

URBAN ACCESSIBILITY IN AN INEFFICIENT TRANSPORTATION SYSTEM: CAN TEHRANI HOUSEHOLDS AFFORD THEIR DAILY TRIPS?

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ABSTRACT

Capital and the largest city of Iran, the metropolitan area of Tehran with its approximately thirteen million inhabitants, concentrates about a quarter of Iranian urban population. Mobility is here, as in other cities, a necessity of urban life and an essential condition for enjoying the urban amenities. However, Tehran's urban transportation system does not facilitate this mobility. The under-developed mass transportation network (bus and metro), is far from satisfying the Tehranis' demand: the metro network for example, attracts only 5 % of motorised daily trips (2007). Over the years, the private transportation modes, personal as collective, have confirmed their place as the most used transportation means by Tehranis. However, the using cost of these modes is generally higher than that of public transportation. This causes then an unequal access to the transportation modes for Tehranis according to their financial capacity and thus an unequal access to the city and the urban amenities. The purpose of this paper is to identify the Tehrani households' travel strategies through the analysis of their global budgets. We intend to highlight the households' probable mobility strategies by analysing their transport expenditure and its importance in their monthly budget considering that their financial capacity is most likely to restrict their modal choice.

Keywords: Household budget, Transportation expenditure, Transportation service offer, Tehran, Urban transportation.

I. TEHRAN, A DYNAMIC METROPOLIS

Tehran, the capital and the largest city of Iran, is situated in the northern part of Iran, in the Valley of Alborz Mountains. Tehran is a cosmopolitan city with approximately 7 million inhabitants on a surface of about 800 km². The "Greater Tehran" or "Tehran Metropolis"¹ that includes the city of Tehran and its immediate adjacent constructed area, counts an approximate population of 12 millions on a surface of about 1 800 km². According to the last national census (2006), Tehran metropolitan area accommodates about a quarter of Iranian urban population of which 60% live in the city of Tehran². As the capital of Iran, Tehran concentrates the major part of Iranian economic, industrial, educational and administrative activities and thus offers a very important employment market on national and local levels. The economic activity rate calculated on population of 10 years and older³ is 40 % for Tehran metropolitan area and varies between 30% and 50% in Tehran's different municipal districts⁴.

During the last decades, Tehran has gone through a fast and unregulated urban development. From the oil crisis in 70's to the Islamic revolution of 1979, the Iran-Iraq war period of 1980-1988 followed by a period of economic liberalisation and development, the city has got a particular urban form. The combination of the historical north-south divide pattern in urban structure with the more recent core-periphery duality has resulted in the concentration of economic activities and urban amenities in the central area of the city. Meanwhile, residential areas have dramatically spread out across suburb.

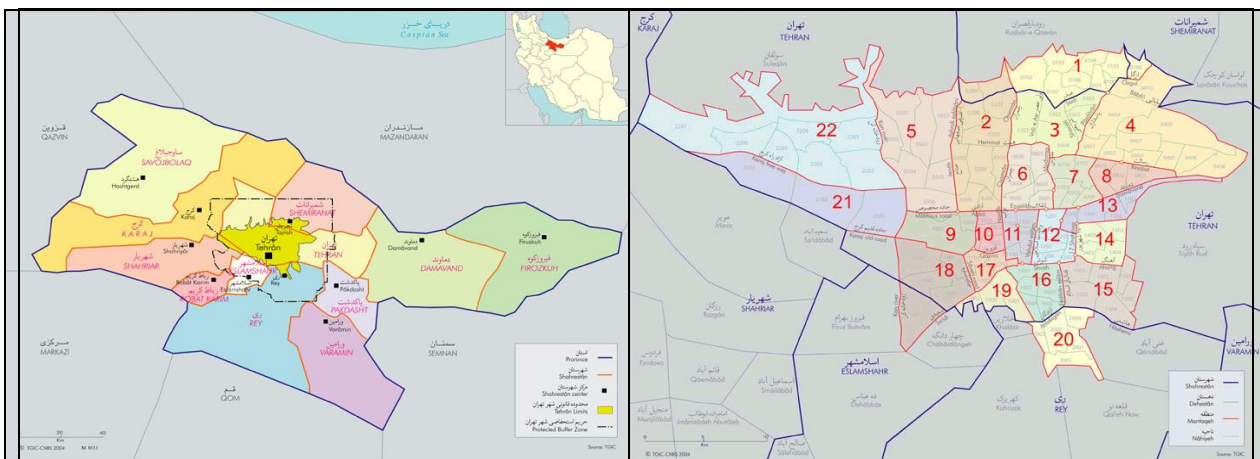


Figure 1: Tehran city administrative area on Tehran province (left) and Tehran municipal districts (right) - Atlas of Tehran (TGIC-CNRS 2004)

¹ The "Greater Tehran" (*Tehrân-e bozorg*) is a geographic and administrative expression defined by the Ministry of Housing and Urban Development. This definition includes the city of Tehran and its immediate adjacent constructed area.

² According to the Statistics Centre of Iran (2006), 12 260 431 persons are inhabitants of Tehran metropolitan area of which 7 088 287 live in the city of Tehran. The Iranian urban population counts 48 260 000 individuals.

³ The ratio of active population (occupied or not) of ten years and more to the total population of ten years and more. Ibid.

⁴ HABIBI M. and HOURCADE B. (2005). 2nd part: History of Tehran.

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This urban form constrains the Tehrani to move on a pendulous manner, and on long distances, between their residence and their place of activity (economic, social, cultural...). Note that in 2004, the average distance of a motorised trip is of 7 kilometres for the city of Tehran.⁵ This tendency is reflected when comparing the rate of produced and attracted daily trip by Tehran municipal districts. The figures below represent these daily trips. On the left side is the rate of trips produced per inhabitants of Tehran districts, where on the right side we have the attracted trips rate per inhabitant in hectare for these districts⁶. The rate of produced trips varies from 1 to 2.6 trips per inhabitant, when that of attracted trips varies from 10 to 914 trips per inhabitant in hectare. Note that a darker colour means a higher rate.

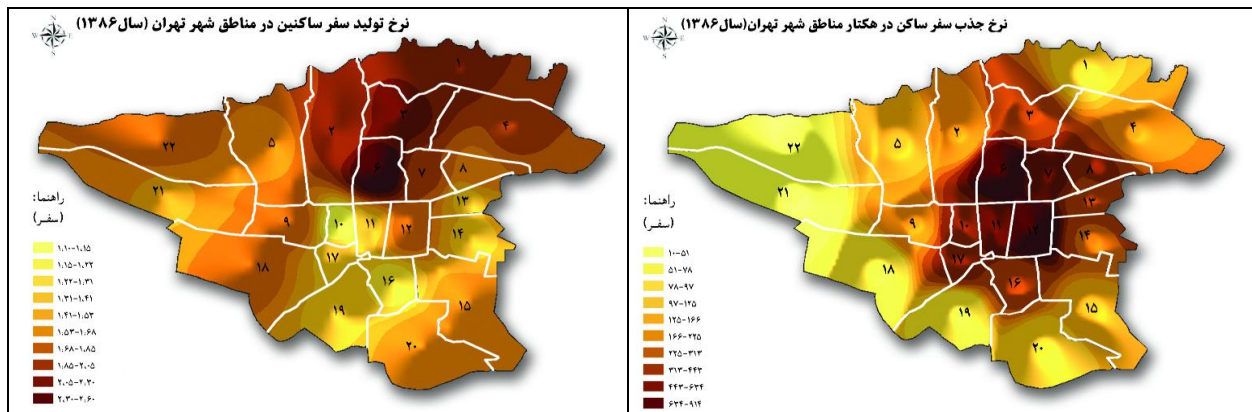


Figure 2: Trip produced per inhabitant (left) and trip attracted per inhabitant in hectare (right), on Tehran districts (TCTTS- 2007)

The northern districts of Tehran, by their residential nature, have produced more trips and have the highest rate of produced trips per inhabitant. The central districts, on the other hand, have a lower residential density, especially districts 6 and 12, but have attracted the highest number of trips, as by the concentration of commercial activities due to localisation in these areas of the Great Bazar (Bazar-e Bozorg); of University of Tehran and numerous campuses; as well as several State's administrations. These figures represent then the concentration of urban amenities in the city centre and justify the pendulous daily movements of Tehranis.

