

“Reconciling” Micro and Macro in Family Demography Research: An Update

Daniele Vignoli* – Anna Matysiak**

* Dipartimento di Statistica “G. Parenti”, Università di Firenze, Viale Morgagni 59, 50134, Italia – email: vignoli@ds.unifi.it

** Institute of Statistics and Demography, Warsaw School of Economics, Al. Niepodległości 164, 02-554 Warsaw, Poland – email: amatys@sgh.waw.pl

Abstract: After mid-20th century the scientific study of population changed its paradigm from macro to micro so that the main focus of attention has been devoted to individuals as the agents of demographic action. However, to handle all the complexities of human behaviours, the interactions between individuals and the context they belong to cannot be ignored. Therefore, in order to explain (or, at least, understand) contemporary fertility and family dynamics the gap between micro and macro should be bridged. In this contribution we highlight two possible directions for bridging the gap: (1) integrating life-course analyses with contextual characteristics, thanks to the emergence of theory and tools of multi-level modelling and event-history analysis of groups and (2) bringing the findings at the micro-level back to macro-outcomes via meta-analytic techniques and agent-based simulations.

Keywords: family demography, multilevel event history models, agent-based simulations, meta-analyses.

1. The need to bridge the gap between micro and macro in family demography research

After mid-20th century the scientific study of population changed its paradigm from macro to micro so that the main focus of attention has been devoted to individuals as the agents of demographic action. Event-history analysis was born from the need to elaborate a comprehensive theoretical framework for studying the events that occur within the life-course (Courgeau & Lelièvre, 1997). This new approach led to a much wider set of research into human behaviours than classical macro-demographic analysis and allowed to shift the research from the mere description of phenomena to its interpretation.

The strong shift from macro to micro created a series of disadvantages, however. First, for many years the importance of the social and economic context in which individuals live was disregarded and its potential effect on fertility and family behaviours was ignored. Second, the improvement in the access to the individual-level data and development of the techniques of event-history analysis led to a rapid increase in the number of micro-level studies. These studies often provide contradictory results. Furthermore, their findings are generally fragmented since the micro-level studies focus on a specific situation, constituting only a piece in the overall puzzle of understanding contemporary fertility and family dynamics.

Recently, a renewed interest in linking the macro- and micro-level research has been recorded in many disciplines of social science (e.g. Voss, 2008). Scientists are now emphasizing the need to bridge the gap between micro- and macro-approaches in family demography research as a prerequisite to explain (or, at least, understand) contemporary fertility and family dynamics. The Italian Statistical Society has already devoted two appointments to this debated issue during its meetings, the first organized by Antonella Pinnelli in 1995 (“Micro and macro dimensions of demographic behaviours: theoretical frameworks and models”) and the second by Antonio Santini in 2000 (“Micro and macro analyses in demographic studies”).

Beside this state of affair, in this contribution we advocate that the “reconciliation” between micro and macro in family demography research may occur following two directions: (1) integrating life-course analyses with contextual characteristics, thanks to the emergence of theory and tools of multi-level modelling and event-history analysis of groups and (2) bringing the findings at the micro-level back to macro-outcomes via meta-analytic techniques and agent-based simulations.

2. Bridging the macro-to-micro gap: multi-level event-history analyses and event-history analyses of groups

Life-course theory and event-history techniques have become standard practice in family and fertility research. These approaches ignore that individuals are by definition nested in households, census tracts, regions, countries, etc. This led to two inconveniences, one theoretical and one technical. From a theoretical point of view, too little attention is paid to the environment (political, social, economic) which constantly provides individuals with information on opportunities and restrictions and hence influences the individual life choices. Thus, ignoring the context of decision-making significantly limits our possibilities to understand human behaviours. From a technical point of view, applying single-level models to hierarchically structured data leads to a bias to the model estimates. The reason is that single-level models assume independence among the observations while the observations nested within the same unit are in fact dependent. For instance, households residing within the same neighbourhood are likely to have similar characteristics.

Against this background, two approaches have been developed to combine individual and contextual characteristics. These are the multi-level models and event-history analysis of groups.

Multi-level models see individuals, as behavioural agents, embedded in social units (tracts, regions, country, etc.). They allow the analyst to detect the effect of the context on individual behaviour as well as to identify macro-characteristics which are mainly responsible for the contextual effect (Zaccarin & Rivellini, 2002). The natural implication of these methods is that they blur the artificial boundaries between micro and macro analyses (Voss, 2008).

