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Does the microsimulation approach used in macro–micro modelling matter? An application to the distributional effects of capital outflows during Argentina's Currency Board regime

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ABSTRACT

We provide a novel comparison between the behavioural and the non-parametric microsimulation approach. Coupled with a CGE model, we consider the distributional effects of the significant capital outflows faced by the Argentinean economy at the end of its Currency Board, in a context with significant macroeconomic similarities to the present crisis in Greece. Both the relatively straightforward 'non-parametric' approach and the more complex behavioural approach lead to distributional results that are consistent with the data, suggesting that both are viable alternatives. Looking forward, it would be desirable for researchers to look for additional evidence regarding the distributional effects that these microsimulation models can illuminate for given macroeconomic shocks.

1. Introduction

Capital outflows in Argentina during its Currency Board regime (1991–2001) had significant economic and social consequences. National authorities in Argentina during this period ceded their power to modify the exchange rate due to the Currency Board and an array of foreign currency-denominated contracts, were unable to print hard currency[1] and, with the economy suffering current and fiscal account deficits and increasing public and private foreign debts, were forced to impose capital controls and freeze bank deposits. This scenario provides a relevant case study with strong similarities to the current situation in Greece.[2] Non-residents' deposits at banks in Argentina dropped by 35.0% from US$32.9 billion to US$21.4 billion (from December 2000 to December 2001). Understanding the way in which this shock affected income distribution in the Argentinean economy is of special interest, given that it led to an economic crisis that included a significant short-run worsening of social indicators and, ultimately, a significant change in economic policy. Official unemployment rates increased from 14.7% (second semester of 2000) to 18.3% (second semester of 2001). The official moderated poverty rate, initially at 31.2%, increased by 6.5 p.p., and the Gini index of inequality, already at 48.9% initially, increased by more than 1 p.p. during this period. The associated manifestations of social discontent ultimately led the Argentinean government to abandon the Convertibility Plan, first by devaluing the exchange rate (December 2001), and then by letting the domestic currency float (February 2002).

In order to understand how a macroeconomic shock such as the severe capital outflows in the present work affects the different parts of an economy and its income distribution at the level of observed units (individuals or households) as it moves into a new general equilibrium, researchers have extensively used macro–micro economic modelling. This is an area to which this journal has dedicated significant attention (Harrigan et al., 1991; Verikios and Zhang, 2013; Breisinger and Ecker, 2014; Verikios and Zhang, 2015). However, while the macro–micro economic modelling literature has been and continues to be prolific,[3] researchers do not always clearly define and justify the ways in which CGE models and MS models are integrated in their analysis of distributional

Abbreviations: ARUM, additive random utility model; CDF, cumulative distribution function; CES, constant elasticity of substitution; CGE, computable general equilibrium; IFPRI, International Food Policy Research Institute; INDEC, *Instituto Nacional de Estadística y Censos* (National Institute of Statistics and Census) of Argentina; MS, microsimulation; OLS, ordinary least squares; PDF, probability density function; PHS, Permanent Household Survey; p.p., percentage points; PPP, purchasing power parity; RHG, representative household group.

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[1] For a definition, please see Arestis et al. (2005).

[2] In the case of Greece, the national authorities have also ceded the power to modify the exchange rate, but via participating in a monetary union.

[3] For a recent and comprehensive review on macro–micro modelling, please see Cockburn et al. (2014).

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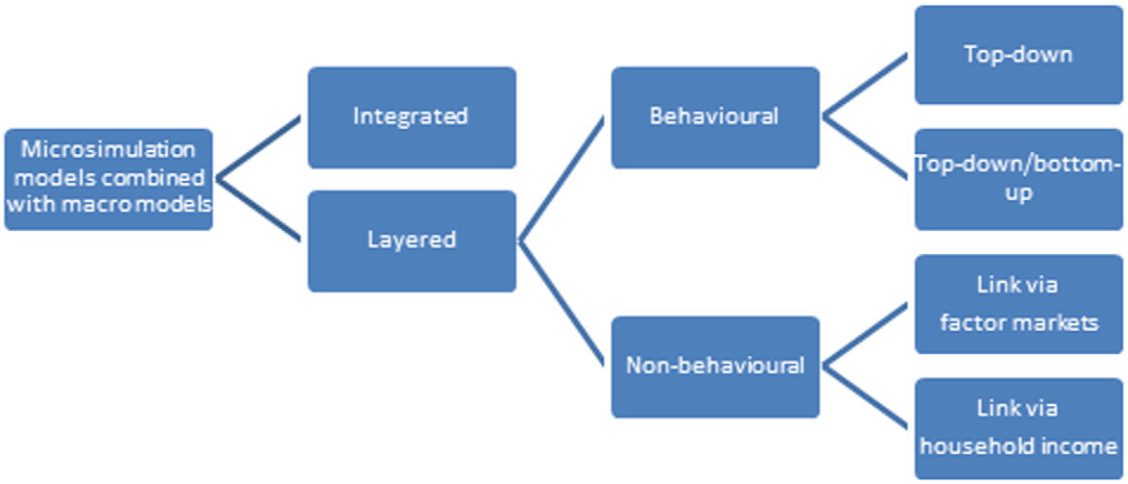

