Car ownership levels by income deciles

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1. Background

The level of car ownership per income decile is an indicator of inequality between *groups* within a generation and/or a society. The smaller the difference in car ownership rates between income deciles, the greater the level of *equality in accessibility and mobility.*

The level of car ownership per income decile is as much an indicator of the differences in socio-economic of population groups, as it is an indicator of differences in terms of transport. The relevance of the indicator from a *transport perspective* actually depends on the position of the car in society. In societies or regions in which the car is the dominant mode of transport, the differences in car ownership levels between income deciles do not only reflect differences in economic status and/or purchasing power, but also translate into differences in terms of access to opportunities and/or vital destinations. This includes important destinations such as employment, education, health care, and even family and friends.[1] Likewise, in societies and regions that are well-served by public and/or non-motorized transport systems, the unequal distribution of car ownership will have fewer consequences for opportunities and will therefore be less important as an indicator of transport inequality. Examples of regions that come close to these circumstances are the central cities of the conurbations of Singapore, Zürich, Paris or London.

From the *perspective of sustainable development*, the level of car ownership per income decile is relevant for two reasons. First, it can serve as an indicator for future growth in car ownership levels (motorization rate). In cases of large gaps between incomes deciles, it may be expected that improvements in the economic situation of a country will be translated into rising levels of car ownership, especially in the lower income deciles. Secondly, the level of car ownership per income decile can serve as an indicator for environmental justice, thus incorporating within it both the environmental and the justice component of sustainable development. Large gaps in car ownership levels suggest that certain groups are disproportionally responsible for the pollution caused by the

[1] For recent analyses of the relation between car ownership and access to vital services and destinations, see among others: Raje, F. (2004) *Transport Demand Management and social inclusion: the need for ethnic perspectives*. Aldershot, Ashgate; Hamilton, K.,L. Jenkins, et al. (2005) *Promoting gender equality in transport*. Manchester, Equal Opportunities Commission; Harrison, W. N. and S. A. Wardle (2005) Factors affecting the uptake of cardiac rehabilitation services in a rural locality. *Public Health*, 119/11, pp. 1016-1022.

transport sector, while others may suffer disproportionally from this pollution.[2] Large gaps in car ownership are thus likely to go hand in hand with environmental injustice between population groups.
Finally, it should be noted that the differences in car ownership levels between income groups ignore a more important gap in the transport sector: the gap between households with and without a car. This is especially significant in societies in which the car is the dominant transport mode: the lack of a car may imply lack of access to key destinations, such as employment, education or health care. In this sense, the indicator discussed here is insufficient to assess the true inequalities in the field of transport.

2. Methods

a. Definition

Car ownership rates by income decile – The percentage of households that owns at least one vehicle within each income decile. The indicator relates to the household (or "family") as an economic unit without considering the size of that unit or the type of vehicle which it possesses, but does include in its calculations work vehicles. The indicator is calculated on the basis of a dichotomous variable: whether there is or is not a vehicle in possession of one of the members of the unit.

Economic household – A group of persons sharing the same dwelling most days of the week, and having a shared food expenditure budget. Soldiers in the regular army are included in the household of their civil address.

Income decile – Division of all households into ten equal parts, with the households arranged in ascending order according to income variables. For example, the lowest decile (Decile 1) in "household gross income" is the group of 10% of households that have the lowest gross household income.

Survey population – As of 1997, the survey population included the entire urban and non-urban population except for kibbutzim, collective moshavim and Bedouins living outside of recognized localities.

b. Unit of measurement – not applicable

c. Data Sources

1986/7 – Household Expenditure Survey (urban households)
1992/3 – Household Expenditure Survey (urban households)
1997 – Household Expenditure Survey (urban households)
2000-2003 – Household Expenditure Survey

[2] See e.g. de Vasconcellos, E. A. (2005) Transport metabolism, social diversity and equity: the case of Sao Paulo, Brazil. *Journal of Transport Geography*, 13/4, pp. 329-339.