Daily trips purposes & transportation offer

The importance of economic activity in Tehran is demonstrated by the important part of working-trips in Tehran daily trips. Indeed 37 % of Teranis' daily trips are home-working trips followed by those for educational purposes (Table 1)⁷.

Table 1: Percent of Tehran daily trips by purpose 1383[2004]

Purpose	Travail	Education	Achat	Loisir	Secondaire	Total
%	37%	18%	13%	14%	18%	100%

⁵ ARAGHI, M,(dir)(2004b),2nd part, p.59.

⁶ TCTTS (1386[2007]).

⁷ ARAGHI, M. (dir.) (2004a). p. 68.

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In their motorised daily trips, the Tehranis use the passenger cars in 32 % of cases when 7 % is done on motorcycles and 4 % on pick-ups. This means a modal share of 43 % for the private transportation. Shared taxi and jitneys ensure 17 % of motorised trips when 22 % relies on the mass transportation network, with only 4 % of trips realised on metro. The minibus network absorbs 13 % of the trips where 5 % is realised on service bus^{8,9}.

The under-development of mass transportation causes here a predominance of private modes. Tehran's mass transportation system is composed of two operational urban metro lines and one suburban line (inauguration of the first line on 1999). The transit bus network has 272 lines¹⁰ that provide, on a radio centric schema, a service towards the city centre. The transportation service provided by the transit bus and metro system is financed and subsidized by the State and so the ticket price is very cheap in comparison with other transportation means. However, the underdeveloped service absorbs only a small part to the modal share, despite the attractive price.

The shared taxi network of Tehran has developed faster than the mass transportation especially due to the period of Iran-Iraq war where mass immigration to Tehran, high unemployment rate and the research of higher revenue has conducted a part of the population to this business. The taxi, by its flexibility and availability, become rapidly an essential transportation mean in Tehran. Nowadays, we count approximately 92 000 taxi in Tehran of which 60 % works on a regulated fixed itinerary and the rest are the Orange taxi that transport the passengers on their requested itinerary¹¹. Even if the shared taxi has become an important public transportation mean in Tehran, the service provided is not a public service. The price of this service is subject to the negotiations between the drivers, the public organisation in charge of control over them and the city council. In comparison to public mass transportation, the price is then more expensive.

Furthermore, the urban sprawl of Tehran has caused a rapid development of urban roads to interconnect the new residential areas without however any development plan for mass transportation means. The spread of urban road network has increased transportation demand. The absence of public transportation supply in line with the recent economic growth¹² has created a strong tendency to motorisation among Tehrani household. Note that the estimated number of passenger cars possessed by Tehrani in 2003 is 138 cars per thousand inhabitants where it was 95 passenger cars in 1995¹³. Thus, with an average number of 4 persons per household, we count in average 0.5 passenger car per household in 2003, for only 0.37 passenger car per household in 1995. Besides, this growth in motorisation is more important for some households than others. Thereby, the number of

⁸ Service bus is an advantage provided by the employers to transport their employees on a defined itinerary for free.

⁹ Based on morning peak hour modal share. TCTTS(2003).

¹⁰ Idem.

¹¹ Tehran municipality (1386 [2007]).

¹² During the years before 1998, the GDP annual growth rate is 3 % where after this date we calculate an annual growth rate of 6 %. TARR (2001). French Ministry of the Economy, Industry and Employment (2005).

¹³ TCTTS(2003)

passenger car per thousand inhabitants varies from 69 in poor southern districts of Tehran to 314 per thousand inhabitants in the northern rich districts¹⁴.

Regarding this particular transportation service offer, where the mass transportation has a small modal share, the taxi is an essential but expensive transportation mean, and the private transportation modal share is important and more accessible to rich households we can expect an unequal urban accessibility among Tehrani inhabitants. Their financial capacity under a limited time-budget, influence directly their modal choice and consequently the facility or the possibility of access to urban amenities, the most important of which is the employment market. The actual transportation service offer is of advantage to the most-favoured households. The rich households, as mentioned, are more numerous to be equipped on passenger car and their financial level let them finance more easily its utilisation. Besides, they can afford more expensive collective modes, like taxi, more comfortable and more rapid. The households incapable of neither possessing nor using a private car have to face an underdeveloped transport service that might limit their accessibility to urban amenities. The purpose of this paper is to identify the Tehrani household's travel strategies through the analysis of their global budgets. We intend to highlight the households' potential mobility by analysing their transport expenditure and its importance in their monthly budget, considering that their financial capacity is most likely to restrict their modal choice and then their potential mobility and accessibility to the city. This is likely to impose a heavy limit on their daily travels and permit only the most essential trips, like for example, those related to income generating activities. The failure of urban transportation system can then prevent a regular contact with the city, generate a serious exclusion from urban life and result in the deprivation of households, particularly the poor ones, from access to the city, to the labour market and to a better standard of living.

Data, methodology and limits

To construct the Tehrani households' potential mobility strategies, we use three main sources. The major part of our analysis is based on "Iranian Households' socio-economic characteristics survey" database. This survey has been realised in 2002-20003 by the French research institute *Monde Iranien et Indien (CNRS)* in collaboration with Statistics Centre of Iran¹⁵. This database is composed of 6 960 households and contains their responses to questions treating their socio-demographic and economic characteristics¹⁶. One fifth of the households questioned lives in Tehran province of which 84 % in the urban area. These 1 139 households represent then 27 % of the Iranian urban population surveyed. Our analyses are based on this sample, that we accept being representative of Tehrani households living on Tehran metropolitan area and particularly the city of Tehran. Therefore, we dispose the general information on household's compositions and the socio-demographic characteristics of its members (sex, age, marital situation, education, activity,

¹⁴ These numbers concern only the private passenger cars and not the motorcycles. Besides, to calculate average number of vehicle per household we make the hypothesis that each household has only one car.

¹⁵ We wish to thank M. Bernard Hourcade, research director of CNRS- UMR Monde iranien et indien, who has kindly put the database issue of this survey at our disposal.

¹⁶ 30 715 individuals.

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property...). We also have information concerning the economic characteristics of the household like its annual revenue and the monthly expenditures on different budget items (housing, alimentation, transport, clothing...). The transportation budget here is composed of three main items: 1) the monthly instalments of purchasing value of a motorised vehicle for private use of household members (provided that this acquisition has occurred during the last twelve months previous to the survey); 2) the monthly amount spent on utilisation and maintenance of the household's private vehicle; 3) the monthly expenditure on intra-urban trips. The last item representing the monthly amount of household's expenditure on transportation services when not using its private vehicle(s), and so we consider it as household's expenditure on public transportation. As mentioned earlier, the shared taxi system is an essential part of transportation service in Tehran. Even if in reality it's a private-owned shared service; in this paper we consider it as a part of the public transportation system and thus an item in household's expenditure on public transportation service.

Using this database, we then define the factors determining household's transportation service expenditure. We create as well a typology of Tehrani household groups who have the similar transportation consumption behaviour. This survey however does not question the mobility characteristics of the households. In order to construct the household's mobility structure we then use two other main sources. The first one is the annual reports published by *Tehran Comprehensive Transportation and Traffic Studies institute* (TCTTS). These are the annual estimation of different transportation indexes and characteristics in Tehran, as modal share, O-D matrices, car ownership, motorised trips, speed on urban network, CO² emissions, etc. These reports are based on the aggregated results of a transport mobility survey conducted on 1383[2004] by this institute. We complete this information with other official activity reports published by the *Municipality of Tehran*, the *Tehran Transportation and Traffic Organisation* and the *City Council*, in charge of definition, pricing, supervision and control of urban public transportation services. This allows us to make different hypothesis on household's modal choice. We then calculate a kilometric price for each transportation mean according to the available data on their respective rates. Having these prices, the probability of borrowing each transportation mode and the household's monetary expenditure on transportation services let us then to calculate the potential distance travelled by each group of households. The comparison of these potential spatial mobilities gives then a general viewpoint on household's utilisation of the urban space and the eventual inequalities among different groups to access to the city.

Note that however the data we have are aggregate. This means that the modal choice hypotheses are based on the average repartitions and so are the potential mobility distances calculated. Therefore, the constructed mobility strategies of the Tehrani households represent an average level. More detailed data on household's mobility behaviour is thus required to give a more accurate estimation of urban accessibility patterns in Tehran.

