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**Aggregate Structural Macroeconomic Modelling:
A Reconsideration and Defence**

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Abstract

Aggregate structural macroeconomic modelling (ASMM) is frequently criticized for being ad hoc and justified (if at all) only as a pragmatic expedient. This paper argues instead that ASMM is consistent with the principles of well-established bodies of social theory. Appeal to these principles reveals that aggregate-level analysis of the type exemplified by ASMM is likely necessary and (in some circumstances) certainly sufficient for the successful prosecution of macroeconomic enquiry.

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1. Introduction

According to mainstream economic thought, the determinants of all economic outcomes are to be sought and found at the level of the individual decision maker. In macroeconomics, this thinking has found expression in the “microfoundations of macroeconomics” project. The microfoundations project is central to the “consensus view” of macroeconomics enshrined in contemporary dynamic stochastic general equilibrium (DSGE) models, as celebrated by authors such as Blanchard (2009) and Woodford (2009).¹

At its core, the microfoundations project is a reaction against aggregate structural macroeconomic modelling (ASMM), which seeks to explain aggregate economic outcomes in terms of models based on aggregate structural and behavioural relations. The microfoundations project deems ASMM an insufficient basis for explaining aggregate outcomes, because it does not involve explicit description of the intentions and actions of the individual decision makers of which the economy as a whole is undoubtedly comprised.

ASMM is not without its advocates, even amongst prominent mainstream economists. Hence Romer (1996) acknowledges that aggregate structural models are “externally consistent” in the sense that they capture salient features of reality, although he contrasts such models with “internally consistent” alternatives that are based on choice-theoretic microfoundations and are thus “fully specified”. Solow (1994, p.49), meanwhile, criticizes the emphasis on microfoundations in contemporary neoclassical growth theory as being of almost no marginal value to the growth theorist, whilst simultaneously “encumbering it [neoclassical growth theory]

¹ Whether or not contemporary understanding of the microfoundations project is truly consistent with the intentions of the progenitors of this project is a matter of debate that lies beyond the scope of this paper, but see Howitt (1996) and Boianovsky and Backhouse (2006).

with unnecessary implausibilities and complexities”. Finally, Krugman (2000) argues that aggregate structural models are no less accurate in their predictions than microfounded models, while their ease of use lends them to many practical applications.

But each of these arguments makes an essentially *pragmatic* case for ASMM: microfounded models are understood to be both possible and (Solow excepted) superior, but this does not preclude the usefulness of aggregate structural models in some cases. The point of this paper is to make the case for ASMM *in principle*. Specifically, the paper argues that: (i) there are conceptual problems with the microfoundations project and the conventional wisdom in macroeconomics with which it is allied; and (ii) the economy, in fact, both requires and possesses *macrofoundations* that provide a context for individual decision making and without which, individuals would struggle to think, behave and act in an orderly fashion.²

The remainder of the paper is organised as follows. In section 2, we first describe the microfoundations project in macroeconomics. Section 3 then discusses internal critiques of this project, together with the second generation microfoundations project alluded to above. In section 4, numerous external critiques of the microfoundations project are identified, that variously demonstrate either the *necessity* or *sufficiency* of the sort of aggregate-level analysis exemplified by ASMM. Section 5 outlines an alternative vision of and approach to

² Note that it could be argued that there now exists a “second generation” microfoundations project that, in at least some of its guises, accepts or even embraces either one or both of these points (see, for example, Gallegati and Kirman, 1999; Delli Gatti et al, 2000; Colander, 2006; Delli Gatti et al, 2011). Hence rather than there being a simple antagonism between a monolithic microfoundations project on one hand and ASMM on the other, it may be more appropriate to think of there being an original microfoundations project to which both ASMM and the second generation microfoundations project are opposed. Although the focus of this paper is on ASMM, we will return to discuss the second generation microfoundations project in greater detail below.

macroeconomics, that acknowledges the existence of *macrofoundations* of economic behaviour and activity and the case – in principle – for ASMM. Section 6 concludes.

2. The Microfoundations Project in Macroeconomics

The microfoundations project in macroeconomics is rooted in a Walrasian vision of the economy. This Walrasian vision has three distinguishing features. First, the economy is conceived as a collection of markets which are not, themselves, explained, but are instead treated as a given state of nature. Second, this “natural” market system facilitates the purely voluntary interaction of individuals through the process of market exchange - a form of social interaction that, it should be noted, is understood to leave entirely unaltered the preferences, values, aspirations and so forth of the individuals that participate in it.³ Third, individuals possess all of the information they need to formulate and engage in optimal plans of action that are consistent with the underlying structure of the economy itself.⁴

³ In more general terms, the “internal structure” of the individual buyers and sellers who participate in market exchange is treated as data that remains unaltered regardless of the specific experiences that buyers and sellers accumulate as they actually engage in trade. The latter affects only the “external” characteristics of buyers and sellers - in particular, what they own. In this way, and to draw a popular analogy, buyers and sellers interact in markets in the same fashion that billiard balls interact on a billiard table.

⁴ Optimization is not purely and simply a subjective process, then. Rather, in the language of the rational expectations hypothesis, there exists a unique, “true” model of the economy, and individuals know this model and use it in their decision making. Note, then, that the way that “optimization” is conceived in this paper is narrower than the way it is understood by, for example, Boland (1981) or Williamson (2012), who essentially claim that any behaviour can be characterized as optimizing. The conception here is closer to that of Quiggin (2012), for whom it refers “to the kind of behavior found in the simplest form of the DSGE [dynamic stochastic general equilibrium] models: farsighted, and purely egoistic, agents maximizing the expected utility of stochastic consumption streams over time. Most of the time, at least when no one is challenging them on it, this is the way neoclassical economists use the term themselves”.

The microfoundations project arose during the late 1960s and early 1970s from discontent with what, from the point of view of the Walrasian vision outlined above, were *ad hoc* features of Keynesian macroeconomics.⁵ Most notable amongst these were aggregate behavioural relations (such as the simple aggregate savings function $S = sY$, where S is the aggregate volume of savings, s the propensity to save and Y denotes aggregate income) that were not explicitly derived from optimizing individual decision making processes. Thus began the project of re-making macroeconomics in the image of mainstream microeconomics, conceiving the individual (or more specifically, the rational optimizing individual) as the ultimate cause of *all* economic phenomena, regardless of the level of aggregation at which these phenomena occur. One of the most important tools developed in the pursuit of this microfoundations project has been the representative agent, an intertemporal optimizer who allows macroeconomic theorists to describe aggregate outcomes “as if” they resulted from the decisions and actions of a single individual. The idea is that the outcomes so-derived are analogous to those that would arise from a Walrasian general equilibrium system populated by many individual optimizing agents.