In the years 2000 and 2001 the population of East Jerusalem was not surveyed due to difficulties encountered in collecting data, but as of 2002 this population is again included in the survey.
Before 1997 the surveys were performed once every five years. Since 1997 the survey is conducted annually.

d. Data Limitations

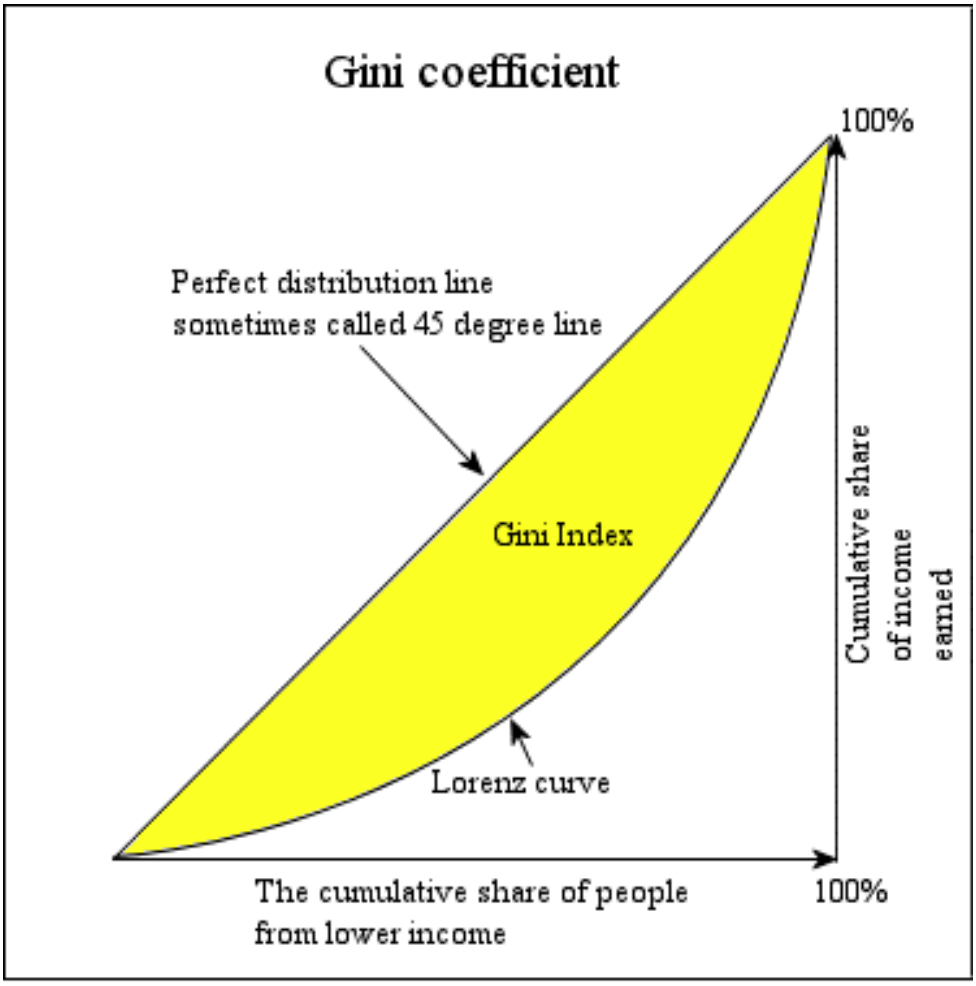
- The statistics are not consistent for the course of the years, since those for the years 1992/3 and 1997 include only data from urban population whilst those for the years 2000-2003 include also some of the rural population. The statistics for 2002-2003 include East Jerusalem which was not surveyed in 2000 and 2001.
- The methodology of the survey taken in 1992/3 was different to that used in 1997 and 2000-2003.
- The statistics are concerned with ownership of private vehicles by economic households and not by individuals. Due to the fact that the average number of members of an economic household differs between population groups, drawing conclusions from the data concerning vehicle ownership may be misleading: the higher the income decile of the group, the fewer the number of members in an average economic household which distorts the per capita availability of cars within the household.
- The statistics are not concerned with the date of manufacture, cost or type of the vehicle.