II. TEHRANI HOUSEHOLDS' TRANSPORTATION EXPENDITURE

An average Tehrani household spends the major part of its budget on three items: housing (38 %), alimentation (20 %) and transportation (13 %). Note that this transportation expenditure includes the monthly instalments of purchasing a motorised vehicle added by the monthly expenditure on transportation services. The latter includes the utilisation cost of the private vehicle (fuel and maintenance) and budget spent on public transportation services. Note as well that only 6 % of Tehrani households have purchased a new vehicle during the last year before the survey, however, the high value of this act (38 millions Rials in average) influences the average transportation budget of our sample. Indeed, we will treat the household's expenditure on transportation service rather than its transportation budget, as it reflects the real mobility demand of a household.

Determinant factors of transportation service expenditure

Through the statistical analysis, we define three main factors stimulating the Tehrani household's consumption of transportation service. These factors are chosen because of their important impact on household's expenditure but also for their independence from other variables. These factors, in order of importance are as follows:

- The financial level of the household is the first factor influencing its transportation expenditure. This financial level is defined as the household's income quintile. The wealthy/rich households are those whose income level fits in the two highest income quintiles. The first three income-quintiles regroup then the less wealthy/poor households. Household's financial level influences positively its expenditure on transportation service. Note that, comparison of these two groups shows that the rich households have spent 3.4 times more on transportation and about 2.7 times more on transport services than the poor households.
- The second factor is the economic activity situation of the household head. His/her activity has a positive influence on the household's expenditure on transportation. The obligation of professional mobility seems to impose a higher expenditure on active-head households. But, beyond this immediate impact, the activity situation of the head refers also to the household's life cycle. Indeed, as we will see afterwards, the household's stage of life modifies its composition and thus its transportation needs. The comparison shows that an active-head household has spent in average 70 % more on transportation and 16 % more on transport services than an inactive-head one. When taking into account their financial level, the rich inactive-head households spent in average 24 % more on transportation services

than the active-head ones. However among the poor ones, it's the active-head households who spent 46 % more on transportation services than the inactive-head ones. Indeed, the professional mobility constraint seems to weight more on the poor households while the rich ones seem to increase their consumption when advancing on the life cycle. Furthermore, the cross-comparison of the households shows that among the active-head households, the rich ones have spent 2 times more on transport service than the poor ones when this ratio is 4 among the non-active head households. Indeed, we expect a major difference in transportation consumption behaviour among our households based on their lifecycle and their financial capacity.

- The presence of adult children in the households is the third factor influencing its expenditure on transportation. We define adult children as those who have fifteen years of age and more. Arriving of a child at the "adult age" modifies his/her motorised displacement needs as his/her outdoor activities (social and economic) increases. Furthermore, passing this limit of age, the children are generally able to use the transportation modes on their own. Besides, reaching the legal age of driving (18 years-old) modifies as well their capability to use independently a private vehicle. Indeed, in an active-head poor household for example, having adult children increases by 40 % its expenditure on transportation services, while this increase is of 52 % for the rich ones.

Note that the household's motorisation, particularly its equipment on private car, has also an important and non-negligible positive impact on its transportation services expenditure. However, being motorised is dependent on different other factors, like financial situation for example, that's why we do not consider it among the three mains transportation determinant factors. Crossing the three mains factors listed above, we create then a typology of Tehrani households groups with different consumption behaviours on transportation services. These groups are presented below. The connecting thread of this partition is the lifecycle position of the household, that modifies its demand but also its constraint for motorised mobility.

Who are these consumer groups?

The first group of Tehrani households is composed of poor young couples, in their thirties with in average a young child of 6 years old. Their income level sets in the first three income quintiles and they are principally mono-active. The household head is a married active man whose spouse is housewife. A quarter of Tehrani households fit in this group. At the beginning of their lifecycle, the majority of these households are non-motorised (70%).

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One household out of seven take part in the second group with a similar structure to the first one, despite their financial level. These are the young rich couples at the end of their thirties with in average 1.5 young children of seven years old. These rich households count in average 1.3 active members composed of a male active household head and in 26 % of cases his active spouse. In fact, this group counts the highest number of active spouses compared to the average proportion of 10 % of active spouses for all Tehrani households. Indeed, the presence of a second active member creates a higher need of professional mobility. Furthermore, in the contrary to the first group, these rich couples are mostly motorised (55%).

The third group are poor couples at the end of their forties, living with in average 2.8 children whose average of ages is 16. As for the other poor couples, the household head is a married active man whose spouse is housewife (only 5% of spouses work). These households count however an average number of 1.35 active members, as approximately 28 % of children are active. This group represent one fifth of Tehrani households and are principally non-motorised (60%).

One fifth of Tehrani households are rich couples at their early fifties. The household head is mainly a married active man whose wife, as for the other rich couple, is more probably active than the average tehrani wives. Here, the spouse's activity rate reaches 19 %. These couples have in average 2.8 children, mostly adult, whose average of ages is 18. These adult children are for 27 % active and each household counts then in average 0.5 active children. Therefore, two active members are present in average in these households and so we expect a higher level of professional mobility among them. Besides, their children are more probable to use the motorised vehicles and particularly the private vehicle of the households (as their age but also the motorisation of the household). That consequently will increase the household's transportation service expenditure. These rich households are for 65 % motorised.

As the household advances in the life cycle, the activity situation of the household head changes. From their late fifties and on, the household heads are mainly inactive. From the moment when the household head is inactive, the activity situation of household's children becomes determinant of the activity life of the household.

The fifth group of Tehrani households is composed of non-active couples with a low financial level. The particularity of this group is the presence of female household head, mostly widows, in about one third of the households. Each household has in average two adult children whose average of ages is 22. The probability of an adult child being active is 25 %, and then each household counts in average 0.5 active member. However, the presence of adult children does not seem to compensate the inactivity of the household head, but will surely modify the mobility needs of the household. These children need to travel to fulfil their outdoor activities (education, social life, job search...). Like other poor households, the major part of this group is non-motorised (70%).

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The last two household categories are elders. Among the wealthy ones, the household head is married and lives with his spouse and their 2 adult children. These adult children have in average 26 years old and are thus most likely to be active. Indeed, each household count in average one active child. This group counts for 8 % of Tehrani households and a half of them are motorised. We mention here that inside this group we observe different consumption patterns of transportation services but because of the small number of households present in this sample, we cannot construct sub-categories for this group. Nevertheless, the presence of adult children along with the financial capacity of these households generates high transportation expenditure for this group, not only to fulfil the economic activities but also to satisfy their social life requirements¹⁷.

The poor elders without any adult child form our last group. Here, widows represent half of the household heads while the other half is senior couples. They form the smallest household unity in Tehran, count no active member and are mainly non-motorised (only 7% possess a motorised vehicle). This group consume the least amount of transportation services among all the other groups.

Using this typology, we distinguish the seven different groups of Tehrani households, according to their stages of life that modifies their motorised transportation demand, but also regarding their possibilities to satisfy this demand. Table 2 represents these groups and resumes their socio-demographic characteristics.

Table 2: Tehrani household groups based on three determinant factors of transportation service expenditure

		Head's Age	Household's structure	Active No.	% THR	Motorisation
1.	Poor/Active/NoAdultChild	34	Young couple with young children (6 yrs) - Active head, housewife spouse.	1,04	25%	21,5% VP, 10% Moto, 69% NonMotorised
2.	Rich/Active/ NoAdultChild	38	Young couple with young children (7 yrs.) - Active head, 26% active spouses.	1,35	14%	49% VP, 5% Moto, 46% NonMotorised
3.	Poor/Active/WithAdultChild	48	Couple with 2 to 3 teenage children (16 yrs.) - Active head, housewife spouse.	1,32	18%	32% VP, 8% Moto, 60% NonMotorised
4.	Rich/ Active/WithAdultChild	51	Couple with 2 to 3 adult children (18 yrs.) - Active head, 19% active spouses, 0,5 active child per household.	1,7	19%	57% VP, 7% Moto, 36% NonMotorised
5.	Poor/Inactive/ WithAdultChild	58	Couple with 2 adult children (22 yrs.), 0,5 active child per household.	0,53	10%	25% VP, 5% Moto, 70% NonMotorised
6.	Rich/Inactif	63	Couple with 2 children (26 yrs), One active child per household.	1,06	7%	50% VP, 1% Moto, 49% NonMotorised
7.	Poor/Inactif/ NoAdultChild	67	Elder widow or couple	0,02	8%	5% VP, 2% Moto, 93% NonMotorised

¹⁷ These groups have higher expenditure on clothing and housing equipments for example.