3. Challenges to the Microfoundations Project

i) Internal critique

Both the vision and the tools of the microfoundations project have had an enduring impact on macroeconomics over the past four decades and remain prominent features of mainstream macroeconomic research, whether it is focused on short-run stabilization issues or

⁵ See also Colander (1993) on the historical origins and development of the microfoundations project.

long run growth (see, for example Woodford, 2003 and Turnovsky, 2003 respectively). But despite its popularity, the microfoundations project has not met with universal approval. On the contrary, it has been subject to both internal and external critiques. In this and the next section, we examine these critiques in detail.

One controversial aspect of the microfoundations project is whether or not there *can be* microfoundations of macroeconomics consistent with the Walrasian vision of the economy outlined earlier, a topic that has attracted particular attention from Walrasian economists themselves. In the first place, it is well understood that Walrasian general equilibrium models commonly contain structural features that cannot be traced to individual behaviour or assumptions made about individuals. For example, the assumption of gross substitutability that gives rise to the stability of general equilibrium is not derived from assumptions made about individuals (Kirman, 1989, p.127); nor is the process of changing prices in response to excess supply or demand an explicit result of individual action (Arrow, 1968; Kirman, 1992, p.119). In this way, not even the Walrasian microeconomics that inspires the microfoundations project can (or does) claim to be fully “microfounded” in the characteristics and behaviour of individuals.

Second, when Walrasian microeconomics has utilized only individualistic assumptions, the results obtained have been negative for those aspiring to provide microfoundations for macroeconomics. This point is illustrated by the famous results obtained by Sonnenschein (1972, 1973), Debreu (1974) and Mantel (1976) (referred to hereafter as SDM).⁶ These results reflect on the question as to whether or not the standard assumptions made about individual preferences

⁶ See Kirman (1989), Ingrao and Israel (1990, chpts. 10, 11) and Rizvi (1994, 1997) for fuller accounts of the development and substance of the SDM results.

and behaviour in Walrasian general equilibrium theory (or, in the case of Mantel (1976), more restrictive assumptions) give rise to aggregate excess demand functions that, in turn, yield *unique and stable* general equilibria. What SDM show is that, even with strong assumptions about individuals, the economy can be characterized by any one of a great variety of excess demand functions,⁷ and it is unlikely that the actual aggregate excess demand function will yield a unique and stable general equilibrium. In short, what the SDM results demonstrate is that it is not possible to derive conditions from assumptions made about individuals that guarantee the uniqueness and stability of general equilibrium (Kirman, 1992, p.121).

What is the importance of these results for the microfoundations project in macroeconomics? Recall that this project aspires to root macroeconomic outcomes - such as the rate of unemployment - in the optimizing behaviour of individuals. But macroeconomic outcomes are frequently regarded as unique and stable equilibria. Take, for example, the natural rate of unemployment, which Friedman (1968) himself defined as being:

ground out by the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the costs of mobility, and so on.

(Friedman, 1968, p.8)

What the SDM results show, however, is that it is highly unlikely that a unique and stable macroeconomic equilibrium such as the natural rate of unemployment would emerge from an economic system characterized only by the standard assumptions made about individuals in

⁷ Specifically, any continuous function that is homogenous of degree zero, satisfies Walras' Law and possesses certain boundary properties (excess demand goes to infinity if the price of any one good falls to zero) can emerge as the economy's excess demand function. See Kirman (1989, pp.129-32).

Walrasian microeconomics. Friedman's allusion to "the Walrasian system of general equilibrium equations" working away in the background behind his natural rate construct is inappropriate: there is no strong intuitive connection between such constructs and the results of Walrasian microeconomics. The search for the microfoundations of such constructs in accordance with the Walrasian vision described earlier would appear to be, therefore, a folly.

But what of the representative agent which, as intimated earlier, is one of the most important tools associated with the microfoundations project? Does the representative agent avoid the problems identified above and provide a firm basis for developing the microfoundations of macroeconomics? The answer to this last question is no. In the first place, it is questionable as to whether or not the representative agent really brings any more microeconomics into macroeconomics than the aggregate behavioural equations it seeks to replace. Describing, for example, saving behaviour as the result of intertemporal optimization by a single individual is little different from writing $S = sY$. From the point of view of the microfoundations project, both approaches can be castigated for implicitly assuming a one-person economy by not explicitly describing how an aggregate outcome (in this case, total savings) arises from the actions and interactions of many (potentially different) individual agents.⁸ The only novelty of the representative agent approach would thus appear to be its use of

⁸ Advocates of analyzing the economy in terms of aggregate behavioural relations would insist that this is a blunt criticism of their approach, because they do not pretend that macroeconomic outcomes *can* be successfully described and explained solely in terms of the properties of individuals. Rather, these economists adopt the view that the behaviour of the macroeconomy is distinct and separate from that of individuals, in the sense that macroeconomic outcomes cannot be reduced to explanation in terms of the characteristics and behaviour of individuals. This view is developed at length in section 4 below. But the point to be made here is that this anti-reductionist view is *not* shared by the microfoundations project, so the observation

the techniques of constrained optimization in the explanation of macroeconomic outcomes,⁹ but this, in and of itself, has no bearing on the *level of aggregation* at which macroeconomic analysis should be conducted.

A second point – one that turns out to be closely related to the first – is that the representative agent approach *evades* rather than *solves* the problems for the microfoundations project posed by the SDM results. As such, it is revealed as little more than an analytical sleight of hand. Recall that the substance of the SDM results is that assumptions made about individuals do not give rise to conditions that will guarantee the uniqueness and stability of general equilibrium: even if individuals are “well behaved,” the economy in the aggregate need not be. But by treating aggregate economic outcomes “as if” they resulted from the actions of a single individual, the representative agent approach effectively assumes away the problem posed by the SDM results. Specifically, since the *individual* excess demand functions of “well behaved” agents *do* have unique and stable equilibria (even though the *aggregate* excess demand functions to which they give rise, in general, do not), “the ‘representative’ individual is being used to *provide* the stability and the uniqueness of [economy-wide] equilibria which are not *guaranteed* by the underlying model” (Kirman, 1992, p.120. Emphasis in original). So the notion that the representative agent is just a convenient fiction that mimics the behaviour of an economy comprised of many individuals cannot be sustained, because it attempts to pass off the behaviour

that the representative agent is guilty of the same “vice” as analysis conducted in terms of aggregate behavioural relations is a blow for those who see the representative agent as a basis for developing the microfoundations of macroeconomics.

