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The impact of population ageing on energy use: Evidence from Italy

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ABSTRACT

In this study we evaluate the impact of demographic change on energy use. The results are obtained from calibrated overlapping generations general equilibrium model for Italy. Contrary to studies based on partial equilibrium regression models, or fixed price models that are unable to account for supply side effects, we found that a pronounced ageing population leads to a reduction in energy use, although in principle, the increase in the share of old people produces a shift in consumption towards a more energy intensive mix of goods and services.

1. Introduction

Much of the current debate on the impact of demographic change focuses on the negative supply side effects, particularly on the labour market effects of an ageing population (e.g. Attanasio et al., 2007; Auerbach and Kotlikoff, 1987; Fougère and Mérette, 1999; Fougere et al., 2007; Fougère et al., 2009; Ludwig et al., 2012; Miles, 1999). However, a pronounced ageing society also has a direct impact on the consumption structure. We would expect, for instance, elderly households to consume a greater share of health care services and a smaller share of transport and education.

Therefore, there are two main effects associated with population ageing. The first is a decline in the growth rate of the labour force, and a consequentially lower productivity rate due to a scarcity of young workers.[1] The second is that changes in the age composition of the population will lead to changes in consumption structure, since different age groups differ significantly in their consumption patterns.

There are also environmental implications of population ageing. A smaller population consumes less energy which, in turn, reduces carbon emissions. However, there is evidence that older people use more energy than younger people (Brounen et al., 2012; Faiella, 2011; Oneill and Belinda, 2002), leading to higher energy consumption and increased CO_2 emissions following population ageing.

Tonn and Eisenberg (2007) study the relationship between changes in age structure and demand for residential energy in the US. They find that elderly people use more residential energy per capita. Hamza and Gilroy (2011) investigate the implication of an ageing population on UK energy policy concluding that attempts to reduce carbon emissions may be threatened by the consumption-switching that results from a pronounced ageing society. Menz and Welsch (2010) analysed the demographic transition in OECD countries and found that, since old people consume more energy intensive goods, carbon emissions rise as the share of older people in the total population increases.

To our knowledge, Dalton et al. (2008) and Kronenberg (2009) are amongst the few authors to investigate the relationship between demographic change and carbon emissions in a modelling framework. Their studies focus on the US and Germany respectively. Dalton et al. (2008) using a closed economy growth model, predict a long-term reduction in emissions following population ageing. Furthermore, under standard assumptions, the model demonstrates that technological change is unable to counterbalance the effect of ageing on emissions.

Kronenberg (2009) using a static, fixed price input–output (IO) model, in contrast to Dalton et al. (2008), shows that demographic change leads to a redistribution of consumption expenditures between energy sources, with an increase in greenhouse gas (GHG) emissions.

The aim of the paper is to determine whether the expected environmental benefits of a reduction in energy use, due to the negative supply-side effects of a decline in working-age population, can be offset by an increase in demand for energy, arising from consumption-switching, in turn driven by an increase in the old age dependency ratio.

Adopting Italy as a case study, we construct a calibrated overlapping generations (OLG) general equilibrium model to examine the general

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[1] After the seminal work of Auerbach and Kotlikoff (1987) it is widely accepted in the OLG modelling literature that the negative supply side effects of population ageing cause an increase in wages and a raise in the capital–labour ratio. Furthermore, relative scarcity of young workers lowers labour mobility therefore exacerbating the effects on wages. Additionally, the age-productivity profile changes over time. Changes in physical strength and cognitive abilities generate average labour productivity decline after middle age (see e.g., Skirbekk, 2003).

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