration, financial and industrial centres are located in Monterrey. According to Pozos (1995) between 1975 and 1980 there was already empirical evidence that tertiary activities linked to the industrial sector showed

higher growth rates than the rest of the service branches. These activities were those offered by real states, financial services and technical services (together they had an average growth rate of 13.7% in employment and 21.6% in real value added). According to the last economic census, in 2003, the service sector contained 80 628 establishments that employed 509 040 workers in the entire MMA (INEGI).

The objective of this paper is to investigate whether the shift from manufactures to services in Mexico and in particular in the MMA has been similar to that experienced by advanced economies in Europe, in other words if the driving force is predominantly due to higher growth rates in producer services. To achieve the objective we determine the patterns of localisation, specialisation and competition in the MMA and identify the branches with the best performance and how they are related to producer or consumer services. The characteristics of services in tertiary economies show that they tend to concentrate in metropolitan areas where there is a strong industrial base, a condition that favours the expansion of producer services rather than personal services. We would expect to find the same in the case of the MMA.

2. Methodology

The division of services in two subsectors, producer and consumer services and 17 branches is based on the methodology developed by Garza (2008). Garza's methodology homogenises the different classifications used by INEGI in the census collected in 1980, 1988, 1994, 1998 and 2003. The numbers attached to each branch were selected by Garza (2008) arbitrarily; however we maintain his classification for comparison reasons. We chose to analyse the evolution of services only through three variables, real value added, number of employees and establishments. Value added in current pesos was deflated by the implicit price index using 1993 as the base year.

The methodology applied to attain the objectives is a regional analysis with different techniques such as Shift and Share, the calculations of coefficients of specialisation (or diversification) and localisation (or dispersion) and location quotients.

Shift and Share technique. This is a standard measure to analysis a regional growth in comparison to the national growth in the same economic sector and with the same variable. The calculation follows the formula:

$$y_r = s + y^*$$

Where y_r is the regional growth rate of a variable attributed to: s (*shift*) represents the difference between the national growth rate and the regional growth rate in the same sector (and which is explained by a structural effect and competitive effect). y^* (*share*) is the growth rate that the region would have achieved if it had grown at the national rate.

We follow the methodology developed by Capello (2007) who illustrates the shift and share calculations on a Cartesian plot to indicate the position of each branch in relation to the regional growth and national growth (y, x). In this way, we can visualize activities that are growing fast in competitive branches and those which are lagged. A line in the vertical axis (x) indicates the average national growth in the whole sector and a line in the horizontal axis (y) indicates the average regional growth. Therefore each square shows the relative position of each branch. A 45 degree horizontal line will divide the whole sector in two, above the line are branches with high growth rates in fast growing activities and below the line are branches with slow growth rates in lagged activities.

The location quotient (Q).- It measures the relative size of an activity in a city (in terms of employment or value added) in comparison to the size of the same activity in the whole region, the purpose is to show different degrees of specialisation. The quotient can be lower, equal or higher to 1. A number equal to one would indicate that the relative size of branch in a city is equal to the size in the entire MMA, so there is no specialisation. A number higher than one would indicate that the relative size of the branch in the city is higher than the size of the entire MMA, and then the city is relatively specialised. The calculation is obtained with the formula:

$$Q = \frac{\left(\frac{V_{ij}}{\sum_{i=1}^n V_{ij}} \right)}{\left(\frac{\sum_{j=1}^m V_{ij}}{\sum_{i=1}^n \sum_{j=1}^m V_{ij}} \right)}$$

Where V = variable, i = branch, $i=1,2\dots n$ and j =city, $j=1,2\dots m$

The specialisation coefficient (QR).- This coefficient measures how similar is the economic structure of the region with the totality. The coefficient can go from 0 to 1, a number closer to zero would indicate diversification of the tertiary activity since the distribution is similar to the entire MMA, a number closer to one would indicate a divergence from the regional structure and therefore a more specialised activity in a certain city. The calculation of the coefficient is as follows:

$$QR = \frac{1}{2} \sum_{i=1}^n \left| \frac{V_{ij}}{\sum_{i=1}^n V_{ij}} - \frac{\sum_{j=1}^m V_{ij}}{\sum_{i=1}^n \sum_{j=1}^m V_{ij}} \right|$$

