TECHNICAL NOTE Nº. 3

GENERATIONAL ASPECTS OF TRAVEL BEHAVIOUR

AGE-PERIOD-COHORT ANALYSIS WITH THE EXAMPLE OF PARIS

CREATE PROJECT

Congestion Reduction in Europe, Advancing Transport Efficiency

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WHAT THIS APPROACH IS ABOUT

Background and Idea

Age-Period-Cohort analysis (APC) is an established approach for systematically studying age-specific data collected at different points in time from different sets of individuals. The analytic problem can be described as an investigation of different outcome contributions from three time-related changes: age, period, cohort. APC-analyses give a holistic perspective of causes behind observed changes in behaviour. They do not enable the clear separation of the three effects.

Age Effect
Respondents get older from one survey year to the next. Changes in their life-stage such as the natural aging process, having children, beginning or finishing a job, may lead to changes in their individual travel behaviour.

Period Effect
Framework conditions such as the built environment, population income, fuel prices, and transport services, may change from one survey period to the next. These changes impact on all age groups' travel behaviour simultaneously.

Cohort Effect
Respondents of two birth cohorts have each specific experiences in the same age due to their exposure to different external conditions in each age. The same age group in two surveys at two points in time may therefore behave differently thanks to their cohort-specific socialisation.

What Types of Analysis are Possible?
Three different perspectives exist for analysing time-series data based on the APC-approach. They are visualised in the figure below and briefly described.
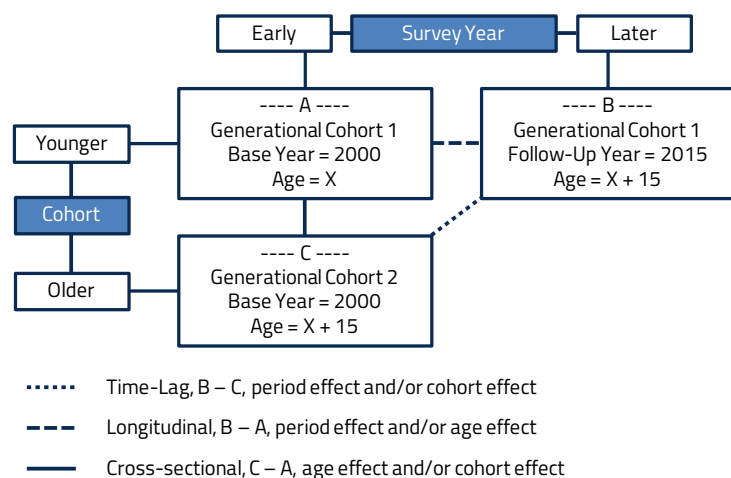
Longitudinal Analysis (B – A)
Two age groups are analysed in a pseudo-panel approach as if the same person were analysed at two different points in time. The observed differences in travel behaviour can be attributed either to the age effect or the period effect, or to both effects together. No cohort effect can exist as the same cohort is analysed.

Cross-Sectional Analysis (C – A)
Two age groups are analysed in one point in time, i.e. in the same survey year. Behavioural differences might result from differences between the generational cohorts to which the two age groups belong, or from the different age of the two groups. No period effect can exist as the analysis covers only one survey year.

Time-Lag Analysis (B – C)
Individuals of the same age group are compared in two subsequent survey periods. Time-lag differences might result from the period effect or the cohort effect or both together. No age effect can exist as the same age group is analysed.

Selected Literature

- Beldona, S. (2005): Cohort Analysis of Online Travel Information Search Behaviour: 1995-2000. Journal of Travel Research, Vol. 44, November 2005, pp. 135–142.

- Bell, A., Jones, K. (2013): The impossibility of separating age, period and cohort effects. Social Science & Medicine, 93, pp. 163–165.

- Konings, H., Van Dist, S. (2015): MIND-SETS: A generational perspective on mobility. Deliverable 2.1.C of the MIND-SETS project. European Commission Directorate General for Research, Covent Garden, Brussels.