Gini coefficient as indicator

The development in car ownership level per income decile has been calculated using the so-called Gini coefficient. The Gini coefficient is a measure of inequality developed by the Italian statistician Corrado Gini. It is usually used to measure income inequality, but can be used to measure any form of uneven distribution, including distribution of cars over income deciles. The Gini coefficient is calculated as a ratio of the areas on the so-called Lorenz curve diagram (see Figure 1). If the area between the line of perfect equality and Lorenz curve is A, and the area underneath the Lorenz curve is B, then the Gini coefficient is A/(A+B). This ratio is expressed as a percentage or as the numerical equivalent of that percentage, which is always a number between 0 and 1. Thus, the Gini coefficient is a number between 0 and 1, where 0 corresponds with perfect equality (where every income decile has the same level of car ownership) and 1 corresponds with perfect inequality (where one income decile owns all the cars in a country).[3]

[3] For a simple explanation of the Lorenz curve and the calculation of the Gini coefficient, see http://en.wikipedia.org/wiki/Gini_coefficient#Calculation.

Figure 1 The relationship between Gini coefficient, line of absolute equality and the Lorenz curve. [4]



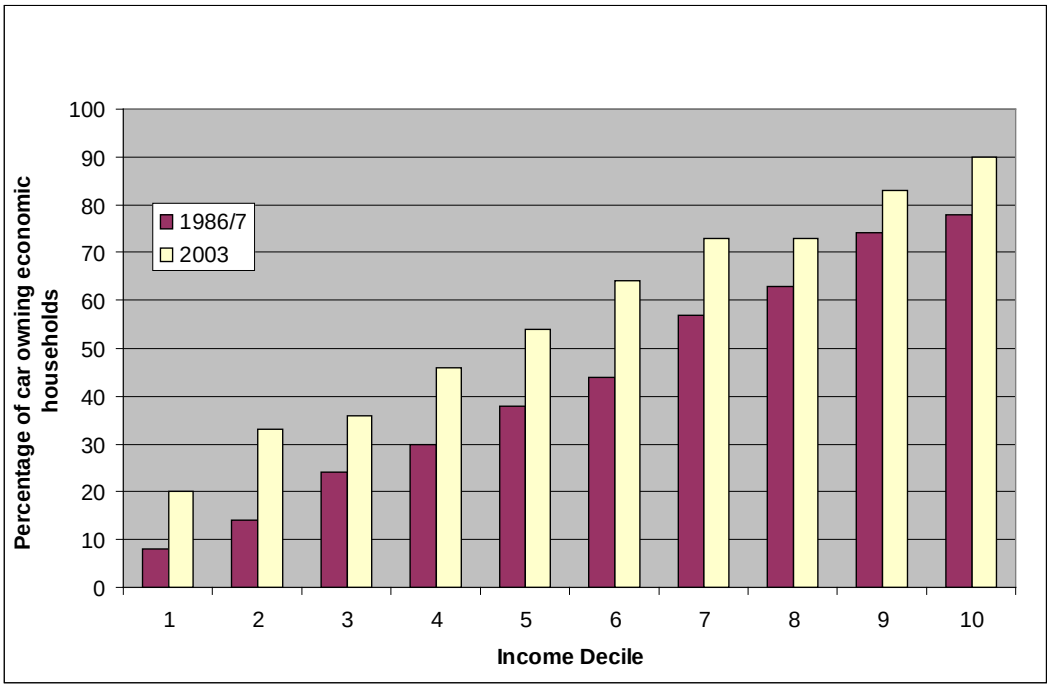
[4] Source: http://en.wikipedia.org/wiki/Gini_coefficient.

3. Results

The car ownership levels in Israel differ substantially between income deciles, both in the base year 1986/1987 and in 2003 (Figure 2). In 1986/1987 only 8% of

all economic households in the poorest income decile owned a car, while 78% of the economic households in the highest income decile owned one or more cars. The rate of car ownership has increased among all income deciles during the 1990s and early 2000s, with higher growth rates reported in the lower income deciles. The result is a decrease in inequality over the past decade. In 2003, 20% of the economic households in the poorest income decile owned a car, against 90% of economic households in the most wealthy income decile.