Where V = variable, i = branch, $i=1, 2 \dots n$ and j =city, $j=1, 2 \dots m$

The localisation coefficient (QL).- The purpose is to show the interregional distribution of a variable (employment, value added or number of establishments) in relation to the distribution in the whole region, it is also considered as a measure of concentration. Its value goes from 0 to 1, a number higher than one would indicate that the relative size of that activity is more concentrated in relation to the distribution in the entire MMA. The calculation follows the formula:

$$QL = \frac{1}{2} \sum_{j=1}^m \left| \frac{V_{ij}}{\sum_{i=1}^n V_{ij}} - \frac{\sum_{i=1}^n V_{ij}}{\sum_{i=1}^n \sum_{j=1}^m V_{ij}} \right|$$

Where V = variable, i = branch, $i=1,2 \dots n$ and j =city, $j=1,2 \dots m$

For a detail description of the location quotient and localisation and specialisation coefficients see Mendez *et al.* (2004).

3. Results

The MMA concentrates around 87% of the state total population; data from 2003 show that the service sector in the metropolitan area concentrates more than 80% of establishments, 94% of the real value added and 88% of employment. These figures give us a good indication that most of the economic activity occurs in the MMA and its high concentration responds to the long history of industrial development. In absolute terms, the MMA has increased the number of tertiary establishments from 25 412 in

1980 to 80 628 in 2003, that means a 217% rise. Employment by the same sector grew from 111 990 employees to 509 040 in the same period, this represents a 354% rise in the same period (see Table A1 in the appendix). Obviously there have been some activities with higher and lower growth rates within the sector, but the most relevant aspect to take in consideration is how well some branches have grown in terms of value added per worker. In this sense, unfortunately the entire sector has reduced the real value added per worker in the period (it went from 160 real thousand pesos per worker in 1980 to 85.3 real thousand pesos in 2003), possibly due to recurrent economic crisis (in 1982, 1987 and 1994) that have deteriorated the Mexican economic performance. In general, the contribution to value added per worker is higher in the group of producer services, this has gone from \$314.6 to \$135.7 real thousand pesos per worker. On the other hand, in the group of consumer services, the value added per worker has gone from \$94.5 to \$52.5 real thousand pesos (from 1980 to 2003).

The analysis of the data was using the number of establishments, the employment and real value added. Table 1 shows the relative distribution of both groups in the MMA. The number of establishments of consumer services are more abundant than producer services (for example in 2003, the proportion was 87% versus 13%). However, producer services not only has a higher capacity to create real value added -which was 52% of total value added in the sector- but also to generate more value added per worker.

Table 1

Monterrey Metropolitan Area: percentage distribution (%) of producer and consumer services in terms of establishments, employees and real value added (1980-2003)

