Journal of Economic Dynamics & Control 37 (2013) 2998–3011

Contents lists available at ScienceDirect

Journal of Economic Dynamics & Control

journal homepage: www.elsevier.com/locate/jedc

Revisiting the effect of household size on consumption over the life-cycle ☆

Alexander Bick [a,*], Sekyu Choi [b,c,d]

[a] Arizona State University, PO Box 879801, Tempe, AZ 85287, United States
[b] Universitat Autònoma de Barcelona, Spain
[c] Barcelona GSE, Spain
[d] MOVE, Spain

ARTICLE INFO

Article history:
Received 7 May 2013
Received in revised form
5 August 2013
Accepted 22 August 2013
Available online 3 September 2013

JEL classification:
D12
D91
E21
J10

Keywords:
Consumption
Life-cycle models

ABSTRACT

Although the link between household size and consumption has strong empirical support, there is no consistent way in which demographics are dealt with in standard life-cycle models. We study the relationship between the predictions of the *Single Agent* model (the standard in the literature) versus a simple model extension (the *Demographics* model) where deterministic changes in household size and composition affect optimal consumption decisions. We show theoretically that the *Demographics* model is conceptually preferable to the *Single Agent* model as it captures economic mechanisms ignored by the latter. However, our quantitative analysis demonstrates that differences in predictions for consumption are negligible across models, when using standard calibration strategies. This suggests that it is largely irrelevant which model specification is used.

Published by Elsevier B.V.

1. Introduction

Consumption-savings life-cycle models are one of the workhorse models of modern macroeconomics. Connecting them to the data requires to take a stand on household size and composition effects as these are empirically closely related to household consumption over the life-cycle, as noted by Attanasio and Weber (1995), Attanasio et al. (1999), and Gourinchas and Parker (2002). The standard approach in quantitative macroeconomics entails extracting per-adult equivalent consumption facts from household survey data and using them as targets to be replicated by *Single Agent* or *Bachelor* models, which for consistency are calibrated with per-adult equivalent income. Put differently, household effects are controlled for *in the data* but abstracted from in the modeling environment. Some recent papers in this vein include Heathcote et al. (2008), who assess the welfare effects of a rise in wage dispersion and the welfare gains of completing markets and eliminating income risk; Low and Pistaferri (2010), who decompose changes in income risk using consumption data based on the predictions of a life-cycle model; Fernández-Villaverde and Krueger (2010), who investigate the role of consumer durables for life-cycle consumption patterns.

☆ Previously circulated under the title *Life-Cycle Consumption: Can Single Agent Models Get it Right?*

* Corresponding author. Tel.: +1 4809653754.
E-mail addresses: alexander.bick@asu.edu (A. Bick), sekyu.choi@uab.cat (S. Choi).

0165-1889/$ - see front matter Published by Elsevier B.V.
http://dx.doi.org/10.1016/j.jedc.2013.08.006

There are numerous ways in which household consumption choices might differ from individual ones, e.g. because of two individuals choosing instead of one, the presence of children, uncertainty about household's compositional changes, etc. Probably, the simplest way to take this into account *within the model environment* has been introduced by Attanasio et al. (1999) (henceforth labeled as the *Demographics* model): household size and composition change deterministically over the life-cycle and affect consumption/savings choices in a unitary household model. Various specifications of that model have been used to study different questions in the literature: the welfare effects of different bankruptcy laws in Livshits et al. (2007), the effects of German reunification on savings behavior in Fuchs-Schündeln (2008), and the analysis of day care subsidies from an optimal taxation perspective in Domeij and Klein (2013).

The contribution of this paper is to provide a theoretical and quantitative comparison between the *Single Agent* model and the *Demographics* model in its various specifications. We start by studying a simple two period model. We find, not surprisingly, that differences in the way demographic effects are specified across models alter the predictions with respect to the timing of consumption. While both models are obviously reduced-form approaches to more complicated models of the family, the *Demographics* model captures two important channels absent in the *Single Agent* model: first, since tomorrow's assets have to be shared with other household members, the effective interest rate faced by the household varies over time and is lower than in the *Single Agent* model; second, the relative price of consumption across periods varies through changes in the cost of providing consumption to a household of different size (*scale effect*) versus a direct *utility effect* because a different number of household members enjoys utility from consumption.

We then turn to the question wether the different assumptions about household size (changes) matter quantitatively in an off-the-shelf standard model of life-cycle consumption with income uncertainty and incomplete markets as in Storesletten et al. (2004). Specifically, we embed both the *Demographics* model and *Single Agent* model in this framework and calibrate them using information on income, household composition and other features of the US economy. All models are subject to the same *macroeconomic* restriction, in the sense that we use a common target for the wealth to income ratio. In order to match this ratio, each specification (the *Single Agent* model and the different variations of the *Demographics* -model) exhibits different calibrated discount factors, which induce households in our model economies to save as much as their empirical counterparts do in the aggregate.

Using numerical simulations we compare the quantitative predictions for per-adult equivalent consumption (mean and variance) over the life-cycle. We first perform an exercise for the case when the relative price of per-adult equivalent consumption across periods is unchanged by demographics in the *Demographics* model (scale and utility effects cancel each other), and thus only the effective interest rates between the two setups differ. This channel is however quantitatively unimportant: the difference between mean per-adult equivalent consumption is on average 1% (and at most 9% prior to age of retirement) whereas the difference in the log variance of per-adult equivalent consumption never exceeds 3%.

The two specifications of the *Demographics* model featuring the largest differences in the relative price of consumption across periods (relative to each other, due to differences in the strength of the utility effect) generate differences of similar magnitude as above. Mean consumption during working life differs at most by 7% and on average by less than a 1%, while the variance of (log) consumption is virtually the same.

To conclude, our theoretical results show that the *Demographics* model is conceptually preferable to the *Single Agent* model as it captures economic mechanisms ignored by the latter. Our quantitative analysis however demonstrates that differences in predictions of mean and cross-sectional inequality in consumption over the life-cycle are negligible across models as long as each model is restricted to generate the same amount of aggregate savings. The intuition behind this result is simple: when the model is disciplined by an aggregate wealth to income ratio target, the resulting discount factors offset the differences in the effective interest rate or in the relative price effect of consumption stemming from different utility effects.

The structure of the paper is as follows: in Section 2 we discuss the preference structure and optimization problem for the *Demographics* model and *Single Agent* model, and present theoretical predictions in a stylized two period framework. In Section 3 we layout the model used to quantify these theoretical predictions. Section 4 presents our quantitative results. We conclude in the last section.

2. A two period model

2.1. Setup

At least since the empirical work by Attanasio and Weber (1993) and Attanasio and Browning (1995) it is well understood that household size changes are important for understanding the patterns of household consumption over the life-cycle. In this section we setup the most simple framework to analyze two popular approaches for dealing with household size changes in the consumption-savings literature.

Households live for two periods. Household size is normalized to one in the first period ($N_1 = 1$, e.g. a young person living alone) and increases deterministically in the second period ($N_2 > 1$, e.g. a child is born). For the theoretical analysis we only need a change of household size between the two periods. The quantitative analysis features a full life-cycle model, which emulates basic facts of the US economy, in terms of earnings processes and family size and composition. Households receive income $\mathbb{Y}_1$ in the first period and $\mathbb{Y}_2$ in the second period. We first consider the case when $\mathbb{Y}_2$ is deterministic and introduce income uncertainty in a second step. Households can borrow up to the natural borrowing constraint at an interest