Fig. 1. Types of microsimulation models combined with macro models. Source: Author elaboration based on literature review.

results (Boccanfuso et al., 2008). Focusing on this concern, the present work contributes to our understanding of the distributional consequences of macroeconomic shocks by providing a novel model comparison, applied to the effects of capital outflows in Argentina.

CGE and MS models have been combined in different ways, allowing for the taxonomy presented in Fig. 1. The models have been fully integrated into a single one by increasing the number of elements in the set of households in the CGE model, allowing it to reflect relevant attributes of observed households in a disaggregated way. The link was also made by 'layering' the CGE and the MS models as distinct entities and allowing some communication between them. In this layered approach, the MS model can be behavioural or not, with only the former modelling individuals' behaviour (typically, consumption demand or labour supply) by specifying an associated functional form and econometrically estimating its parameters.[4] Non-behavioural models have been applied in various ways: Agénor et al. (2003) communicate the percentage change in the welfare indicator (income or consumption) of each representative household group (RHG) in the CGE to that of the observed households classified under that representative household; Vos and Sanchez (2010) adapt a method used by Almeida dos Reis and Paes de Barros (1991) that they call the 'non-parametric'. This method changes the labour status of randomly selected individuals to match employment aggregates informed by the CGE model without explaining the underlying individuals' behaviour, and transmit percentage changes in the labour wages from the CGE model to workers in the MS model; Buddelmeyer et al. (2008) alters the sample weights of labour suppliers in the microdata to match the simulated employment targets generated by the CGE model, minimizing a measure of the changes in weights subject to relevant totals (employment level, population size, etc.), in what they call the 'reweighting approach'.

Inside the layered CGE-MS framework, we develop an MS model using the behavioural approach. Following the lines set by Bourguignon et al. (2004), we rely on an econometric explanation of key behavioural relationships, in a household income model that fully accounts for the heterogeneity of the observed characteristics of individuals affecting their labour status. We also improve its implementation, as explained below. We link the MS model to a real-financial macro CGE model,[5] and apply the combined model to investigate the distributional effects of the capital outflows suffered by the Argentinean economy at the end of its Currency Board regime. We compare the results to those achieved with straightforward RHG and 'non-parametric' approaches—which we also conduct—adding to the results obtained by Herault (2010), who compared the results of the behavioural approach against the reweighting approach in a trade liberalization scenario in South Africa.

In this economic modelling comparison, the following steps—presented in associated sections below—are followed: (i) a household income model is specified consistent with a stylized CGE model; (ii) the specified model is estimated; (iii) CGE macro outcomes are generated and communicated to the household income model; (iv) CGE simulation outcomes are attributed at the micro level using behavioural and non-behavioural MS approaches, generating new distributions of employment status, wages, capital incomes and, in turn, household incomes; and (v) distributional indicators and graphs are evaluated, showing the magnitude of the channels illuminated by the behavioural approach in comparison to RHG and non-parametric layered approaches. From these results, we derive a set of conclusions concerning the domain of applicability of the various MS approaches to the distributional impacts of macroeconomic shocks, and consider the direction that future research in this area can fruitfully follow.

2. Specification of the household income model

The household income model defines the total income of each household as a function of the observed and unobserved characteristics of the household and its members. The model is composed of four elements: (i) a household income identity, which separates labour from non-labour income; (ii) an individual labour status (employed vs. unemployed) indicator function for labour suppliers; (iii) a wage equation for individuals at work; and (iv) a non-wage income equation. We explain in the following how these equations are specified.

2.1. Household income identity

Household income is simply the sum of labour and non-labour income of the individuals in the household.

$$YH_h = \sum_{i \in h} (W_i IW_i + Y_{0i}) \quad (1)$$

where YH_h is the income of household h, IW_i is a dummy variable identifying the labour status (1 for employed, 0 otherwise) of individual i in

[4] The behavioural approach has been applied in a 'top-down' and, more recently, a 'top-down/bottom-up' fashion. While in the former the macro model (a level above actual individuals and households) is allowed to inform the MS model without allowing feedback to the macro model, in the latter approach the communication is bilateral and iterative.

[5] A full description of the model can be found at http://www.mendeley.com/profiles/Dario-Debowicz/, Thesis: Modelling trade and financial liberalisation effects for Argentina, Chapter 3 (final model).