	Establishments			Number of employees			Value added (thousands pesos, 1993 prices)								
	1980	1988	1993	1988	1993	1988	1988	1993	2003						
I. Producer services	11.4	13.0	16.1	18.4	12.6	29.8	33.2	35.6	44.2	39.4	58.5	52.6	59.5	67.2	62.7
721 Professional services	5.2	6.9	8.0	10.8	7.6	13.5	16.8	18.8	28.3	26.8	25.0	17.9	28.6	37.6	38.1
731 Food, beverage and tobacco (wholesale)	2.3	0.9	1.5	1.4	1.0	7.2	4.4	5.3	4.8	4.3	17.1	8.5	10.0	7.1	9.3
732 Machinery and industrial equipment trade	3.9	5.2	5.7	6.2	4.1	9.1	12.0	11.5	11.1	8.9	16.5	26.2	19.9	22.1	15.3
II Consumer services	88.6	87.0	84.9	81.6	87.4	70.2	66.8	64.4	56.8	60.6	41.5	47.4	40.5	30.9	37.3
811 Food, beverage and tobacco (retail trade)	35.4	34.8	33.2	27.3	28.2	13.8	13.5	13.4	9.4	9.1	3.2	5.7	3.9	2.9	3.2
812 Supermarkets	0.8	0.6	0.7	1.6	1.4	4.3	5.5	4.2	4.7	5.9	5.2	5.0	4.2	2.4	3.0
813 Gas stations and fuel trade	0.2	0.2	0.1	0.2	0.5	0.7	0.6	0.6	0.8	1.1	0.1	0.9	0.6	0.8	1.2
821 Catering	8.0	6.5	6.2	6.8	8.1	7.8	7.3	8.2	6.6	7.7	3.5	3.3	3.5	2.1	2.8
822 Cleaning services	4.7	4.0	4.2	4.8	6.6	2.2	1.7	1.9	1.7	2.2	0.8	0.7	0.8	0.5	0.8
823 Leisure	1.1	0.7	1.3	1.0	0.7	1.8	1.8	1.5	1.6	1.5	1.3	0.8	0.8	0.5	0.8
824 Information and transmission services	0.4	0.3	0.2	0.3	0.1	1.3	1.0	0.8	0.3	0.8	2.1	1.1	1.1	4.2	1.3
825 Hotels, motels and hostels	0.6	0.2	0.1	0.2	0.2	2.0	1.2	1.1	1.0	0.9	1.5	1.3	1.1	1.0	0.7
831 Personal and household retail trade	18.8	20.1	20.2	19.0	23.3	13.5	15.0	12.7	10.9	12.1	8.2	13.9	9.9	6.7	7.9
832 Department stores	0.3	0.1	0.1	0.1	0.1	2.7	1.3	1.0	1.1	2.1	1.3	1.6	0.8	0.9	1.2
833 Automobiles and autoparts trade	2.1	2.3	2.2	2.3	2.6	3.4	2.9	2.9	2.7	3.3	5.4	3.7	2.9	2.7	4.1
841 Repair shops	9.8	11.1	10.3	10.7	9.8	5.9	7.0	6.3	5.3	4.3	2.4	2.9	2.4	2.7	1.6
842 Education and private cultural services	1.3	1.3	1.2	1.6	1.6	6.4	4.3	5.4	5.5	5.8	3.9	4.5	5.8	4.1	6.6
843 Health and private social assistance	5.2	4.8	4.8	5.7	4.3	4.7	3.6	4.5	4.1	3.8	2.8	2.0	2.8	1.7	2.4
Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: IV, VI, VII, VIII, X, XI, XII y XIII Censos comercial y de servicios, INEGI, México.
Compatibility of different census classifications is based on Garza's methodology (2008)

The dynamics of the regional development in the MMA

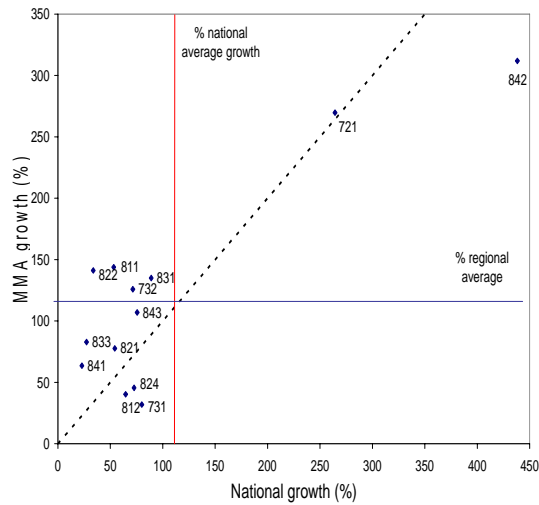
The analysis of the dynamics in the service sector was partially possible with the calculation of the shift and share components, following Capello's methodology (2007) who illustrates the relative position of each branch at the regional and national level. We plot in the following figures the growth rate of value added and employment in the MMA in the period 1980 to 2003. In this way we can observe in a Cartesian plot, the branches with growth rates above or below the average regional and national rates. The 45 degree line helps to distinguish activities with better regional capacity (differential effect) than their national counterpart; they lie above the 45 degree line.

