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S41 Spatial Mobility

Commuting in the Central Region of Mexico.

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The new economic model adopted by the Mexican Government in the nineteen-eighties has changed the economic structure as well as the location of industrial activity. Such changes have increased definitive migration to new sites and streams of commuters within the Central Region (map 1). This phenomenon is most visible in the Metropolitan Area of Mexico City (MAMC), which used to be the best choice for immigrants, but now this area is the one that expels the largest number of people. The effects of changes in migration streams can be detected in the whole country, but especially in the cities that are close to the MAMC: Cuernavaca, Cuautla, Toluca, Puebla, Queretaro, Pachuca and Tlaxcala.

Along with changes in migration streams, a more intense relationship between the surrounding cities can be observed, not only in terms of population movements, but also of industrial and commercial activities. These facts can be confirmed by the increase in the number of commuters. Traditionally, a change in one's place of residence determined changes in other facets of family life, such as job, schools and places to go shopping. Or the other way around, a change in the place of work signified a move to another place to live, school, clinic, shopping area, etc. Now, the place of residence and the location where everyday activities are carried out are not necessarily the same, thanks to commuter migration. There are several reasons given for these phenomena: economic and educational opportunities, air pollution, living costs, available services, etc.

In Mexico, only a few studies exist on this topic. Up to now, the social and economic characteristics of migrants have been unknown. We do not have an adequate estimation of the number of persons involved in daily or weekly movements; therefore, it is not possible to evaluate the effects on the place of origin or on the destination.

The object of the present study is to examine the form in which spatial mobility of populations occurs between the Metropolitan Area of Mexico City (MAMC) and the Metropolitan Area of Cuautla, in the central region of Mexico. It also aims to study the characteristics of the people who travel, as well as their motives.

In presentational terms, this document is divided into four different sections: in the first, the methodology used is explained; in the second, an approximation of the volume and types of mobility occurring between the two cities and intermediate areas are given; in the third, the main characteristics of the commuters, alongside their motives for making the journeys, are looked at, and finally, some reflections on the implications of this type of mobility in the region are given.

The interurban mobility referred to in this paper has been studied by Zelinsky (1971) in his pioneering work and alludes to the concept of "circulation" characterized in this way because it "denotes a great variety of movements, normally short-term, of a repetitive and cyclical nature, but which have in common a lack of declared intention to change residence in a permanent or lasting form. Under this heading we can include different types of

movement, such as weekend trips, or movements of students when term begins or ends, holidays or weekends away, shopping trips or similar, as well as social visits; many of the trips are apparently made for no particular reason or for pleasure by youngsters”.

According to this author, this form of mobility can be seen in the highest levels of development and is a reflection of the new role of urban economies, where a complex network of migratory and circulatory movements between cities, or within a metropolitan region, exists. These migratory flows appear to respond to economic conditions.

Interurban mobility can be of many different varieties: one type can be referred to as permanent and another, cyclical or frequent. Both types of mobility are closely linked; however, in this paper we are interested in the second type, which is defined as the population who travel at least once a month between two cities, for work or study reasons, to buy or sell products, or to visit family, for medical reasons or for recreation. This type of mobility is a means through which the links between metropolitan areas and cities in a region can be studied, as they provide elements to explain the organization of, and relationship between, the different labour markets.

In the study of mobility between the MAMC and the metropolitan area of Cuautla, three main reasons for making the journeys were found: firstly, because of a dissociation between the place of residence and the place of work or study, which is denominated commuting; secondly, because of the interdependence between different labour markets, goods and services, but which does not involve a separation of place of residence, work or study, which can be referred to as mobility associated with productive activity, and finally mobility with social, cultural or recreational motives, for consumption of goods and services for personal use, which we will call social mobility.

1. Methodology Used to Calculate Frequent Mobility

The main problem in studying commuters is the lack of information on this subject. Once the research was under way, we came up against the following problems: firstly, we are talking about cyclical movements, for which reason published statistics talk about journeys and not people. Of the people who travel, only a few do so daily, and also their socio-demographic profile is unknown.

There is not a sole method which can be used to study the commuting phenomenon. Therefore, we used an innovative method using surveys in coaches travelling between Mexico City and Cuautla. The challenge was to work with a probabilistic sampling survey of streams and not of stocks, like it is usually done. But another innovation is that the survey allows us to translate the stream into stocks.