This analysis shows that for example, the financial level of the household represents not only its capacity to finance the transportation needs, but also is an indicator of the household's social position. For example, the proportion of active women is more important among the rich households, *ceteris paribus*. This reflects not only their different viewpoint on female economic activity but also is the sign of a higher professional qualification of these women that enables them to find their position in employment market and to get better-paid jobs. As well, we see that the adult children of rich households have a higher activity rate in comparison with the poor ones. Therefore, the financial level of the household represents as well its capacity to maintain its activity situation. In other words, among the rich households, when the head is active, there is a good chance for his spouse to be active too. Later, the activity of their adult children will compensate his inactivity. For the poor households, however, the activity of the head is the main determinant of household's activity situation and once the head is inactive, he would only be replaced partially by the adult active children. To have a more precise idea of their differences, we are now going to compare their monetary expenditure on transportation services.

How much they spent on transportation?

As mentioned above, in this article we focus our analysis on household's monetary expenditure on transportation services. This expense is defined as the monetary amount spent on fuel and maintenance of the household's private vehicle plus the monetary amount spent on other urban transportation services. We call the first expenditure private transport expenses when the latter will be assigned as public transport expenses. Note that the public transport expenses will then include all shared transportation modes used by the household members, when private transport includes only the utilisation cost of household's private vehicle(s).

When we compare our households' expenditures on transportation services, the first important observation is the great difference in the monetary values spent by the rich households in comparison to the poor ones (Figure 3).

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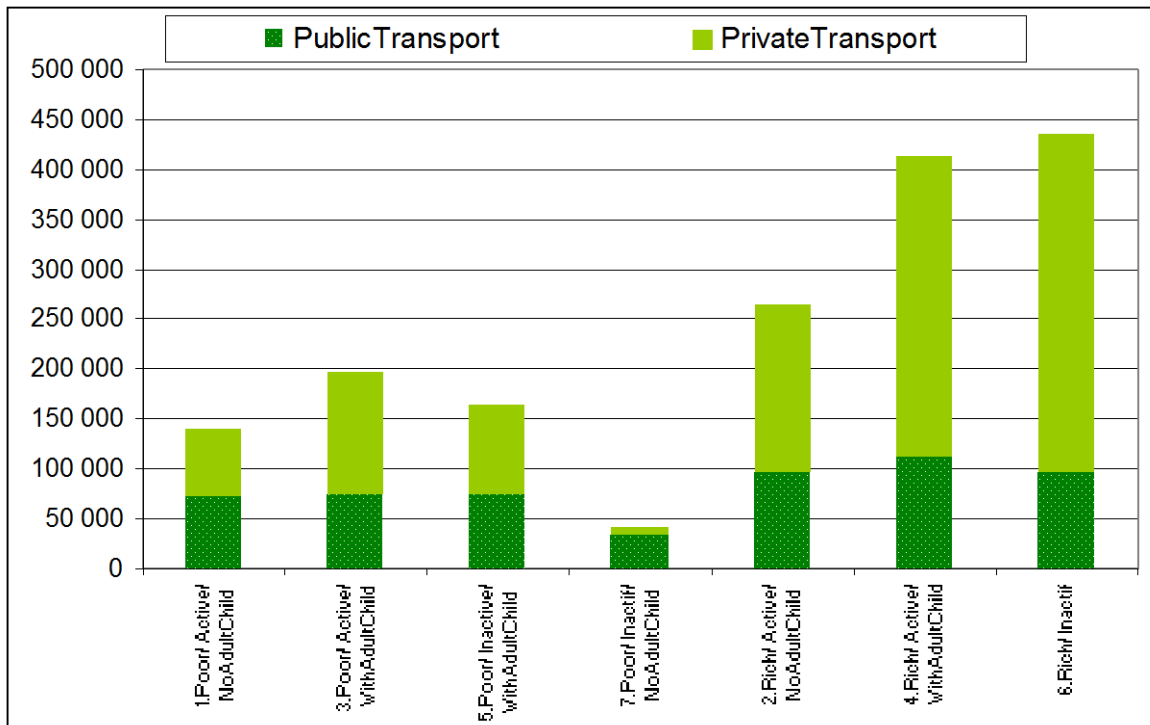


Figure 3: Monthly expenditure on urban transportation services by Tehrani household groups (Rials)

As expected, the financial capacity is the main reason for this gap. Besides, as we have seen before, in every stage of life cycle, the rich households count more active members than the poor ones. This means a higher need for professional mobility and justifies the higher level of motorised transportation service consumption for rich households. Note here that group 6, the rich inactive-head couples, are those with the highest amount spent on transportation services. Despite the parents being inactive, the presence of young members increases the probability of outdoor activities in these households, especially when each household counts, in average, one active member. Besides, more than a half of these households are motorised and their financial capacity permits a higher use of this vehicle. As reflected in this figure, the major part of their transportation service consumption is that of the private transport.

On the other extreme side, there are the poor inactive households, the 7th group, with the lowest monetary amount of expenditure on transportation services. As we have seen, this group is composed of old widows and couples who are principally non-motorised. That's why almost all their transportation budget is spent on public transport. These poor elders seem to have the least motorised mobility, probably as a result of their physical conditions. So, they might have a limited displacements area, situated close to their residence where they can accomplish most of their activities without using a motorised vehicle. When they need to go farther, they will use the public transportation only if they are not transported by a third person, a child or a relative.

Note that for the poor households, we observe an increase in transportation expenditure when the household counts adult children in comparison to the young active couples. However, when the head becomes inactive, the expenditure falls, as the professional mobility

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decreases. Nevertheless, this fall is not so important, as the presence of adult children (active or not) encourages the household to maintain a higher amount of expenditure than the very young couples. When the adult children leave the household, the transport expenditures falls dramatically, as the household's needs reduce, but also does the physical capacity of its members. Indeed, the highest amount spent on transportation among the poor households is that of active couples with adult children (group 3), reflecting their higher mobility needs. Despite the fact that only one third of them is motorised, the usage of private vehicle costs, in average, for a half of their transportation expenses.

Therefore, we have the two extreme sides of the transport service consumption among the three inactive-head households. So, when the household head has no professional mobility obligation, in a comparable financial situation, the presence of adult children is the motivation to a higher consumption of transportation service by the household (groups 5 and 7). On the contrary, for the households in the same step of the lifecycle, the financial capacity turns to be the important factor conditioning their consumption of transport services. Comparing two inactive-head households with children (groups 5 and 6) shows that a higher financial level results in a higher transportation expenses, and specially a higher utilisation of the private vehicle. In other words, being rich means not only having more chance to access to a private vehicle, but also being able to use it more. This gap persist even when we compare the motorised inactive-head households, where the rich ones have used their private vehicle more than the poor ones.

When the household head is active, the transportation expenses increase with age, for the rich as well as the poor ones. The two rich household groups (2 and 4) are those that count the highest rate of active spouses. If a higher number of active members increase the mobility needs of the household, we cannot ignore the importance of children's age on household's transport service consumption. In other words, for these two comparable groups, the higher expense of group 4 is also the consequence of having adult children. This increases the probability of outdoor activities for these children, so their motorised transport consumption. Furthermore, these children are more probably in legal age of driving and so capable of using the private vehicle of the household. The private transportation expense of group 4 is effectively higher than that of group 2, as a probable result of sharing the vehicle between parents and children that intensify its usage.

The same tendency is present among the poor active-head households (groups 1 and 3). Here, the head is active and his spouse is housewife. However, when the household counts adult children, its consumption of motorised transportation increases, especially as a consequence of increase in usage of private transport, in average but also among the motorised ones.