In the period 1980 to 2003, in terms of real value added (see Figure 3), the vertical line represents the average national growth rate which was 115% and the horizontal line represents the average regional growth rate which was 111%. Thus, branches located in the upper right square had the highest growth rates not only in the MMA but also above the national rate, in this case, gas stations and fuel trade (813) which grew 4314% (the branch does not appear in the figure in order to preserve the scale and visualise the rest of the branches)³, followed by education and private cultural services (842) and professional services (721) with a 311% and 270% respectively. On the opposite, branches located in the lower left side of the plot and below the 45 degree line are activities in recession not only at the regional but also at the national level. In terms of value added, they are not contributing to the economy at the same capacity and competition levels than other branches. In the MMA, the branches in recession are hotels, motels and hostels (825), food, beverage and tobacco wholesale (731) and supermarkets (812). Their growth rates were 18%, 32% and 40% respectively.

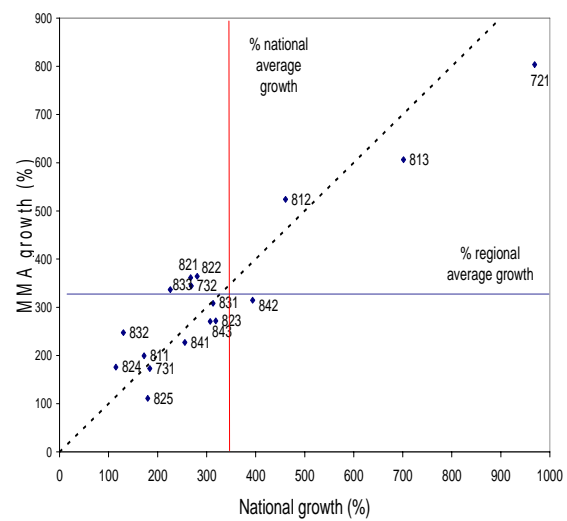
³ The impressive 4314% growth in gas stations and fuel trade (813) is explained by the small number of these establishments in 1980, so although they increased in number in 2003, the disproportionate numbers between the two years makes the growth rate look extremely large.

Figure 3

Relative sectoral growth of value added in the MMA, 1980-2003

**Figure 4**

Relative sectoral growth of employment in the MMA, 1980-2003



Branches :

- 721 Professional services
- 731 Food, beverage and tobacco (wholesale)
- 732 Machinery and industrial equipment trade
- 811 Food, beverage and tobacco (retail trade)
- 812 Supermarkets
- 813 Gas stations and fuel trade
- 821 Catering
- 822 Cleaning services
- 823 Leisure
- 824 Information and transmission services
- 825 Hotels, motels and hostels
- 831 Personal and household retail trade
- 832 Department stores
- 833 Automobile and auto parts trade
- 841 Repair shops
- 842 Education and private cultural services
- 843 Health and private social assistance

The analysis of jobs creation shows a similar pattern to value added, in the period 1980 to 2003, the average regional growth was 331% and the average national growth was 326%, both are indicated by the horizontal and vertical lines respectively. The branches with the highest growth rates were professional services (721) with 803% and gas stations and fuel trade (813) with 606% (see Figure 4). Surprisingly even though supermarkets were lagged in value added creation, their performance in terms of employment was outstanding. Their growth in this period was 524%. Activities with poor performance were hotels, motels and hostels (825), food, beverage and tobacco wholesale (731) and diffusion and information services (824) among others. Their growth rates were 111%, 173% and 176% respectively. In summary, from the shift and share analysis we find evidence that professional services in the MMA is one of the most important activities in the service sector. Its high growth rates in real value added

and jobs creation show that the tertiary activities in the MMA are moving towards producer services, probably due to the regional capacity and local competitiveness. Another important branch were gas stations and fuel trade, these activities have grown rapidly since 1980 and although they are not driving the sector at national level, they are still contributing to valued added and jobs creation in the MMA.

It is important to mention that one of the limitations of the shift and share analysis is the sensitiveness to the base year selection and initial absolute values of some branches, as we saw in the case of gas stations and fuel trade. This situation affects the national and regional average growth rates, and inevitably will underestimate the performance of other branches in the sector.

