Why do you buy a car?

Assessing consumers'choice through behavioral approach

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1 Introduction

2 Literature review

2.1 "The challenge of our time"

In the last decades, the increase in income inequality has generated growing concern. In 2013 it was defined "the challenge of our time" by President Obama and one year later Pope Francis condemned the global "economy of exclusion". Nowadays, the richest 1% of the population owns more wealth than the rest of the world combined. If in 2010 388 individuals had the same wealth as 3.6 billion people, in 2015 this share of population narrowed further to 62 people. Furthermore, the average annual income of the poorest 10% of people in the world has risen by less than a single dollar cent every year in the last 15 years (OXFAM 2016).

Inequality and economic growth can be regarded as two sides of the same coin and the rise in the former associates both developed economies, where the gap between rich and poor is now at the highest levels in decades, and emerging economies, experiencing more mixed trends (Dabla-Norris et al. 2015).

The relation between economic development and inequality is bilateral. On the one hand, a rise in income inequality reduces economic growth. First, it triggers political instability, which in turn tends to reduce investment and - consequently - economic growth. Moreover, disparities in income distribution encourage poor people to undertake rent-seeking or illegal activities threatening property rights, and that drives down investment (Alesina and Perotti 1996). In addition, inequality reduces the capacity of poorer members of the society to invest in education thus hampering social mobility and skill development (Cingano 2014). Furthermore, it reduces social consensus required to adjust shocks and sustain growth. Nevertheless, all those effects may be non-linear: increases in inequality from low levels provide growth enhancing incentives, while increases part some point encourage rent-seeking and lower growth (Ostry, Berg, and Tsangarides 2014). Finally, in highly unequal contexts the majority of the voters - who are usually poor - ask for redistributive policies, which decrease the after-tax marginal product of capital, hence lowering the rate of accumulation and driving down growth (Alesina and Perotti 1996). Nevertheless, redistribution policies may also affect growth positively, by reducing tensions and incentivizing productive activities and capital accumulation. Yet, the net effect of redistributive policies on growth has to weigh the costs of distortionary taxation against the benefits of reduced social tensions. More broadly, taxation may not be inherently detrimental to growth, as long as it reduces tax expenditure or loopholes that benefit the rich, increases public investment through progressive taxation or social insurance spending on welfare favouring poor people (Ostry, Berg, and Tsangarides 2014).

On the other hand, economic growth may produce a rise in income inequality, leading to social tensions and political discontent jeopardizing the wellbeing of society (Gallo 2002). According to the inverted U hypothesis (Kuznets 1955), income inequality widens in the early phases of economic growth; then it stabilizes for a while; and finally it narrows in the later phases. There are two factors explaining the rise in income inequality. First, the concentration of savings in the hands of the upper social classes leads to higher amount of income for them and their descendants. Second, the rise in the urban share of the population resulting from economic growth, that is assumed to be more unequal than rural population, whose income is lower than the urban one: hence, this gap in relative mean incomes tends to widen as a result of a more rapid growth of the per capita productivity in economic urban activities than in agriculture. However, such negative effects of economic growth only hold in the short run, since in the long run this trend tends to reverse due to government redistribution policies and other exogenous factors (the decrease in the proportion of rich families and immigration entering at the lower income levels). Moreover, this tendency towards increasing inequality is reversed when all the surplus labour is absorbed into modern sector employment, becoming a scarce factor of production. Therefore, further growth, implying an increase in labour demand, will push the wages up, thus levelling inequality. Nevertheless, no definite causal relation has been found that allows generalizing the ways in which economic growth affects income inequality. Instead, empirical evidence shows that the impact of economic growth on income distribution depends more on the way in which growth is pursued than on the level of per capita income or the rate of growth (Gallo 2002).

2.2 Inequality and consumption behaviour

According to rational choice theory, individuals have rational preferences and use the full and relevant information at their disposal to determine which options are available, rank them and choose the most preferred one in order to maximise their utility (optimization-based approach) (Levin and Milgrom 2004). It is further assumed that individuals rationally pursue their self-interest taking into account all economics constraints (such as time, prices, income and capital). Particularly, in maximising utility, consumers are constrained by the total amount of wealth they draw upon to purchase goods/services, save money or invest. Moreover, it is assumed that goods have inherent and unique characteristics: for example, butter made by different companies should provide the same utility. Therefore, utility maximisation is a matter of arranging spending permitted by the budget constraint to achieve the highest total utility possible (Green 2002).

In recent years, the standard rational choice theory has been challenged by findings in the behavioural economics turf. The first critique came from Lancaster in 1996, when he wrote that *???Elementary textbooks bristle with substitution examples about butter and margarine, rather than about shoes and ships, as though the authors believed that there was something intrinsic to butter and margarine that made them good substitutes and about automobiles and gasoline that made them somehow intrinsically complementary???*. His conclusions are three-fold:

- it is not the good *per se* that gives utility to the consumer, but rather its characteristics;
- in general, a good will possess more than one characteristic, and many characteristics will be shared by more than one good;
- the combination of goods may possess characteristics different from those pertaining to the goods by themselves (Lancaster 1966, 133). For instance, the utility provided by a good like a car is not only mobility, but also other "benefits", such as, prestige, status, etc.

