Stock-Flow-Consistent Models and Institutional Variety

Amelia Correa
St Andrew's College, India

Romar Correa
formerly Department of Economics,
University of Mumbai, India

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To

the Department of Economics

University of Mumbai

Preface

We started out to consolidate our work on the Godley-Cripps-Lavoie (GCL) Stock-Flow-Consistent (SFC) framework but were quickly forced to follow in the footsteps of other giants in political economy who wrote their own pioneering aggregative accounting equations. Depending on sweep and scope, all of the above were captivated by the unfolding of the dynamics of the capitalist economy and as well as the transition of pre-capitalist through capitalist to "casino capitalist" (Susan Strange) forms. To that end, we rearrange GCL identities and highlight the aggregates of interest for chapter and subsection. The special feature of GCL is the postulation of SFC norms, ratios between sub aggregates, some of which connect one period with the next. These ratios are empirical and can, consequently, change across time and space. Our institutional variety includes the concatenation of different such numbers. SFC norms can also be created and imposed and this feature emerges when the issue at hand is one of "stabilizing an unstable economy" (Hyman Minsky).

What about micro foundations? One popular disaggregation of GNP is that between wages and profits. Behind these categories are, naturally, workers and capitalists. The existence and behaviour of these classes is theoretically and statistically problematic when the income of both dwindles as they become better off transmuting into rentiers. Continuing in front of us is the flat trajectory of real activity and the vibrancy of financial activity everywhere in the world. By way of explanation, our research strategy has been to move and shake identities to derive first-order difference equations. Thereafter, we look at the steady state solutions. The classes backing the aggregates interact in conflict or cooperation mode. We set up and solve a series of dynamic games.

The critical comments of two anonymous reviewers went a long way in providing sequence and structure to a first draft that was short on both fronts.

Amelia Correa

Romar Correa

Chapter 1

Introduction

Ever since Kenneth Arrow, along with Samuel Bowles and Herbert Gintis, the latter two having learnt early to straddle the divide between orthodoxy and heterodoxy, removed themselves along with others to the Santa Fe Institute to ponder over political economy as progressive social science, both neoclassical and non neoclassical economists have discovered systems theory. The whole and the parts are connected in mysterious ways. The aggregates that define "higher-level" phenomena have properties not possessed by the "lower-level" individual items that constitute them (Sugden, 2016). System properties combine emergence and, in principle, an unknowable future (Heise, 2016). The proposition connects determinacy in the sense of the connections between system elements, and "downward causation" which states that macro cannot be derived from micro. Emergence is a "brute and unexplainable fact" since there is an ontological gap between the micro and the new property (Brisset, 2016). At the same time, while new arrangements are indispensable to our apparatus, existing arrangements are equally primary as the bases for real agents to choose and act. A related aspect of the systems view is reflexivity in the sense that agents' means act on ends which act on adjusted means in a sequential process (Davis, 2016). That is to say, by transitivity and the cessation of processes through the realisation of ends, means operate on means

Systems theory has developed a battery of concepts to elucidate the hierarchical ordering of the organisational structure of all systems. Apart from lateral connections, there are "supremal units" and "infimal units" with orders going out from 'bosses' to 'workers', so to speak. Power and authority, in other words, are an integral feature of institutions (Dosi et al, 2016; Sakai, 2016). Indeed, the notions are at the heart of the market process. Even members of the Chicago School would not deny that market agents need "control units". With financial arrangements getting more complex, in particular, the demands of central control over banking and currency systems get more urgent. Free banking would reduce stable monetary systems to chaos. A few possess the capacity to determine the choice sets of many. A handful can veto the decisions of millions. Recently, the concept of entropy has been applied to the conceptual armoury of economics (Vozna, 2016). The pioneer was Nicholas Georgesçu-Roegen, another giant who defied categorisation in 'cold

war' terms. In the beginning, human labour in agriculture added to the accumulation of the productive potential of society. Work in the form of mechanical and intellectual effort resulted in the growth of transformed energy on the earth. In other words, labour offers the possibility of counteracting entropy or the dissipation of energy.

