THE ROAD TRAVEL DEMAND IN IRAN

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Abstract:

This paper examines road trip demand (passenger public fleet) in Iran using quarterly time series data during the period 2006-2010. We apply SUR model relating per trip in every mode of road transport to fare, income, service level, fare of other transport modes and population. The results indicate that developed public transportation network is the most important factor for public transport demand in passenger public transport fleet and also railways isn't a suitable substitute for road transport due to undeveloped railroad network, although it is complement for some routes due to chained trips. Low fare elasticity indicates lack of serious substitute for road trip. These results suggest a wider array of factors needs to be considered in policy.

Keywords: Public transport; Transport demand; Gravity model; Fares; Quality of service; Income

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1. Introduction:

In all communities, it is widely acknowledged that transport has a crucial role to play in economic and social development it means economic activities increase of each country needs to develop and improve the transport network. Road constitutes the principal mode of transportation in Iran so that road transport has emerged as the dominant segment in Iran's transportation sector with a share of 5 percent in Iran's GDP and share of 90.7 percent in passenger transport in 2009(National Account of the Central Bank of Iran). Despite the major importance of this sector of transport in Iran, little researches have been done in this case Therefore, road transportation requires further studies.

In developed countries, there have been a few studies on road transport due to the low importance of road transport and also most studies are based on gravity model so travel demand variable as the dependent variable and population, income, trip cost, distance as the independent variable are considered.

Dargy and Hanly(2002) examine the demand for local bus services in England which is based on a dynamic model relating per capita bus patronage to bus fare, income, and service level and is estimated using a combination of time series and cross section data for English countries. Tobias Groscche, Franz Rothlauf, Armin Heinzl(2007) presents two gravity models for the estimation of air passenger volume between city-pairs. The models include variables describing the general economic activity and geographical characteristics of city-pairs instead of variables describing air service characteristics. Nicola Commins, Anne Nolan(2010) concentrate on travel for a specific journey purpose, namely the journey to work. Using data on the full population of working individuals from the 2006 Census of Population, they analyse the influence of travel and supply-side characteristics, as well as demographic and socio-economic characteristics on the choice of mode of transport to work in the Greater Dublin Area. The results indicate that household composition, public transport availability, journey time and work location are particularly significant in explaining the choice of mode of transport to work

In addition to important role of road transport in passenger transport, recent Government policy according to development of public transport rule and fuel consumption management, fuel ration elimination rule emphasizes the development of passenger transport fleet on the other hand any decision requires to recognition of major factors on transportation supply and demand functions

so the object of this paper is estimating of travel demand in road public transport fleet and also finally the article sheds light on some currently unresolved empirical question on the determinants of travel behavior.

Some data was collected from Iran Road Maintenance and Transportation Organization (IRMTO). It contains information on freight and passenger segments for example number of public road transport, fares, passenger journeys, receipts, revenue support,… and others were obtained from National Account of Iran that this database provided by Central Bank of The Islamic Republic Of Iran(CBI). These data have been collected in this form since 2006-2010. The data on Iran Road Maintenance and Transportation Organization includes all inter city trips both inner province trips and inter province trips

The next section gives a brief overview of passenger transport demand for road transport in Iran and its structure. The econometric model is presented in the next section, followed by statistical estimates and elasticities. The paper ends with some concluding remarks.

2. Overview:

Transport is vital to the economic development and social integration of the country**.** According to National Account of Iran, CBI, transport sector accounts for a share of 9.09 percent in Iran's GDP in 2009 however, road transport including freight and passenger has essential role in Iran's transportation sector with a share of 8.2 percent in Iran's GDP in comparison to other transport modes that has a mere 0.89 percent share of GDP in 2009 as per the revised data on National Accounts released by the Central Statistical Bank Of The Islamic Republic Of Iran and also road transport share in passenger and freight movement is 90.7 and 75.3 respectively.