Therefore, differently from the standard theory, behavioural economics draws on psychology and the behavioural sciences in assessing consumer behaviour, maintaining that there is a wide variety of cognitive, social and emotional variables that can influence consumers' choice, such as:

- aversion to loss;
- evaluation of goods relatively to some reference point, rather than objectively;
- frequently changing opinions;
- influence of social factors (social norms, ego, channels through which they receive information, etc.);
- additional factors such as incapacity to value money (due to attached values, for instance), mental short-cuts when taking decisions, and emotions (Green 2002).

Among the above-mentioned variables that may drive to luxury consumption, reference points are particularly relevant. Reference points are mental thresholds that individual set in order to compare themselves with others. It is often assumed that the relevant reference point for evaluating gains and losses is the current status of wealth and welfare, exhibited, for instance, by purchasing and expensive good (Wilkinson and Klaes 2012): in fact, especially when information is incomplete, people may use conspicuous consumption as a signal of their wealth to acquire acknowledgement of the social status (Jin, Li, and Wu 2010). However, the reference point may also be the expected status, rather than the current one.

The importance of reference points in making consumption decisions was further strengthened by Daniel Kahneman and Amos Tversky, theorising the model of choice under uncertainty, broadly known as Prospect Theory. *???Prospect theory distinguishes between gains and losses from a situation-specific reference point. The agent evaluates gains and losses differently and exhibits first-order risk aversion locally around the reference point. Utility depends on a reference point that partitions outcomes into gains and losses???* (Pesendorfer

2006, 1). An example is provided by the decision to accept a low wage after long-term unemployment: in such case, unemployment acts as a reference point when taking the decision. However, as Bogliacino (2013, 1) states, the entire literature has focused only on two very specific types of reference-points: the agents??? past choice and/or their status quo. However, there is a third additional element that seems to be playing an important role: the behaviour of others. For example, buying a Mercedes Benz instead a BMW since members of the closer network have made a similar decision.

In the case of cars, the literature shows two cases in which the reference points influence the consumption choice.

In a first study, a group of people claimed that their car preference was based not only on the desire to show their social status but also on the will to be environmentally conscious. However, when the same group of people was asked which are the reasons that drive other people to buy a car, status resulted as the main answer (Johansson-Stenman and Martinsson 2006, 130). This shows that people hide their preferences to avoid clashing with prevailing social norms, but also that subjective additional traits of the good can be the drivers of the consumption decision. A second study found that people tend to choose more luxury cars if they hypothetically could buy them, since they base the hedonic forecast on memories, experiences, representation of others, namely a ???focusing illusion???. One of the factors that influences the most is the measure of social status by car ownership (Xu and Schwarz 2006). In this case, the study reveals that given a possibility, social norms of status address the potential purchase of consumers.

Likewise, the so-called ???anchoring effect??? (initial reference point in estimating values) affects purchase of cars given that the ???anchor??? is set by others and is considered the threshold to reach. Similarly, ego as the behaviour to build positive self-image also highly influence purchasers (Green 2002).

Following these approaches, consumption decisions can therefore be explained not only by comparing costs and benefits related to them, but also by ???irrational??? and emotional decisions based on the desire to experiment a feeling of pleasure, happiness and gratification because of consumption (Bilge 2015).

To conclude, income inequality can generally produce two different consumption behaviours in the the people, depending on the social strata of which they are part. In the case of lower classes, inequality may strengthen the incentive to reduce consumption and accumulate wealth so as to improve social status. However, if both the poor and the rich tend to over-accumulate in the rat-race of status seeking, the poor have a stronger status-seeking incentive to save than rich families do: in fact, the diminishing marginal utility of status means that the poor get more pleasure from a marginal increase in their relative wealth than the rich. Sociologists have long emphasized that individuals care about social status, and their behaviour are often motivated by the desire to improve their ranks in the hierarchy, not less than by pecuniary rewards such as consumption (Jin, Li, and Wu 2010).

3 General overwiew of the project

3.1 Research question, justification and hypotheses

The aim of our work is to investigate **how the rise in inequality, economic growth, population growth, usage of public transportation modes and the presence of cars influence the purchase of new cars in Singapore**.

Singapore claims to be a successful country, which accorindig the its national discourse imply having high standards of competition, social welfare and mainly economic development. The government of Singapore constantly displays how well ranked the country is, in order to promote the *'success'* paradigm. Kishore Mahbudani, Dean of Lee Kuan Yew School of Public Policy, recently stated that the island went from having a 500 dollars GDP per capita in 1965 to 76.237 dollars in 2015, almost doubling U.K., its former colonizer. Likewise, he added that *'more than one out of six households have $1 million in cash savings'* (Mahbudani 2015a). International competitiveness of Singapore is out of doubt. However, how competitive Singaporeans are between each other, how unequal the society is and what is triggered by this traits, are considerations worth analyzing.