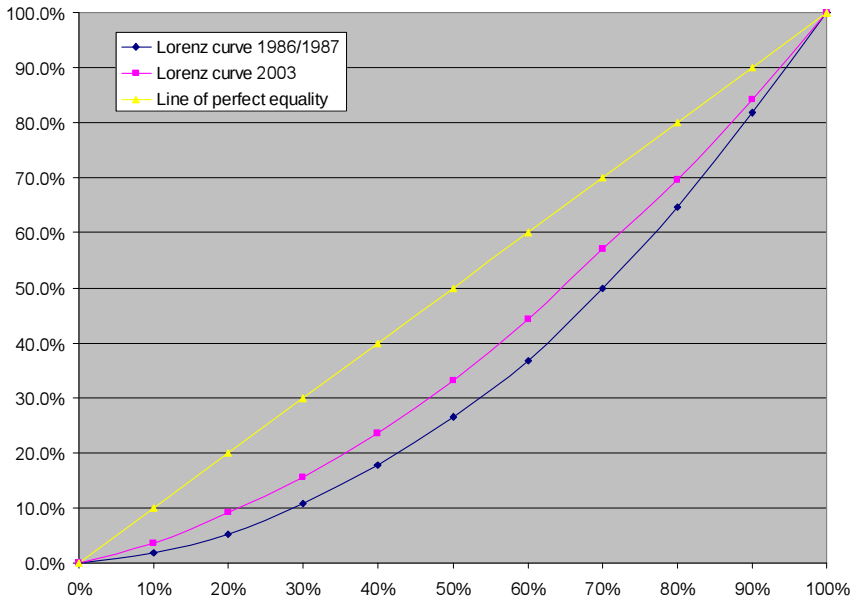
Figure 2 Percentage of car owning by household income decile in Israel, 1986/1987 and 2003.[5]



[5] Source: Central Bureau of Statistics.

The Gini coefficient confirms this analysis. The coefficient has decreased over time, reflecting a reduction in the level of inequality with regard to car ownership between the income deciles. The Gini coefficient in 1986/1987 stood at 0.30 and shrank to 0.21 in 2003 (a coefficient of 0 implies perfect equality between income groups). The graph in Figure 3 visualizes the reduction in inequality. It shows how the surface area between the Lorenz curve and the line of perfect equality has shrunk between 1986/1987 and 2003.

Figure 3 Lorenz curve for car ownership per income decile in 1986/1987 and in 2003.



International comparison

International comparison reveals that Israel differs substantially from a number of Western countries. Table 1 provides the data for four countries for which statistics were readily available: Canada, France, Germany and the UK. The table shows that these countries are largely comparable in terms of car ownership levels per income quintile. A comparison with Israel leads to three observations. First, the overall share of economic households with a car is substantially lower in Israel than in the selected countries.[6] Second, the level of car ownership in Israel is lower for each of the income quintiles. Third, the big differences in car ownership levels and motorization rate are in the second and/or third income quintile.

[6] For more details see the contribution on the indicator 'motorization rate'.

Table 1 Percentage of households with a car, selected countries, by income quintile. [7]

Income quintile	Canada	France	Germany	UK	Israel
First	47%	42%	49%	35%	27%
Second	77%	71%	78%	57%	41%
Third	88%	93%	81%	81%	59%
Fourth	92%	96%	96%	90%	73%
Fifth	93%	N/K	97%	95%	87%
All households	79%	77%	75%	72%	57%
Gini coefficient	0.11	0.14	0.11	0.17	0.21

4. Discussion

Status and Trends in Israel

The gaps in car ownership between the poorest and richest income deciles have declined somewhat in the period 1986/87-2003. This is the result of a stronger growth of car ownership among the poorer income deciles in comparison to the richer ones. A number of factors can explain this trend of growing car ownership among poorer economic households, including economic, transportation, spatial and social factors.

First, the income in real terms of the poorer income deciles has grown over recent years, possibly with the exception of the poorest income decile. At the same time, the cost of buying and running a car has been falling in real terms over the past decades. This has made it easier for the lower income deciles to purchase cars. The rising cost of public transport during the same period has also stimulated people to switch to the private car.

A second, inter-related, factor concerns changes in the transport system. During the period 1986/87-2003, the road system was substantially expanded, while public transport services declined. The first made car ownership more valuable, as it became more and more easy to reach a large set of destinations by car (most notably outside rush hours), while the second made car ownership more necessary, as it became more and more difficult to reach necessary destinations by bus or train within set time constraints. The last factor especially may have 'pushed' lower income households to purchase a car, despite the relatively high costs related to it.

