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INTRODUCTION TO *MACROECONOMIC DYNAMICS* SPECIAL ISSUE ON NEW TOOLS FOR GLOBAL ANALYSIS OF ECONOMIC DYNAMICS

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We provide an overview to the special issue entitled New Tools for Global Analysis of Economic Dynamics by detailing the main aim of each contribution being part of it.

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The special issue entitled "New Tools for Global Analysis of Economic Dynamics" contains a selection of papers presented at the 10^{th} *International Conference on Nonlinear Economic Dynamics-Centro Interuniversitario Crescita & Sviluppo Economico* (NED-CICSE 2017) that took place on September 7–9, 2017, at the University of Pisa, Italy. The conference is a biennial international meeting of scholars interested in the study of economic dynamics, with the aim of bringing together different streams of the growing literature in this field and to stimulate a fruitful exchange of ideas between theoretical research and applications in economics. Scholars belonging to the group deal with a variety of subjects, methods, and applications of nonlinear dynamics in economics and social sciences. In organizing the edition held in Pisa, the long tradition of *Nonlinear Economic Dynamics* conferences was accompanied by

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Centro Interuniversitario Crescita & Sviluppo Economico, whose main aim is to promote and coordinate theoretical and applied research focused on economic growth and development.

A common feature of the contributions included in the present special issue is the study of the dynamic properties of a wide variety of macroeconomic models, which can be grouped under the general topics as reported below.

(1) A first group of contributions focuses on *fertility and/or human capital* in overlapping generations models with finite-lived individuals.

The article entitled "Children's health, human capital accumulation, and R&D-based economic growth" by Annarita Baldanzi, Alberto Bucci, and Klaus Prettner builds on a general equilibrium model that incorporates the child quantity–quality trade-off in a broad sense, where parents choose the desired number (quantity) and quality of children, the latter being measured by expenditures in education and health affecting human capital of the next generation. In this framework, the authors focus on long-run economic growth by designing an R&D-based model, where human capital accumulation is determined by education and health investments and the R&D sector employs scientists to discover new blueprints. The main result is the complementarity between education and health, that is, parents that prefer better educated children reinforce the role of children's health by raising health investments (and vice versa) and then reduce the precautionary demand of children. This mechanism improves human capital accumulation and favors R&D. Their results are consistent with the main empirical evidence of modern economies in the twentieth century.

The article entitled "Intergenerational mobility and social status in a model with human capital investments and trait inheritance" by Rainer Andergassen and Franco Nardini proposes an overlapping generations model in which parents care for the social status of their offspring. Parents transmit to them innate traits and invest in their human capital. The chances for offspring of climbing the social ladder depend on innate traits, on human capital investments, and on exogenous events. Income and trait heterogeneity are the determinants of unequal opportunities and of intergenerational mobility. The authors highlight the role played by the status competition, the trait inheritance probability, and the effectiveness of human capital investments in determining the level of intergenerational mobility. Furthermore, they find the conditions under which only poverty trap equilibria—with no intergenerational mobility—exist and those giving rise to the emergence of equilibria with intergenerational mobility.

The article entitled "Endogenous demographic change, retirement and social security" by Giam Pietro Cipriani and Tamara Fioroni sets up a Diamond-like general equilibrium model with production augmented with labor/leisure choices by the old, endogenous fertility (child quantity) and exogenous adult survival. The main aim is to study the effects of demographic changes on the sustainability of pay-as-you-go (PAYG) public pension systems financed with a defined contribution scheme. The article analyzes two main cases, one where retirement age is mandatory and one where the retirement age is chosen by individuals.

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When the retirement age is mandatory, an increase in the adult survival probability negatively affects the demand for children (fertility), whereas pension benefits positively affects the steady-state stock of capital. Differently, when the age of retirement is freely chosen by the individuals, a positive shock on the adult survival probability increases capital accumulation only when the tax rate is sufficiently low and, under this circumstance, it can have a positive impact on pension benefits. This is because agents may find optimal to retire later and decrease fertility to a lesser extent as compared to the case of mandatory retirement. The impact of the social security tax on capital per worker is negative with mandatory retirement; however, it could be positive in the case of (individual) optimal retirement.

The article entitled "Social capital, human capital and fertility" by Raffaella Coppier, Fabio Sabatini, and Mauro Sodini offers a new perspective to the debate on the determinants of fertility by studying how the interplay between human capital and social capital affects individual childbearing decisions. The authors develop an overlapping generations model in which parents face a trade-off between child quantity and child quality, and social capital plays a key role in the accumulation of human capital. On one hand, the dynamic analysis shows how the erosion of social capital can trigger a chain of reactions leading parents to base their childbearing decisions on quantity, instead of quality. This results in higher fertility, thus leading the economy toward an underdevelopment trap. On the other hand, a scenario characterized by a larger stock of social capital may let the return on education investments become high, triggering a development trajectory where fertility is lower, education and human capital higher than the corresponding values in the underdevelopment scenario.

(2) A second group of contributions deals with issues related to *development and public policies*.

The article entitled "Tax policy and food security: a dynamic analysis" by Pawan Gopalakrishnan and Anuradha Saha analyzes the effects of a food subsidy program on output and welfare in a growth model with heterogenous agents. Specifically, there exist two (representative) infinitely lived agents, a farmer and an industrialist. The dynamics of the economy is conditioned by the choices of a policymaker levying an income tax on the industrialists to finance a subsidy on food consumption to both types of agents. Food consumption enhances agents' utility and fuels the accumulation process of health, which increases labor productivity of both types of agents. Numerical simulations show that food subsidy increases food consumption and agents' health in the short and long run. However, the production of manufacturing goods, the accumulation of physical capital, and aggregate GDP fall in the short run and increase only in the long run. The analysis of the model highlights both the sectoral and distributional trade-off of the subsidy program and indicates the conditions under which social welfare gains can be achieved.