Intrametropolitan localisation and specialisation

We cannot talk of homogeneity within the service sector, as we have seen, some activities are very productive and are rapidly growing while others are lagged and their own nature do not allow them to compete with more technologically advanced activities, this will be explained later. Similarly, there is no homogeneity between the cities that the MMA comprises. Some like Monterrey concentrate the largest amount of establishments, although it does not necessarily imply that it has the highest specialisation coefficient in the sector. In Table 2 we present the calculations of the location quotient (Q) in terms of real value added for 2003 only. A location quotient higher than one indicates that the relative size of the branch in the city is higher than the same branch in the entire MMA. Cases like this would point towards a city's concentration of certain activity. If we read the table row by row, the highest concentration of professional services (721) is in Garcia (2.07) San Pedro Garza (1.62), Santa Catarina (1.46) and Monterrey (1.01). The cities mentioned before are also the ones with the best infrastructure and urban development in the state, so it is expected that professional services that required relative high levels of information and technological resources are also located in these cities. Additionally, it is important to mention that Monterrey, being the oldest industrial city in the MMA, has also become an important location of education and private health services (quotients of 1.26 and 1.44 respectively) along with San Pedro Garza Garcia (1.33 in education) which is the city with the highest income per capita in Mexico. This suggests that more industrial-oriented tertiary activities have moved outside the MMA's centre.

Table 2

Location quotient for real value added in the MMA cities, 2003.

	Apodaca	García	General Escobedo	Guadalupe	Juárez	Monterrey	San Nicolás de los Garza	San Pedro Garza García	Santa Catarina
I Producer services									
721 Professional services	0.98	2.07	0.17	0.32	0.30	1.01	0.38	1.62	1.46
731 Food, beverage and tobacco (wholesale)	1.94	0.11	1.21	2.90	1.68	0.62	2.36	0.15	1.50
732 Machinery and industrial equipment trade	1.46	0.59	3.14	0.94	1.20	0.96	1.53	0.49	0.58
II Consumer services									
811 Food, beverage and tobacco trade (retail trade)	1.69	1.21	1.64	2.53	6.13	0.70	2.13	0.21	1.08
812 Supermarkets	0.80	0.00	2.24	2.98	0.76	0.76	0.77	0.74	1.84
813 Gas stations and fuel trade	1.33	3.88	2.94	1.25	5.50	1.09	0.71	0.29	0.48
821 Catering	0.82	0.27	0.83	1.33	3.12	1.10	1.14	0.73	0.38
822 Clearing services	1.03	0.12	0.43	1.40	1.74	0.94	0.75	1.47	0.52
823 Leisure	0.16	0.05	0.47	0.97	4.10	1.02	0.85	1.76	0.05
824 Information and transmission services	0.01	0.00	0.22	0.66	0.34	1.22	1.26	1.03	0.20
825 Hotels, motels and hostels	0.46	0.00	0.13	0.56	0.00	1.29	0.58	1.16	0.03
831 Personal and household retail trade	0.66	0.15	0.89	1.21	1.15	1.11	0.97	0.78	0.74
832 Department stores	0.35	0.00	1.24	1.42	0.00	1.09	1.18	0.76	0.60
833 Automobile and auto parts trade	0.51	0.04	1.06	0.99	0.32	1.21	1.48	0.45	0.18
841 Repair shops	0.55	0.14	1.18	1.67	1.60	1.15	1.34	0.34	0.35
842 Education and private cultural services	0.13	0.04	0.08	0.33	0.03	1.26	0.65	1.33	0.38
843 Health and private social assistance	0.10	0.05	0.07	0.47	0.12	1.44	0.93	0.59	0.05

Source: Own elaboration with data from the IV, VI, VII, VIII, X, XI XII and XIII Censos Económicos INEGI.

Reading Table 2 in terms of cities' performance, we identify Guadalupe as a city with a high concentration of wholesale and retail trade of food, beverage and tobacco (2.9 and 2.5) and supermarkets (2.98). Guadalupe is relevant as a source of value added creation in commercial activities; a similar case was General Escobedo, in 2003 it achieved the highest location quotient in machinery and industrial equipment trade (3.14). A market demand for these sorts of services is due to the industrial sector located in the MMA, exerting an important demand. For this reason cities with high concentration of producer services and trade of industrial equipment are located close to industrial clusters.