According to a recent survey (Mahbudani 2015b), 9 out 15 Singaporeans agreed that its society is based on competitiveness, materialism, self-centredness, *'kiasi-ism'* (fear of diying) and blame-shifting. Additionally,the same rate of Singaporean youngsters are worried that extreme competition would get them out of not affording what they called "basic goods", namely flats and cars. (Rachel and Maryam 2014).

The consideration of cars as a basic need, in a country that has relentlessly tried to have world class transportation systems, indicates that there are other reasons for owning cars than simply commuting. In fact, the country displays a variety of alternative public means of transportation covering almost all the island, a factor that should limit the scope of owing a car. In fact, a part from buses and taxis (that are public in Singapore), the country also has two extensive rail lines, the MRT (Mass Rapid transit) and the LRT (Light Rail Transit, complementing the MRT).

In addition, Singapore has tried to deter the purchase of cars by subjecting the purchase of cars to high taxation: in fact car onwers need to own a certificate of car entitlement that can cost even more than 70.000 dollars (Authority 2014). Therefore and paradoxically *'Singapore has made the car one of the most important status symbols in Singapore. This explains the attraction of European car brands in Singapore'* (Mahbudani 2014). Arguably, all cars in Singapore can be considered luxury, since the final price is the result of adding the market price to the 70.000 average Certificate of Entitlement. For example, as in 2014 a Mercedes Benz E-class costed upwards of 277.000 plus an 79.000 Singaorean dollars for the Certificate of Entitlement, whereas in Germany a Mercedes Benz E-class costed 71.062 singaporean dollars upwards; 5 times less(Times 2015).

When the number of private cars grows, despite the attempt of the state to reduce their usage (Economist 2012) through extensive provision of public transports and high taxation on car purchasing, such overpopulation of might be understood under the lenses of high inequality, fierce competition and the need of displaying status symbols.

3.2 Description of variables

Under these sonsiderations, we collected data on economic growth, inequality, population, usage of public tranports, and number of cars in Singapore from 1994 to 2015.

Economic growth is measured by Singopore's GDP per capita in singaporean dollars (in thousands) at current prices.

Inequality is measured by the number of times by which the top 10% earners are richer than those earning the bottom 90% average income. Both top 10% and bottom 90% average income are measured in real singaporean dollars (in thousands).

Finally, the usage of public transports can be divided into three parts:

- usage of buses;
- usage of MRT;
- usage of LRT.

In all of the cases data is expressed by the daily average of commuters (in thousands) using public trasport yearly.

The following table summarizes the variables taken into consideration for the analysis.[1]

[1]Time frame refers to the time span available in the sources from which gathered the data. Instead, as specified by the research question, our analysis only takes into account the years from 1995 to 2014

Table 1: Summary of variables

Variable	Description	Time.frame
GDP per capita	Current price GDP divided by the population, in singaporean dollars (thousands)	1980-2021
Population	Singapore permanent and termporary residents	1960-2015
Top 10% average income	Yearly average income earned by the top 10% of the poluation in real singaporean dollars	1947-2009
Bottom 90% average income	Yearly, average income earned by the bottom 90% of the poluation in real singaporean dollars	1947-2009
Inequality	Difference beteen top 10% and bottom 90% average income (number of times)	1947-2009
Cars	Yearly number of private cars	1960-2015
Public transport utilization	Average daily commuters using MRT, LRT, buses (in thousands)	1995-2014

The relation between the variables is the following:

- *Dependant variable:* Purchase of new cars
- *Independant variables:*
  - Population of cars
  - Income inequality
  - Use of public transportation modes
  - Gdp percapita

3.3 Hypotheses

The hypthesis to be tested, under certain assumptions, are:

- *H1:* The higher the economic growth, the higher the purchase of cars
  - *Assumption:* Economic growth increases disposable income, reduces budgetary constraints and increases propensity to spend, specially for the upper class.
- *H2:* The higher the inequality, the higher the purchase of cars
  - *Assumption:* The emerging and consolidated social classes need to set reference points displaying their status, by buying cars (symbols)
- *H3:* The less usage of public transport, the higher the purchase of cars
  - *Assumption:* Despite the density of public transportantion modes, commuters choose cars by incentives not explained by the ratinal choice standard model (ego, salience)
- *H4:* The more population, the higher the purchase of cars
  - *Assumption:* The increase of population with purchasing power are highly influenced by the social norms driving to buy more cars. These, are not neccessarily rational, but behavioral deviations from it.

