Inequality and macroeconomic models

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"All models are wrong, some are useful." This quote from George Box has often been used to justify the simplistic assumptions made in macroeconomic models. One of these has long been criticised: the fact that the behaviour of households, although differing (heterogeneous) in their individual characteristics (age, profession, gender, income, wealth, state of health, labour market status), can be approximated at the macroeconomic level by that of a so-called "representative" agent. This assumption of a representative agent means considering that the heterogeneity of agents and the resulting inequalities are of little importance for aggregate fluctuations.

Economists are not blind – they are well aware that households, companies and banks are not all identical. Many studies have looked at the effects of household heterogeneity on aggregate savings and, consequently, on macroeconomic fluctuations[1]. On the other hand, some studies propose so-called "overlapping generations" models in which age plays an important role[2].

Most often, households in these models move from one state to another (from employment to unemployment, from one level of skills and therefore of income to another, from one age to another) and the probabilities of a transition are known. In the absence of insurance mechanisms (unemployment, redistribution, health), the expected risk of a transition produces an expected risk of income or health, which leads

agents to save in order to insure themselves. Furthermore, differences in savings and consumption behaviour are also likely to lead to differences in labour supply behaviour. Finally, changes in the macroeconomic environment (changes in the unemployment rate, interest rates, wages, taxes and contributions, public spending, insurance schemes) potentially affect these individual probabilities and the resulting microeconomic behaviour. Aggregate risks therefore affect each household differently, depending on its characteristics, generating general equilibrium and redistributive effects. However, this relatively old work has come up against two obstacles.

The first is technical: tracking the evolution of the distribution of agents over time is mathematically complex. It is of course possible to reduce the extent of the heterogeneity by limiting ourselves to two agents (or two types of agent): those with access to the financial markets and those who are forced to consume their income at each period[3], working people and pensioners, etc. But while these simplified models make it possible to understand and validate broad intuitions, they are still limited, particularly from an empirical point of view. They do not, for example, allow us to carry out a realistic study of changes in inequality across the entire distribution of income or wealth.

The second obstacle is more profound: several of these studies have concluded that models with heterogeneous agents, although much more complex to manipulate, did not perform significantly better than models with representative agents in terms of aggregate macroeconomic validation (**Krusell and Smith, 1998**). Admittedly, they were not aiming to study changes in inequality or the macroeconomic impact, but rather the contribution of agent heterogeneity to aggregate dynamics. In fact, the subject of inequality has long been considered to be almost or fully orthogonal to macroeconomic analysis (at least when considering fluctuations) and to fall more within the

remit of labour economics, microeconomics or collective choice theory. As a result, heterogeneous agent models have long suffered from the image of being an unnecessarily complex subject in the macroeconomic analysis of fluctuations.

In recent years, these models have undergone an exceptional revival, to the point where they seem to be becoming the standard for macroeconomic analysis. The first obstacle has been overcome by an exponential increase in the computing power used to solve and simulate these models, combined with the development of powerful mathematical tools that render their solution easier (**Achdou *et al.*, 2022**). The second obstacle has been overcome by the three-pronged movement that we describe below: the growing body of work (particularly empirical work) demonstrating the importance of income and wealth inequalities for issues typically addressed by macroeconomics – over and above their intrinsic interest; the development of tools for measuring inequalities that make it possible to reconcile them with macroeconomic analysis; and the refinement of the assumptions made in models with heterogeneous agents.

First, numerous empirical studies show that precautionary savings plays a major role in macroeconomic fluctuations (**Gourinchas and Parker, 2001**). But precautionary savings and the sensitivity of savings (and household spending) to income are not identical for all households. Indeed, empirical work suggests that the aggregate marginal propensity to consume (MPC) lies between 15% and 25% (**Jappelli and Pistaferri, 2010**), and that the MPC of a large proportion of the population is higher than the MPC obtained in representative agent models. In representative agent models at the top of the wealth distribution, the latter is approximately equal to the real interest rate, and therefore much lower than the empirical estimates (see Kaplan and Violante, 2022). It is therefore critical to understand the origin of a high aggregate MPC based on solid microeconomic foundations,

particularly if we wish to carry out a realistic study of the impact of macroeconomic policies (monetary, fiscal, etc.) that rely on multiplier effects linked to the distribution of MPCs.

In recent years, an abundant and increasingly well-developed empirical literature has been dealing with issues relating to income inequality. Following the seminal article by **Atkinson (1970)** along with more recent developments[4], we now have long data series that measure income inequality before and after tax, along with wealth inequality, across the entire household distribution for a large number of countries. Finally, what are known as **Distributional National Accounts** make it possible to compare in great detail the predictions of macroeconomic models using heterogeneous agents with microeconomic data that are totally consistent with the framework of macroeconomic analysis.

Finally, the heterogeneous agent models themselves have evolved. The "first generation" models generally considered a single asset (physical capital, in other words, company shares) and prevented agents from taking on debt, which led them to save for precautionary reasons. These hypotheses were not able to explain why MPCs were high. They failed to correctly replicate the observed distribution of income and, above all, of wealth. In reality, households have access to several assets (liquid savings, housing, equities), and the composition of their wealth differs greatly depending on the level of wealth: households generally start saving in liquid form, then invest their savings in property by taking out bank loans, and finally diversify their savings (only for those with the greatest wealth, above the 60th percentile of the wealth distribution) by buying shares (**Auray, Eyquem, Goupille-Lebret and Garbinti, 2023**). In doing so, a large proportion of the population ends up in debt in order to build up their property wealth, which is thus not very liquid. Although they have high incomes, many households consume almost all their income, which reduces their capacity for

self-insurance through savings. This increases their MPC (and therefore the aggregate MPC) in line with empirical observations (**Kaplan, Violante and Weidner, 2014**).

Macroeconomists can now fully integrate the analysis of inequalities in income, wealth and health into models based on more realistic microeconomic behaviour. They can re-examine the consensus reached on the conduct of monetary[5] or fiscal[6] policies and examine their redistributive effects. They are also in a position to quantify the aggregate and redistributive effects of trade or environmental policies, which are or will be at the heart of their political acceptability – giving rise to new horizons for less wrong, more useful models.

[1] See in particular **Bewley (1977)**, **Campbell and Mankiw (1991)**, **Aiyagari (1994)**, **Krusell and Smith (1998)**, **Castaneda, Diaz-Gimenez and Rios-Rull (1998)**.

[2] See the work of Allais (1947) and **Samuelson (1958)**, and among others **De Nardi (2004)**.

[3] See **Campbell and Mankiw (1989)** ; **Bilbiie and Straub (2004)** ; **Gali, Lopez-Salido and Valles (2007)**.

[4] See (**2001**, **2003**), Piketty and Saez (**2003**, **2006**), **Atkinson, Piketty and Saez (2011)**, **Piketty, Saez and Zucman (2018)** and **Alvaredo *et al*. (2020)**.

[5] **Kaplan, Moll and Violante (2018)**; **Auclert (2019)**; **Le Grand, Martin-Baillon and Ragot (2023)**.

[6] **Heathcote (2005)**; **Le Grand and Ragot (2022)**; **Bayer, Born and Luetticke (2020)**.