The methodology used in this survey to measure cyclical or frequent mobility is the principal achievement of this study, especially given its complex nature and the scarce or non-existent research in Mexico on this topic. It was based on the application of surveys in coaches. These surveys were novel in that they were carried out on board the buses during the journey. The first time, this survey was carried out between the metropolitan areas of Cuautla and Mexico City (see map 2) between 21 November and 6 December, 1999, and it

is representative of the population who travel by bus in different routes and classes; this was the result of three pilot studies carried out throughout the year (April, May and September).

The implementation of the methodology began with a recognition of the importance of stressing the relationship which exists between the trip and the individual, i.e. between migration and migrant. This was done through the two dimensions that define the journey, space and time, in order to carry out a sample of migration which includes data on the journey and which collects information on the migrant, their characteristics, socio-demographic profile, migratory experience etc.

The survey rescues various research mechanisms to obtain data on passenger characteristics, as well as widening the concept of traditional (permanent) migration, which implies a change in the place of work or study and of residence, to include one of frequent mobility, in which different types of cyclical mobility are included, such as commuting, those associated with productive activity and social types such as cultural and recreational motives, as these also speak of functional relations and interdependence between regions.

One of the basic characteristics of the phenomenon is the process of circularity of these population movements, during which one person is able to remain some time in their destination without changing their place of residence. This gives validity and relevance to the observation of the movements as a unit of analysis, which gives dimension and character to the phenomenon.

The information needed for the construction of the sample framework was obtained from the bus companies and the design was tentatively proportional to size, i.e. according to the amount of passengers each line transports. In the elaboration of the sample, two aspects were contemplated: on one hand, the trips carried out daily over one route during the study period (number of runs); and on the other hand, the identification of the number of passengers. In this way, the sample size was determined, as was the construction of the correct balance, to make it representative.

The sample units are the number of runs carried out on the routes; i.e. they are the buses which leave the departure point and reach the destination point. In order to obtain an efficient sample, it was necessary to attain a proportional distribution of runs; therefore, it was necessary to obtain statistical information which could indicate the number of runs each one of the bus companies carries out daily in the aforementioned routes. At the beginning of the study, we had an estimated number of departures provided by the bus companies, but the total number of persons transported was unknown due to the fact that the bus companies kept this information hidden, because of fiscal matters and competition between companies.

For this reason, a mechanism was created where two counters were positioned in each bus station to obtain reliable statistics on the number of runs and persons travelling between Mexico City and Cuautla. With this information, we will be able to estimate the correct balances to make the corresponding calculations on the number of people who travel between the cities in the study.

Due to the fact that the number or volume of persons who could be denominated frequent travellers is also unknown, a filter questionnaire was given to all the passengers (excluding the driver and helpers) to identify them. It is worth mentioning that in the cases where the companies make continuous stops, and the number of passengers is high, two interviewers were used per bus. The people we were interested in for this study were those who fitted the following description:

- Their departure point (where they had just left) was located in the MAMC or the MA of Cuautla,
- That their destination was situated in the MACM or in that of Cuautla,
- That the passenger travelled at least once a month,
- That the interviewee was at least twelve years old.

Once the population, the object of study, was identified, the sample was designed by a very simple process of interviewee selection. On the first day, the first three or four eligible passengers will be chosen, on the second day, from the second to the fourth, on the third day, from the third to the fifth, and so on until the eighth day. On the ninth day it will begin again from the first eligible passenger, but this time starting from the back of the bus so the sample will be representative. The instrument used is the individual questionnaire, which was elaborated with the results of the three pilot tests. Its principal themes are: mobility characteristics (origin-destination; cost; frequency; motive and duration of trip; alternative and complementary transport); socio-economic characteristics (family composition, consumption of goods and services in places of origin and destination; occupation, income and education levels, migratory history) and the characteristics of the habitual residence and its occupants. The differentiation between the trip and the migrant is stressed. Passengers are asked if they have already answered a questionnaire in order to estimate the number of people duplicated in the survey.