- *H5:* The larger the car population, the higher the purchase of cars
  - *Assumption:* The average social reference poimt is having a car, thus, that is the threshold to reach

3.4 Methodology

3.5 Data sources and gathering

The data for our empirical analysis were retrieved from the following sources:

- IMF Cross Country Macroeconomic Statistics open data available on Quandl. From this source we downloaded data showing the trend in Singopore's GDP per capita meassured in singaporean dollars from 1981 to 2021 (forecasted from 2015 onwards). The data was provided in csv format and imported on R using the URL of the website.
- World Top Incomes Database available on Knoema, provides access to data on the distribution of top incomes in more than twenty five countries across the globe. From this source we downloaded data on the top 10% average income and bottom 90% average income in Singapore from 1947 until 2009, meassured in singaporean dollars. Since it was not possible to directly import the database to R, we requested and received the data via e-mail in csv format. This data set is available in the repository.[2]
- Singapore's open data portal offered two data bases:
  - The Annual Motor Vehicle Population, provides the number of public and private vehicles from 1960 to 2015, including: mortorbikes, rental cars, buses, taxis and other type of vehicles. While mortorbikes, rental cars and cars are private means of transportation, buses and taxis are to be considered public since in Singapore even the taxis are provided by the state. Data were imported on R using the URL of the website.
  - Public transport utilization. This data is expressed as the daily average of thounsand commuters using public trasport by year. It covers the span from 1995 to 2014 and includes the following modes of transportation: MRT (underground), LRT (a localised rail systems acting as feeder services to the Mass Rapid Transit network), taxis (publicly run) and buses. Data were imported on R using the URL of the website.
  - Population Trend. The data shows the trend in the number of Singapore residents by ethinc group and gender (male and females) between 1960 and 2015 in absolute number. Ethnic gruop include Malays, Chinese, Indiand (including Sri Lankans); other less represented ethincities are grouped together under the label "Other Ethnic Groups (Total)". Data were imported on R using the URL of the website.

3.6 Cleaning, processing and merging data sets

After importing data we used the "date" variable (year) as a unique identifier for all four datasets, in order to merge them afterwards. The following operations were needed before proceeding to the merge.

Since time frames of the data were different, we selected a common span of time: 1995-2014. In the case of bottom 90% and top 10% average income, we had to make a linear regression to forecast missing values (from 2009 until 2014): in the linear regressions both top 10% and bottomo 90% average income were used as dependent variables, while the year was used as independent variable; then, the coefficient was multiplied by the lacking years. The results, available in a new dataframe, were later on bounded with the orginal one, in order to have the entire time series. As for LRT, values from 1995 until 1998 were missing since the service

[2]We did not gather data from the database Clio Infra as initially stated in our ResearchProposal, since it did not provide sufficient data for the time span we are considering.

started to be provided from 1999 (Infopedia 2005); therefore, we completed the dataframe giving the value "0" for the first 4 years of the time span taken into consideration.

Cleaning the data was limited to changing column names, eliminating the unnecesary ones and organizing the various data frames so to merge them more easily afterwards, using the year as common denominator. Only in the case of the dataframe cointaining the number of private cars in Singapore from 1995 until 2014 we had to change the format of the data from characters to integers, due to an incorrect import.

In order to have an indicator showing the trend in inequality in Singapore between 1995 and 2014, we created a new variable - named "inequality" - by divididing the top 10% avereage income by the bottom 90% average income for each year: the coefficient of the division shows how many times Singaporeans earning the top 10% average income are reacher than the bottom 90% earners of the population.

As for the number of cars, we simply divided them into the categories provided in the data original set: cars, buses, etc. Originally, they were in one column so we separate them in several ones to have the year as a unique identifier.

Finally, we merged all the single dataframes into the new one, containing all the variables that we used to perfom descriptive and inferential statistical analyses.

4 Statistical analysis

4.1 Descriptive statistics and central tendency

The table below shows the basic decriptive statistics for our variables.

Throughout the period the average GDP per capita is 50.277 singaporean dollars, but it varied a lot, ranging from a minimum of 35.345,5 to 70.966,9 singaporean dollars per person. Similarly, the population has increased by only 28% between 1995 and 2015, with an average of 3,471,255.0 people living in the Island.A grater variation can be observed in the top 10% average income, whose value has been increasing reaching the peak of 325,450 singaporean dollars. Compared to the top 10%, the bottom 90% average income witnessed a more reduced change and its average of 29.022 singaporean dollars shows a great distance from the top 10% earners. In fact, if we look at inequality we see that on average top 10% average income is 6 times greater than the bottom 90% average income. Moreover, the difference between the richest and the poorest has been high for the entire period, with the top 10% earners gaining from 4 to 8 times more than the bottom 90% earners.

As for the number of vehicles, troughout the period there were, on average, 466.148 cars in Singapore, and their number varied consistently, with a minimum of 342.245 (in 1995) and a maximum of 607.292 (in 2013). Instead, the variation in the number of rental cars, taxis, buses and motorbikes was more restrained, as shown by the standard deviation.

