MOTORIZATION IN TURKEY: THE CASE OF PASSENGER CARS

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1. INTRODUCTION

According to Sperling and Claussen (2004), the inherent dilemma of motorization in developing countries is that "…for many, vehicles are desirable as a secure and private means of travel, and as status symbols…but personal motorization also imposes enormous costs, especially in cities. The well-known litany includes air and noise pollution, neighborhood fragmentation, and high energy use". Especially, the energy use will be of prime importance in the near future as oil consumption in developing countries will be two thirds of the global increase between 2002-2030; surpassing total energy consumption of developed countries around 2030 (IEA, 2004). A significant part of the energy consumption is expected to be consumed by the transport sector, in which private transport is estimated to constitute a significant part. On the other hand, sharp increases are expected in passenger car ownership levels when per capita income level reaches a level between US$3,000 and US$5,000 (Dargay and Gately, 1999). Besides, Ingram and Liu (2004) estimate that in developing countries passenger car ownership is expected to increase at a rate more than income growth. A possible explanation to this is social determinism—a sociological explanation—which associates car ownership in developing countries exclusively with middle class life styles, and stresses the social forces on the middle class to sustain a mobility level tied to car ownership (Vasconcellos, 1997).

Since 1970s in Turkey, there has been car production for the domestic and the international markets, which has been strongly supported by successful alliances of the international car makers with the domestic partners (Tekeli, 2009). Since 1980s, economic development spurred by the economic restructuring of the economy has proceeded hand in hand with urbanization. Besides economic liberalization, customs union with the European Union eased import and export of passenger cars. In addition to traditional Fiat and Renault alliances, now in Turkey, big international car makers such as Ford, Toyota, Honda, Hyundai have passenger car production units in Turkey.

Overall result of these developments is a tremendous increase in the passenger car ownership levels in Turkey—in 17 years from January, 1995 to January, 2012 number of cars owned has increased from 2,876,616 to 8,185,556 which equals to a mere 2.8 times increase.[1] Although the actual figures have increased a lot, passenger car ownership is still in its infancy when one considers that the increase has been from nearly 45 passenger cars to around 110 passenger cars per thousand people in the same period. The increase in passenger car ownership has first gained momentum in provinces such as Istanbul and Ankara where per thousand people passenger car ownership levels are around 138 and 198 respectively as of 2011. When these figures are compared with those in Europe of in North America, one can notice that private car ownership in Turkey is still in its infancy. In other words, the current condition of the passenger car ownership is on the verge of fast increase.

As traditional compact urban structure of the Turkish cities is insufficient to locate the increasing number of private cars, various sorts of problems arise in terms of traffic conditions, land use changes and daily quality of life. Accordingly, the compact urban form has been dissolving with the increasing motorization in the past 20 years. However, this is continuing only with the sprawl of the residential areas. Residential areas near city centers have been transforming into new employment centers or remain as decaying areas with the flight of new members of “the automobile club” (Dupuy, 1999).

In this study, we try to uncover the underlying regional dynamics of motorization in Turkey. To do so, we use macroeconomic and demographic statistics based on provinces and derive statistics that explain regional differences in motorization and its pace. The study has been organized in four parts. The second part presents information about historical development of

[1] Turkish Statistical Institute, Accessed: April 15, 2012.

passenger car ownership in Turkey along with other countries, i.e., France, Germany, Greece and the USA. In the third part, we devise statistical variables which account for passenger car ownership levels at the provincial level. By this, we try to relate motorization to the urban development and local economic conditions too. General conclusions are presented in the last part according to the results derived from estimation given in the fourth part.

2. PASSENGER CAR OWNERSHIP IN TURKEY

In the past 17 years from 1995 to 2012, passenger car ownership in Turkey has nearly tripled from 2,876,616 to 8,185,556. In the same period, GDP has increased nearly 2 times, the population of Turkey increased by 1.3 times, the urban population increased by 1.7 times.[2] The increase in passenger car ownership is evident and eminent. There are many factors affecting private car ownership in Turkey. As a developing country, economic development and increase in economic wealth are prime factors behind passenger car ownership. However, there are many other factors too. One may contemplate factors such as condition of the public transit, social status gained by private car ownership, status of the prospective owner, household size, etc. Whatever the factors are, if the production is not enough to meet the demand, the increase will be limited to a certain extent. This was the case especially in 1970s and 1980s as there were only two car producers active in Turkey.