Here again, among the active-head household groups at similar stage of life cycle, a higher financial level, consequence of a higher number of active members, let the household spend more on motorised transportation service. This is true for our young couples (groups 1 and 2) as well as for the older ones (3 and 4). Moreover, the difference among our households is mostly due to the gap in utilisation cost of the private vehicle, as they have spent

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approximately the same amounts on public transportation. The gap persists as well when comparing the motorised groups.

To conclude, these comparisons confirm that the household's life cycle modifies its expenditure on transportation services, through the evolution of the number of active members but also that of the household members' displacement needs. In Tehran, a higher financial capacity leads to a higher use of motorised transportation service. Moreover, the economic activity situation of the household head conditions the main transportation consumption of the household. In other word, the head being active guaranties the presence of an active member for the poor households, and thus an obligation for mobility, however, when he is not, the household counts hardly another active member. On the contrary, among the rich households, when the head is young and active, he can count on his active spouse, and later on, the active adult children will compensate his non-activity. Thus, these rich households count, in average, at least one active member all the time, and so a higher obligation for mobility.

The positive influence of adult children on household's transportation service expenditure is confirmed when comparing this expenditure per consumption unit¹⁸. The consumption unit is calculated on OECD-scale¹⁹. This scale attributes 1 consumption unit to the household head, 0.5 to all other adult members (15 years old and more for our households) and 0.3 to all members under 15 years old. Here again, there's an important gap between the amount available per consumption unit in poor households and that of the rich ones. Besides, for the poor, as we advance in the lifecycle the available transportation budget per consumption unit decreases. Even if the amount of this decrease is not so different between the two first groups (1 and 3), having adult children for these active head poor households is equivalent of increasing the global transportation budget without being able to increase that of each consumption unit and thus to catch up with the new transportation needs.

On the contrary, the financial capacity of the rich households allows them to catch up with the increasing transportation demand of their members. Indeed, their transportation budget increases as they advance in the life cycle, and this rise is high enough to maintain an increasing budget per consumption unit. Again, as shown by the figure below, the major part of transportation expenditure per consumption unit is spent on private vehicle usage among the rich households. The poor ones however have a more balanced consumption budget on the two modes.

¹⁸ The number of adult children is important for the household size, as we have seen, the Tehrani households are principally composed of couples, and so the difference comes from the number of their children.

¹⁹ ACCARDO(2007)

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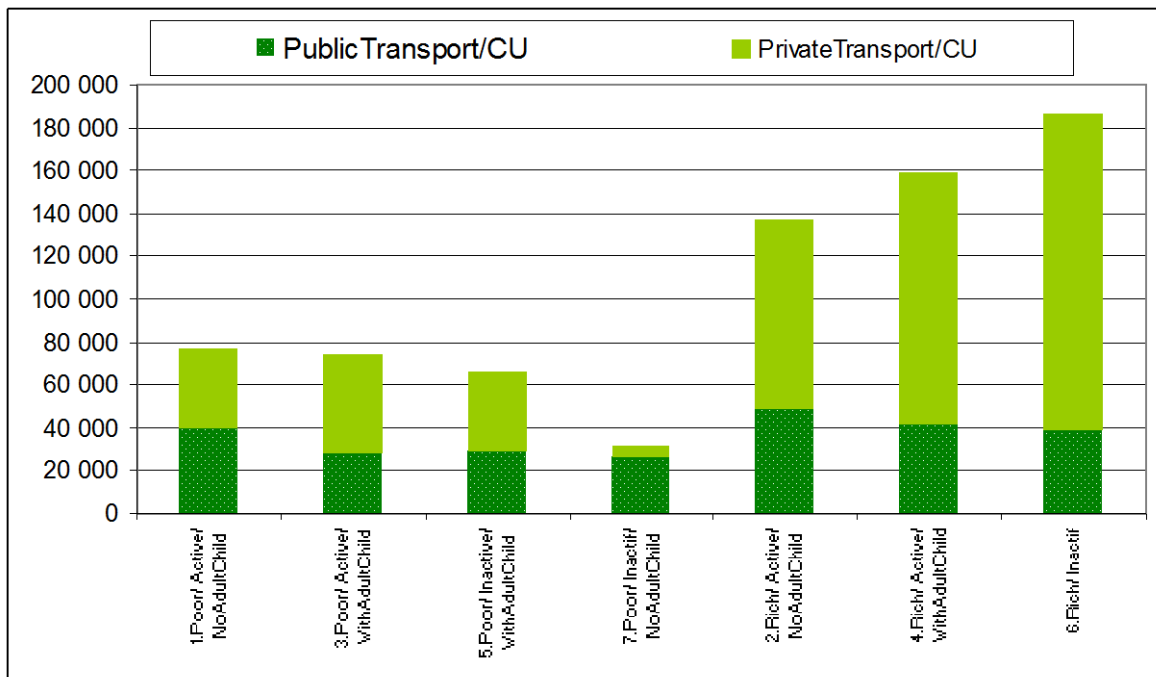


Figure 4: Monthly expenditure on urban transportation services per consumption unit (OECD-scale) by Tehrani household groups (Rials)

The importance of transportation expenditure in household's budget

As noted above, the monetary amounts of transportation expenditure vary among different household groups. The importance of this expenditure varies as well in each household group's budget. The transportation expenditure is, as we have seen, the third budget item for average Tehrani households and represents 13 % of their global monthly expenses. Remember that this proportion includes not only the transportation service expenditure but also the acquisition cost of a private vehicle. However only 6 % of the Tehrani household are concerned with this purchase, particularly those in the beginning of their life cycle. The transportation service expenditure counts then, in average, 7 % of the household's monthly budget. The table below represent the average weight of these expenditures in each household group's monthly budget.

Table 3: Urban transportation service weight in household's monthly budget (public and private motorised transport)

	TransportService / TotalExpense	Transportation / TotalExpense	TransportService / Transportation	PublicTransport / TotalExpense	PrivateVehicle / TotalExpense
1.Poor/ Active/ NoAdultChild	6%	11%	55%	3%	3%
3.Poor/ Active/ WithAdultChild	7%	10%	69%	3%	4%
5.Poor/ Inactive/ WithAdultChild	6%	6%	90%	3%	3%
7.Poor/ Inactif/ NoAdultChild	2%	2%	100%	2%	0%
2.Rich/ Active/ NoAdultChild	6%	18%	33%	2%	4%
4.Rich/ Active/ WithAdultChild	8%	15%	55%	2%	6%
6.Rich/ Inactif	10%	15%	65%	2%	8%
Total	7%	13%	54%	2%	4%

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The rich inactive-head households (group 6) have not only the highest monetary amount spent on transportation services, but this expenditure has the highest proportion of global budget in comparison to other Tehrani households (10 %). As mentioned before, their financial capacity and the presence of adult children are the two reasons for this important expense on transportation services. At the opposite side, as expected, we find the poor inactive households (group 7) who have the least transportation consumption and the least budget proportion spent on this item, with only 2 % of their monthly budget. The transportation service expenditure has similar weight in other household groups' budgets (6 to 8 %) even if the total transportation expenditure proportion differs among these groups as a result of their difference towards vehicle acquisition.

Note that the major difference among our households is due to their capacity in using private motorised transport. In other words, all our groups have spent in average 2-3 % of their budget on public transport, where the proportions spent on private transport vary between 3-4 % of the monthly budget for the poor households but represents respectively 4,6 and 8 % of the rich household's budget as they advance in the life cycle. The young rich households are more concerned with acquisition of a private vehicle, when the older ones, already motorised, can enjoy using their vehicle. Indeed, the poor households seem to maintain stable transport service consumption behaviour in their lifetime. The rich households however keep the same proportion of budget for the public transport service, but as they advance in the lifecycle, they devote a higher proportion of their budget to using of their private vehicle. This difference is more emphasized by a higher rate of motorisation among the rich households.

This difference in private transport consumption among our rich and poor groups suggests that a higher financial situation, thus a higher income, modifies the use of private transportation, but has no important impact on consumption of public transportation service. This suggests that the consumption of private transportation service is more sensitive to household's income than is that of the public transportation. When comparing the income elasticity of global transportation service consumption, all our households seems to have the same approach toward this budget item, as they all have a positive and less than one elasticity despite their different consumption behaviours (average is 0.6). In other words, transportation service is a normal necessity goods for all Tehrani households and its consumption increases at approximately the same rate as the increase in their income. However, when calculated separately, the income elasticity of household's expenditure on private vehicle is a positive number greater than one (1.97) when that of the public transportation remains a positive number below one (0.17). In other words, using the private car seems to be a luxury goods for our Tehrani households as its utilisation increases more than proportionally to their income rises. The public transportation however, remains a necessity goods, as its consumption rises proportionally to their income. This explains the gap of private vehicle utilisation between the rich and the poor households and confirms the hypothesis of inequality among Tehrani households towards utilisation of private transportation due to their financial capacity.

