Institute for New Economic Thinking

Working Papers
ineteconomics.org/workingpapers

Cordon of Conformity: Why DSGE models Are *Not* the Future of Macroeconomics

Servaas Storm*

Working Paper No. 148

February 14th, 2021

ABSTRACT

The *Rebuilding Macroeconomic Theory Project*, led by David Vines and Samuel Wills (2020), is an important, albeit long overdue, initiative to rethink a failing mainstream macroeconomics. Professors Vines and Wills, who must be congratulated for stepping up to the challenge of trying to make mainstream macroeconomics relevant again, call for a *new multiple-equilibrium and diverse* (MEADE) paradigm for macroeconomics. Their idea is to start with simple models, ideally two-dimensional sketches, that explain mechanisms that can cause multiple equilibria. These mechanisms should then be incorporated into larger DSGE models in a new, multiple-equilibrium synthesis – to see how the fundamental pieces of the economy fit together, subject to it being 'properly micro-founded'. This paper argues that the MEADE paradigm is bound to fail, because it maintains the DSGE model as the unifying framework at the center of macroeconomic analysis. The paper reviews 10 fundamental weaknesses inherent in DSGE models which make these models

* Delft University of Technology. Support from INET and comments from Thomas Ferguson are gratefully acknowledged.

irreparably useless for macroeconomic policy analysis. Mainstream macroeconomics must put DSGE models, once and for all, in the *Museum of Implausible Economic Models* – and learn important lessons from non-DSGE macroeconomic approaches.

https://doi.org/10.36687/inetwp148

JEL codes: E20; E60; F60; O10; O40.

Key words: New Keynesian DSGE models; rational expectations; micro-foundations; loanable funds model; Lucas critique; multiple equilibria; income distribution; demand-led growth; money and monetary production economy.

Introduction

Macroeconomics is in decade-long existential crisis. After the hubris of August 2008 ("The state of macro is good", Blanchard 2008) came the downfall: the financial crisis erupting in September 2008 that mainstream macroeconomists failed to predict. It is clear to most that macroeconomics needs a major rethink, but the actual response of mainstream macroeconomists has been to defend the accepted paradigm: some version of the New Keynesian Dynamic Stochastic General Equilibrium (DSGE) model. Mainstream macroeconomists have been building publication CV's and professional careers, trying to make the flawed DSGE model more realistic by adding ever more, and cleverer, frictions and imperfections in labor and financial markets and tinkering with (temporary errors in) expectations. The result has been a Ptolemaic proliferation of DSGE models with each model 'explaining' the massive financial crash, and the slow recovery after the crisis, in terms of one, often tiny, idiosyncratic, and ad-hoc market friction and/or expectational shock. Each one of the multitude of explanations on offer beggars belief and borders on the teleological — a competent DSGE practitioner can produce a DSGE model that proves anything at all about the world. Most DSGE analyses are, therefore, in spirit, similar to Rudyard Kipling's (1902) "*Just So Stories*" – stories which relate how the camel got his hump, how the kangaroo got its powerful hind legs, long tail and hopping gait, and so on.

The result is that DSGE models are not driving the thinking of anyone in the private sector. Banks and big corporations do not 'do' DSGE modeling, but instead continue to rely on traditional Tinbergen-Klein-type macro-econometric modeling. True, economists in central banks including the Federal Reserve, do operate DSGE models, but don't be fooled: this is mostly done for highbrow make-believe. When it comes to actual monetary policy-making, the Fed staff falls back on the FRB/US model, which is in essence an updated traditional model. Likewise, the CBO and the Council of Economic Advisors use traditional models for both forecasting and policy analysis.

Milton Friedman famously argued that a theory should be judged on its ability to predict, not the realism of its assumptions. DSGE models fail Friedman's test, because, with a lot of work, they are successful only in predicting what has already happened. But Friedman was wrong: model assumptions matter – *but only to economists*. "After 1968 the restored communist regime required all Czech rock musicians to sit a written exam in Marxism Leninism", writes Niall Ferguson (2012, p. 248). In macroeconomics, the *Politburo of Correct Macroeconomic Thinking* requires all Respectable Macroeconomists to frame their argument within the straightjacket of a DSGE model. Those who don't, cannot be a member of the club.

Recognizing this deeply unsatisfactory state of macroeconomics, David Vines and Samuel Wills called for a more drastic reform of modern macro. They brought together a group of critical mainstream macroeconomists to explore the limitations and problems inherent in DSGE models and to consider future pathways for a more relevant macroeconomics. Professors Vines and Wills call their effort the 'Rebuilding Macroeconomic Theory" project, with a second collection of papers coming out of this project recently published in the Oxford Review of Economic Policy 2020, volume 36 (3).