Road transport in public section has consisted of bus, minibus and taxi mode. According to IRMTO's year book statistics in 2010, there are around 24 percent bus, 33.4 percent minibus and 42.5 percent taxi in 2010, over 90 percent of minibuses are more than 25 years old and should be removed. The average age of other fleets in Iran is 23.32 for minibus, 13 for bus and 5.75 for taxi. . Bus fleet has been 35.8 percent of inner province trips and 79 percent of inter province trips while 48.7 percent of inner province trips occurs by minibus fleet the remaining 15.5 percent of inner province trips and 8 percent of inter province trips was handled by taxi.

3. Methodology and econometric modeling issues:

Transport is basically a derived demand depending upon the size and structure of the economy and the demographic. Transport demand such as demand for other commodities is defined as the quantity of a well-defined good or service that people are willing and able to buy and decreases or increases as the price of that good and service rises or falls in during a particular period of time with the assumption that all other factors remain constant. In general the factors influencing transport demand can be divided into two main categories: factors produce a trip like population, income, social and economic activities, quality of services and factors is barrier to trip such as price of services, distance between origin and destination, travel time.

Road transport demand is based on macro and micro models. Macro model focuses the total trips which are done in the whole country so the model variables are related to the whole country. The basic equation for macro model is:

$$T = T(D,S) \quad (1)$$

Where T is traffic volume, D is social and economic activities such as income and population, S is transportation supply variables such as price and service of trip.

While a micro model considers traffic and trips flow in a particular direction thus this model is faced with the origin and destination of each trip. The general form of micro model is:

$$Tij = T(Di,Dj,Sij) \quad (2)$$

Where Tij is traffic volume between cities i and j, D is social and economic characteristic of cities i and j, Sij is characteristic of transportation supply.

Gravity models were the earliest causal models developed for traffic forecasting however in recent studies, the extended gravity model is used in the estimating of transportation demand. This paper is also based on the developed gravity model. Basically, this model assumes that the number of trips between to zones is 1) directly proportional to the trips produced and attracted to both zones and 2) inversely proportional to the travel time between the zones. The basic gravity model is:

$$Q_{ij} = a^{\varepsilon} F_{ij}^{\beta} FR_{ij}^{\theta} G_{ij}^{\gamma} D_{ij}^{\delta} P_{ij}^{\pi} \quad (3)$$

Where Q_{ij} is total passenger volume between cities i and j, F is transportation fare, FR is fare of alternative modes, G is gross domestic product, D is geographical distance, P is population. In general, the objective of estimating of transportation demand is analysis of price, income and cross elasticity so demand function is estimated as the logarithmic. All variables to be in logarithmic forms result in the following constant elasticity specification:

$$\ln Q_{ij} = a + \beta \ln F_{ij} + \theta \ln FR_{ij} + \gamma \ln G_{ij} + \delta \ln D_{ij} + \pi \ln P_{ij} \quad (4)$$

Where i is different modes of road transport in Passenger Public Fleet, t is time ,Q is passenger-kilometer per trip ,F is average fare per passenger/Km, FR is average fare Per passenger /Km of other transport modes, including rail transport

, G is gross domestic product (GDP), D is distance per trip and P is population per kilometer.

Passenger transport is done by bus, minibus and taxi in road transport so three equations is defined in road transport sector. In order to systematic approach to estimating the road transport demand, this article uses the seemingly unrelated regression (SUR) model. In fact the SUR model comprises several individual relationships that are linked by the fact that their disturbances are correlated. There are two main motivations for use of SUR. The first one is to gain efficiency in estimation by combining information on different equations. The second motivation is to impose and test restrictions that involve parameters in different equations.

We use quarterly data during 2006-2010. The data have obtained from Statistica Center of Iran(SCI)

4. Model Estimation:

The result of estimated parameters is given in the Appendix Tables. The first step of estimate is reported in Tables 1-3 however coefficient of rail fare as a cross elasticity and coefficient of population in the equation of bus demand and also coefficient of income in the equation of taxi were found to be insignificant at the 5% level. According this result, the mentioned variables do not have significant effects on road demand equation so in the next step, the model is estimated

with excluding these variables (see Table 4-6). The model fit the data well, with adjusted R-Squared values near one.