The specialisation coefficient (QR) was calculated to determine the similarity between the tertiary structure of the cities and the whole MMA. So, this coefficient fluctuates between 0 to 1, a coefficient closer to 1 would indicate a strong difference between the corresponding city with the regional structure, we can infer that the city in question is relatively more specialised in some activities. Due to space limitations we only present the calculations of specialisation coefficients in the MMA. This presentation provides information about how the degree of specialisation in the service

sector has changed from the census in 1980 to the census in 2003. In Table 3, for example, the branches closer to 1 show more specialisation, in this case they are in the group of producer services. These activities in the MMA have increased progressively from 0.69 in 1980 to 0.95 in 2003, making the MMA especially important in this regard. In the group of consumer services, trade of food beverage and tobacco was an activity where the MMA has a high specialisation coefficient in 1980. However this situation has rapidly decreased, in 2003, the coefficient was only 0.17. Other branches with similar experiences are catering (821) and personal and household retail trade (811).

Table 3
Specialization coefficient in terms of real value added in the MMA, (1980- 2003)

	1980	1988	1993	1998	2003
I Producer services					
721 Professional services	0.69	0.61	0.72	0.76	0.95
731 Food, beverage and tobacco (wholesale)	0.72	0.31	0.32	0.21	0.36
732 Machinery and industrial equipment trade	0.36	0.47	0.41	0.40	0.37
II Consumer services					
811 Food, beverage and tobacco (retail trade)	0.82	0.49	0.31	0.32	0.17
812 Supermarkets	0.16	0.20	0.13	0.08	0.09
813 Gas stations and fuel trade	0.03	0.27	0.06	0.07	0.07
821 Catering	0.24	0.07	0.07	0.04	0.06
822 Cleaning services	0.04	0.01	0.01	0.01	0.02
823 Leisure	0.08	0.14	0.13	0.07	0.03
824 Information and transmission services	0.08	0.04	0.04	0.14	0.03
825 Hotels, motels and hostels	0.08	0.04	0.03	0.03	0.02
831 Personal and household retail trade	0.22	0.30	0.16	0.08	0.09
832 Department stores	0.05	0.06	0.03	0.03	0.03
833 Automobile and auto parts trade	0.19	0.10	0.06	0.07	0.09
841 Repair shops	0.05	0.11	0.04	0.07	0.04
842 Education and private cultural services	0.23	0.20	0.18	0.13	0.20
843 Health and private social assistance	0.10	0.06	0.09	0.05	0.07

Own elaboration with data from the IV, VI, VII, VIII, X, XI XII and XIII Censos Económicos INEGI.

In Mexico, it is well known that the MMA is an important region in the offer of private education and cultural services, besides public institution such as the Universidad Autonoma de Nuevo Leon, private centres such as the Instituto Tecnológico de Estudios Superiores de Monterrey (ITESM), the University of Monterrey, the Regiomontana University and many other technical schools attract large number of students from the rest of the country and abroad. For this reason, we can see in Table 3, how the specialisation coefficient of this branch has maintained a relative high position since 1980. Despite being in principle non money oriented activities,

education and private cultural services contribute with significant amounts of value added to the MMA.

To analyse the number of employees in the service sector, localisation coefficients were calculated for each city. In Table 4, we only present a summary for the MMA in the whole period (1980 to 2003). The results show that consumer services have a large relative concentration of employees. These activities are important source of employment even though in terms of specialisation and value added creation they are not outstanding. The coefficients show that the branches with more employees' concentration (the coefficients are above 0.20 in most of the cases) were food, beverage and tobacco (811), department stores (832), and health and private social assistance (843).

Table 4
Localisation coefficients in terms of no. of employees in the MMA, (1980- 2003)

	1980	1988	1993	1998	2003
I Producer services					
721 Professional services	0.06	0.10	0.11	0.12	0.11
731 Food, beverage and tobacco (wholesale)	0.10	0.18	0.22	0.22	0.23
732 Machinery and industrial equipment trade	0.06	0.08	0.07	0.10	0.08
II Consumer services					
811 Food, beverage and tobacco (retail trade)	0.23	0.24	0.26	0.24	0.23
812 Supermarkets	0.12	0.16	0.12	0.15	0.20
813 Gas stations and fuel trade	0.18	0.20	0.16	0.09	0.16
821 Catering	0.03	0.08	0.07	0.07	0.04
822 Cleaning services	0.04	0.04	0.06	0.04	0.04
823 Leisure	0.44	0.17	0.20	0.11	0.21
824 Information and transmission services	0.18	0.20	0.26	0.19	0.20
825 Hotels, motels and hostels	0.18	0.15	0.14	0.18	0.21
831 Personal and household retail trade	0.08	0.07	0.04	0.09	0.07
832 Department stores	0.22	0.25	0.29	0.30	0.21
833 Automobile and auto parts trade	0.10	0.09	0.07	0.13	0.11
841 Repair shops	0.03	0.04	0.08	0.10	0.09
842 Education and private cultural services	0.14	0.15	0.18	0.20	0.14
843 Health and private social assistance	0.21	0.12	0.17	0.23	0.20