⁹ Even this is not a novelty, strictly speaking, the “optimizing drive” in macroeconomics having begun prior to the development of the representative agent approach. See, for example, Colander, (1993).

of the aggregate economy as being akin to that of a single individual and, as the SDM results demonstrate, this cannot be justified. As such, the representative agent cannot be said to provide “microfoundations” for the type of economy-wide phenomena it purports to explain. As Kirman argues:

There is no more misleading description in modern economics than the so-called microfoundations of macroeconomics which in fact describe the behaviour of the consumption or production sector by the behaviour of one individual or firm. If we aggregate over several individuals, such a model is unjustified. On the other hand if we do not deal with the aggregation problem then we should be honest from the outset and assert simply that *by assumption* we postulate that each sector of the economy behaves as one individual and not claim any spurious microjustification.

(Kirman, 1989, p.138. Emphasis in original.)

ii) A “second generation” microfoundations project?

Inspired, in part, by the internal critique of the microfoundations project outlined above, there has recently arisen what might be identified as a “second generation” microfoundations project which enunciates an explicitly post-Walrasian vision of the economy. This project is anticipated by Kirman (1992, pp.129–32) and is evident in the contributions to Gallegati and Kirman (1999) and Delli Gatti, Gallegati and Kirman (2000). It also finds expression in the Post Walrasian Economics (PWE) heralded by Colander (1996a), which has begun to coalesce around a particular set of theoretical tools drawn together under the rubric of agent-based or multi-agent systems (MAS) modelling, in which reasoning (but not necessarily optimizing), heterogeneous individuals interact in activities such as production and exchange, and aggregate outcomes are studied as the results of this interaction (see, for example, Colander, 2006; Delli Gatti et al, 2008, 2011). Indeed, it is Colander (1996b, 2005) who best gives expression to the post-Walrasian *vision* of this work, when he describes the three key characteristics of PWE as being multiple

equilibria and complexity, bounded rationality, and the importance of institutions and other non-price coordinating mechanisms.¹⁰

It is quite possible that advocates of the second generation microfoundations project identified above would accept some if not all of the external critique of the microfoundations project outlined below, and on the basis of which this paper ultimately makes the case for ASMM.¹¹ This possibility is not investigated further in what follows. But it is important to recognize that the principles outlined below and the vision of the economy to which they give rise may lend support to a *plurality* of approaches to macroeconomics rather than purely and simply to ASMM.¹² As such, whilst the propriety of ASMM is unequivocally the focus of this paper, the point we seek to establish is *not* that aggregate structural models are demonstrably the

¹⁰ It is important to note that some of the principles of this second generation microfoundations project or PWE – and in particular, the notion of agent heterogeneity – have begun to appear in the DSGE models that are the most contemporary expression of the original microfoundations project. Hence according to Chari (2010, p.2-3), “[DSGE] models have all kinds of heterogeneity in behavior and decisions. Please look at the seminal work by Rao Aiyagari, Per Krusell and Tony Smith, Tim Kehoe and David Levine, Victor Rios Rull, Nobu Kiyotaki and John Moore ... much of their work is explicitly about models without representative agents.” But it is important to note that the representative agent framework continues to dominate contemporary mainstream macroeconomic modelling. As Kockerlakota (2010, p.7) states, “as far as I am aware, no central bank is using a model in which heterogeneity among agents or firms plays a prominent role” (see also Pesaran and Smith, 2011). It would therefore be hard to argue that the insights of PWE have already been fully assimilated into mainstream macroeconomic modelling, and that the issues raised in the internal critique of the microfoundations project are now moot.

¹¹ In other words, much if not all of our external critique of the microfoundations project is directed at the original or “first generation” microfoundations project, which remains the dominant approach to macroeconomic modelling.

¹² To the extent that this claim is true, it may be interpreted as being conducive to Colander’s (2005) thesis that the “cutting edge” of mainstream economics is now embracing themes previously associated only with heterodox economics (including, in contemporary macroeconomics, ASMM), and that the latter needs to identify with and contribute to these developments in order to remain relevant. See also Dutt (2005) and Gibson (2005) for responses to this thesis.

“be all and end all” of macroeconomic inquiry. Instead, the argument advanced is that ASMM constitutes *a viable* approach to macroeconomic analysis based on appeal to first principles.¹³

4. External Critique: Beyond Microfoundations

Quite apart from the internal problems discussed above, it is apparent from the contributions of a variety of traditions that lie outside mainstream economics that the microfoundations project suffers a variety of other shortcomings and failings. Most importantly of all, many of these contributions suggest that an absolute insistence on pursuing any microfoundations project that seeks to reduce all macroeconomics to explanation in terms of the characteristics and behaviour of individuals is inherently flawed, because there are circumstances in which some form of aggregate analysis is either necessary or sufficient for successful economic analysis.

i) Do Individuals Optimize?

As intimated earlier, one of the pre-occupations of the microfoundations project is with *optimizing* individuals, whose decision making is optimal not just because it takes account of their own subjective values and preferences, but also because it is consistent with their objective circumstances. Specifically, it is commonly assumed that the economy possesses a unique and easily identifiable structure (both in the present and at future points in time) and that individuals are familiar with this “true model” and use it in their (optimal) decision making. But a

¹³ This having been said the potential *necessity*, in some circumstances, of some form of aggregate-level analysis is entertained in section 4(ii) below.

longstanding theme in economics is that individuals do not have access to this sort of information about the economy, either because they are incapable of gathering and processing it, or because some of it does not yet exist. Hence some Keynesian economists argue that the structure of the economy is evolving, which means (amongst other things) that it is subject to *novel* change over time as a result of product and process innovation, behavioural innovations, and so forth. As such, it is impossible to know in the present the precise structure of the economy (whether it be deterministic, stochastic, or some combination of the two) that will ultimately constitute the “data generating process” responsible for producing macroeconomic outcomes in the future: to assume otherwise would contradict the claim that the structure of the economy is subject to *novel* change. Alternatively, it can be argued that even if individuals possess full information about their *local* environments, they do not have access to and/or the computational capacities necessary to process information about *global wholes* (such as an entire economy). This perspective is congruent with the behaviourist notion that individual rationality is bounded (Simon, 1957). According to Simon (1957), “boundedly rational agents experience limits in formulating and solving complex problems and in processing (receiving, storing, retrieving, transmitting) information.”¹⁴ Whether because of novel change or bounded rationality (or both, since they are not mutually exclusive), decision makers can be said to experience *fundamental uncertainty* about the future. Fundamental uncertainty places decision makers in situations where they are partially ignorant of the precise structure of the mechanisms and processes that will generate future economic outcomes, and is therefore categorically different from situations of known stochastic risk (Knight, 1921). Fundamental uncertainty about the future denies the