Changes in land use patterns are a third factor. The overall increase in car ownership has gone hand in hand with suburbanization of housing and employment and with concentration of services in space. These processes have changed transport patterns from a typical radial pattern to a tangential pattern. Public transport services have been slow to adjust to the new spatial configuration, thus limiting the possibilities for people without cars to reach

[7] Source for Israel: Israeli Bureau of Statistics. Source for other countries: Lucas, K (2002) *Transport & Social Exclusion: A Survey of the Group of Seven Nations*. Transport Studies Group, University of Westminster/FIA Foundation for the Automobile and Society

destinations located outside the urban center. The suburbanization and spatial concentration of services have also increased the need to travel over longer distances, reducing the possibility to reach destinations by foot. In short, the new spatial configuration has increased the need to own a car in order to reach destinations that could previously be reached by (radial) public transport systems and/or by foot. This may have resulted in car purchases among lower income households that live in localities that are poorly served by public transport.

A less tangible factor concerns the changes in lifestyles, partly as a response to the demands generated by society. Modern lives are characterized by more leisure time and by more engagement in non-work, out-of-home activities. Work hours have become more flexible and more women have joined the labor market. As a result, individuals make more, and more complicated, trips than before, reflected in, for example, more trip chaining, growing diversity in destinations, and more chauffeuring trips. The flexibility offered by the car makes it very well suited to make these complicated trips. Public transport, in contrast, offers substantially less flexibility to cater for the growing diversity in trip patterns. These trends can explain part of the growth in car ownership among all income groups, including the poorer deciles.

In sum, the developments over the past decades have increased the necessity of car ownership, also among the poorer income deciles. This, in combination with a drop in the real costs of purchasing and operating a car, may explain the relatively large growth in car ownership among the poorer income deciles and thus the reduction in inequality between the income deciles.

Sources of Pressure

The growing equality in the distribution of cars over income deciles goes hand in hand with three pressures.

First, the growing equality is the result of a relatively strong increase in car ownership among the poorer deciles. This may put pressure on the dispensable income of these households, as car expenses take up a large share of the household budget.[8] Among the lowest income groups, car ownership may even come at the expense of healthy food or other key purchases (education, health). While there is currently no research on this issue, it should be an area of concern as the necessity for car ownership is likely to grow as the gap between public transport services and complex travel patterns grows, and as the costs of operating a car will rise as a result of rising oil prices.

Second, the growing equality in car ownership level by income decile has not erased the existence of households without a car. It is this group of car-less households that will experience growing gaps in accessibility in comparison with households that do own a car. As the percentage of car-owning households grows among all income deciles, it may be expected that economic development, land use patterns, as well as transport policies, will be tuned more and more to

[8] See e.g. Litman, T. (2002) Social inclusion as a transport planning issue in Canada: contribution to the FIA Foundation G7 comparison. Canada, Victoria Transport Policy Institute; Lucas, K. (2002) Transport & Social Exclusion: A Survey of the Group of Seven Nations, Transport Studies Group, University of Westminster/FIA Foundation for the Automobile and Society.

the needs of the car owners and less to the decreasing group of car-less households. Public transport services will be reduced or will hardly be expanded to serve new land use patterns, thus severely impeding the possibilities for movement for those without a car. Note that this does not only include economic households without a car, but also members of those economic households with 'only' one car, and youth in all types of economic households. Note also the number of economic households with 'only' one car will also be substantially higher among the lower income deciles, a fact that is hidden in the indicator as it does not relate to the number of cars per household.
The third pressure is related to sustainable development. The growing equality in car ownership level has come about as a result of an increase in the general motorization rate of the population, and not as a result of a declining car ownership level among the richer deciles. Thus, growing equality goes hand in hand with increasing pressure on Israel's environment.

Legal Situation – not applicable

Expectation for the future: regulation, pressure, trend
Expectations for the future point to a further increase in car ownership levels per income decile and a further decrease in inequality between income deciles. This follows from the current trend, which shows a decrease in inequality, as well as from the international comparison with selected industrialized countries. In addition, the trends over the last decade – economic development, transport policies, land use changes, social changes – have created a situation that makes the car a necessity rather than a luxury if one wants to participate fully in modern life. It seems unlikely that the recent change in policy towards more investment in public transport and more people-friendly urban design will bring about a change in the short term. The trend of growing equality between income groups is thus likely to continue, unless fundamental changes take place, most notably in the costs related to purchasing and operating a car and/or in the quality of the public transport network.