Knowing the importance of transportation service in the household's budget allows us to confirm the importance of financial capacity on their consumption behaviour. However, our

households, according to their needs and their opportunities, might spend the same budget differently. Their modal choice has thus an important impact on their potential mobility and their practise of the urban area. Indeed, we are going to transform these monetary expenses to a more tangible mobility index, like for example an equivalence of potential kilometres travelled on the urban transportation system. For doing so, we need to know the urban transportation means, as well as their respective price and modal share. In the absence of information on our household's modal choice, we are going to use potential modal-share hypothesis based on Tehran's urban modal-split. We calculate then an approximate potential distance accessible for each group of household, according to its monetary expenditure.

Note that, as explained earlier, the household's private vehicle ownership, especially the private car, is an important factor motivating a higher consumption of motorised transportation. Besides, in our database, the transportation service budget is composed of the private and public expenditure. Indeed, we will take into account the household's equipment on private vehicle to have a more appropriate estimation of the household's potential mobility. This choice is justified by the fact that evidently, a non-motorised household has no expenses on private transport and though it does not make any sense to attribute a positive number of private car kilometres to its global potential mobility distance. The opposite is true for the motorised households whose potential mobility distance would be underestimated if calculated based on the average expenditure of the group, who counts also the non-motorised households. Besides, it's important to take the motorisation into account to reflect the inequality of potential travelled distance among Tehrani households, as the captive users of public transportation have a more restraint choice than those with access to private modes.

III. TEHRAN URBAN TRANSPORTATION OFFER, PRICE AND MODAL SPLIT

The urban transportation network in Tehran is composed of three main categories. The private motorised transport is basically composed of the passenger cars but also the motorcycles, the pick-ups and the private taxi-service. By definition, these modes are used for private transportation of the owner or his family members. The shared-taxi and jitneys²⁰ are a hybrid form between the private and public transportation service where, like in many other developing countries, a private car owner propose, as his profession, to transport strangers that share a journey on a predefined itinerary (fixed-itinerary taxi) or on a flexible route (orange taxi) for a price fixed by public authorities. The third form of Tehran's transportation service is the mass transportation system, composed of a bus-minibus network added more recently by a metro network²¹. As mentioned above, we consider the shared-taxi and mass transportation services as "public transport", as in our database the households' expenditure on non-private transportation service are added up in a same item

²⁰ Unlicensed taxi cabs

²¹ The first metro line has been inaugurated on 1999, on a sub-urban line, connecting Tehran to Karaj. The first urban connection line has been inaugurated on 2000.

opposed to that of usage and maintenance of private vehicle. The table below resumes then the average prices practiced on Tehran transportation network on 2002, the reference date of our budget survey. Note that the kilometric price for taxi has been calculated taking into account the official price and the average distance travelled per taxi. We will calculate afterwards the price per kilometre on Tehran's transportation network.

Table 4: Prices practiced on Tehran transportation modes in 2002

Mode	Price (Rials)
Fuel per litre ²²	450 Rials
Orange Taxi ²³	187 Rials/Km
Fixed itinerary taxi ²⁴	150 Rials/Km
Bus	200 Rials/Ticket
Metro	500 Rials/Ticket
Minibus ²⁵	500 Rials/Ridership

Price per kilometre

Taking into account these prices and the average performance of each mode, we will now calculate an estimated average kilometric price per transportation mode.

- According to *Tehran Transportation and Traffic Organisation* a private car consumes in average 11 litres per 100 kilometres²⁶. So, using a private car on one-kilometre costs about 49.5 Rials of fuel²⁷. The same source, estimates that the annual cost of circulation of a private car is about 15 900 000 Rials of which 4 200 000 Rials are paid directly by the owner^{28,29}. With an average of 43 kilometres travelled per day³⁰, circulation of a private car would cost about 267 Rials per kilometre to its owner³¹. This is the amount that we use afterwards, to compare the potential kilometric distance accessible for our households.
- The official statistics of 2005 estimate that a motorcycle consumes in average about 3.5³² to 4 litres³³ per 100 kilometres. Considering that this is a stable consumption rate for motorcycles, we calculate a fuel cost of 18 Rials per kilometre, based on 2002 fuel prices. However, this does not reflect the real global circulation cost of the motorcycle (insurances, maintenance etc). In the absence of information on this cost, we attribute

²² http://aftab.ir/articles/economy_marketing_business/oil_gas/c2c1108310631p1.php

²³ Calculated on the basis of prices in 2005 and 2006. Taxi pricing report(1384 [2004-2005]).

²⁴ Idem.

²⁵ <http://www.farsnews.com/printable.php?nn=8602250311> (Consulted on 5 February 2010)

²⁶ Calculating the fuel waste by the vehicles in Tehran (2003[1382]).

²⁷ 100 kilometres costs 11*450 rials.

²⁸ The rest of this amount is the imposed cost of a private car's circulation on government, in form of different subsidies, as that on fuel, but also the cost of different urban road construction and maintenance.

²⁹ NAMDARI (16 fevrier 2007).

³⁰ Calculating the fuel waste by the vehicles in Tehran (2003[1382]).

³¹ Considering 365 days for a year

³² In 2005, about 80% of motorcycles produced in Iran consumes 3,5 litres per hundred kilometres. Jahan-e-Eghtesad, 1385, n°3628.

³³ The new motorcycles produced in Iran consume in average 4 litres per hundred kilometres. The Management and Planning Organisation of Iran. <http://www.spac.ir/barnameh/Barnameh%20220/4.htm> (consulted 05.02.2010)

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to the motorcycles the same circulation to fuel ratio as that of a private car³⁴. Then, travelling on motorcycle would cost about 97 Rials per kilometre for its owner.

- A bus ticket, demanded for every ride, costs 200 Rials. In average, a trip on Tehran's bus network is 5 kilometres long³⁵ and includes 1.5 rides³⁶. Thus, the average price for a five-kilometre trip is calculated as 1.5 times the ticket price (1.5*200=300Rials). Taking bus costs then in average 60 Rials per kilometre. The minibus network is controlled by the same identity in charge of the bus network. That's why in the absence of detailed information on minibus ridership we make the hypothesis that it has a similar functionality as the bus system³⁷. According to the statistics, a trip on minibus includes in average 1.8 rides³⁸, and a ride costs approximately 454 Rials³⁹. So, a trip on minibus would cost 817 Rials in average and, accepting that it's five kilometres long the kilometric price is 163 Rials.
- The metro proposes a faster service than the bus and minibus network. A trip distance is about 10 kilometres in average and demands 1.5 rides⁴⁰. In 2002, we could have access to all metro network with one ticket of 500 Rials. The average kilometric price of using metro would then be 50 Rials.

Thus, we can formulate an estimated kilometric price of using each transportation mode on Tehran urban network in 2002 (table 5).

Table 5: Price per kilometre of using Tehran transportation network modes (2002)

Mode	Kilometric price (Rials/km)
Private Car	267
Private Motorcycle	97
Taxi (Orange + fixed itinerary)	168.5
Bus	60
Metro	50
Minibus	163

Having these prices, we can then calculate the potential distance travelled by our households. Note that however their modal choice is not reported in our basis. Indeed, using available statistics on Tehran's average modal split, we make different hypothesis on our household's public modal choice, as its private transport expenditure is treated separately.

³⁴ A private car costs 49.5 Rials per kilometre on fuel and 267 Rials per kilometre on circulation. So the ratio is 5.4.

³⁵ This has been calculated by dividing the passenger-kilometre transported on the network during a morning peak-hour by the total number of passengers transported on the same period. 397 876 passengers have travelled on 1 959 227 passenger kilometres. This gives an average distance on 5 kilometres per passenger. TCTTS (2003). p.42.

³⁶ TCTTS (1386[2007]).