Finally, if we look at the usage of public transports, we see that the highest variation in the number of passengers was witnessed by the MRT, with a number of daily commuters ranging from 740 to 2762 thousands. However, buses show the highest number of average daily passengers, whose amount was more stable than MRT passengers in the time-span considered. Finally, the LRT displays the lowest amount of daily passengers and a relatively low variation, probably due to the fact that the service was only provided from 1999 onwards (Infopedia 2005).

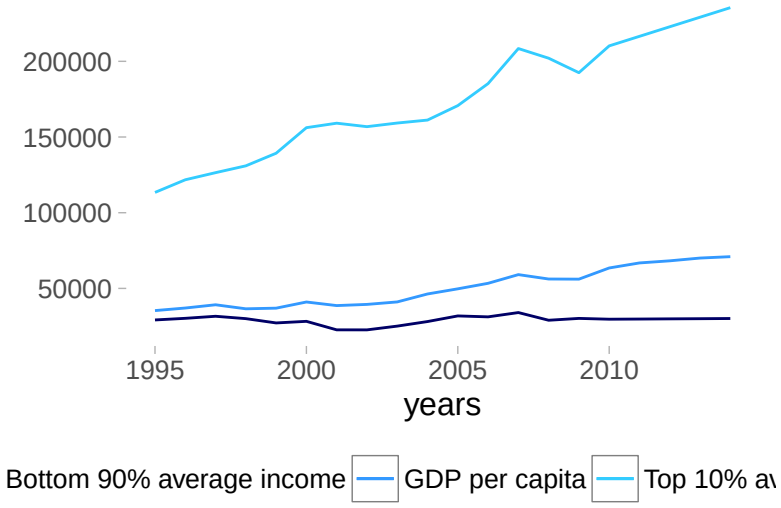
4.1.1 Trends in gdp per capita, top 10% and bottom 90% average income

The following graph shows the trend of the explanatory variables in Singapore between 1995 and 2014. As we can see, although slowly, the gdp per capita has risen thourghout the whole period, despite a slight decline between 2002 and 2005 and a more serious reduction in the years of the financial crisis, between 2008 and 2010. The top 10% average income shows the same trend: a steady increase throughout the whole period

Table 2: General data summary

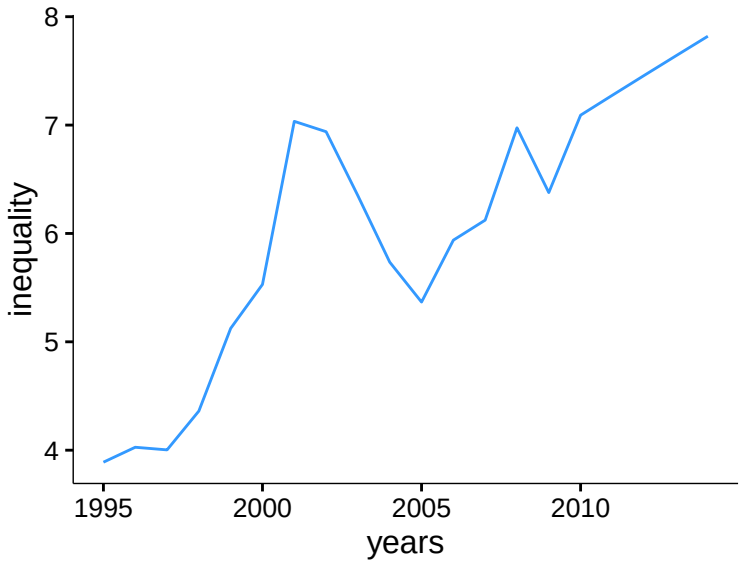
Statistic	N	Mean	St. Dev.	Min	Max
GDP per capita	20	50,277.2	12,717.7	35,345.5	70,966.9
Population	20	4,451,248.0	609,622.1	3,524,506	5,469,724
Top 10% average income	20	174,881.0	38,176.0	113,402.5	235,450.0
Bottom 90% average income	20	29,022.2	2,851.4	22,602.4	34,043.3
Inequality	20	6.1	1.3	3.9	7.8
Cars	20	466,148.3	97,290.5	342,245	607,292
Bus usage	20	3,159.9	254.5	2,779	3,751
MRT usage	20	1,504.2	635.1	740	2,762
LRT usage	20	62.8	45.0	0	137

(in 2014 its value was more than 100% higher than the initial one), with a slight decline between 2002 and 2005, and a more serious reduction in the years of the financial crisis. However, the value of the bottom 90% average income has barely changed, enlarging the difference between the top and bottom populations.



4.1.2 Trend in inequality gap

The growing difference between the top and bottom earners is clarified by the following graph, showing trend in inequality in Singapore, measured in number of times by which the top 10% earners are richer than those earning the bottom 90% average income. The graph confirms what already highlighted above: the difference between the rich and the poor has been increasing all the time, and the trend only reversed between 2002 and 2005 and between 2008 and 2010. The average ratio between both groups is 6.1 and has reaached a maximum value of 7.8.