Individual choices are enmeshed in a skein of multifarious influences which eventually result in "contradictions" underlying a socio-economic system which distinguishes it from a deterministic or stochastic system (Hanappi & Scholz-Waeckerle, 2016; Irwin, 2017). The term suggests, in the first place, the impossibility of identifying all the characteristics of alternative systems and, therefore, of unambiguously specifying utility functions for social choice theory. Secondly, the word suggests the limitations of communicating decisions which entail uncertain costs and benefits to different sections of society over time. For instance, with fiscal policy it is not easy to convey regressive taxation policy or balanced budgets in the light of inter temporal Ricardian equivalence. Lest the complexity approach be seen as a case for nihilism, history provides causal arrows, statistical regularities and constraints that can be identified. So-called "generative structures" exist that are independent of the conditions under which their econometric identification takes place. They are causal mechanisms that are tendencies even though they may never be actualised. Every epoch is a plateau that calls a ceasefire in real contradictions either through their postponement (in time) or through the colonisation of virgin territory (in space). Institutions can be durable as well as assume a life of their own. As culture, they succeed in blocking paths to revolutionary transformation. However, real contradictions cannot be suppressed forever. When the contradictions are grasped by a wide section of the people, the conditions of a tipping point are laid. The denouement must be grasped and reflected upon before the evolutionary jump is made.

Another neglected quiet revolutionary solidly within the mainstream camp whose work bears on our thesis is George Katona. According to him, aggregate phenomena must be seen as social phenomena which do not correspond to individual behaviour (Dechaux, 2014). Unlike Herbert Simon, Katona focussed on macro and unlike the behavioural economics of today, his behavioural economics combined social psychology and *gestalt*. He elucidated the concept of "macrolearning". Individual attitudes and behaviour are a measure of the impact of social mores and conventions on the individual. Katona made the case for a social scientific approach to expectations formation which investigated the origin and transformation of the degrees of confidence of people, their optimism that gave way to pessimism and the more difficult reverse journey (Dechaux, 2015). In short, Katona's perception of the economic process was one in which the

judgements of agents and their codes of conduct that followed were central. He distanced himself from the unquestioned assumption that information determined expectations and opted, instead, for the equivalence of expectations and attitudes. Attitudes are points of view widely held that influence perceptions and then behaviour. Katona neatly summarises the concepts in individual thought and action in the following scheme (Dechaux, 2015, p 17). A change in the data or stimulus, S, conditional on a given battery of concepts, X, are filtered through expectations as an intervening variable, I, to determine behaviour R. We have $S/X \rightarrow I \rightarrow R$. There are no functions connecting the three elements. Expectations are orientations towards the future that might change current behaviour. They can be taken as ex ante intervening variables.

In sum, real-world economies consist of "heterogeneous interacting participants" constrained by a changing state of the world (Tesfatsion, 2017). These participants are "locally constructive", that is plan and act on the basis of the markets in which they operate at any point of time. Agents can mean classes. "System constructivity" here means the construction of the state vector by piecing together the dispersed information scalars of different agents. The language of differential games is commonly used to join these elements. The state of the world evolves through a dynamical equation that is driven by classes that, depending on the description of the state vector, may be playing a cooperative or a non cooperative dynamic game. The description of the laws of motion of the system is not unique and neither is the configuration of classes. We will respect the distinction in our survey of political economy in the next chapter. Following in the footsteps of the founding fathers, there will be models best confined to the evocations of national income identities masterfully reconstructed. Our contribution will be to introduce a dynamism from lags (leads) emerging naturally from the definitions. Chapters 2 and 4 offer many such illustrations. On the other hand, there will be Keynesian models that beg microeconomic drivers. Keynes himself relied heavily on the maximum principle in his theorizing. Thus, while Profits are critical, the profit function of the entrepreneur or capitalist will be specified. We will not rely on various formulations of investment functions or posit different consumption or savings propensities.