³⁷ The hypothesis tested on bus-minibus price similarity confirms this choice.

³⁸ TCTTS (1386[2007]).

³⁹ The price has been calculated on the prices voted by the municipal council for 2008 (1386 Rials per line for year 1387), with an average growth rate of 15-20% per year.

⁴⁰ In a morning peak hour, 52052 passengers have travelled on 520 637 passenger-kilometres, so an average on 10 kilometres per passenger (TCTTS 2003). The trip/ride ratio is based on TCTTS (1386[2007]).

Modal split hypothesis

Three public transport modal share hypothesis are possible: we first suppose that all the four public transportation modes (taxi, bus, metro, minibus) have the same chance to be used by Tehrani households. A kilometre travelled on public transport would then cost in average 110 Rials⁴¹. This amount is inferior to the price calculated based on real modal split in public transport offer. Indeed, when we take into account the morning peak hour modal share, we calculate an average price of 121 Rials per kilometre and this price would be of 118 Rials when calculated based on public transport daily modal share (table 6).

Table 6: Estimated average public transportation cost per kilometre in Tehran

	Taxi	Bus	Metro	Minibus	Kilometric price on public transportation (Rials/Km)
Average kilometric price (Rials)	168.5	60	50	163.4	
Hyp.1: Equal modal share	25%	25%	25%	25%	110
Hyp. 2: Morning peak hour public transport modal share (2002-2003)	33%	35%	7%	25%	121
Hyp. 3: Daily public transport modal share (2004-1383)	47%	39.5%	6.4%	7.1%	118

We are now going to use these three estimated average prices, in line with the private transport kilometric cost, to calculate the Tehrani households' potential distance travelled. Note that, taking into account the household's car ownership; we will compare fourteen different household groups. We distinguish here the motorised households as those equipped on private car (PV), and those equipped on motorcycles. The latter represent only 7 % of Tehrani households and are principally the poor active-head ones. We regroup these poor motorcycle owners to form a statistically representative sample⁴². Note that we regroup the rich motorcycle owners with the similar non-motorised households, as despite having a motorcycle their transportation consumption behaviour is close to that of the non-motorised ones.

The table below presents the fourteen households groups, their monthly expenditure on transportation service and its components, as well as the proportion of their transportation service budget spent on public transportation. Note that, as expected, the households motorised on a private car have spent the major part of their transportation service budget on using this vehicle, and that, regardless of their financial capacity.

⁴¹ Arithmetic average of the four prices.

⁴² Here we consider a sample being representative if it counts more than 30 households.

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Table 7: Monthly transportation service expenditure of Tehrani households according to their consumption group and their motorisation (Rials)

	Households	Private Transport	Public Transport	Transportation Service	% Spent on Public Transportation
Poor/ Motorcycle	51	66 151	32 843	98 994	33%
Poor/ Active/ NoAdultChild/ NonMotorised	205	4 449	82 424	86 873	95%
Poor/ Active/ WithAdultChild/ NonMotorised	114	325	79 263	79 588	100%
Poor/ Inactif/ NoAdultChild/ NonMotorised	93	1 075	34 860	35 935	97%
Poor/ Inactive/ WithAdultChild/ NonMotorised	73	0	83 688	83 688	100%
Rich/ Active/ NoAdultChild NonMotorised	79	2 190	134 603	136 792	98%
Rich/ Active/ WithAdultChild/ NonMotorised	90	13 711	133 289	147 000	91%
Rich/ Inactif/ NonMotorised	41	220	104 488	104 707	100%
Poor/ Active/ NoAdultChild/ PV	64	277 637	54 191	331 827	16%
Poor/ Active/ WithAdultChild / PV	61	371 902	73 836	445 738	17%
Poor/ Inactive / PV	31	303 968	46 968	350 935	13%
Rich/ Active/ NoAdultChild / PV	75	342 805	57 913	400 719	14%
Rich/ Active/ WithAdultChild/ PV	121	515 345	95 645	610 989	16%
Rich/ Inactif/ PV	41	681 756	86 909	768 665	11%
Total	1 139	150 800	81 460	232 200	35%

These monetary amounts reflect the financial capacity of each household to travel. However, each group of households has a different manner in spending this budget regarding its specific needs and opportunities to use the different motorised modes. Using these monetary amounts, the kilometric prices of transportation modes and the estimated modal choices, we are going to define the average potential distance travelled by each household group.

IV. HOW MANY KILOMETRES POTENTIALLY TRAVELLED?

To calculate each household's potential kilometres travelled, we divide its private transportation budget by kilometric price of using a car or a motorcycle, according to the household's vehicle. Two extreme public modal choice hypotheses have been added to our three initial hypotheses. Therefore, besides the equal-weighted, the morning-peak-hour and the daily modal splits, we consider also two situations when a household moves exclusively on bus or on taxi. The household's monetary expenditure on public transportation would then be calculated according to the estimated kilometric prices based on these hypotheses. The estimated distance budget of our households is shown in figure below.

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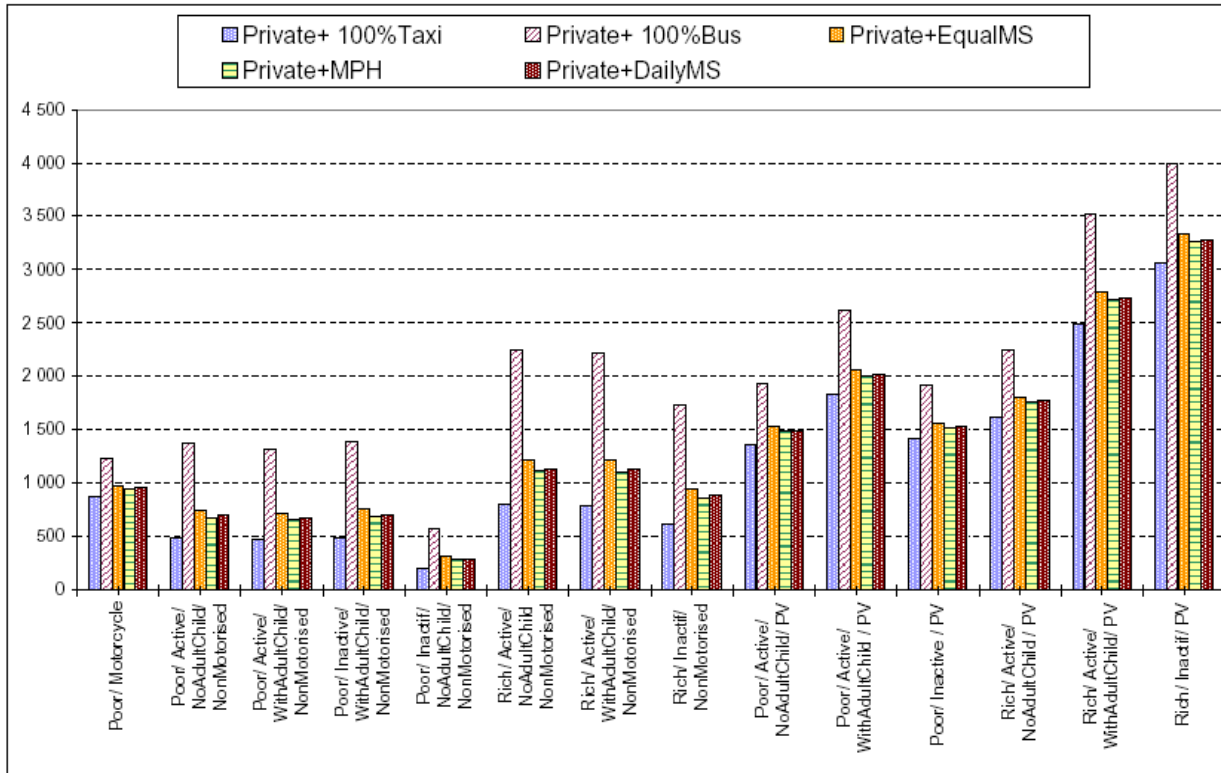


Figure 5: Monthly kilometres travelled by Tehrani household groups according to their motorisation and different modal share hypothesis (Km)

Despite the high price of using a private vehicle, the households with a private car (the right hand side groups) travelled on longer distances per month compared to those captive of public transportation system. Still, when taking into account separately, the non-motorised households have used the public transportation service on a longer distance in comparison to the motorised ones. In other words, access to private vehicle seems not only absorb a part of household's consumption of public transport, but motivates also a higher consumption of private transport. Even if it's more expensive, the private car seems to increase the households' accessible spatial area, and enable them to travel farther independent of the underdeveloped public transport service. Indeed, the public and private transportation services in Tehran are not complementary. In other words, having access to private car shifts household's consumption of public transportation to that of private one ceteris paribus. Further more, for every group of household, having a private car means a higher distance-budget and so a different utilisation of the urban space. This means then a better accessibility to the urban amenities like educational services or employment market for example. This must be considered as a strong signal of a growing gap between the private and public transportation users in Tehran, taking into account the growing rate of motorisation among the households, disfavouring those not capable of purchasing a private car.