4.1.3 Trends in the number of privately owned cars

A shown by following graph, the number of private cars present in Singapore between 1995 and 2015 has been growing throughout the period, especially from 2006 onwards and with a slight reduction between 1997 and 1998 and between 2001 and 2002. Similarly, the number of residents has been growing over the period, and the rise was even more continuous and steady than the one characterising private cars. Therefore, together with the trends observed in the previous graphs, this patterns supports the hypotheses linking high economic growth, high inequality and increase of cars' purchase.[3] A further assumption to be investigated is that such increase might be linked to the likewise rise in the top 10% average income: as the rich become richer, the purchase of luxury goods, such as cars, increases as well.

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## Loading required package: grid
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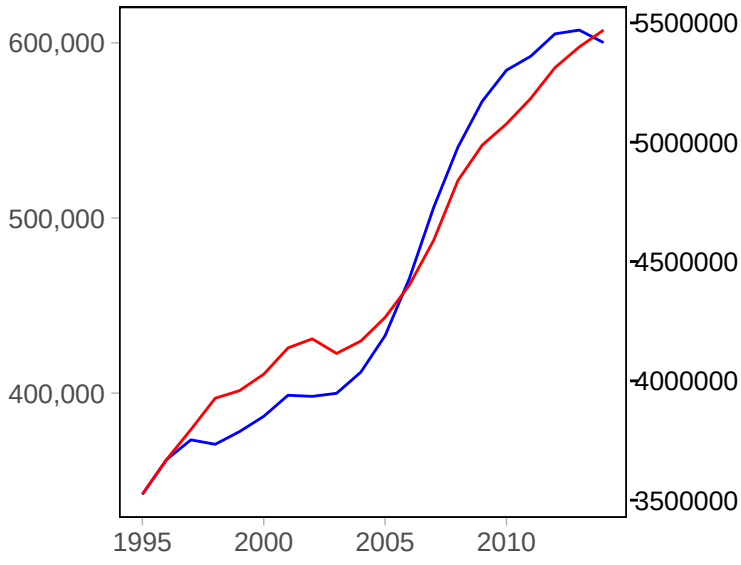
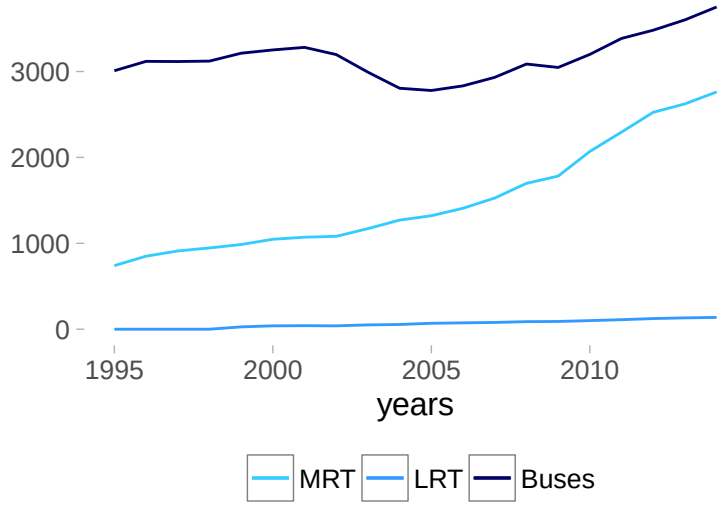


[3]For more details about the hypotheses see https://github.com/EmiliaSicari/ResearchProposal