---- A ----
Generational Cohort 1
Base Year = 2000
Age = X

---- B ----
Generational Cohort 1
Follow-Up Year = 2015
Age = X + 15

---- C ----
Generational Cohort 2
Base Year = 2000
Age = X + 15

······ Time-Lag, B – C, period effect and/or cohort effect

- - - - Longitudinal, B – A, period effect and/or age effect

——— Cross-sectional, C – A, age effect and/or cohort effect

Source: Adapted from Beldona (2005), p. 137, modified

THE GENERATIONAL APPROACH FOR A BETTER UNDERSTANDING OF TRAVEL BEHAVIOUR

Definition of Birth Cohorts

APC-analysis in the CREATE project uses the six generational groups, the so-called birth-cohorts, as defined in the European Union's Horizon 2020 funded MIND-sets research project. Generations are classified into 15-year groups based on generation theory. This approach goes beyond the analysis of behaviour in specific age groups or life-cycle stages. It takes the generational perspective considering social imprints, shared experiences, and developments in societies, mentalities as well as cultural circumstances for each individual generation. Besides behavioural aspects, the fixed 15-years intervals have also clear advantages from the methodological APC-analysis perspective.

DIGITAL ABORIGINALS
Gen I, Screenagers, Digital Natives, ADHD, Born 2000–

MILLENNIALS
Gen Y, Digital Natives
Born 1985–2000

PRIME BUSTERS
Gen X, Baby Busters
Born 1970–1984

BABY BLOOMERS
Back-End Boomers
Born 1955–1969

MASTER BOOMERS
Front-End Boomers
Born 1940–1954

SILENT GENERATION
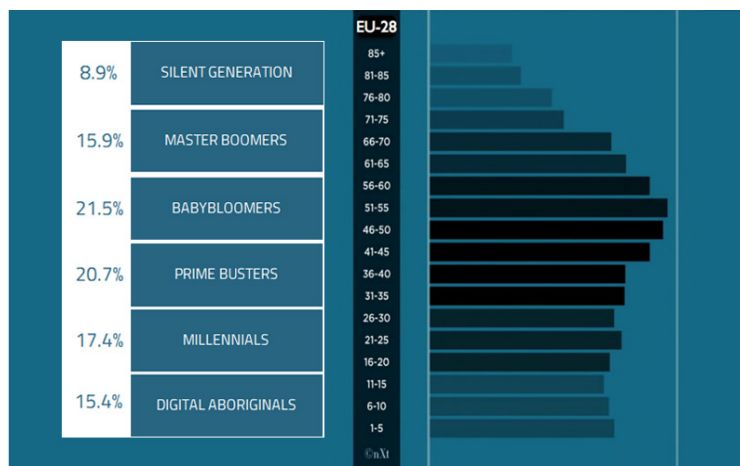Front-End Boomers
Born until 1939

How to use it?

Using generational cohorts for analysis purposes enables a closer look into (travel) behaviour patterns while still being aware that there are as many differences (i.e. perceptions, attitudes, values, norms, and lifestyles) within each generation as between generations.

Distribution of Cohorts Across Europe (EU-28)

The distribution of the MIND-sets segmentation across Europe gives interesting insights. Nowadays, 80 % of the European Union citizens live in the Western part of Europe. The Silent Generation is the smallest group comprising almost 9 % of the inhabitants. Together with most people of the 'Master Boomers' (about 16 % of population), this group represents the people who have already reached their age of retirement.

The 'Baby Bloomers', who represent the old labour force, and the 'Prime Busters' are, with 20 % each, the two biggest groups. 'Prime Busters' are often referred to as Generation X; they are between 35–45 years old and are oriented toward family life. 'Millennials' as young adults are often also labelled as Generation Y and make up about 17 % of the population. People born in 2000 or later are the second smallest group within the EU-28 population, with about 15 %.