¹⁴ As cited by Williamson (1981, p.553).

possibility of decision makers engaging in intertemporal optimization (i.e., planning optimal behaviours over a succession of future points in time), because they do not know the “true model” necessary for undertaking this task. The consequences of this last observation for macroeconomic modelling are far from trivial. As Caballero (2012) argues:

This issue is not one that can be addressed by adding a parameter capturing a little bit more risk aversion about macroeconomic, rather than local, phenomena. The reaction of human beings to the truly unknown is fundamentally different from the way they deal with the risks associated with a known situation and environment (Knight, 1921; Ellsberg, 1961). In realistic, real-time settings, both economic agents and researchers have a very limited understanding of the mechanisms at work. This is an order-of-magnitude less knowledge than our core macroeconomic models currently assume, and hence it is highly likely that the optimal approximation paradigm is quite different from current workhorses [associated with the microfoundations project].

(Caballero, 2012, p.91)¹⁵

What these arguments demonstrate is that ASMM cannot and should not be dismissed on the grounds that it encourages macroeconomic theorizing that does not feature dynamic optimization by decision makers.

ii) At What Level of Aggregation should Macroeconomic Analysis Proceed?

The topic of optimization aside, the single greatest concern of the microfoundations project is with the level of aggregation at which macroeconomic analysis should be performed. The microfoundations project insists that *all* economic inquiry should be conducted through analysis of the individual decision maker. In this regard, a second traditional concern of Keynesian economists that also bears negatively on the search for microfoundations of

¹⁵ For empirical evidence regarding the responses of decision makers to probabilistic risk as opposed to fundamental uncertainty, see Hsu et al (2005).

macroeconomics is with the existence of fallacies of composition in macroeconomics. The best known of these is the so-called paradox of thrift, according to which an increase in the propensity to save of all households will have no effect on the volume of aggregate saving. This result appears paradoxical because, at first sight, it appears that the decision by all households to save more must surely raise the amount saved by each individual household and hence the total amount saved in the aggregate. But this reasoning is revealed as fallacious (and the “paradox” of thrift is explained) once it is realized that increased saving at any given level of income will reduce aggregate consumption spending which, by lowering aggregate demand, will reduce aggregate income and hence the total quantity saved. Ultimately, households end up saving a larger fraction of a smaller income, and the level of aggregate saving remains unchanged.

A second fallacy of composition is the paradox of costs, according to which cutting wages may reduce corporate profits. Again, this result seems counterintuitive: by cutting wages, firms succeed in cutting their costs of production - an act that will seemingly *raise* profits, both for each individual cost-cutting firm and, by extension, for all firms as a whole.¹⁶ Again, such reasoning is revealed as fallacious (and the “paradox” of costs is explained) once it is realized that wages constitute *both* a cost of production to firms *and* a source of income to workers, from which they fund some part of their total consumption expenditures. Hence cutting all wages may reduce aggregate demand and hence aggregate income - including that part of aggregate income that accrues to firms as profits. Ultimately, firms can end up with a larger share of a smaller

¹⁶ This reasoning may prove fallacious even in the absence of the paradox of costs if firms’ employment relations are subject to efficiency wage, insider-outsider or implicit contract considerations. These supply-side complications are overlooked here in order to focus attention on the demand-side ramifications of cutting wages that are the substance of the paradox of costs.

aggregate income, and profits can fall as a result.

In terms of our critique of the microfoundations project, the substance of these results is straightforward: what appears to be true at one level of aggregation (an increased propensity to save will raise the amount saved by an individual household; cutting wages will raise the profits of an individual firm) is revealed as false at a higher level of aggregation (total savings remain unchanged; aggregate profits may fall). As such, economists cannot hope to deduce all of the properties of an economy from studying the characteristics of individuals: instead, they must pay careful attention to properties that may only become apparent through aggregate analysis.

Recently, the traditional Keynesian concern with the benefits of aggregate analysis has been reinforced by discussion of *emergent properties*. Emergent properties, which are frequently associated with the results of complexity theory, are essentially features of an aggregate system (e.g., the economy as a whole) that cannot be discerned solely by means of examination of the individual units or parts of which the system is comprised.¹⁷ For example, organic matter can be said to possess emergent properties that are not characteristic of the inorganic matter of which it is composed (Lawson, 2003, p.183). In economics, meanwhile, both institutions and expectations have been described as emergent properties by virtue of their possessing social characteristics that cannot be deduced from the features of a single individual (van den Bergh and Gowdy,

¹⁷ A more expansive definition is as follows:

A strata of reality can be said to be emergent ... if there is a sense in which it (1) has arisen out of a lower strata, being formed by principles operative at the lower level and (2) remains dependent on the lower level for its existence but (3) contains causal powers of its own which are both irreducible to those operating at the lower level and (perhaps) capable of acting back on the lower level.

(Lawson, 2003, p.183)

2003, pp.77-8). Indeed, the fallacies of composition identified earlier can be thought of as a special class of emergent properties. And like the fallacies of composition identified by Keynesian economists, the existence of a broader class of emergent properties in the economy suggests that any analysis like the microfoundations project, that privileges and focuses only on the characteristics of individual decision makers, is inherently flawed. Such analysis will remain blind to the features and characteristics of economic systems that are evident only in the aggregate.¹⁸

A further argument that reveals the paucity of conducting economic analysis in a manner that focuses exclusively on the individual decision maker is associated with critical realists such as Lawson (2003). Hence according to Lawson (2003, pp.181-2), it is necessary to think of the economy as possessing an aggregate structure that cannot be reduced to the characteristics, properties and behaviour of individuals just to make sense of certain types of everyday events - specifically, events that involve the deliberate and purposeful contravention of behavioural rules. For example, consider workers who threaten to engage in industrial action by “working to rule”. The threat of this action makes no sense unless we conceive the rule (or rules) in question as being something *other* than the way in which workers generally behave, either individually or “on average” as a group - otherwise, they would effectively always be working to rule. Instead, the rule or rules in question must be considered as something distinct and separable from individual behaviour as it is actually observed.