The fieldwork was carried out in conjunction with the bus companies, which facilitated the interviewers' access to the buses; in exchange, the bus companies will be given the information, which will be useful for them to help improve their services and programme the activities of the trips they realize; all this meant a reduction in the costs of the study.

The strategy differed according to the route the buses followed; along the federal highway two interviewers were used on one journey. On the freeway, each interviewer carried out two journeys a day and only one person got on each bus.

2. Principal Characteristics of Interurban Mobility

One of the most significant results of the survey was the importance of frequent mobility, not only between the two cities, but also in the intermediate area of both metropolises. Preliminary results showed that the total volume of persons transported over the 16 days of the survey was 120,000, a figure which comes close to a third of the population of the Metropolitan Area of Cuautla, which was 357,880 inhabitants in the year 2000.

Of the 120,000 passengers transported, 53 % travelled from Mexico City to Cuautla and 47% from Cuautla to Mexico City by three different routes: Federal (Chalco), Xochimilco and Freeway (Pera). Of the total volume of passengers transported along the Mexico City-Cuautla route, 49% completed the entire journey. Therefore, 39% got off in the intermediate area. (see Map 3), while the remaining 12% were to travel to another final destination, mainly the municipalities of Puebla close to Morelos. This last percentage includes those passengers who got off in the delegations of the Federal District or in the municipalities of MAMC, as in this case, the bus was used as a form of intraurban transport.

Regarding the Cuautla-Mexico City route, the results showed that of the total volume of passengers transported, 70% completed the whole journey, 26% stayed in the intermediate area and the remaining 4% were to travel to another final destination, principally Puebla or the Metropolitan Area of Cuautla; in this last case the transport was used as local.

These figures reveal the increasing importance of frequent mobility between metropolises, particularly in commuting spaces where the transferences are necessary given the dissociation between place of residence and work, as well as trade and other economic and social activities.

One of the relevant data of this questionnaire is the detection and estimation of an important number of passengers who get off in the intermediate area, which could be denominated urban-rural strip, as it is located on the limits of both metropolitan areas with rural areas, which, following the urbanization processes, have been left inside this organization, where it is often difficult to distinguish the limits of each area, as the established functionality has slowly erased them.

The term urban-rural strip denotes a transition between the forms of rural and urban life in which the sophistication of transport and the extension of road networks have given added impetus to the extension of the cities and have contributed to the modification of the physiognomy of agricultural areas, as well as stimulating the functional relations between both areas. It is because of this that rural life has become more closely tied to that of the metropolis.

According to the survey, from the total number of passengers who travelled between Mexico City and Cuautla, 39% got off in this intermediate area, whereas in the Cuautla-Mexico City route, 26% alighted in this area. On the federal highway (Chalco), the principal getting-off point was Amecameca; on the freeway (Pera) passengers descended in two localities of the Metropolitan Area of Cuautla: Oacalco and Oaxtepec; and in the Xochimilco route, Tlayacapan, Totolapan and Milpa Alta were the main destinations, which indicates a close tie between these localities and the metropolitan area, and their relationship with other nearby rural localities.

This process which has started to link rural and urban areas has been referred to by some authors as the New Rurality (Lara, Chauvet and Lon, 1996): rurbanization or periurban agriculture (Lara, 1996) or agrocities (Pepin, 1997). In these approaches what stands out is that the spatial manifestation of this process is constituted by the formation of the crown

and peripheral spaces, in which economic activities and forms of life presenting characteristics from both urban and rural settings are intertwined.

In underdeveloped countries like Mexico, cities have grown uncontrollably, and have generated continuous processes of urban expansion. Suburban areas of the city are the ideal space to be occupied, in some cases illegally, owing to their low costs, and in other cases by the middle and upper classes looking for a better environment in which to live. However, the current reorganization of space in which urban and rural areas converge, presents other characteristics and phenomena, such as frequent population mobility between metropolitan areas and between rural and urban areas.

If the results of the survey are analysed by each route in turn, i.e. by federal highway, by freeway and via Xochimilco, other aspects of mobility and the relationship between rural and urban spaces can be appreciated.

In the case of the federal highway (Chalco) this relationship is notorious as 41% of the passengers got off in the intermediate area on the Mexico City-Cuautla route, on the Cuautla-Mexico City route 28% got off in this area, 2% were going to some municipality in Puebla or another entity, and 70% completed the entire journey.

