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Ageing and private transport fuel expenditure: Do generations matter?

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ABSTRACT

An ageing population is generally associated with decreasing private transport-related energy demand. However, we hold that besides this pure age effect other cultural elements should be considered in order to understand and forecast energy-related choices. Individuals react to the pressure of several factors that define the concept of energy culture (Stephenson et al., 2015), among which are sociodemographic and economic transformations and changes in lifestyle and pro-environmental attitudes. In this paper, we analyse the use of fuels for private mobility in Italy. In our view, this case is particularly interesting because of the country's very high car and motorcycle ownership rates and the very fast ageing of its population. Because of this demographic shift, various generations coexist and a relevant share of the elderly population are still driving a car. We use several waves of the Italian Household Budget Survey to run a double-hurdle model augmented by age and cohort effects. According to our estimates, baby boomers exhibit a positive cohort effect, so that their transport fuel expenditure is significantly higher compared with younger generations. We interpret this result as a confirmation of evolving generational energy culture towards a sustainable transport system, speeding up the decarbonisation process.

1. Introduction

Europe is experiencing a fast demographic shift, the consequences of which for energy consumption and the environment have been studied but generally undervalued by policy-makers. The economics literature almost universally predicts that an ageing population will increase residential energy demand and reduce transport-related energy use: older households spend more on heating and less on transportation because their members stay at home for a larger proportion of the day. However, this causal link is more complex than expected because different generations progressively reach retirement and we cannot assume that their behaviour in old age will be the same. Indeed, different social norms, including individual expectations and aspirations, interplay with material culture and energy practices in shaping individual behaviour. Individuals react to pressure from several factors that define the concept of energy culture (Stephenson et al., 2015): sociodemographic transformations (longer life expectancy and smaller family size), economic transformations (income distribution by age and by income category) and changes in lifestyle and environmental attitudes, among which concern about global warming. This is particularly important in the case of private transport, where the energy culture of high income countries is indissolubly linked to a preference for cars. Cars are generally perceived as a means of transport giving status, a sense of comfort, control and freedom (Steg, 2003). Additional impacts may come from consumer preference shifts (Torgler et al., 2008), different attitudes towards environment protection among generations and from differentiated habits and preferences of the growing immigrant share of the population.

In this paper, we pursue this line of research by exploring household heterogeneity in terms of age and generations in Italy. We think that the Italian case is particularly interesting because of at least three concurring factors: an almost complete energy dependency, a very high car and motorcycle ownership rate and a very fast rate of population ageing, due also to a steady increase in life expectancy. Because of this demographic shift, several generations coexist and a relevant share of the elderly population (aged 80 and over) are still driving a car. We believe that the two concurrent effects of Italian aging population - lower driving intensity and longer driving activity - will result in a decrease of household fuel use in Italy in the long run. Indeed, taking into account the cohort component, we expect that a reduced preference for car exhibited by younger generations can contribute to the prevalence of the first effect (lower driving intensity) on the second. To investigate the relevance of age and cohort effects, we proceed as follows. After a brief analysis of the relevant literature, we first analyse the Italian context concerning private transport and fuel expenditure and then assess the role of sociodemographic factors by looking at microdata taken from the Italian Household Budget Survey (IHBS) published by the Italian Statistical Office (ISTAT) for the period 1997–2013. We then explore the role of changing generation preferences by distinguishing between a pure age effect and a cohort effect on private

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transport-related energy demand. We apply a double-hurdle model (Cragg, 1971), which also allows us to deal appropriately with zero expenditures in the data. This methodology assumes that a household's decision to use private transport is separated from the decision on how much fuel to buy. This model is augmented with age and cohort variables to disentangle the generational from the life-cycle components in transport fuel consumption profiles. In other words, we apply a decomposition into age effects, cohort effects and year effects, in this way analysing how the generational attitude component is interacting with the general transport demand trend (Deaton and Paxson, 1994).

The paper is organized as follows. After a survey of the literature on the linkages between ageing and energy consumption (Section 1), Section 2 briefly discusses the main characteristics of private transport in Italy and its role in greenhouse gas (GHG) emissions. Section 3 describes the dataset and differences in private transport expenditure within the Italian population. The estimation strategy is introduced in Section 4 and the results of the double-hurdle model with age and cohort effects are presented in Section 5. The final section contains our conclusions.

2. Literature review

Is energy culture linked to generational dynamics and is this link important when forecasting energy use and tailoring effective energy-saving policies? A growing literature is showing that age-related factors are important drivers of energy demand and therefore of GHG emissions and they must be considered when designing policies in the medium-long term (Zagheni, 2011; Chancel, 2014). Several papers highlight the link between age and energy use and their empirical findings have proven very robust to cross-country comparisons: residential energy use generally increases with age, while transport energy use decreases (Liddle, 2014; Brand et al., 2013).