¹⁸ Indeed, it can be argued that contemporary emphasis on emergent properties – an important theme in the heterogeneous-agent-based PWE project outlined earlier – suggests an interpretation of the evolution of modern macroeconomics in which the usefulness of ASMM has been rediscovered. See the Appendix to this paper.

Each of the arguments produced so far suggests that the individualistic thrust of the microfoundations project is disadvantageous in certain circumstances, because aggregate economic systems possess features that are distinct and separate from those of its constituent parts (i.e., individual decision makers): in other words, the aggregate economy is relatively autonomous from the individual parts of which it is comprised (see also Hoover, 2009). Hence contrary to the thrust of the microfoundations project and its insistence on analysis of the individual decision maker, it is quite possible to justify performing economic analysis that concentrates on the features and outcomes of economic systems in the aggregate – as in ASMM. Indeed, it seems reasonable at the present point in time to make a stronger statement: that macroeconomics is a distinct and separate field of analysis in that it is irreducible to microeconomics, and that some form of aggregate-level analysis is therefore *necessary* for successful macroeconomic analysis. Of course, it may yet prove possible to conduct all macroeconomic research in terms of agent-based models that generate emergent properties and are thus entirely consistent with the features of the aggregate economy discussed in this section. In this case, it may ultimately be possible to show that the alleged *necessity* of a distinct and separate aggregate-level macroeconomic analysis is more apparent than real. But this state of affairs does not currently exist and would, in fact, appear to be some way off. Indeed, in conducting his review of Gallegati and Kirman (1999), Hartley (2001) questions the quantity of macroeconomics that has and is ever likely to emerge from the “second generation” microfoundations project, asking:

do the sorts of models built in this book break too incompletely from the representative agent methodology? They have kept the microfoundations goal and have merely substituted a different, albeit better, microeconomics on which to build the foundation. But, whence comes our certainty

that it is possible to build tractable models of the macroeconomy from the ground up? Maybe the real lesson of the book is that it may not be possible to build such models, that we can certainly build better microeconomic models than those used in the representative agent literature, but that such models do not directly translate into macroeconomics.

(Hartley, 2001, pp.F146–7)

But suppose that Hartley’s concerns are unfounded and that agent-based models eventually prove highly successful at generating macroeconomic insights. Even then, the weaker claim that ASMM constitutes *one* approach to macroeconomics that is justifiable in principle (rather than as an inferior but pragmatic expedient) still holds. Put differently, in light of the features of social material and associated principles of social enquiry highlighted in this sub-section, ASMM is still revealed as *sufficient* even if not strictly *necessary* for the successful prosecution of macroeconomic analysis.

iii) Institutionalism and the Sufficiency of ASMM

One of the foremost claims of Institutional economics is that individual action does not take place in a vacuum, but instead has a social context.¹⁹ This disarmingly simple and intuitive observation has numerous implications for macroeconomics.²⁰ In particular, it is suggestive of problems with the microfoundations project that ultimately recommend the sufficiency of ASMM for macroeconomic analysis.

As discussed earlier, according to the Walrasian vision on which the microfoundations

¹⁹ It has become conventional to distinguish between new institutional economics (NIE) and the original or old institutional economics (OIE) (see, for example, Rutherford, 2001). It is the latter tradition on which the observations made in this section draw.

²⁰ See, for example, Hodgson (1989, 1999) on the links between Institutional economics and Post Keynesian macroeconomics.

project is based, the only “social context” in which individuals act is the collection of markets, treated as a given state of nature, in which they voluntarily engage in exchange. Moreover, their participation in this market system is understood to have no effect on the values, preferences, aspirations and so forth that comprise the *internal structure* of individual decision makers. In capitalist economies, in which economic decision making is decentralized, markets proliferate and are certainly one of the most important organizational features of economic activity. Nevertheless, Institutional economics allows us to identify three important problems with the basic vision of the microfoundations project as recounted above.

First, markets are not a “state of nature” but are, themselves, social constructs that need to be explained.²¹ This, in turn, raises the possibility that the structure of markets can change over time, and that accounting for this and, indeed, other changes in the structure of the economy - rather than focusing on individual behaviour in the context of a given and presumed immutable collection of markets - is one of the main tasks confronting economics.

Second, there is more to the structure of the economy than markets, and economic interaction amongst individuals is not limited to voluntary participation in market exchange.²² For example, production takes place within organizations – namely, firms – that are distinct from markets, and within which individuals interact in ways that are not mediated by voluntary market exchange, but rather by processes such as hierarchical command.²³ The latter differs from the

²¹ This same conclusion has been reached by other authors not directly associated with Institutional economics as defined here. See, for example, Colander (1996c, p.118; 1999, p.215).

²² Once again, this same conclusion has been reached by authors not traditionally associated with Institutional economics. See, for example, Kirman (1992, p.131).

²³ The precise ways in which individuals interact within firms will, of course, depend on the internal organization of the firm, but it is fair to say that hierarchical command is a common

limited conception of social interaction found in the Walrasian vision of the microfoundations project not only in the obvious sense that it does not revolve around the exchange of property rights (the hallmark of market exchange), but also because it is not based on the principle of voluntarism.²⁴ This draws to our attention the potential for conflict and the exercise of power to be important characteristics of economic interaction, a potential to which the basic vision of the microfoundations project is blind.

Finally, by focusing on the individual as the basis for all economic explanation and, in the process, characterizing individuals as essentially unaltered by their experience of social interaction in the process of market exchange, the Walrasian vision of the microfoundations project over-simplifies and misrepresents the relationship between economic structure and individual agency in economic life. The microfoundations project explicitly professes methodological individualism - “the doctrine that all social phenomena (their structure and their change) are in principle explicable only in terms of individuals - their properties, goals and

organizing principle within capitalist firms.

²⁴ There are, of course, markets external to the firm to which individuals may in principle voluntarily resort should they become unhappy with the demands made of them by any individual firm. This process is, however, complicated by factors such as involuntary unemployment in labour markets, which constrains the ability of individuals to escape the employment of one firm and re-contract elsewhere.