4.1.4 Trend in the usage of public transportation modes

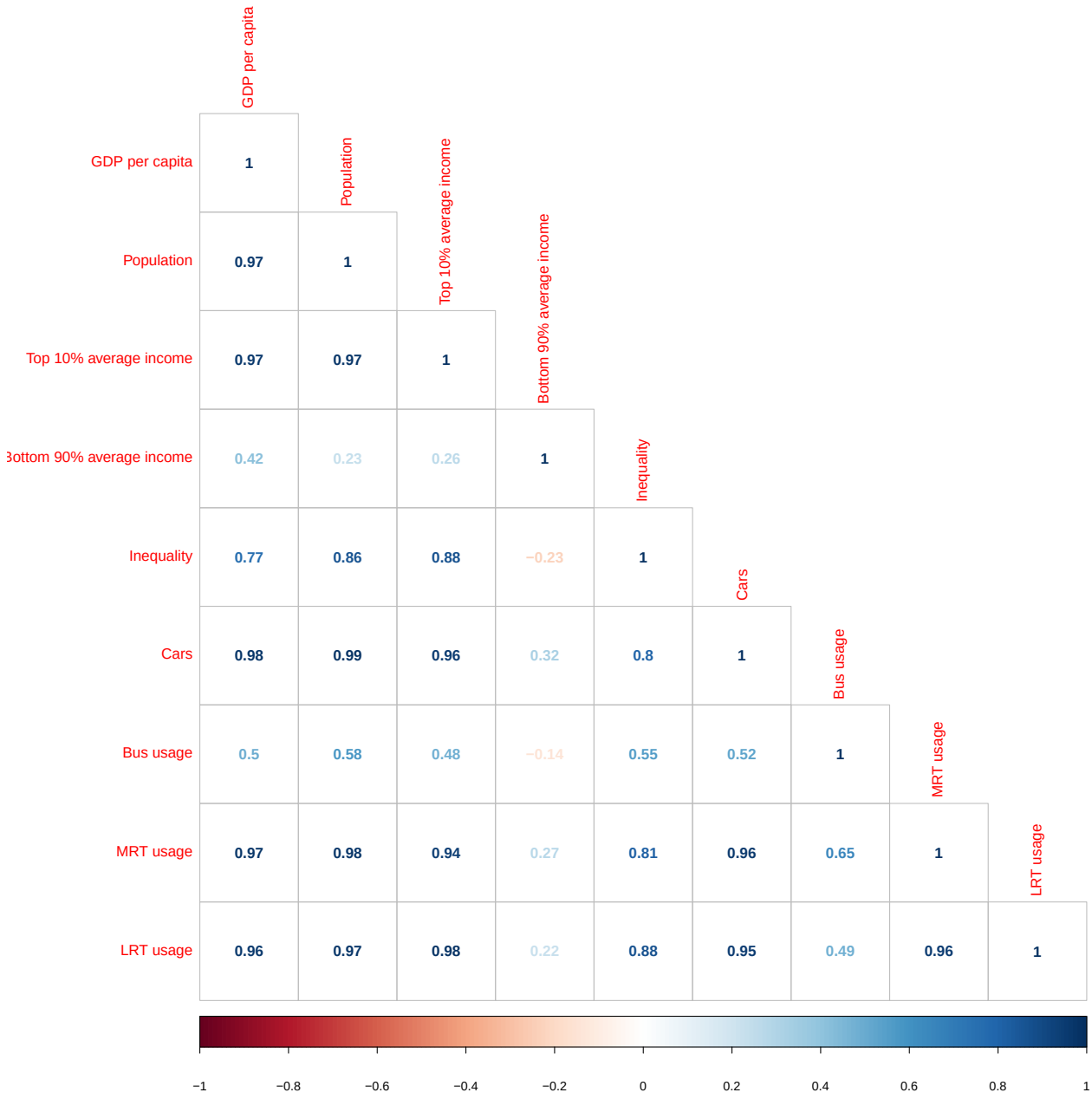
At the same time, the number of passengers in the main public transportation (MRT and buses) has increased consistenlty over time. Despite that, the publicly owned buses have not significantly changed in number. Consequently, this also supports the hypothesis that the usage of public transport is not entirely linked with the purchase of cars: in fact, usage of public transport has either increased (in the case of MRT and buses) or stayed the same (in the case of LRT), while the number of private cars has grown consistently. Even in this case a further assumption to be investigated is that those using public transports are lower earners.



4.2 Correlation analysis

The graph below shows the correlation among the varibles considered in our analysis: the darker the colour, the stronger the correlation. Likewise, the magnitude of the correlation is pointed out by the coefficients in eac box. While blue indicates positive correlation, red is associated with negative correlation.

What clearly emerges from the plot, is that the variables are in almost all of the cases highly and positively correlated to each other. Bottom 90% average income and buses utilization are less correlated to the other variables. Moreover, the two variables show a low negative correlation, weakening the assumption that the poorest are those who use more public transportations. Similarly, Inequality is negatively correlated with bottom 90% averag income, suggesting that the rise in inequality depends more on the increased wealth in the hand of those earning the top 10% average income (in fact, the latter is highly positively correlated with inequality) However, high correlation among explanatory variables might create problems due to multicollinearity and may show a bias in the variables in general.


GDP per capita
Population
Top 10% average income
Bottom 90% average income
Inequality
Cars
Bus usage
MRT usage
LRT usage
1
0.97 1
0.97 0.97 1
0.42 0.23 0.26 1
0.77 0.86 0.88 −0.23 1
0.98 0.99 0.96 0.32 0.8 1
0.5 0.58 0.48 −0.14 0.55 0.52 1
0.97 0.98 0.94 0.27 0.81 0.96 0.65 1
0.96 0.97 0.98 0.22 0.88 0.95 0.49 0.96 1
−1 −0.8 −0.6 −0.4 −0.2 0 0.2 0.4 0.6 0.8 1

4.3 Inferential Statistics

$$C_T = \beta_1 + \beta_2 EC_{t-1} + \beta_3 GDPpc_{ch} + \beta_4 POP_{ch} + \beta_5 BOT_{t-1} + \beta_6 TOPt - 1 + \beta_7 BUS_u + \beta_8 MRT_u + \beta_9 LRT_u$$