Regarding the intermediate area, the main departure and arrival point is the municipality of Amecameca, a city which has been converted into an intersection point between both metropolitan areas, although, given the amount of people who arrive here daily, it could well be said that this municipality is already incorporated into the MAMC. There are also many settlements and rural localities, in both Mexico State and Morelos State, which have established a relationship with this municipality where they sell their products. It is also an intersection point for people who are on their way to different municipalities close to this one, and a final destination for many people of the area, as the construction of roads and highways converge in this municipality.

This highway, therefore, unites the Federal District, Mexico State and Morelos State in an important way, and Morelos has become an important gateway to the south of the country, which has converted this area into an important trade corridor, including the agricultural activities of the different localities.

The Xochimilco route revealed similar characteristics to Chalco as of the total number of people transported along the Cuautla-Mexico route, 41% got off in the intermediate area, which tells us that a significant amount of passengers are involved in activities in this region and the metropolitan area; 55% carried out the complete journey, another 2% used the bus as a form of intraurban transport as they alighted in some part of the metropolitan area of Cuautla, and the remaining 2% were heading for a different destination. In the case of the Mexico City-Cuautla route, 62% of the passengers got off in the intermediate area, 10% in MAMC, using the bus as intraurban transport, 25% completed the journey and 3% were heading for Puebla or another entity.

On this route, the intersection points which stood out were Tlayacapan, Totolapan and Milpa Alta, which involved other rural localities located in the northern part of Morelos

State and the south of the Federal District, where the sale of agricultural produce also featured. In this area, the transport which goes through both the metropolitan area of Cuautla and the MAMC, and small towns in Morelos, Mexico State and the Federal District, has facilitated the links between rural and urban areas, as well as the interaction between the two metropolitan areas.

The situation of the Mexico City-Cuautla route via the “Pera” is different to the two previous ones, as this is a toll-road located within the Ajusco-Chichinautzin ecological reserve so there are hardly any villages, only at the toll-booths in Oaxtepec and Oacalco, localities which form part of the metropolitan area of Cuautla. On this route, specifically on the Mexico City-Cuautla route, the total number of passengers who got off in the intermediate area was 15%, which denotes a slow process of rurbanization due to the geographic conditions. 3% of the passengers got off in MAMC, 77% completed the journey to Cuautla and 5% were heading for some municipality in Puebla or another entity.

While 11% alighted in the intermediate area on the Cuautla-Mexico City route, 80% completed the journey to the MAMC, 7% used the bus as intraurban transport as they got off in the metropolitan area of Cuautla, and the remaining 2% had another entity as their final destination. The only intersection points in this route were Oacalco, Oaxtepec, Tepoztlán and occasionally Tres Marías; therefore, it is more likely that Morelos State will be integrated into the organization of the MAMC on the eastern side; i.e. via the Chalco route which links settlements and villages of the eastern and southern parts of Mexico State by the federal highway, where the population can cover distances of between 90 and 120 kms in a period of one and a half to two and a half hours, depending on the quality of the transport.

In order to find out more about this mobility we will now show the results of the survey carried out with the passengers, which is a second part of the study; this allowed us to capture the characteristics not only of the movements but also of the population that was moving.

3. Principal Characteristics of the Commuters in the Eastern Part of the Central Region of Mexico

We estimated that 12 percent of the total number of passengers travelling between the metropolitan areas did so daily; the data shown here are the result of the interviews carried out with these passengers; the data have still not been processed, so these must be seen only as preliminary results.

Of the population who travel frequently it was found that they carried out, on average, 2 round trips per week. Of these, 32.2% can be considered as commuting; i.e. that their place of work or study and their place of residence are different, 21.6% belong to motives related to the productive process, which together comes to a little over 50%, and finally, 46.2% are located in the type of mobility considered social or recreational, as can be observed in Graph 1. Considering the three types of mobility, we can exemplify the strong interaction

between the labour markets of MAMC and the metropolitan areas of Cuernavaca and Cuautla.