Moreover, none of the above defeats the point that, at any given point in time, the interaction that takes place within firms in the process of production *follows* rather than directly involves a process of voluntary market exchange. Since Alchian and Demsetz (1972), there has, of course, been a tradition of using the market as a metaphor for interaction within firms, a tradition that purposely blurs the distinction between market and non-market interactions. But the position adopted here is that since a market is, by definition, an arrangement that brings buyers and sellers together voluntarily to exchange property rights, and since neither voluntarism nor the exchange of property rights have obvious counterparts in many of the interactions that take place within firms, the market metaphor is a poor one and the blurring of the distinction between market and non-market activity to which it gives rise is unhelpful.

beliefs” (Elster, 1982, p.453). According to this view, individuals *must* be treated as the basic “building blocks” of all economic explanation, including the explanation of macroeconomic outcomes. But methodological individualism rests on the presupposition that whilst individuals create society, society (including the experience of interaction in economic activities such as market exchange) has no effect on individuals, or at least, no effect on their essential or internal structure (what Elster calls “their properties, goals and beliefs”). As remarked earlier, individuals interact like billiard balls on a billiard table - their external properties change (where they are located, what they own) but their internal structure (their preferences, values, ambitions, etc.) is unaltered. Institutional economics rejects this “billiard ball” metaphor as a superficial description of social interaction, arguing instead that there exists a two-way causal relationship between structure and agency, rather than a causal “one way street” running from agency to structure. On this view, the internal structure of individuals *is* affected by their engagement in economic activities such as market exchange, so that market outcomes affect individuals just as individuals affect market outcomes. More generally:

Just as society cannot exist without individuals, the individual does not exist prior to the social reality. Individuals both constitute, and are constituted by, society. We often hear the truism that society is composed of individuals. [Institutional economics] does not deny this, but insists that individuality is itself a social phenomenon. In short, the individual is socially constructed.²⁵
(Hodgson, 1994, p.61)

But what exactly is the substance of all this for our critique of the microfoundations

²⁵ Elsewhere, Hodgson (2003, pp.164-7) describes this process of the social construction of the individual as “reconstitutive downward causation”, and accounts for this process in detail. See also Hédoïn (2012) on the role of macro-structures in constituting individual agency.

Once again, similar ideas are found outside Institutional economics. See, for example, Lawson’s (2003, pp.183-5) account of the “transformational model of social activity” in critical realism.

project in macroeconomics? Recall that the latter pursues methodological individualism: the individual is claimed to be *the* building block of all economic analysis. In order to sustain this view, the individual must be conceived as existing prior to and independently of any social context (such as market exchange) - an assumption that is, indeed, an explicit feature of the Walrasian vision on which the microfoundations project is based. But the Institutionalist arguments above deny the legitimacy of this assumption: individual agency both constitutes, *and is constituted by*, economic outcomes such as buying and selling, mass unemployment, experience of sustained high rates of inflation, and so forth. Hence the idea that it is both possible and necessary in principle to reduce all economic phenomena to explanation in terms of the individual agent - the *raison d'être* of the microfoundations project - is an unjustified folly. One might just as easily (and just as incorrectly) assert that it is imperative to reduce the explanation of all individual behaviour to the macroeconomic context within which this behaviour takes place. When agency presupposes structure and *vice versa*, neither agent nor structure can be privileged as the ultimate building block of all economic explanation. However, and equally importantly for our purposes, what this view *does* support is the notion that *either* the individual agent *or* the structural features of the economy as a whole provide legitimate and defensible starting points for economic analysis. Contrary to the view espoused by the microfoundations project, that it is essential to ground explanation of all macroeconomic outcomes in the behaviour of the individual, ASMM based on aggregate structural and behavioural relations is perfectly justified according to the Institutionalist critique of methodological individualism. To put it differently, given the Institutionalist argument that it is impossible to reduce all economic phenomena to explanation in terms of the individual agent,

ASMM is revealed as *sufficient* for the successful analysis of aggregate economic outcomes.

Of course, one of the central themes of Institutionalism, a theme that has re-surfaced in contemporary behavioural economics,²⁶ is the prevalent use by decision makers of *norms* to guide behaviour. Norms are procedural in nature, specifying “whenever event *x* occurs, do *y*”. (Social norms, as their name suggests, are norms shared by a community of decision makers.) The microfoundations project has sought to expunge norm-based behaviour from macroeconomic analysis, replacing it with dynamic optimization, in which behaviour is predicated entirely on the anticipated future consequences of action. Norms, however, have *always* been a feature of ASMM, inspired by (for example) Keynes’ (1936) appeal to a conventional propensity to consume out of current income and the conventional basis for decision making under uncertainty. To the extent that norms are a prevalent feature of actual decision making (as emphasized by Institutionalist and behavioural economists), the fact that they are widely used in the construction of aggregate structural models only reinforces our earlier claim regarding the sufficiency of ASMM for successful macroeconomic analysis.

iv) Model generality and the sufficiency of ASMM

Each of the arguments advanced above suggesting the sufficiency of ASMM leaves open the possibility that other approaches to macroeconomic analysis are at least as good. Consider, however, the following proposition:

But suppose there is in fact *more than one* valid microfoundation for a particular aggregate model. In other words, there is not just one, but perhaps a variety of particular worlds which would lead to this set of aggregate macro relationships ... Furthermore,

²⁶ See, for example, Akerlof (2007).

suppose that more than one of these particular worlds was a reasonable representation of reality ... It would seem to me that in this case the aggregate model derived from these different worlds has some utility beyond just one of these microfounded models. It is robust to alternative microfoundations. ... If an aggregate model can be derived from a number of different microfoundations, then we actually *appear to* restrict the generality of what we are doing by choosing one derivation and then working with this particular microfounded model.

(Wren Lewis, 2012)

Similar sentiments are expressed by Ekkhart Schlicht:

Furthermore, macro theories are more general than micro theories in the following sense: Typically the aggregation procedure will not be bijective, since different micro models might lead to the same macro model. Assume that all micro models out of a certain class C lead to the same macro model This macro model is more general than any micro model since it refers to the whole class C of micro models.

(Schlicht, 1997, p.95)

The arguments above suggest that at least some ASMM analysis is more *general* than microfounded analysis designed to address the same topic. To the extent that generality is valuable in scientific explanation, this, in turn, means that ASMM can be *superior* to microfounded analysis. The superiority of a particular approach does not, in and of itself, make demand its use a necessity. Nevertheless, the arguments of Wren Lewis and Schlicht suggest that, based on the criterion of generality, the case can be made that in at least some instances, ASMM is not only sufficient but also *desirable relative to alternative approaches* for the prosecution of macroeconomic analysis.