Own elaboration with data from the IV, VI, VII, VIII, X, XI XII and XIII Censos Económicos INEGI.

It is logical to expect that the knowledge and information activities would create a relative less amount of employment in relation to the rest of the sector; this would only support the intensive use of technology per worker. For example, earlier we showed that professional services have the highest real value added per worker, so it is inevitable that the economic policy ponders what it is desirable in terms of economic development, either jobs creation or rises in productivity per worker. In general we can also see that traditional services such as catering, cleaning, repair shops among the most

important are being left behind in the tertiary revolution even though they are quickly associated to the service sector. On the opposite, activities that are based on information, knowledge and technology are becoming more relevant in value added creation and are driving the entire sector positive growth rates.

4. Some policy implications

The empirical evidence obtained for the MMA shows that despite that the tertiary revolution occurred relatively very recently, the characteristics of the service sector indicates that there is a significant propensity to specialise in producer services that require high technology and information based resources. Consumer services seem to be important in terms of establishment and jobs creation. However, the relative concentration and specialisation of professional services in the MMA indicate a tendency to quaternarise the economy. The challenges that policy makers face is to decide how to balance the need to create jobs in a developing country where resources are limited and the need to move the economy towards higher levels of development.

A possibility would be to promote investment in services that are based on technology, knowledge and information at the same time as to increase public investment in preparing workers with higher skills. The quaternarisation of the economy seems inevitable and its link with the industrial sector should be regarded as complementary rather than substitutive. The best way to face the structural change is to promote efficiency progressively, starting from the most productive branches that can complement the production process and lower the price of commodity goods.

Peneder *et al.* (2003) considers that it is vital to acknowledge the heterogeneity within the service sector in order to distinguish knowledge and information based activities from traditional services, only then we can identify the transition to an economic quaternarisation. This is understood as a development stage where services are intensive in information and technological progress. Other authors such as Parrinello (2004) argue that knowledge and information activities are inherent to any human economic activity, so in principle the entire tertiary sector would fall in this category. Peneder *et al.* (2003) assert that what matters is the degree of information and knowledge acquired and required by a worker to perform an activity. In this respect we can distinguish between the knowledge and skills required in professional services from those required in traditional services. This might be the reason why traditional services

have remained relatively behind in the sector's development and why their possibilities to play a part in the international competitive market are slim. Especially when compared to producer services and some branches from the consumer services.

5. Conclusions

The growth of services is linked to the development of the economy. The high specialisation of commodity production has been a key element to increase the demand of intermediate services. In the case of developing countries, we would expect to find this pattern in modern metropolitan areas. The reason being that services usually require the existence of a strong industrial demand in order to expand rapidly; otherwise we would expect traditional development of services.

Although the MMA was a very important industrial pole of development, in the last years there has been a significant shift to the service sector in terms of value added and jobs creation. The structural change has been relatively recent in comparison to other countries where the tertiary revolution occurred in the middle 1970s, possibly for the existence of a strong export industry in the local economy that has prevailed until very recently.

The purpose of this document was to show that given certain economic conditions, regardless of being a developing or developed region, the existence of an industrial sector will give place to the birth of a service sector with peculiar characteristics which eventually will cause a structural change. We gathered information that shows that the characteristics of services in the MMA are similar to other developed economies where there was already a shift from manufactures to tertiary activities. In specific, we identified the quaternarisation of the economy as the result of a development stage where information and knowledge based services are driving the entire sector to become more successful in increasing valued added and productivity. The analysis on the MMA confirms that given the existence of a strong industrial activity, professional services have become the most important source of real value added and output per worker. According to the shift and share analysis this is also consequence of its regional capacity and local competitiveness in comparison to average standards. Professional services are linked strongly to producers demand for specialised technical services, lawyers, engineers, architects, data processing, machinery repair and maintenance, consultancy and real estate services, among others. It is clear that these activities require superior levels of knowledge and information resources than

traditional services such as catering, cleaning, wholesale and retail trade for example. Professional services can be considered as intermediary and part of the production process of industrial activities and therefore are more prone to increase the gross domestic product.