The two editors have to be admired for sticking out their necks and for arguing that macroeconomics needs a paradigm shift. They propose "a new multiple-equilibrium and diverse

(MEADE) paradigm (in honor of Professor James Meade) as the future of macroeconomics. The way forward for macro, in their opinion, is "to start with simple models, ideally two-dimensional sketches, that explain mechanisms that can cause multiple equilibria. *These mechanisms should then be incorporated into larger DSGE models in a new, multiple-equilibrium synthesis*. All of this will need to be informed by closer fidelity to the data, drawing on lessons obtained from detailed work on policy models' (*italics added*).

The proposal of using smaller models designed to focus on particular aspects of the macroeconomy looks like a positive development toward a more pluralistic macroeconomics. This impression is strengthened by the fact that Vines and Wills (2020) recommend that DSGE models be downgraded from core models to mere 'toy' models, the use of which is "to allow model builders to take a quick first pass at important questions." But there is more to the picture than meets the eye. As Professor Sheila Dow (2021) points out, the goal of the "Rebuilding Macroeconomic Theory" project remains to arrive at a DSGE model synthesis informed by evidence from policy models. Dow rightly doubts that it will be possible to integrate key mechanisms of smaller structural models with DSGE models, because DSGE modelers privilege internal consistency over ontological consistency. Accordingly, Dow concludes that the "formal DSGE model remains central to analysis rather than one of many contributions to a broader analysis." This is key. Why? Because for as long as mainstream macroeconomists remain unwilling to bury the failed DSGE approach, mainstream macroeconomics will remain doomed to irrelevance, incapable of tackling real societal problems.

Professors Vines and Wills are in right in removing DSGE models from their pedestal, but they are wrong by keeping the same model approach at the center of macroeconomic analysis. I argue instead that, paraphrasing Lance Taylor and Nelson Barbosa Filho (2021), the macroeconomics profession has to put DSGE models, once and for all, in the *Museum of Implausible Economic Models*. To help the visitors to this museum understand why DSGE models occupy such a central place in its Main Exhibition Hall, this article revisits the fundamental weaknesses inherent in DSGE models which make these models irreparably useless for macroeconomic policy analysis. Below I detail ten (inter-related) irremediable flaws. Each flaw is fatal on its own. Taken together, they constitute an unbearable pomposity that is asphyxiating modern macroeconomics.

Fallacy #1: The heart of any macro-model must be the trade-off between consuming now versus consuming in future

Medieval peasant farmers, unable to obtain credit from their feudal lords, faced a trade-off between consuming all their produce this year versus putting aside a share as seed stock for next year's harvest. This medieval logic matches the neoclassical belief in the virtue of thrift and Weber's Protestant Ethic, which both emphasize austerity, belt-tightening, savings and 'delayed gratification' as the worldly path to bliss. The problem is that this logic is outdated. In today's *monetary production economies* (Keynes 1933), households and firms do not face this constraint, because they can borrow from commercial banks, capable of creating new money to finance additional spending. And given the reality of unemployment, the idea that inter-temporal trade-offs are the essence of economic decision making is simply ridiculous.

What a commercial bank does, is to accept an individual debt (the loan) and substitute in lieu thereof the bank's own obligation. That is, the individual borrower has simply substituted the bank's obligation of more general acceptability for his own obligation of limited acceptability. This corresponds to Hyman Minsky's (1986, p. 256) observation that "the fundamental banking activity is accepting, that is, guaranteeing that some party is creditworthy." Accordingly, today's households and firms are not in the same position as the medieval peasant farmer – and do not have to 'save' first to be able to consume in future. This is what we call progress: credit allows us to expand our productive capacity and capabilities, without any tightening of the belts, provided banks act like Schumpeterian 'ephors' which have "either replaced private capitalists or become their agent; [the banker] has himself become the capitalist par excellence. He stands between those who wish to form new combinations and the possessors of productive means" (Schumpeter 1934, p. 74). [*Disclaimer: This does not imply commercial banks can lend limitlessly; they can't, because they do face constraints, but that is another story. The point is simply that available savings deposits are not a constraint on lending by money-creating commercial banks; see Jakab and Kumhoff (2015); Taylor (2016); Storm (2017b); Galbraith (2020).*]

In DSGE models, agents are supposed to optimize their life-time utility, subject to an inter-temporal budget constraint, by choosing (depending upon their time preference and the interest rate) how much to consume today and how much to save (in the form of bonds) in order to consume tomorrow. While this might be an appropriate way to model the decision-making process of the representative medieval peasant if they had had bonds as a savings option, the inter-temporal trade-off is bogus for agents 'populating' our monetary production economies.