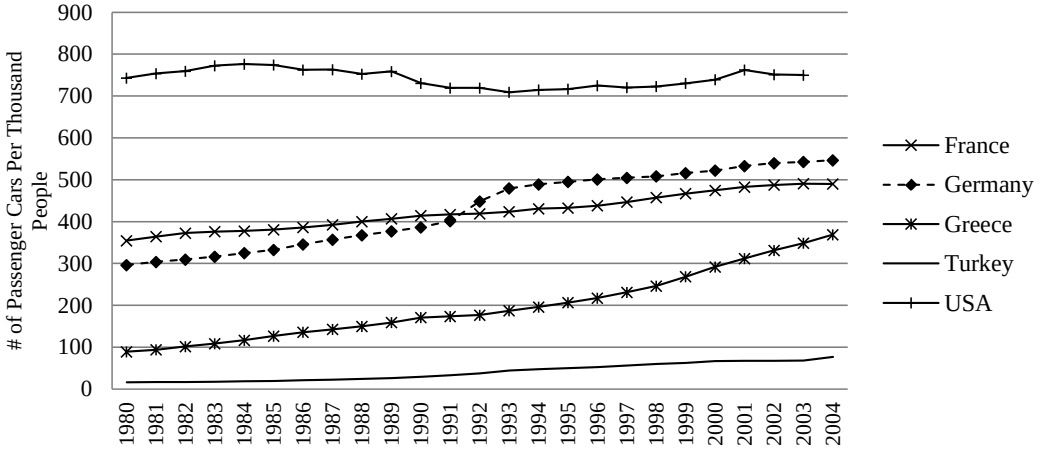


Figure 1 Passenger cars per thousand people in France, Germany, Greece, Turkey, and USA (Source: UNEP Geodata Portal, Accessed May 19, 2012)

[2] Population figures are available for 1990 and 2011.

Before 1980, import of passenger cars was restricted, only foreign cars imported earlier and those produced domestically by foreign car producers were being used. In 1980, structural reforms besides economic liberalization in Turkey have opened the domestic market to cars produced abroad. However till 1990s private car production was not enough to meet the increasing demand. Besides, there were economic obstacles too, viz., household income was not enough to purchase a passenger car. From 1980 to 2004, while Turkey reached 77 cars per thousand population (from 16 cars), Greece attained 369 cars per thousand people (see Figure 1).

If car ownership is to catch up with the levels in the developed world, one may expect that the levels are to increase levels more than 400 passenger cars per thousand people. USA shows the upper limit for car ownership, which is between 700 and 800 passenger cars per thousand people. For all countries except USA in Figure 1, there is nearly a perfect match between GDP per capita and passenger car ownership levels, i.e., correlation between income and passenger car ownership is between 0.90 and 1.00.

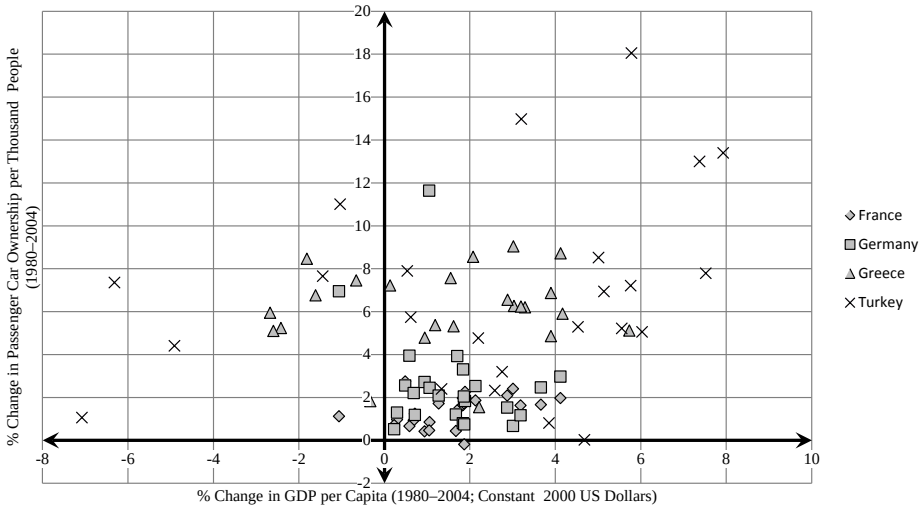


Figure 2 Income vs. passenger car ownership in France, Germany, Greece and Turkey (1980-2004; Source: UNEP Geodata Portal, Accessed May 19, 2012).