Our plan of action is to offer dynamical models and pause. They merit scrutiny in their own right as the sometimes surprising fruit of identities. Chapter 3, from a tiny clutch of definitions, comes up with transitional dynamics for a predominantly agrarian economy, on the one hand, and three species of movement for a financially-sophisticated modern economy. The treatment can be regarded as independent of Chapter 6 where all the dynamical systems are regarded as constraints under which appropriate sets

of agents operate. The agents introduce themselves from the specification of the equations. Thus, the representative agent is the amalgam of worker and household. Introductory macroeconomic identities can be written for Consumption or Wages. Our procedure to solve out for consumption or wages (lower-case letters) only means that the equivalent other identity is not on the page. The payoffs are that in these illustrations of the macro foundations of microeconomics, strong policy regimes suggest themselves. Our strategy can be also described as a constructive rendition of "analytic narratives" (Mongin, 2017). The task is to explain historical epochs with game theory tools. The agenda is riven by enthusiasts (economists and game theorists) and historians who are indifferent. Our formulations turn out be the least tendentious in dealing with two-player games and objective functions drawn from basic microeconomics. Uncertainty about the characteristics of systems is captured by differential equations working, to some extent, behind the backs of agents. Complexity is handled by different dynamical equations emanating from the same set of national income identities. Chapter 7 provides further proofs including an open-economy example.

Chapter 2

From Main Street to Wall Street

We trace the treatment of the topic through time. The start will be familiar to students of economic thought in the deep pondering over physical/real national production identities. However, the leading lights of economic science were not blind to the potentially debilitating role finance could play and the subject enters, appropriately, in a modern Marxian model. In our times, the full-blown intersection of Wall Street with Main Street is, of course, the work of Hyman Minsky.

2.1 From François Quesnay ...

The author of the *Tableau Économique*, 1759, figures in an introduction to the fraternity of models of which the SFC framework is a part. He is the guiding light illuminating the circuit approach to monetary macroeconomics. Like SFC models, the logic is structural and closed. In the model of Augusto Graziani, for instance, "initial finance" is the creation of money when a bank intermediates between business and labour and originates a process of production and "final finance" is associated with the expenditure of incomes arising thereby and the reflux of the wage outlay to firms in the form of profits. Firms repay their loans to banks closing the circuit (Fontana & Realfonzo, 2017). The special contribution of the French theorist in contrast to the input-output tables of the icons of classical political economy is the meld of technological coefficients and nominal values. The framework is not constructed in independent real and monetary terms. The nominal values that will drive our models are the product of prices and quantities.

Secondly, Quesnay's *Tableau* was not alone in being shot through with political economy. National Income Accounting has always been contested terrain. One description of the discipline is policy-based evidence (Assa, 2016). William Petty used his estimates to prove that taxes and "Publick Levies" would increase the wealth of the commonwealth. At the same time, the then British Prime Minister excluded labour income in his accounts because he wished to exclude the working class in the first proposal for a general income tax in Britain in 1798. In 1799 and 1802, Benjamin Bell prepared his estimates to challenge Pitt's numbers as well as argue for a repeal of the Corn Laws. The French Physiocrats, of whom Quesnay's *Tableau*

Économique was the most illustrious manifesto, were the prime movers in using economic theory to inform National Income computations.

For our purposes, we retain the emphasis on classes in the *Tableau* and the distinction between "productive expenditures" and "sterile expenses". Given the time of writing, the former was associated with agriculture. The latter included "interest on money" and "commercial expenses". Quesnay worried over the consumption of "luxuries" overtaking reproductive expenditures over time.