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The article entitled "Public debt management and tax evasion" by Amedeo Argentiero and Roy Cerqueti is concerned with the study of the optimal management of the public debt to GDP ratio. The authors assume that the policymaker has two distinct instruments for controlling the public debt to GDP ratio: (1) the level of the tax rate levied on the income of the tax payers and (2) the monitoring activity to detect the evaded taxed. By using stochastic optimal control techniques, the authors find that a fair Laffer tax rate and the minimum level of control represent optimal strategies to manage the public debt to GDP ratio. This implies that the most effective policies in controlling public debt are those that rely on setting optimal taxation rather than contrasting tax evasion.

The article entitled "Don't feed the bears! Environmental defensive expenditures and species-typical behavior in an optimal growth model" by Angelo Antoci, Simone Borghesi and Paolo Russu investigates a relatively new and rather unexplored research line concerning the interaction between economic growth and the typicality of species' behavior. For this purpose, they study a bio-economic-dynamic setting—which merges economic growth, biodiversity loss, and individual preferences for species' behavior—proposing a standard AK growth model in which agents care for both the number and the behavior of a given animal species. Environmental defensive expenditures performed to protect the species have a positive effect on the species' population size but can have ambiguous effects on the typicality of their behavior. In other words, the attempt to protect the species can be effective in avoiding their extinction, but at the same time it can induce the species to modify their behavior. The analysis of the model suggests that if the social planner cares for the typicality of species' behavior, an infinite growth process may no longer be optimal. Numerical simulations, moreover, show the possible existence of a trade-off between the number of members of a given species and the typicality of their behavior: the system may lead to either a high number of species' members behaving in an atypical way or few members behaving very typically.

(3) A third group of contributions includes growth models characterized by the existence of expectation-driven multiple development paths, which give rise to *local and/or global indeterminacy*.

The article entitled "A note on balanced-budget income taxes and aggregate (in)stability in multi-sector economies" by Nicolas Abad and Alain Venditti studies a two-sector economy producing a consumption good and a capital good. In this framework, the authors introduce constant government expenditures and counter-cyclical taxes showing that the impact of labor income taxes generally has an ambiguous role depending on the difference in capital intensity across sectors. Local indeterminacy is more likely when the sector producing the consumption good is capital intensive. The study also shows that the expectation-driven onset of fluctuations and development paths emerging in the economy are consistent with meaningful parameter values.

The article entitled "Globally indeterminate growth paths in the Lucas model of endogenous growth" by Giovanni Bella, Paolo Mattana, and Beatrice Venturi

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focuses on the study of global indeterminacy, that is, the emergence of alternative long-run growth paths, given the same initial values of the stock variables, selected according to the expectations of economic agents. After a description of various mechanisms that can generate global indeterminacy in continuous-time models with optimizing agents, the authors study a specification of the Lucas model able to show this characteristic through the emergence of a family of homoclinic orbits connecting the steady state to itself backward and forward in time.

The article entitled "A contribution to the theory of fertility and economic development" by Luca Gori and Mauro Sodini builds on a theory for explaining economic development by using a parsimonious approach making use of a neoclassical general equilibrium growth model with endogenous fertility (child quantity) and no externalities in production. The economy is comprised of finite-lived overlapping generations of rational and identical individuals and identical competitive firms producing with a constant-returns-to-scale technology. The theoretical distinguishing feature of the work is that endogenous fertility per se can explain the existence of low and high development trajectories. The former is characterized by high fertility and low GDP (underdevelopment regime) and the latter by low fertility and high GDP (development regime). The article provides different reasons (history-driven or expectation-driven) why some countries enter distinct development scenarios with different demo-economic outcomes. Coordination failures (global indeterminacy) therefore may become a possible explanation of underdevelopment. The model is also able to reproduce fertility fluctuations and to explain the baby busts and baby booms observed in the last century in some developed countries.

(4) The work by Davide Radi, Fabio Lamantia, and Gian-Italo Bischi entitled "Offshoring, reshoring, unemployment and wage dynamics in a two-country evolutionary model" belongs to the literature denoted *New Economic Geography* (NEG). The geographic distribution of industrial activities impacts many socio-economic aspects of a domestic economy. The offshore of manufacturing activities to take advantage of cheap labor costs and lenient legislation offered by a developing economy increases unemployment in developed economies. At the same time, the reshoring of manufacturing activity to exploit the technological spillovers offered by a developed economy hinders the development of technological-laggard countries. NEG focuses on the market-demand drivers of the location patterns of manufacturing activities according to which the activity is decentralized with the aim to enter regional markets. The production drivers of the decentralization process are almost neglected by this literature, which are instead considered by the contributions belonging to International Business. Following this literature that distinguishes between agglomeration drivers and endowment drivers in firms' location choices, the authors propose a two-country evolutionary model where a multinational enterprise can concentrate its production in a technological-leader country to exploit technological spillovers that make the production more efficient (agglomeration drivers) or can offshore its production in

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a technological-laggard country to take advantage of a cheaper labor cost and nearby-country spill-over (endowment drivers). The work studies the effects of labor policies on the decentralization of the manufacturing activity and on unemployment. A flexible remuneration scheme can indeed increase employment and wage in a country. The article also analyzes the impact of industrial policies, such as an increase of labor productivities. In this regard, the authors show that letting the production in one country be more efficient is neither sufficient nor necessary to increase the domestic level of manufacturing activity.

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