Figure 2 depicts the relationship between income and passenger car ownership better. Almost all of the extreme values are associated with Turkey in Figure 2. At all times, even when GDP per capita decreased, passenger car ownership increased at varying degrees, and mostly the accompanying increase in passenger car ownership was higher than the GDP per capita increase. In both Germany and France, the increase in passenger cars is in consonance with the increase in income, but increase in passenger car levels in both Greece and Turkey is

generally higher than the increase in incomes. This might be due to the relative saturation in European passenger car levels, which is well below USA levels. On the other hand, both Greece and Turkey are well behind saturation levels, hence the higher rates of passenger car increase with respect to income increase.

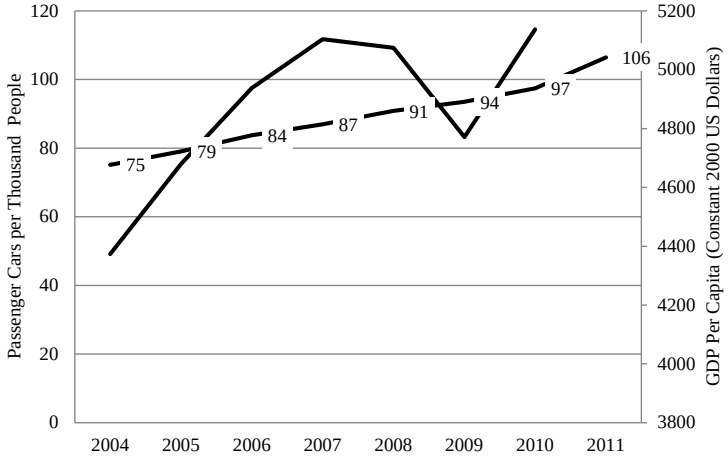


Figure 3 Passenger car ownership per thousand people and GDP per capita between 2004 and 2011 in Turkey (Source: UNEP Geodata portal and Turkish Statistical Institute, Accessed: May 19, 2012).

In Figure 3, passenger cars per thousand people in Turkey have increased 41.63 % in 7 years from 2004 to 2011 (the total number of passenger cars increased by 50.66 % in the same period). From 2004 to 2010, on the other hand, GDP per capita has increased by 17.46 %, which supports the outcome that the increase in income supports a higher increase in passenger car ownership levels, i.e., income elasticity of passenger car ownership is higher than 1). However, passenger car ownership is still in its infancy and it is expected to increase at least at these rates in the future. If the current trend continues with the same smoothness into the future, in 15 years from now, passenger car ownership is expected to be at around 225.68 per thousand people in 2027, which is more than two fold increase. However, it is highly probably that this smoothness might turn into a steepness, which means that the 226 passenger-cars is an estimate from below.

3. PASSENGER CAR OWENERSHIP AT THE PROVINCIAL LEVEL

As of 2011 (August), per thousand passenger car level is highest in the capital city of Turkey, Ankara, and lowest in Şırnak, in the South-East region of Turkey (Figure 4). The gap between the highest and the lowest figures is tremendous; the highest level is nearly twenty fold of the lowest figure. The distribution of the car ownership displays a strong regional disparity in

Turkey. South-East Region of Turkey departs from the rest of Turkey with poor level of passenger car ownership. This region is buffered with another low level region to the west. Western Turkey is dominated with passenger car ownership levels between 100 and 150 passenger cars per thousand people.