Another member of the pantheon that inspires circuitistes and SFC modelers alike is Joseph A Schumpeter. Schumpeter is always hard to identify in one's corner for his work best embodies the difficulty of moving from an evenly rotating economy adequately described by the tools of the theory of value to a rupture of that general equilibrium by new ways and means of producing goods and services spearheaded by the heroic entrepreneur. 'Schumpeterians' of different stripes have been developing models of technical change not requiring money, deriving sustenance from the master's seminal writings. A private enterprise economy is assumed wherein there is freedom to enter explicit and implicit contracts. The individual is the constitutive unit of the capitalist system. The theory of ophelimity (Vilfredo Pareto) is the proof that preferences and constraints determine all aggregate phenomena. To the standard theorems about substitutes and complements we would, today, add extensions in strategic complements and substitutes. The grand achievement of Léon Walras was the derivation of the conditions of general equilibrium. The system of exchange relationships renews itself from period to period. Sellers of commodities reappear as buyers with the wherewithal to purchase the commodities which would maintain their consumption and capital intact in the subsequent period at the current level and so on. Jean-Baptiste Say joins hands with Walras. The economy is dynamic in this sense. Each period is the basis of the next in that it generates data that enable workers and capitalists to repeat the same process in the next time interval. The economic system is, thus, stable. The capitalist dynamic can be extended to incorporate money. As with intermediate goods, there is no need to construct an independent exchange value of money as it is no more than a temporary abode of purchasing power as is an input. The value of money is derived from the value of consumption goods it commands. Walras' analysis is carried out for the case of a given stock of fiat money. Money is the $n+1^{st}$ item in the initial endowment of households and firms. It has a price by virtue of its marginal utility function. The price, emerging in a market called the capital market, equates the demand for money with the available stock. At the hands of Kenneth Arrow and Gerard Debreu later, the future was envisioned as a tree with spreading branches with transactions at nodes

across different states of the world and time points assumed possible. The foundations of finance were laid. The bases for hedging, futures, and options, and the hothouse outgrowths to follow will be found in Arrow securities.

Banking plays no role in the "circular flow". "Development", on the other hand, is the generation of surprises from within the "industrial and commercial" life of the economy. Schumpeter, it is well known, laid stress on the institution of "new combinations" by means of the creation of purchasing power by banks. All the same, the annual growth of savings which is the resultant of previous "development" is no less important. There are upper bounds to the possibility of financing entrepreneurs with no prior savings. Schumpeter examines the case of a gold standard and the institution of central banking. New commodities financed by the creation of fresh purchasing power will flow after a time lag. In the short run, prices will rise and the value of gold contained in the gold coin will exceed the value of the monetary unit. Bank IOUs will be presented for redemption. The solvency of banks will be threatened. If, in addition, there are constraints to the commodity complement of the freshly-minted notes coming to the market on time, banks must intervene with the savings of depositors. Thus, reserves are important both for commercial banks as well as central banks.

2.2 … through Karl Marx …

The circular production economy, most elegantly displayed by Piero Sraffa, demonstrates that production is a social process in which the production of commodities is technically connected through coefficients of production as well as socially connected through the corresponding activity of households, business enterprises, the State. Capitalists engage in the production of commodities with the expectation of earning a flow of money profits. Marx, Keynes, and others like Veblen, were joined in the perspective that the capitalist economy was a monetary production economy (Ho, 2016). The appropriation of money, $C' - M'$, in Marx's circuit of money capital is achieved through the conversion of working capital into inputs, $M - C$, required in the production process. Class conflict arises because of the tension between the reproduction of the working class or the enjoyment of use values $C - M - C'$ and the surplus maximization of the capitalist class $M - C - M'$.

Before we follow with a literal historical sequence, following Quesnay with the epoch-marker whose name adorns the title of this section, since we have broken off with Schumpeter to develop a thematic line, it is worth our while to detour through the work of Michal Kalecki, the Polish Marxist, a contemporary of Keynes who arrived at the results of the latter through a

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