	EU-28	
8.9%	SILENT GENERATION	85+ / 81-85 / 76-80
15.9%	MASTER BOOMERS	71-75 / 66-70 / 61-65
21.5%	BABYBLOOMERS	56-60 / 51-55 / 46-50
20.7%	PRIME BUSTERS	41-45 / 36-40 / 31-35
17.4%	MILLENNIALS	26-30 / 21-25 / 16-20
15.4%	DIGITAL ABORIGINALS	11-15 / 6-10 / 1-5

Source: Konings, H. and Van Dist, S. (2015), http://www.mind-sets.eu

THE EXAMPLE OF PARIS – COHORT ANALYSIS OF TRAVEL BEHAVIOUR

Idea and Data Preparation

Microdata harmonisation for the Paris household travel surveys (HTS) has been successfully completed back to the Late 1970s. All (generational) cohorts are available with an adequate sample size for each group. Data availability in the other CREATE Stage 3 cities was not as comprehensive and in addition, descriptive analyses showed various similarities between the cities. Therefore, APC-analysis was specifically done for the example of Paris.

The Paris microdata was specifically organised for cohort analysis purposes. Cohort-specific developments were analysed for working people only, as they turned out as the main generator for the observed peak-car effects.

Interdependency of Age and Cohort (Generational Approach)

The visualisation of APC results can be organised differently along the three dimensions of age, cohort and period. In the figure on the right side, the survey period is only indirectly assessable whereas age and cohort are chosen for visualisation. Generations move across time / survey years while aging. A certain age group of a cohort might be included either in one survey period or in the next one.

For example, millennials (born 1985–1999) can be observed as young adults (18–34) in the early 2000s but also in the early 2010s. A person who is born 1985 was already 19 years of age in 2004 (early 2000s) but 29 years of age in 2014 (early 2010s) and therefore remains still within the group of young adults. In this case, a young adult from the millennial generation can be surveyed at different points in time.
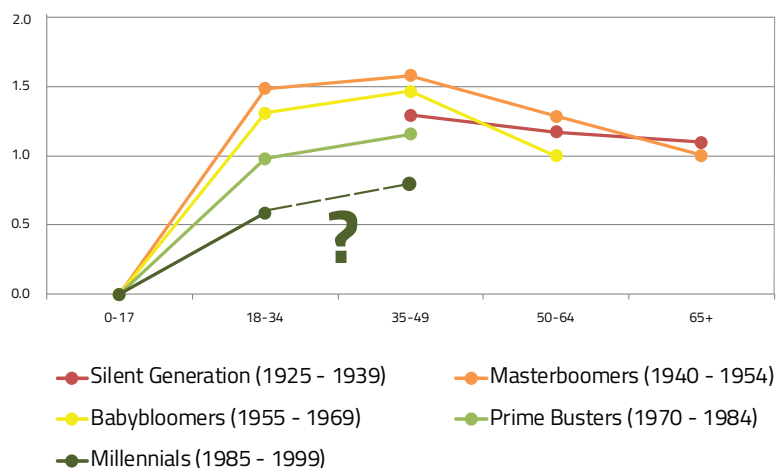
Results of the Paris' APC Analyses

The figure below illustrates car-driver trip rates of Parisians by generation. Some data points are not included in the diagrams as not every age group is available for each generation (e.g. millennials are not aged 65+ today). The analysis reveals clear cohort-specific travel patterns. The younger a generation is, the fewer car-driver trips it has.

This rule particularly applies for the Millennials, the young adults aged 18–34 years. People in this group have less car-driver trips than all previous generations. Only one data point is available so far for this generation but the developments in the former generations across age support the hypothesis that the Millennials will carry on their behaviour while aging. Prime busters show significantly fewer car-driver trips compared to previous generations even in their middle ages (35 to 49). Only the Silent Generation has fewer car-driver trips at this age group. This is intuitively comprehensible, because data points for people of the Silent Generation mainly result from survey years when generally motorisation, driving licence ownership, and therefore car access, were lower than for later generations at the same age.

The use of public transport and cycling is opposite to the described generational relationships for car-driver trips. Younger generations have systematically more public transport and bicycle trips than their predecessors. These interdependencies are also visible in the later life stages. Remarkably, Baby Bloomers and Prime Busters show a significantly increasing cycling behaviour across their lifetime. Nevertheless, the number of bicycle trips in Paris is low in comparison to the other CREATE Stage 3 cities.