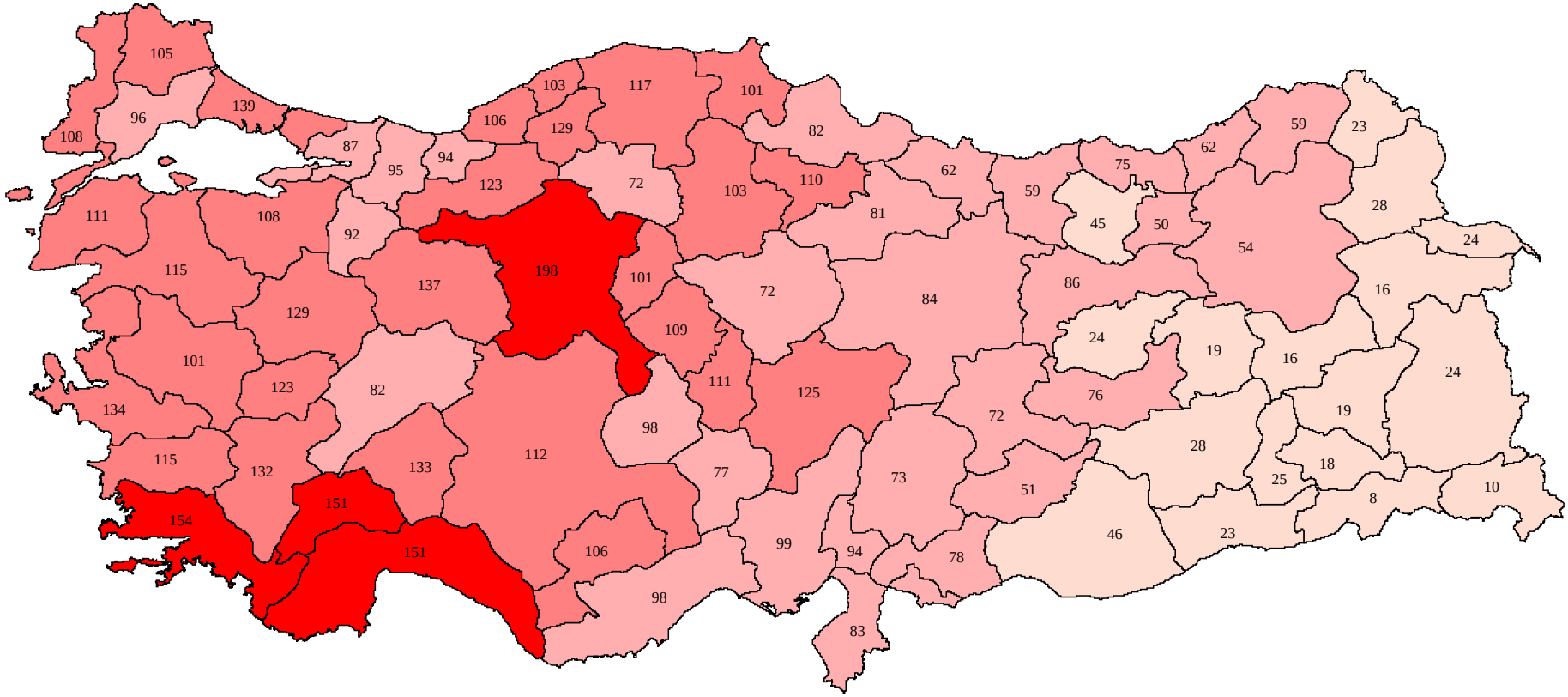


Figure 4 Distribution of passenger car ownership per thousand people in Turkey in 2011 (figures are given within provincial boundaries, scales of red represent increasing intervals of 50 cars per thousand people).