5. Conclusion:

The objective of this study is to estimate of travel demand in road public transport fleet. According to diversity of transport modes in road public transport, the method is used SUR model that it is based on structure of passenger public fleet. The model includes fare, income, service level, fare of other transport modes and population. The Estimation was done in two steps: in first step, all variables are included. However some of them are not significant at the 5% level such as rail fare and population in the equation of bus demand and also income in the equation of taxi so these variables are eliminated in second step.

Fare elasticities are less than unity. In other words, road transport have a low elasticity of demand because no substitutes exist so that 90 percent of passengers are transported by road transport sector. Low income elasticity indicates road transport is necessary goods, although it is negative for minibus demand, implying that minibus is an inferior good. In general higher economic activity, income and standard of living lead to increased demand for mobility. The growing demand for passenger transport in general is directly related to growth in the economy. Coefficient of rail fare does not have expected sign, therefore rail transport can not be an alternative for road transport due to undeveloped rail. Rail transport is good choice for long distance if rail network is expanded to these routes. On the other hand rail transport is a complement for taxi due to chained trip. In other words passengers use different transport modes in order to reach a special destination. Indeed, train stations in some large cities, is located outside the city, hence passengers use taxi in order to transfer. Moreover, bus is not used in the city due to the traffic ban and minibus fleet is used in small towns, especially in rural areas. Distance elasticity is higher than other elasticities in all equations. This emphasizes the importance of extensive public transport network. In fact distance per trip is used as the proxy for quality of service. Growth in road travels would require improvement of road transport services such as increasing of distance per trip that in turn depends on road infrastructure. Passenger movement by road is expected to rapidly expand in the coming years. So the policy makers in this section should pay special attention to quality factors such as age and facilities of

fleet. Particularly government has to speed up renovation of minibus fleet, although the high price of these minibuses, high depreciation cost and the high rate of interest are not in accordance with the revenues of the Iranian families. As a result the owner of the old minibus will not be financially able to go for new generation minibus and in addition to this those who want to begin their career in this industry show more tendencies toward buying used minibus. Basically there is a good demand in road transport and there haven't been enough manufacturers or enough vehicles domestically produced because most of the manufacturers have focused on the other segments of the markets such as passenger cars. However a strong travel demand is sensed in the public passenger segments, consequently investment in this industry provides the infrastructure for growth and success in the Transportation Industry. After all, the reconstruction and renovation of the transportation fleet will have direct effects on the growth of GDP.

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Appendix

Table 1-Estimate of bus travel demand

Variable	Estimate	Std. Error
a	-4.639	3.085
F	0.204-	0.05
D	1.565	0.360
FR	**-0.020**	0.048
G	0.410	0.075
P	**0.090**	0.596

Note: coefficient in the bold type are not significant at the 95% level.

Table 2-Estimate of minibus travel demand

Variable	Estimate	Std. Error
a	1.851	0.225
F	-0.038	0.006
D	0.951	0.010
FR	-0.007	0.003

G	0.028-	0.006
P	0.447	0.075

Table 3-Estimate of taxi travel demand

Variable	Estimate	Std. Error
a	-4.068	1.263
F	0.209-	0.029
D	0.772	0.106
FR	-0.066	0.017
G	**0.020**	0.019
P	1.805	0.297
PKP(-15)	0.127	0.054

Note: coefficient in the bold type are not significant at the 95% level.

Table 4-Estimate of bus travel demand

Variable	Estimate	Std. Error
a	-3.976	1.77
F	0.227-	0.20
D	1.492	0.31
G	0.420	0.04

Table 5-Estimate of minibus travel demand

Variable	Estimate	Std. Error
a	2.050	0.21
F	-0.039	0.006
D	0.961	0.009
G	0.023-	0.005
P	0.360	0.064

Table 6-Estimate of taxi travel demand

Variable	Estimate	Std. Error
a	-4.135	1.27
F	0.199-	0.027
D	0.808	0.099
FR	-0.077	0.013
P	1.856	0.29
P(-15)	0.116	0.053