Fallacy #2: Macro-models must include 'rational expectations'

The assumption of 'rational expectations' is a mathematical trick which allows the modeler to solve the inter-temporal optimization problem of model agents with *forward-looking* (inflation) expectations. The trick is to assume that (1) the model agents know the 'true economic model', its parameters and the nature of the stochastic processes that govern its evolution over time; and (2) the model outcomes that are being forecast do not differ systematically or persistently from the equilibrium growth path of the model. By implication, model agents (endowed with model-consistent expectations) do not make systematic errors when predicting the future.

It follows that the 'rational expectations' assumption will be wrong if, in reality, (1) model agents disagree on, or do not know, the 'true economic model'; (2) the 'true economic model' is – sadly – not the 'true economic model' with the result that actual outcomes do systematically differ from what the model predicts; and (3) conditions (1) and (2) hold true simultaneously. I would argue that condition (3) holds true. For a start, how could 'agents populating the economy' agree or know the 'true model' when 'freshwater' and 'saltwater' DSGE practitioners themselves do not agree on which ad-hoc frictions, if any, to include or not? What is the 'true macro model' when DSGE modelers and builders of (alternative) non-DSGE models cannot agree?

For example, even 'saltwater' U.S. macroeconomists disagree on the required size and shape of President Biden's COVID19 relief package. Lawrence Summers, in an op-ed in the Washington

Post, argues that the proposed $1.9 trillion COVID relief package is three times larger than the hole it needs to fill and ominously warns about "inflationary pressures of a kind we have not seen in a generation." Summers received support on this position from Olivier Blanchard. On the other hand, Paul Krugman (2021) and Jared Bernstein argue that Summers is "flat out wrong". Both support Biden's proposed relief package. If members of the tribe of 'saltwater' economics cannot agree amongst themselves, why would Trump Republicans and Coastal Democrats agree on the 'true' model of the U.S. economy?

Or consider the second condition. It is known that not one single DSGE model predicted the financial crisis of 2008 beforehand. However, the failure is more general. ECB economists Michal Andrle, Jan Brůha and Serhat Solmaz (2017) provide a categorical critique of DSGE models and conclude that "the current vintage of DSGE models lacks a dominant demand shock that would explain the business cycle dynamics. This is no ado about nothing—most [DSGE] models fail to coherently explain up to 80% of key macroeconomic variables." As Paul Krugman (2016) writes, "Were there any interesting predictions from DSGE models that were validated by events? If there were, I'm not aware of it. Yet even while failing to offer any measurable gains in insight, DSGE had the effect of crowding out the stuff that actually did work." This is the problem, indeed.

Since real-life outcomes deviate systematically from the predicted equilibrium path, we must conclude that DSGE models are wrong and hence, their agents believe in an incorrect model. This has been acknowledged, albeit implicitly, by the fact that post-2008, DSGE model builders started to frantically add novel financial-intermediation frictions (the interest rate at the zero-lower bound) to their DSGE's in order to 'predict' what had already happened. This is 'back-casting' rather than forecasting – and it does not enhance confidence in the forward-looking abilities of DSGE models and its builders.

'Rational expectations' have another – incurable – shortcoming: they are not rational at all. Why? The reason for this 'dirty little secret' is as follows. Rational expectations ignore known unknowns (*i.e.* possible outcomes to which one cannot attach a probability value of their occurrence) and deals only with known (subjective) risks. After all, inter-temporal optimization is possible only when DSGE agents have a complete probability distribution for every possible future state of the world – as in a complete (Arrow-Debreu) general equilibrium system of present and future markets. This means that the future is known (in a probabilistic sense) as well as 'closed' (since all possible future states have been described). DSGE agents behave 'rationally' by optimally adapting to the already given future.

But it is not rational at all for agents to ignore known unknowns and fundamental uncertainty. Doing so is stupid and knowingly doing so is worse – as is tragically illustrated by the unpreparedness to the sudden, but not unexpected, arrival of SARS-Cov-2. Ignoring uncertainty also means that one cannot explain the dialectical role of money in the conditional stability of the macroeconomy (Crotty 1994) or the extreme liquidity preference of the super-rich and the big corporations which is currently crippling economic progress (Storm 2018).