There is a clear association between frequent mobility and migration, as of the total number of people who travel frequently, 44% of them have changed their place of residence in the last 15 years; i.e. since 1985. Of this group, half are commuters or travel for work or study purposes and 65% of these migrated from the Federal District and Mexico State. We are therefore looking at a process of changing residency, but at the same time maintaining strong ties to the previous place of residence, as happens with intraurban migration. This shows that it is really the same phenomenon but on a much larger scale; the city has increased its limits of immediate influence and has been converted into a city-region which functionally integrates other nearby cities.

Of all the journeys carried out for economic reasons (commuting and those associated with productive activities) seen in the survey, two-thirds resided in Cuautla and lived in the MAMC. This group, which is the most numerous, stands out because the education levels were even higher; 43% had university studies.

The main reason why people changed their place of residence to Cuautla was the improvement in their standard of living (their own and their family's), this translates into two principal motives, the non-economic motives, amongst which environmental and family reasons predominate with 70% (Graph 2). Work-related motives come second; i.e. to improve income levels, either because they found a better-paid job or because they had access to employment, even though this meant travelling daily between the two metropolitan areas, which, for the person who makes the journey, implies a great physical and emotional strain, as well as the actual cost of the trip, which amounts to two minimum wages.

It is also important to stress that this is a survey which was carried out in coaches and that normally managers and directors do not travel in coaches, which means that technical staff and workers, educational workers, salespeople and professionals predominate with a total of 84%. The principal branches in which they belong are, in order of importance, commerce, manufacturing and public administration, which together represents 55.6%.

There is also a stream of commuters who reside in the MAMC. This flow, although it is smaller, stands out because it is made up principally (50%) of specialized technicians and professionals and of traders (30%). Industrial personnel, who are normally the most highly-skilled, are starting to work in the industrial parks and *maquiladoras* which have recently been installed in the area. There is a high correspondence between this type of mobility and the growth of industrial activity in the area. According to the data of personnel working in the MA of Cuautla by work position, one of the branches which has had the highest growth rates is that of skilled workers (see Graph 3).

The reasons behind these journeys are a reflection of changes in economic activity itself, which is also reflected in the urban structure of both areas. On the one hand, the MAMC has lost importance concerning manufacturing activities since the mid-seventies; from concentrating 20.9% of manufacturing industry to only contributing 7.8% of the country's

manufacturing in 1998, while those services have barely increased their participation in the national total, as we can see in Graph 4.

This situation is also reflected in the increase in skilled industrial workers who have recently emigrated to the MAMC. In 1995, 40% of emigrants (over 12 years old) in the MAMC were industrial technicians or professionals (Corona, 1998). A large percentage of this population sought work alternatives in other places outside the MAMC, but others only looked for a new place of residence continuing to work in the MAMC, as can be observed with the survey data.

Over a period of 30 years, the Metropolitan Area of Cuautla has substantially changed its economic and demographic behaviour; from 69,000 inhabitants in 1970 (because the locality of Cuautla had less than 15,000 inhabitants) to becoming a metropolitan area with 357,880 inhabitants thirty years later. Much of this growth owes to the fact that Cuautla has become a centre for receiving population, a third of Cuautla's population was born outside the metropolitan area.

Cuautla has become consolidated as a regional centre of supplies and services over the last thirty years, proof of this is its high specialization in trade and services (see Graph 5). However, this activity depends to a great extent on its relationship with the MAMC. A little over a third of the interviewees were traders resident in Cuautla who travel daily to the MAMC to stock up on merchandise; in most cases, they are retailers. In terms of manufacturing employment, Cuautla was not significant until the end of the nineties when the industrial park of Cuautla opened. Although this situation has offered employment to the inhabitants of the area, it has also attracted specialized and professional workers from other states in the region, as was shown previously.

At the same time, there are professionals and skilled workers who live in Cuautla but have not been able to find work in the area, so they have felt the need to travel daily to the MAMC to work. This situation has meant that a sizeable proportion of the population has had to travel great distances to arrive at their workplaces, giving rise in this way to the commuting phenomenon. Commuting between Mexico City and Cuautla is a process which goes beyond the habitual form of changing residence between these two areas and the movement of persons from one city to the other, as it involves other characteristics such as having a work-related objective, the existence of a labour market, and the exchange of merchandise.