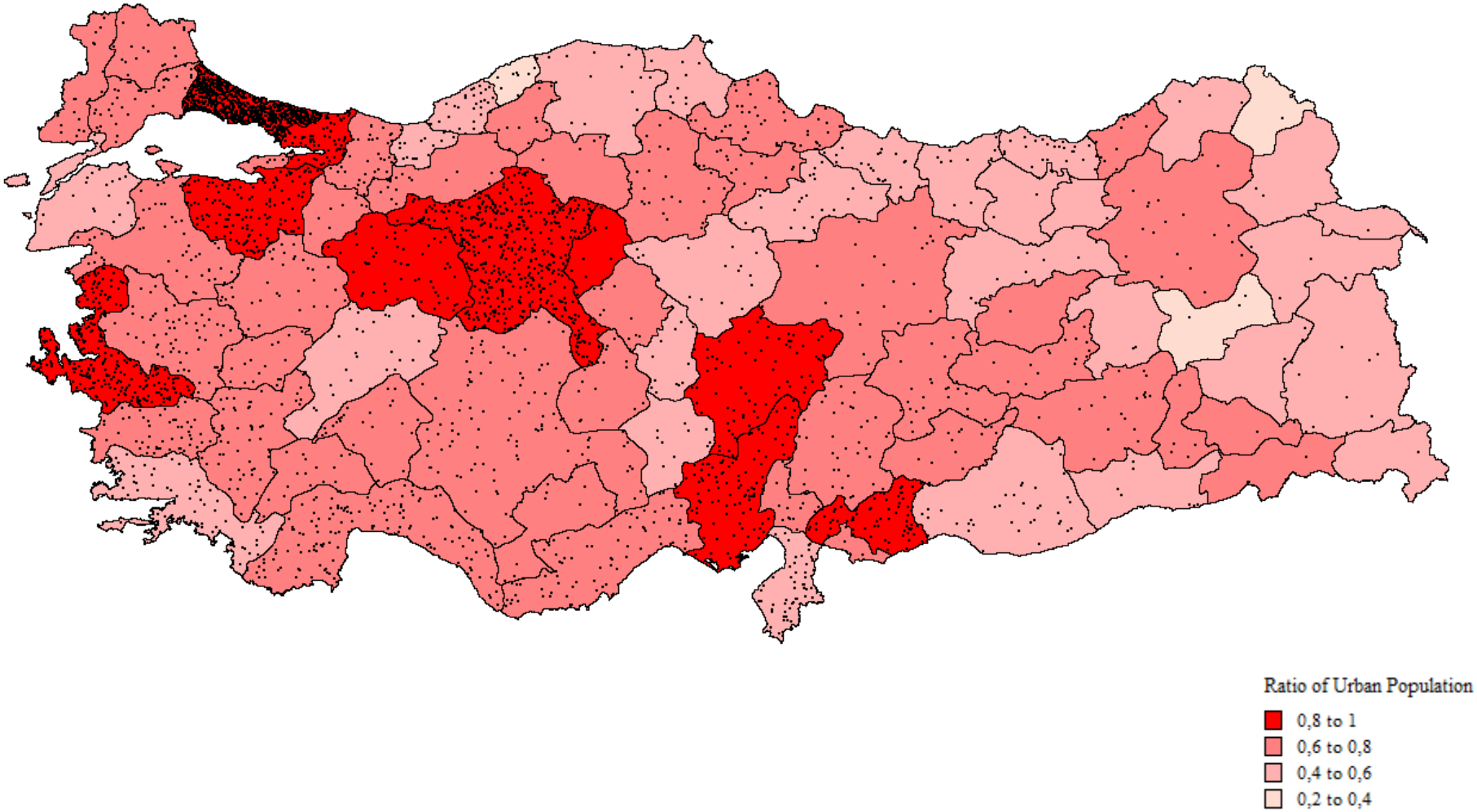
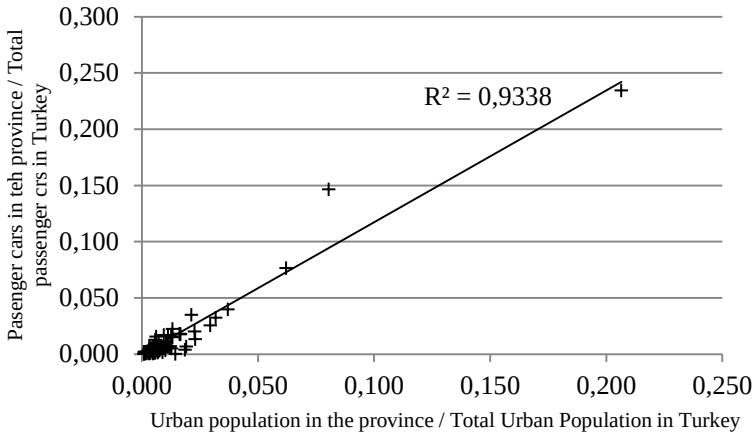
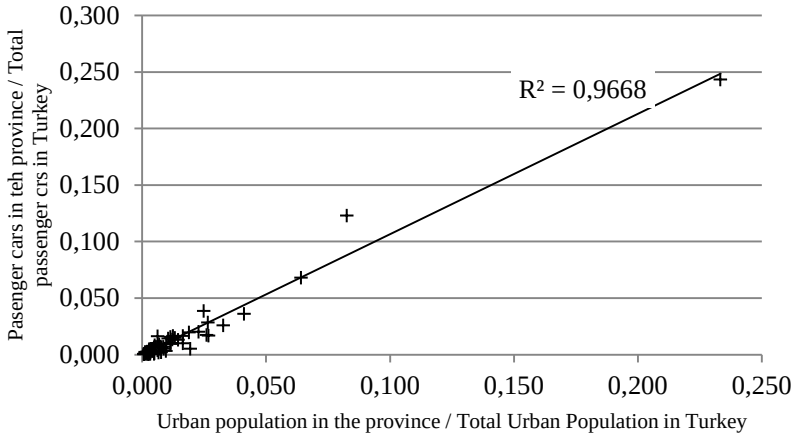