Note that, this distance-budget calculated on kilometric price of transportation modes does not take into account the travel-time. However, there exists a non-negligible difference between the potential travel times on these transportation modes. When we compare the average speed on Tehran urban network during a morning peak hour, we observe an

important gap between that of private and public means. When, the average speed of a passenger car is 30 km/h, a taxi drives at 18 km/h in average and the average speed of the mass transportation network is only 15 km/h (average of 10 km/h for the bus network^{43,44}). Nevertheless, in a city like Tehran with frequent traffic jam, the speed of the transportation mode becomes an important factor in time management and influence directly the number of possible trips in a day. Indeed, we can conclude that the motorised households travel not only on a longer distance, but they do it faster, as the major part of their trips is on passenger car. They go then farther and faster than the non-motorised ones and so can use their time-budget to realise more trips in a day.

Besides, among non-motorised households, we note that the rich households can travel on a farther distance than the poor ones. However, as the time-value increases with financial capacity, we can imagine that, for a given trip, the rich households are more probable to use the taxi, more expensive but faster and more comfortable, and that the poor ones are principally the passengers of mass transportation system, slower but cheaper. There's then a difference in potential time and space mobility of the non-motorised households according to their financial capacity. This will in turn influence their utilisation of urban space and urban amenities as access to these amenities is time-and-money consuming. More qualitative information is however needed to confirm this hypothesis.

How many potential motorised trips?

These time-distance inequalities become more important when we know that the educational and professional trips compose about two-third of Tehran's daily trips⁴⁵ and that as a consequence of urban spread the average distance of a motorised trip is about 7 kilometres⁴⁶. Considering this average distance per trip and household' potential kilometres budget, a poor active-head non-motorised household for example, can realise in average 4 trips per working day⁴⁷ where the same household having a private car realises in average 8 to 11 trips (respectively poor active without and with children). The average number of daily trips for a rich active-head non-motorised household is 6 where those having a private car realise in average 9 to 15 trips per day. Considering that each active member realises two trips a day, then the potential trips budget for other household's members would be very little when non-motorised.

The rich non-motorised elder households, with an inactive head, can realise between 4 to 5 trips per day where the poor ones can only realise in average 1.5 motorised trip. This small number of potential trips can be constraining especially for the rich ones that, as we have seen, count members with a certain social life level⁴⁸. The same household groups, when equipped on private car realise in average 11 and 8 trips respectively. Therefore, not only the

⁴³Analysis, planning and modelling of a unified public transportation network (1385[2006]).

⁴⁴TCTTS(2003). p.14.

⁴⁵TCTTS(2003), p.8. (Professional 38% et education as 19% of Tehran's daily trips)

⁴⁶ARAGHI(dir.), 2004 (b). 2nd part. p.59.

⁴⁷Here we consider that a month counts in average 26 working days.

⁴⁸When comparing the expenditure on clothing or housing furniture for example, the motorised groups have higher expenses than their similar but non-motorised groups.

private car facilitates a higher number of motorised trips, by its availability and its speed, but it seems to be important to maintain a higher level of socio-cultural life, regardless of the household's financial level.

V. CONCLUSION

The results of these analysis permit to identify certain approaches in Tehrani household's transportation consumption as well as their urban mobility behaviour. We have seen that the financial capacity is the first factor determining the transportation service consumption of a household where a higher income allows a higher monetary expenditure on transportation services. Moreover, the financial capacity of a household determines the weight of transportation expenditure in its global budget. In other words, the transportation service becomes a more important budget item when the financial capacity of a household increases.

The number of active members in a household, principally the household's head, is the second determinant factor of its transportation service consumption. The rich households count more active members than the poor ones in the same life cycle, especially as they count supplementary active members to the household head. We have seen that there's a higher probability for a spouse or an adult children being active, if he/she belongs to a rich household. This higher activity probability is due to different reasons, like a higher qualification level and more adaptability to the employment market, but also as a result of a facilitated physical access to this market. A higher number of active members increases then the income level of the household and generates as well a higher mobility demand. This is a virtuous circle where the financial capacity let higher transportation expenditure, then a higher accessibility to employment market and increasing chance of being active, that in turn will increase the household's income and enables higher transportation expenditure.

In a given step of lifecycle, the more adult children counts a household, the higher would be its transportation service consumption. These adult children seem to create a higher level of transportation demand as for their independent outdoor activities. Besides, arriving at the legal driving age, they will potentially modify the household's private vehicle use (if there's any) towards a shared parent-child use. However, these adult children can only satisfy their transportation needs according to the household's available transportation budget. Indeed, in comparison to the poor households, the rich adult children not only possess a more important transportation fond but are also more probable to have access to a private car, as a result of a higher motorisation rate among these latter. This provides them with a more facilitated mobility in comparison to the poor adult children and enables them to establish tighter links to the city and its amenities: to work, to study and to entertain themselves.

Besides, the comparison of Tehrani household's transportation budget has shown that the major variation in their monetary expenses is the result of using the private vehicle. In other words, access to a private vehicle and the financial capacity to use it determine wildly the household's transportation service consumption. This impact is more emphasized when comparing the motorized households, where the rich ones have spent higher amounts on

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using their private vehicles. Besides, even if the monetary amounts spent on public transportation service remain relatively stable among our household groups, the rich households have higher monetary expenditure on this item as well.

The transformation of the monetary expenditures to potential kilometers travelled by our household groups confirms the importance of private vehicle in Tehrani household's spatial mobility. In other words, despite a higher cost, the households equipped with a private car have potentially travelled on a farther distance compared to the similar non-motorized groups thanks to their private car. More detailed comparison confirms that in Tehran, access to a private car not only absorbs a part of household's consumption of public transport, but motivates also a higher consumption of transportation service, thus a higher distance-budget and a different utilization of the urban space. Besides, the comparison of potential number of motorized trips realized by each group of household confirms that the private car enables a higher number of motorized trips per day, by its availability and speed, and enables a higher level of socio-cultural life, regardless of the household's financial situation.

These results reflect the unbalanced situation of Tehran's urban transportation offer, where the private car is a direct concurrent and not complementary to the public transportation. The underdeveloped mass transportation service, the absence of urban policies to improve and promote these transportation means and the increasing motorization rate enforce the predominance of the private transportation means in Tehran. This creates indeed a discriminative situation for the households not capable of purchasing or using a private car. Furthermore, there's a discriminative situation among the captive users of public transportation services. Shared taxi service, as an important part of Tehran's public transportation system, proposes a more rapid and comfortable service than the mass transportation network, but at a higher price. The wealthier clients can then use more easily the taxi, while the least favoured ones are to use the slow and uncomfortable mass transportation service. The access to faster transportation modes enables then a higher number of potential motorised trips per day and a higher distance-budget, thus a facilitated practice of the urban space.

This situation is the generator of an unequal accessibility, where the poorest households are the most deprived. In other words, the rich households, as a result of their financial capacity, have a facilitated access to rapid transportation means, private as public, where the poor ones are constraint to use less expensive transportation modes that are slower and less comfortable. As stated above, with a limited daily time-budget, the latter have a more difficult access to the city and the urban amenities and have to limit their motorised trips to the most essential ones. This is the beginning of a vicious circle of deprivation of the city and particularity of the employment market, which will in turn, causes unintentional unemployment and stagnation, if not deterioration, of their economic level. An engagement of public authorities is thus necessary to improve and develop the mass transportation system of Tehran, to prevent increasing inequalities in urban accessibility to the detriment of the poorest ones.

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