Table 3: Regression Results

	Dependent variable:
	Cars per 100 people
Cars per 100 people (log/lag)	0.99^{***}
	(0.16)
Gdp per capita (log)	1.42
	(0.95)
Inequality gap	-0.09
	(0.07)
Bus usage(000)	0.01
	(0.01)
MRT usage(000)	-0.07^{***}
	(0.02)
LRT usage (000)	0.47
	(0.27)
Constant	-13.56
	(9.26)
Observations	19
R^2	0.98
Adjusted R^2	0.97
Residual Std. Error	0.13 (df = 12)
F Statistic	117.69^{***} (df = 6; 12)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 4: Regression Results

	Dependent variable:
	Cars per 100 people
Cars per 100 people (log/lag)	1.08^{***}
	(0.18)
Gdp per capita (log)	1.60
	(0.95)
Gdp per capita (log/lag)	-0.80
	(0.72)
Inequality gap	-0.09
	(0.07)
Bus usage(000)	0.01
	(0.01)
MRT usage(000)	-0.06^{***}
	(0.02)
LRT usage (000)	0.49^{*}
	(0.27)
Constant	-7.91
	(10.51)
Observations	19
R^2	0.98
Adjusted R^2	0.98
Residual Std. Error	0.12 (df = 11)
F Statistic	102.88^{***} (df = 7; 11)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 5: Regression Results

	Dependent variable:
	Cars per 100 people
Cars per 100 people(log/lag)	1.12^{***}
	(0.17)
Gdp per capita (log)	1.35
	(0.93)
Gdp per capita(log/lag)	0.34
	(1.54)
Bottom(lagged)	-0.24
	(0.68)
top(lagged)	-1.79
	(1.27)
Bus usage	-0.001
	(0.01)
MRT usage	-0.07^{**}
	(0.03)
LRT usage	0.63^{*}
	(0.29)
Constant	6.08
	(14.78)
Observations	19
R^2	0.99
Adjusted R^2	0.98
Residual Std. Error	0.12 (df = 10)
F Statistic	93.89^{***} (df = 8; 10)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 6: Regression Results

	Dependent variable:
	Cars per 100 people
Cars per 100 people(lagged)	1.11^{***}
	(0.17)
Gdp per capita (log)	1.40
	(0.86)
90	(0.36)
10	(0.71)
usage of buses	-0.002
	(0.01)
usage of MRT	-0.07^{***}
	(0.02)
usage of LRT	0.60^{**}
	(0.24)
Constant	5.12
	(13.54)
Observations	19
R^2	0.99
Adjusted R^2	0.98
Residual Std. Error	0.12 (df = 11)
F Statistic	117.44^{***} (df = 7; 11)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 7: Regression Results

	Dependent variable:			
	Cars per 100 people			
	(1)	(2)	(3)	(4)
Cars per 100 people(lagged)	0.99***	1.08***	1.12***	1.11***
	(0.16)	(0.18)	(0.17)	(0.17)
Gdp per capita (log)	1.42	1.60	1.35	1.40
	(0.95)	(0.95)	(0.93)	(0.86)
Gdp per capita (log/lagged)		−0.80	0.34	
		(0.72)	(1.54)	
Inequality gap	−0.09	−0.09		
	(0.07)	(0.07)		
Bus usage per 100 people			−0.24	−0.11
			(0.68)	(0.36)
MRT usage per 100 people			−1.79	−1.56*
			(1.27)	(0.71)
LRT usage per 100 people	0.01	0.01	−0.001	−0.002
	(0.01)	(0.01)	(0.01)	(0.01)
mrt.u.pop	−0.07***	−0.06***	−0.07**	−0.07***
	(0.02)	(0.02)	(0.03)	(0.02)
lrt.u.pop	0.47	0.49*	0.63*	0.60**
	(0.27)	(0.27)	(0.29)	(0.24)
Constant	−13.56	−7.91	6.08	5.12
	(9.26)	(10.51)	(14.78)	(13.54)
Observations	19	19	19	19
R^2	0.98	0.98	0.99	0.99
Adjusted R^2	0.97	0.98	0.98	0.98
Residual Std. Error	0.13 (df = 12)	0.12 (df = 11)	0.12 (df = 10)	0.12 (df = 1
F Statistic	117.69*** (df = 6; 12)	102.88*** (df = 7; 11)	93.89*** (df = 8; 10)	117.44*** (df =
Note:				*p<0.1; **p<0.05; ***p

5 Conclusions

6 Packages used

This document and particularly data processing was made using: R (2016), Quandl (2015), Corrplot (2013), Ggplot(2015), Pander (2015), Stargazer (2015), Knitr (2016), Rio (2016), Gtable (**???**), Grid (**???**), Scales (**???**).

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