5. The Case for ASMM

The main lessons that emerge from the foregoing critique of the microfoundations project in macroeconomics can be summarized as follows:

- Markets are not a state of nature and do not provide the only forum for economic interaction amongst individual decision makers.
- The degree of voluntarism that epitomizes the Walrasian vision of market exchange does not typify all forms of economic interaction. This draws attention to the possibility that conflict and the exercise of power will be characteristic of at least some forms of economic interaction.
- Chronic information problems prevent individual optimization of the form commonly assumed to take place in models associated with the microfoundations project.
- Methodological individualism is untenable: individuals cannot be treated as prior to their social context, but are, instead, socially constructed. The goals, preferences and values of individuals both influence and are influenced by the economic environment in which they interact (including, but not limited to, markets and their outcomes), and neither individual behaviour nor the aggregate structure of the economy and macroeconomic outcomes are reducible to explanation in terms of the other.

These criticisms suggest the need for a different vision for organizing macroeconomic inquiry, that departs from the Walrasian vision outlined earlier and frees macroeconomics from the straitjacket of the microfoundations project. Consider, for example, the following principles:

- The economy is an evolving system, meaning that it is subject to endogenously generated structural change involving novelty.²⁷ This, in turn, gives rise to chronic information problems manifest in the fundamental uncertainty that confronts decision makers in the long run, and that render long run dynamic optimization consistent with the “true” model of the economy impossible in principle.
- The situation described above does not render individual decision making entirely arbitrary nor the economy as a whole subject to continuous kaleidic revision. Instead, the economy creates and, for discrete periods or *episodes* of calendar time, maintains macroscopic “operating systems” (Colander, 1999) consisting of institutions (rules, norms and conventions) that assist individual decision making and (within any given episode) lend structural stability to the economy. Each one of these operating systems constitutes a socially constructed (and therefore ultimately transmutable) but relatively

²⁷ Essentially the same property is suggested by those who regard the economy as an open system (see, for example, Lawson, 1997) and by some proponents of the idea that the economy is complex system (see, for example, Colander et al 2004 and various of the references therein).

enduring social context within which individual decision making and interaction take place, that influences the internal structure (the goals, preferences, values, and so forth) of individuals and that exerts a relatively autonomous influence on macroeconomic outcomes that cannot be reduced to explanation in terms of individual behaviour. These operating systems constitute the *macrofoundations of macroeconomics*.²⁸

- Aggregate-level analysis of some form is likely *necessary* and, in the case of some phenomena, certainly *sufficient* for successful economic analysis.²⁹ The sufficiency of such analysis in some circumstances follows from the fact that methodological individualism is untenable, so that there can be no insistence that all economic explanation must, as a matter of first principle, proceed from analysis of the individual decision maker. Note that aggregate-level analysis does not involve denying that macroeconomic systems comprise (and ultimately depend for their existence upon) a plethora of sentient individual decision makers.

The substance of these principles would not have been unfamiliar to the early twentieth century progenitors of macroeconomics such as Mitchell and Keynes. Note also that what the third principle suggests is that ASMM based on aggregate structural and behavioural relations has a strong grounding in social theory – stronger, it would seem, than the microfoundations project, which is unable to survive even the internal critique (associated with SDM) of economists who otherwise share its individualistic orientation and commitment to an atomistic conception of the individual.

²⁸ It would perhaps be more accurate to say that they *contribute to* the economy's macrofoundations, since the latter can also be thought of as including, for example, class relationships, and even macroeconomic outcomes themselves (consider the ways in which involuntary unemployment in the aggregate labour market might modify the behaviour of an individual employee).

²⁹ The importance of aggregate-level analysis is already widely accepted in sciences such as physics and biology (see, for example, Colander, 2000, p.3; van den Bergh and Gowdy, 2003), so this principle can be interpreted as bringing economics into line with established practice in the two natural sciences from which it has most frequently drawn inspiration.

i) But isn't ASMM ad hoc?

As Amable et al (1997) note, beyond the fact that it is clearly intended as a pejorative, it is not always obvious what economists mean when they label a construct “ad hoc”. Nevertheless, following Amable et al (1997, p.254) two common meanings can be identified:

1. The construct is intended to produce a specific result that is sought by the model builder
2. The theoretical grounding of the construct is insufficient

Each of these meanings can be related back to the common dictionary definition of ad hoc (something that is created or introduced to serve a particular purpose at hand). But is ASMM ad hoc by either standard?

Beginning with the second of the two meanings stated above, it is important to note that “insufficient theoretical grounding” usually means “not derived from individual optimizing behaviour” (or to use Romer’s (1996) terminology, “lacking internal consistency”) when the charge of ad hockery is levelled against ASMM.³⁰ But in any event, this first criterion does not

³⁰ It is ironic that this narrower conception of “insufficient theoretical grounding” has recently been used as a stick with which to beat some models emanating from the microfoundations project. As Wren Lewis (2011, p.129) argues, “the inclusion of price rigidity into ... models via short-cuts like Calvo contracts has required a key modification of the microfoundations methodology, such that internal consistency can only be claimed indirectly by appeal to theory developed elsewhere. This modification has repercussions that imply that the microfoundations project is not as unblemished as the ‘purists’ imagine.” It can also be argued that the microfoundations project lacks theoretical grounding in the broader sense, in that its conception of individual agency is too little grounded in (*inter alia*) psychology and information theory. See, for example, sub-sections 4(i) and 4(iii) above, and Della Vigna (2009). As such, and as the title of Amable et al (1997) suggests, charges of ad hockery in economics (by any definition) very often amount to little more than the pot calling the kettle black.

provide a basis for rejecting ASMM. As has already been argued, the desirability of rooting all economic explanation in individual optimization is more apparent than real; and once a broader view of “theoretical grounding” is adopted, it is clear that ASMM *is* grounded in established social theory. In short, what all this suggests is that criticisms of ASMM as ad hoc in the sense of the second of the two meanings above have little or no foundation. Rather, they serve only to demonstrate the abuse of the term ad hoc in economics, as a rhetorical device for unfairly castigating and dismissing branches of the discipline that are, in fact, rooted in well-established bodies of social theory.