Figure 5 Ratio of urban population and total number of passenger cars in 2011 (1 dot represents 1,500 passenger cars).

Figure 5 shows the relationship between urban population and the number of total passenger cars. Although one can find relationship between urban population and number of passenger cars (correlation coefficient between ratio of urban population and total number of passengers cars is 0.52), the relationship might be spurious to a certain extent as provinces in the west at the same urbanization level with the provinces in the east have more passenger cars—possibly income is a strong intervening variable between urban population and passenger car ownership. On the other hand, one may contemplate that the total number of passenger cars in some of the provinces indicates the severity of the traffic congestion. According to this, Istanbul, which is the most populous province in Turkey with a population around 13 Million people, is almost exhausted by passenger cars.



a. 2000



b. 2010

Figure 6 Urban population vs. passenger cars.

Figure 6 depicts a perfect relationship that does not change in time: relative urbanization of a province in Turkey perfectly matches with its relative motorization in level Turkey. Following Tekeli (2008), we have derived a measure that characterizes directional change and its magnitude of both urban population and number of passenger cars in a province. Let the urban population of a province at time *t* is up_t, total urban population of Turkey at time *t* is UP_t, number of passenger cars in the province at time *t* is pc_t, and the total number of passenger cars in Turkey at time t is PC_t. Then the relative motorization of a province with respect to its relative urban population is as follows:

$$RMwRP_t = \frac{\frac{pc_t}{PC_t}}{\frac{up_t}{UP_t}}$$

When $RMwRP_t$ is equals one, then a province has attracted passenger cars in consonance with its relative position in Turkey with respect to its urban population. Figure 6 above has proved that there is equal to 1 approximately. Average of $RMwRP_t$ is 0.81 in 2000 and it has risen to 0.94 in 2011. When we consider the change between two years, e.g., 2000 and 2010, then a very different computation has to be made in order to find the direction of change, i.e., *DrChRMwRP*, and its magnitude, i.e., *MgChRMwRP*.

$$DrChRMwRP_{t\rightarrow t+n} = arctan\left(\frac{\frac{pc_{t+n}}{PC_{t+n}} - \frac{pc_t}{PC_t}}{\frac{up_{t+n}}{UP_{t+n}} - \frac{up_t}{UP_t}}\right)$$

$$MgChRMwRP_{t\rightarrow t+n} = \sqrt{\left[\left(\frac{pc_{t+n}}{PC_{t+n}} - \frac{pc_t}{PC_t}\right)^2 + \left(\frac{up_{t+n}}{UP_{t+n}} - \frac{up_t}{UP_t}\right)^2\right]}$$

When computation is made and accompanying conversions are made, we can classify motorization in terms of passenger car ownership in provinces with respect to relative population. In order to understand the change better, a two-dimensional graph can be divided into eight parts as given in Figure 7, by which we can classify the change. For example, directional change that falls in I-A means that positive change in relative population is higher than positive change in motorization, III-B means that negative change in motorization is higher than negative change in population.