Consumer services in the MMA are basically important as a source employment, however the low capability to produce value added in this group reduces the possibility to improve the living conditions of the working population in the long run. This is a conundrum that policy makers have to face on whether efforts should be made to stimulate tertiary activities to increase jobs or improve competition and efficiency that can have overall effects in the entire economy.

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Appendix

Table 1A.

Monterrey Metropolitan Area: producer and consumer services characteristics. Number of establishments, employees and real value added (1980-2003)

	Establishments					Number of employees					Value added (thousands pesos, 1983 prices)				
	1980	1988	1993	1998	2003	1980	1988	1993	1998	2003	1980	1988	1993	1998	2003
I. Producer services	2801	5241	10191	14368	10160	33334	63898	105547	182011	200792	10486676	10098727	16736903	23982638	27238907
721 Professional services	1321	2791	5397	8422	6112	15094	32393	55902	116523	136396	4473907	3432240	8313598	13398971	16540080
731 Food, beverage and tobacco (wholesale)	598	358	998	1101	771	8092	8438	15688	19783	22091	3063085	1637297	2824302	2536303	4039310
732 Machinery and industrial equipment trade	984	2084	3818	4835	3277	10148	23077	34057	45705	45073	2948784	5030180	5598914	7871048	8658617
II. Consumer services	22511	35091	57317	63747	70468	78656	128315	190952	229430	308248	7432283	9104488	11387305	11019927	16189576
811 Food, beverage and tobacco (retail trade)	8885	14028	22402	21305	22739	15488	25910	39613	38831	46393	568111	1091971	1102498	1021387	1380470
812 Supermarkets	213	257	484	1285	1105	4781	10518	12500	18331	29838	931937	988025	1174442	855713	1307480
813 Gas stations and fuel trade	57	61	70	148	370	812	1211	1890	3245	5735	11505	171808	156444	287949	507885
821 Catering	2040	2620	4167	5338	6502	8482	14046	24440	27064	39138	628565	636674	985257	742171	11116947
822 Cleaning services	1195	1599	2815	3782	5298	2441	3247	5780	7089	11334	144094	133852	211356	165140	347440
823 Leisure	267	299	898	767	584	2088	3508	4323	6722	7689	225802	160894	234583	188679	363885
824 Information and transmission services	95	110	141	207	111	1404	1884	2404	1388	3876	374089	207131	318813	1514083	544666
825 Hotels, motels and hostels	142	84	91	136	124	2230	2298	3354	4213	4709	263942	248064	307743	358272	310325
831 Personal and household retail trade	4779	8099	13666	14858	18812	15114	28898	37573	44733	61897	1461723	2680281	2775117	2379862	3494409
832 Department stores	79	33	35	85	76	3008	2444	2926	4387	10455	231359	305719	213243	312190	523491
833 Automobiles and autoparts trade	521	944	1499	1808	2079	3611	5585	8481	11198	16644	971337	718815	815882	965179	1776562
841 Repair shops	2499	4494	6958	8353	7871	6681	13417	18564	21649	21790	432694	548074	679268	847013	707757
842 Education and private cultural services	327	513	830	1227	1304	7149	8276	15906	22604	29639	691978	864510	1620604	1445355	2849518
843 Health and private social assistance	1312	1942	3261	4470	3485	5208	6973	13198	18998	19311	497147	388750	792057	560819	1028801
TOTAL	25412	40322	67508	78105	80628	111980	192213	296499	411441	508040	17917839	19204196	28124108	35012595	43428483

Source: IV, VI, VII, VIII, X, XI, XII y XIII Censos comercial y de servicios, INEGI, México.

Compatibility of different census classifications is based on Garza's methodology (2008). Value added was deflated by the implicit price index