Both these links are markedly non-linear and the non-linearity can be easily rationalized by considering household transformations (both size and composition matter) during the life cycle. Governments facing an ageing population therefore need to take into account an increasing demand for residential energy use and a declining one for transport fuel use. O'Neill et al. (2012) review the links between CO_2 emissions and total population dynamics, ageing, urbanization and changes in household size in empirical cross-country estimates based on the IPAT model. By analysing several studies, they report statistically significant coefficients for population growth and age classes as evidence of total population significance, and also a non-linear effect of the age composition of the population. Using a similar methodology and the OECD panel by country, Liddle (2011) finds a positive contribution of the share of young adults in transport decision-making, whereas age structure has a U-shaped impact on residential electricity consumption, with the youngest and oldest age groups exhibiting the most intensive consumption. In a similar line of macroeconomic cross-country analysis, Menz and Welsch (2012) consider a long timespan (1960–2005) and find that shifts in both age and cohort composition may have contributed to rising carbon emissions in OECD countries. In particular, the authors find evidence at the macro level that individuals born in times of peace and affluence seem to have adopted more energy-intensive lifestyles than people whose energy use attitudes were shaped by experiences of shortages. When focusing only on transport-related energy use, the empirical literature using aggregate data analyses both fuel/emission intensity and car ownership choices. In the emission line of research, Okada (2012) estimates the effect of an ageing population on CO_2 travel emissions in a cross-country perspective. He finds a sort of Kuznetz curve (an inverted U-shaped relationship) between per capita CO_2 emissions from road transportation and the share of the elderly in developed countries, therefore forecasting a positive contribution of ageing to the reduction of GHG emissions.

Transport demand forecasts are gaining growing importance as fuel security, urbanization and climate change are becoming increasing worldwide concerns. An emergent literature is showing that generational factors are important drivers of energy demand and different transport mode choices between baby boomers and millennials are under scrutiny in many countries. All the above-mentioned studies give important insights into the roles of population and age structure in residential/transport energy use. However, they cannot properly disentangle life-cycle and cohort effects as they use cross-country aggregate data. Therefore, a new strand of literature is trying to analyse the phenomenon using micro-data sets and pseudo-panels.[1] Yang and Timmermans (2012) use a Dutch pseudo-panel to estimate a dynamic model of transportation energy consumption with the aim of considering fuel price elasticity. Their model also considers cohort effects and they find significantly higher energy intensity for younger generations. However, they also trace an increasing use of slow transport modes (walking and cycling) for the same cohorts. Chancel (2014) also uses individual datasets – for France and the US – to unravel a generational effect on the emission patterns of French and US households, looking at residential and transport energy use. He finds two opposite results: a clear cohort effect for France (with the 1930–1955 cohort consuming more than other cohorts) and a homogenous consumption pattern across US generations. He presents three drivers as possible explanatory factors of the generational effect in France: an income factor (the 1930–1955 generation experienced better life chances and therefore gains in income differentials), a technological factor (important for residential energy use) and a behavioural factor (the younger generation may have higher environmental concern and the baby boom generation may have difficulties in modifying their consumption patterns).

The Fuels Institute (2014) finds evidence that US elderly people are driving more than in the past and newer generations are driving less, with lower driver-licensing rates. Iacono and Levinson (2015) also find a lower car ownership rate among millennials in Minnesota. This recent reduction in car ownership choice is explained by a saturation of transport demand in developed countries and by a preference shift – a declining 'love affair with the car.' In all Western countries, cars have been perceived as a means of travel giving status (Steg, 2003), a sense of comfort, control and freedom. Buying specific models of cars has been associated with a need to fit in and to receive approval from one's immediate social circle.

A preference for cars – or car stickiness – has frequently been associated with irrationality and cognitive bias. The costs associated with car ownership are frequently underestimated because they are not paid entirely simultaneously with car use and a specific resistance to reducing car use has also been proven in experimental economics (Innocenti et al., 2013). However, the useful insights arising from behavioural economics cannot be restricted to asking for more consumer awareness and nudging because there is a risk of considering choices of transport mode to be isolated, without any influence from the surrounding social environment.

Drawing on the energy culture framework (Sarrica et al., 2016; Stephenson et al., 2014), it is possible to sketch out how different social norms, including individual expectations and aspirations, interplay with material culture (availability of technology and infrastructure) and energy practices in shaping different transport choices across generations or groups. In Table 1, we compare the main drivers of the energy cultures of baby boomers and millennials. The baby boom generation, which grew up with expanding private mobility infrastructure and increasing access to privately owned cars, generally perceived cars as a

[1] Bardazzi and Pazienza (2017) find significant age and cohort effects for Italy in residential energy use by considering a pseudo-panel of household energy expenditure. When considering the link between household energy consumption and householder age, the usual inverted-U pattern emerges (confirming the importance of the household composition and size). However, when different age and cohort components are investigated, the younger generation clearly exhibits a higher energy intensity with respect to the war generation.