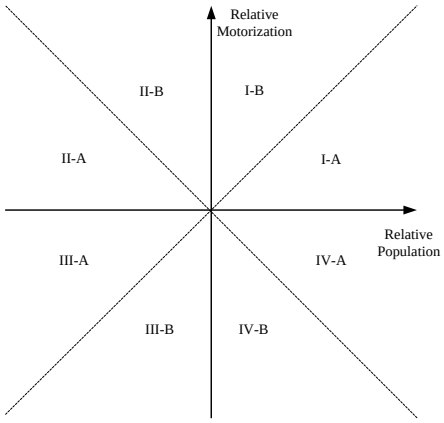


Figure 7 Change in two dimensional graph.

Table 1. Motorization With Respect to Change in Urban Population Between 2000 and 2010.

QUADRANT	RELATİVE CHANGE			
	A		B	
	Province	Magnitude	Province	Magnitude
I	İstanbul	28,362	Samsun	13,026
	Gaziantep	5,170	Antalya	5,286
	Kayseri	2,960	Düzce	3,122
			Tekirdağ	3,065
			Diyarbakır	1,645
			Muğla	0,765
			Yalova	0,524
			Bartın	0,447
			Niğde	0,420
			Mersin	0,118
			Hatay	0,090
II	Konya	4,305	Erzurum	4,043
	Şanlıurfa	4,253	Malatya	2,854
	Osmaniye	3,424	Yozgat	2,676
	Kahramanmaraş	2,639	Kırıkkale	2,361
	Karabük	2,098	Sivas	2,218
	Çorum	1,365	Afyonkarahisar	1,974
	Aksaray	1,100	Adıyaman	1,674
	Bayburt	0,563	Isparta	1,411
	Batman	0,529	Mardin	1,380
	Kilis	0,409	Çankırı	1,262
	Şırnak	0,088	Elazığ	1,245
			Muş	1,080
			Ağrı	0,852
			Hakkari	0,753
			Kastamonu	0,605
			Kırşehir	0,580
			Sinop	0,421
			Nevşehir	0,394
			Tunceli	0,394
			Bingöl	0,351
			Burdur	0,343
			Karaman	0,342
			Siirt	0,262
			Iğdır	0,171
III	Trabzon	3,493	Balıkesir	5,735
	Tokat	2,657	Zonguldak	4,384
	Ordu	2,297	Bolu	2,633
	Giresun	2,080	Eskişehir	2,115
	Bitlis	1,993	Aydın	1,778
	Erzincan	1,533	Edirne	0,995
	Rize	1,336	Kırklareli	0,636
	Kars	1,082	Artvin	0,621
	Gümüşhane	0,694	Kütahya	0,616
	Van	0,565	Çanakkale	0,245
	Amasya	0,563		
	Ardahan	0,303		
	Uşak	0,135		
IV	Ankara	23,690	Kocaeli	9,538
	İzmir	8,616	Bursa	5,514
	Adana	6,607	Denizli	2,319
	Manisa	1,409	Sakarya	1,099
			Bilecik	0,301

According to the relative change, 81 provinces are categorized into one of eight compartments of changes along with their magnitudes of change. According to the results, only three provinces with strong economies attract more population than passenger cars, ceteris paribus.

Provinces that fall into I-B show strong motorization in terms of passenger cars. Of these provinces, Samsun, Düzce and Tekirdağ show strong levels of motorization. On the other hand, provinces, where relative motorization decreases more than population increases, are Kocaeli, Bursa, Denizli, Sakarya and Bilecik. Of special interest are those cities where relative passenger car ownership increases more than population decreases.

4. CONCLUSIONS

Motorization is on the verge of fast increase in Turkey. It is expected to increase two or three fold in the next two years or so if the current trend maintains itself into the future. However, there are vast differences between provinces. West of Turkey strongly differs from the East of Turkey; the passenger car levels in the former are significantly higher than the latter. Passenger car ownership is highest in Ankara where there are 198 passenger cars per thousand people, it is lowest in Şırnak where there are 8 cars per thousand people.

There is almost a perfect match between ratio of provincial urban population in Turkey and ratio of provincial passenger car population in Turkey. In terms of relative urban population change in the provinces, relative motorization also shows strong variation. Accordingly, eight modes of change are detected. Although motorization is increasing and, moreover, it is on the verge of fast increase, we expect that the increase will assume strong variation among provinces. In the past 10 years, real motorization was detected in 35 provinces, where the rate of passenger car increase is higher than the rate of population change. These cities are medium sized cities in fact. We expect that real motorization is expected to take its toll in these cities.

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