4 Final Considerations

Analysing population mobility between the MAMC and the MA of Cuautla, we found that it was a kind of response to changes in economic activity and to the new regional role that the MAMC has assumed. The economic and demographic transformations which have been carried out in this area have had far-reaching effects on the economic and social life of the rest of the country, although this can be felt more readily in the region surrounding it, including both rural areas and small cities.

This influence can be observed on different levels; firstly, in the transformation of the rural area which circles it, whose activities have become increasingly more urban, and secondly, in the three important processes occurring in the MA of Cuautla, which have led to Cuautla

having a new regional role to the East of Mexico City. These processes are the following: the arrival of immigrants from MAMC who, despite changing residence maintain strong ties with it, the development of an industrial plant which has an increasing need for a skilled workforce, which means importing them from other parts of the region and lastly, the continued commercial dependence of Cuautla, which, despite the industrial growth in the nineties, continues to be an important commercial city, not only locally, but also regionally as it supplies some regions of Puebla, Oaxaca and Guerrero.

The processes outlined above clearly show us the transformation of the region to the east of the MAMC, as the analysis of flows reveals a significant interrelation between both areas, including the urban-rural strip that separates them, inside the area of influence of both, so that we can think in terms of a continuum in which the limits of urban and rural are lost.

In this context, we need to think of space in a different way and subsequently also about the way we can respond to the problems generated inside it, starting with the fact that the traditional administrative divisions are inoperative for the distribution of resources, owing to the continuing interaction which takes place between the inhabitants of the three different federative entities; for example, they could generate income in a different entity from that which they would ask for services.

Also we have to think about the need for faster and cheaper transport which would facilitate these journeys without damaging the health and economy of the population who live in the region.

Here we have only studied the region to the east of the MAMC; however, these processes take place in the whole central region; according to conservative calculations, we are talking about almost half a million inhabitants, although this figure could be higher. Therefore, it is important to carry out studies for the whole region, as the population involved in this is highly select, with educational levels higher than the national average, which is why they have had such a big impact on the region. It is also necessary to develop policies for the whole region in which all organizations are fully involved.

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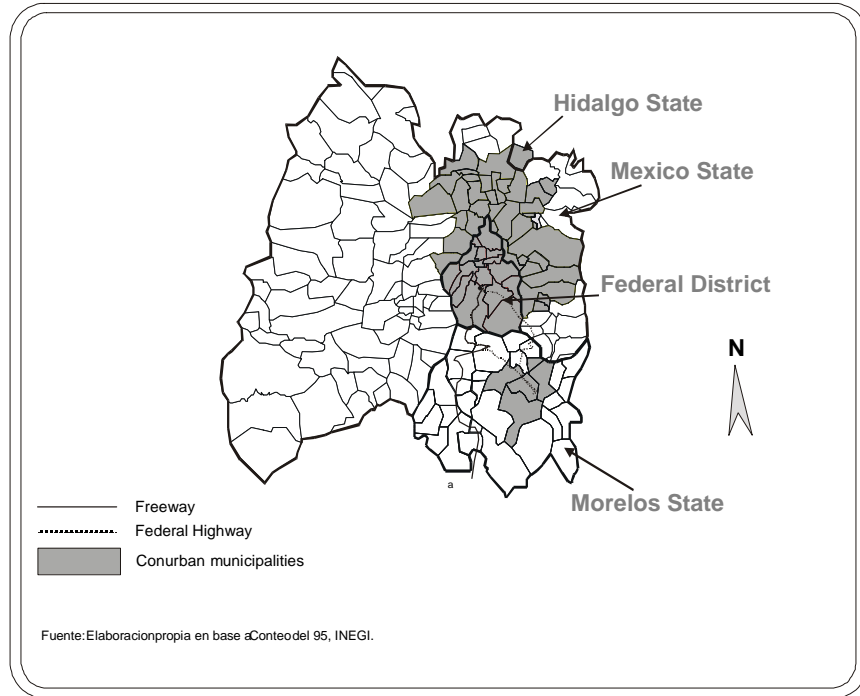
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MAP 1.1 CENTRAL REGION OF MEXICO



Source: Bassols Batalla, (1970)