Car-Driver Trips (Paris, Urban Area)

- ● Silent Generation (1925 - 1939)
- ● Masterboomers (1940 - 1954)
- ● Babybloomers (1955 - 1969)
- ● Prime Busters (1970 - 1984)
- ● Millennials (1985 - 1999)

LESSONS LEARNT FROM MICRODATA COHORT ANALYSES

Different perspectives can be taken for descriptive APC analyses taking into account the final HTS data availability after having completed the temporal harmonisation task. The generational approach allows to examine cohort specific developments of travel behaviour.

Average Trip Distances

- In most cases, mandatory trips (work or education) are comparatively longer than trips related to other activities.
- Overall trip distances for mandatory purposes are slightly higher for younger generations than for older ones at the young-adult life stage.
- Interestingly, regarding car-driver distances, younger generations have longer distances when driving than their predecessors.
- Younger employees with longer distances to work seem to still be more car-dependent.

Direct Car Access and Access to Public Transport Season Tickets

- A main driver of fewer car-driver trips and distances among young employees aged 18–34 years is the declining car access.
- Even the saturation curve seems to have a lower peak at the age of 35 to 49 years.
- Almost 60 % of millennials aged 18-34 have a public transport season ticket.
- These changes in accessibility from car to PT season tickets may have a strong influence on mode choice and travel behaviour.

Trip Rates

- Younger generations (especially Millennials) have the lowest car-driver trip rates. This particularly applies for young adults aged 18-34 years.
- Younger generations have systematically more public transport and bicycle trips than their predecessors. These interdependencies are visible in all life stages.
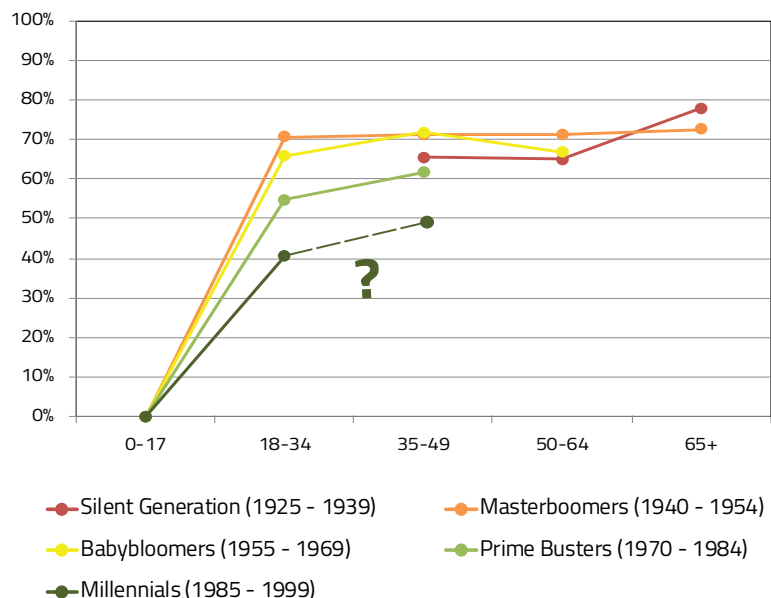
Daily Distances

- Young adults in younger generations drive their car less than in previous generations.
- Differences in daily distances of public transport and cycling between generations are much lower than the mode-specific trip rates.
- Younger generations have longer daily public transport distances and, obviously, a strong modal shift from the car to public transport has occurred.

Overall Conclusions from Cohort Analyses of Parisians

Cohort analyses for Paris suggest that different travel patterns and reduced car use in early life stages of younger generations also influence travel behaviour at the later life stages. The car use of younger generations (i.e. observable for Millennials) peaks at lower levels than for the preceding generations. It can be reasonably assumed that those tendencies and developments are appropriately transferable to the other four CREATE Stage 3 cities because most travel behaviour patterns and changes are quite similar for many indicators across the cities.

This note reflects only the authors' view and the agency is not responsible for any use that may be made of the information it contains.

Direct Car Access (Paris, Urban Area)

Legend:
- Silent Generation (1925 - 1939)
- Masterboomers (1940 - 1954)
- Babybloomers (1955 - 1969)
- Prime Busters (1970 - 1984)
- Millennials (1985 - 1999)

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