Event-history analysis of groups implies a shift in focus from individuals to their contact circle (Lelievre et al. 1998). It allows to describe the structure of the group and the interactions between its members that are manifested in two processes: social learning (acquisition of information from the members of the contact circle) and social influence (influence of significant others for individual decision-making). The required event-history models are relatively complex, but are expected to facilitate the understanding not only of individual but also group behaviours (Courgeau 1998).

These two approaches represent a challenged, and so far not much explored, room to bridge the gap between temporal (micro) and contextual (macro) approaches in family demography research. However, if the methods (and corresponding software package) are well-established, in particular as the multi-level models are concerned, data availability is a critical point.

Conducting a multi-level event-history analysis requires data on migration histories of the individuals, together with all other life-history careers, as well as time-series data on contextual indicators. Therefore, so far this method has been mainly employed on cross-sectional data. Only recently have some longitudinal studies in the field of family demography allowed for a hierarchical structure by accounting for the unobserved community-level factors (e.g., Hank and Kreyenfeld 2003).

Data collection for an event-history analysis of groups is even more challenging since it entails gathering information on the contact circle, i.e. members of various households to which an individual has belonged and on relatives and friends with whom she/he has not cohabited but maintained close relationships (Lelievre et al. 1998). So far such data was collected only in cross-sectional surveys. One of the very few attempts to collect longitudinal data on the contact circle is the Netherlands Kinship Panel Study.

3. Bridging the micro-to-macro gap: meta-analyses and agent-based simulations

Individual life choices are transformed into a social outcome observed at the macro-level. While the contextual influence on action formation is quite well understood already, the transformation mechanism from the micro- to the macro-level is largely unexplored. At the same time the rapid development of micro-level studies increases the need to summarize the existing individual-level empirical evidence in order to explain the macro-level phenomena. In this paper we elaborate on two possible ways of bridging the micro-macro gap from the bottom up. These are meta-analysis and agent-based simulation.

Meta-analysis, or in other words a quantitative literature review, can facilitate drawing general conclusions from findings at the micro-level. It has been developed in order to synthesise, combine and interpret the abundance of empirical evidence on a certain topic. It offers a clear and systematic way to compare the results of different studies standardised for the across-study differences (i.e. the country investigated, the method applied, the control variables employed, the sample selected, etc.). In order to conduct a meta-analysis, papers researching a topic of interest are collected in a systematic manner. Estimated coefficients are selected across studies and recalculated in a standardised way into comparable indicators (i.e. effect sizes). The effect sizes constitute units of statistical analysis and can be combined into single summary indicators or analysed with the use of regression techniques. For instance, a meta-analysis was conducted by Matysiak and Vignoli (2008) in order to summarise the micro-level research on the relation between fertility and women's work in industrialised economies. They found that the micro-level relationship between the two variables is still negative but its magnitude varies across countries. This finding explains the existence of the positive cross-country correlation between fertility and women's labour supply observed in OECD countries since the mid-1980s.

Meta-analysis is certainly a useful tool for summarising and synthesising the abundant micro-level research. Its unquestionable strength is that the effect estimates

produced within this framework have higher external validity than those obtained in individual studies due to the generality of results across various research works (Shadish et al. 2002). Nevertheless, a weakness of this method lies in the assumption that the micro-to-macro transformation can be achieved by a simple summation of individual-level actions into a macro-level outcome. This assumption may not be valid as the production of a social system usually involves complex interactions between individuals and groups.

This problem could be solved by agent-based simulation which seems to us the most powerful tool for transforming the micro to the macro (Billari, 2006). The agent-based simulation is a toolkit that derives the macro-level outcomes from micro-level empirical models (i.e. event-history models) without assuming lack of interactions. This technique was, for instance, used by Aassve et al. (2006) to assess the magnitude of the mutual effects of women's employment, fertility and union formation. The authors first modelled the interrelationship between the three processes applying a multi-process hazard model to individual data for Great Britain. Based on the model estimates they could conclude about the direction of the interrelationship but were not able to assess the impact of the changes in one of the analysed variables on macro-level outcomes of the others. Applying the micro-simulation they showed that changes in women's employment do not necessarily lead to large changes in fertility. By contrast, changes in union formation and fertility have relatively large effects on employment.

4. References

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