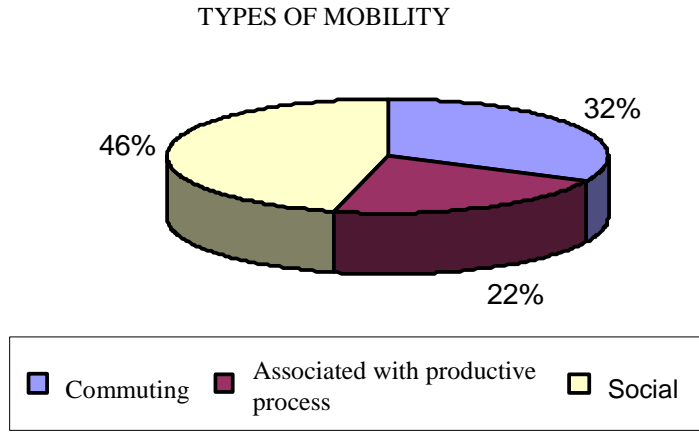
Map 2. The Metropolitan Areas of Mexico City and Cuautla



Map 3 Location of Routes between the Two Metropolitan Areas and the Intermediate Area



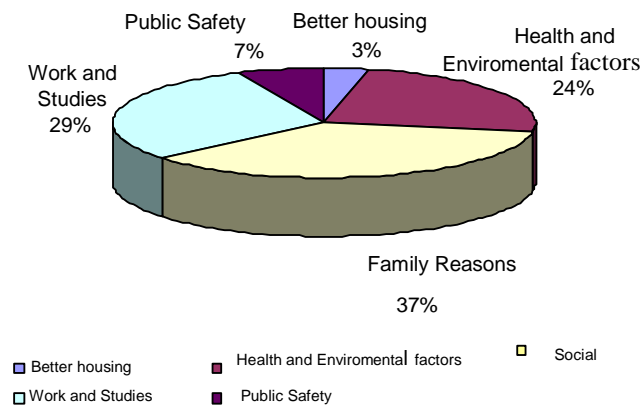
Graph 1 Types of Mobility



Graph 2

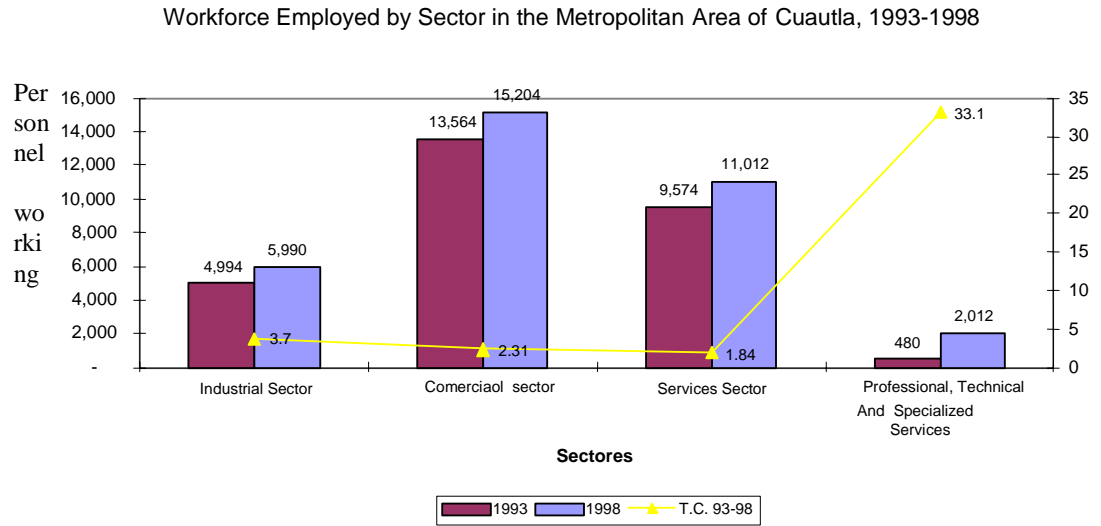
Motives for Changing Habitual Residence of Commuters and Associates of the Metropolitan Area of Cuautla

Motives for Changing Habitual Residence of Commuters and Associates of the Metropolitan Area of Cuautla



Graph 3

Workforce Employed by Sector in the Metropolitan Area of Cuautla, 1993-1998



Graph 4

Relative Participation of Personnel Employed in the MAMC of National Total, 1975-1998