Turning now to the first meaning listed above, there are undoubtedly elements of models based on aggregate structural and behavioural relations that are ad hoc in the sense that they are intended to serve a particular purpose. But the same can be said of any class of models. Witness, for example, the charges of ad hockery levelled against certain variants of microfounded DSGE models by Chari et al (2009) and Fair (2012). More generally, what is more ad hoc (in the first sense of the term) than the propensity of those who construct microfounded macroeconomic models to endlessly modify the arguments found in objective functions and/or the constraints to which decision makers are subject in order to explain new phenomena? Notice, however, that there is nothing necessarily wrong with any of this. As Amable et al (1997, p.254) remark, what is striking about *both* meanings of the term ad hoc that are stated above is that “what is at stake is less the quality of the [construct] *per se* than the quality of [its] formulation”. But as the same authors go on to argue, more attention should be paid to the *relevance* of modelling constructs and to the consequent contribution they make to our understanding of how economies work. These considerations are more important than the precise manner in which these constructs are

introduced.

ii) What about the Lucas critique?

According to Lucas (1976), an important problem with aggregate structural models is that they are subject to parametric instability in the event of policy intervention. A change in policy may result in behavioural change that will alter the parameters of an aggregate structural model, so that the results of the policy differ from those predicted by the model. The solution involves resorting to microfounded models based on “deep parameters” that are immune to the sort of parametric instability described above. Have these time-worn arguments been overlooked in this paper, and do they negate at a stroke the case for ASMM that has been constructed so far?

The answer to this question is no. First, as noted by Hoover (2009), Lucas’s identification of deep parameters with the attributes of individuals (such as their preferences) is ideological. Deep parameters, if they existed at all, might just as well be sought amidst social structure. Even if the thrust of the Lucas critique is accepted, then, there is no reason to suppose that it rules out ASMM *per se* (rather than just specific models based on aggregate structural and behavioural relations that happen not to be based on deep parameters). Second, a more far-reaching criticism of Lucas’s position is to suggest that, as originally stated, the Lucas critique is insufficiently general, because deep parameters *do not exist*. This will be the case if, for example, social systems are open rather than closed systems.³¹ Absent deep parameters, the Lucas critique will apply to *any* model constructed at *any* level of aggregation. It therefore stands to reason that the Lucas critique cannot be used to reject one class of models (based on ASMM) if it applies

³¹ On the generalisation of the Lucas critique along these lines, see Lawson (1995).

equally to *all* models.

In sum, the arguments made in this paper in favour of ASMM are not negated by the Lucas critique.

6. Conclusion

The purpose of this paper has been to establish the continued vitality of aggregate structural macroeconomic modelling (ASMM) as an approach to macroeconomic analysis. The chief contention of the paper is that, beyond the pragmatic defences of ASMM associated with Solow (1994), Romer (1996) and Krugman (2000), ASMM can be justified as either necessary or sufficient for the prosecution of successful macroeconomic analysis by appeal to first principles associated with well-established bodies of social theory.

We are only left to reflect on where this conclusion leads given the current state of macroeconomics. We would draw attention to two points. The first concerns the opportunity cost of devoting additional research resources to the dominant microfoundations project. This opportunity cost is clearly non-zero if, contrary to the claims of many who defend the microfoundations project, ASMM is a viable and justifiable alternative. The substance of this first point is only reinforced if, the discipline having already devoted substantial resources to the dominant project, it is plausible to argue that any additional resources devoted to it are likely to be subject to diminishing marginal returns. Second, we contend that diversity is healthy in macroeconomic research as it is more generally. According to research in complexity science, groups of diverse problem solvers outperform groups of (non-diverse) high-ability problem solvers (see, for example, Hong and Page, 2001; 2004). If we can draw an analogy between

understanding how the economy works and solving a complex multidimensional problem, then this research suggests it is better to encourage diverse approaches to macroeconomics than to focus exclusively on any one approach.³² Ultimately, then, the purpose of this essay is not to advocate the replacement of one monolith with another. Instead, our contention is simply that, having established that ASMM is justified in principle, it should be properly accommodated within the firmament of modern macroeconomic research.

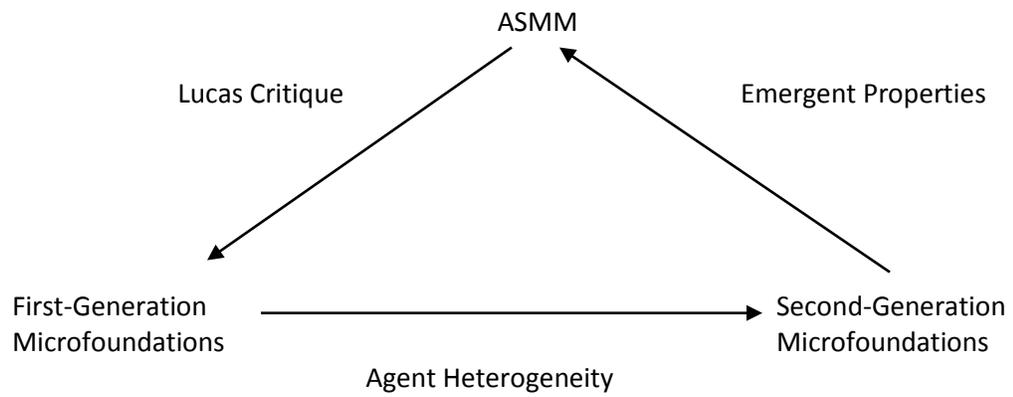
Appendix: Emergent Properties and the Return of ASMM

Figure A.1 below suggests an interpretation of the evolution of macroeconomics since its inception. According to this interpretation, both the first- and second-generation microfoundations projects can be seen as developments that arose from critiques of the previously dominant paradigm in macroeconomic research. The Lucas critique spurred the original microfoundations project, while emphasis on the importance of heterogeneous agents and their interaction (together with various “frictions” including incomplete markets, incomplete information, and bounded rationality) gave rise to the second generation microfoundations project. But the “discovery” of emergent properties in the agent-based models of the latter provides a clear path back towards the ASMM approach characteristic of macroeconomic theorizing at its inception. In this sense, macroeconomics comes “full circle” in its quest for an

³² In his Congressional testimony, Page (2010) makes exactly this argument: “the economy is complex, not in some loose metaphorical way, but according to formal scientific definitions of complexity. As a result, we’re never going to predict its future with much accuracy. Our best approach will be to encourage the creation of diverse models” (Page, 2010, p.2).

appropriate methodology.³³

Figure A.1: The evolution of macroeconomics



³³ The reader is referred to the discussion in section 5(ii) of the paper for reasons as to why the continued relevance of the Lucas critique does not invalidate this conclusion.

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