Worse, these irrational agents, miraculously endowed with 'rational expectations', are automatons, similar to the dumb, mechanical *Digesting Ducks* of Jacques de Vaucanson, that - apart from quacking and flapping their wings - gave the false illusion of eating and defecating. These

automatons populating DSGE models can never be creative, doing new things or doing things that are already being done in a new way (Schumpeter 1947). They are a poor description of human beings – as William Ernest Henley's (1888) famous words elude them:

> "It matters not how strait the gate,
> how charged with punishments the scroll,
> I am the master of my fate,
> I am the captain of my soul."

[*Disclaimer: I am not arguing here that we have to return to adaptive expectations. Forward-looking behavior is important. It's just not model-consistent 'rational expectations'.*]

Fallacy #3: There is nothing wrong with the loanable funds market

The truth is: the loanable funds market is a false description of how the financial sector works. I have belabored this point myself (Storm 2017b), and so have Lance Taylor (2016) and James Galbraith (2020). Echoing Keynes, BoE economists Zoltan Jakab and Michael Kumhoff (2015) reject the loanable-funds approach in favor of a model with money-creating banks; their comparative analysis shows that banks and bank financing have much bigger macroeconomic impacts when one recognizes that banks are money-creating institutions. The point is that causality is turned upside-down in a monetary economy. Banks *pre-finance* investment; investment creates incomes; people save out of their incomes; and at the end of the day, ex-post savings equal investment. This is what Jakab and Kumhoff (2015) write:

> "Furthermore, if the loan is for physical investment purposes, this new lending and money is what triggers investment and therefore, by the national accounts identity of saving and investment (for closed economies), saving. Saving is therefore a consequence, not a cause, of such lending. *Saving does not finance investment, financing does*. To argue otherwise confuses the respective macroeconomic roles of resources saving) and debt-based money (financing)." (*italics* added)

In reality, credit-funded investment 'determines' savings, rather than the other way around as in DSGE models. And since investment depends on (expected) demand, while being rather insensitive to the real interest rate, it is aggregate demand which is driving growth. This is consistent with Andrle, Brůha and Solmaz (2017) who document great regularities in business cycle co-movements of key macroeconomic variables across multiple economies, which can be largely explained by a single source of variation, namely changes in aggregate demand.

Fallacy #4: Macro-models need micro-foundations

Macro-models allegedly need micro-foundations to ensure that these models satisfy the Lucas Critique. Macro-models should be based on 'deep' or 'structural' parameters which reflect the fundamental, unchanging rules of individual behavior and hence, do not change when macro policy

changes. Doing so would guarantee that such micro-founded macro-models can be used not just for forecasting, but also for 'policy-conditional' forecasts, *i.e.* robust predictions of the effects of macroeconomic policies. In contrast, macro-models that lack adequate micro-foundations, are held to be useless, because these are unable to generate Lucas-robust predictions.

If we assume, for the moment, that Lucas-robust models can be built (but see fallacy #5), the question is: how do we unearth and model the fundamental rules of individual behavior? In DSGE models, 'micro-foundations' are just assumed to consist of individual (inter-temporal) optimization under conditions of risk, but (importantly, as we saw above) in the absence of uncertainty. These axiomatic 'micro-foundations' are taken to be so self-evidently true, that they do not need to be justified. This is quite remarkable, because from the Sonnenschein-Mantel-Debreu (SMD) theorem we know that it is not possible to derive the characteristics of the aggregate market demand curve on the basis of individual rationality. "SMD theory means that assumptions guaranteeing good behavior at the microeconomic level do not carry over to the aggregate level or to qualitative features of the equilibrium," concludes S. Abu Turab Rizvi (2006, p. 230). Referring to the SMD theorem, Kenneth Arrow (1986) stated that the hypothesis of individual rationality had few implications at the aggregate level.

DSGE micro-foundations are not just theoretically problematic. They also definitely do not describe actual individual behavior, as is evident from the fact that 'micro-founded' DSGE models fail to coherently explain up to 80% of key macroeconomic variables (Andrle, Brůha and Solmaz 2017). Hence, the micro-founded DSG models are wrong, because they do not have the 'right' micro-foundations.

Let me illustrate this exact point using a recent paper coming out of the European central banking system (Burriel *et al*. 2020). It is written by one economist of the Banco de España, two ECB economists and two economists of the Bundesbank. It uses three 'state-of-the-art' DSGE models (used by the Banco de España, the ECB and Bundesbank, respectively) to evaluate the medium-run risk of sovereign default, when public debt is high (due to the rescue programs to offset the SARS-CoV-2 recession). In these models, whenever the debt level rises above the fiscal limit, a sovereign default will occur. This is how it works in these models:

> ´The fiscal limit is assumed to depend on *the economy's Laffer curve*, which arises from distortionary taxes and constrains the government's ability to service its debt. If the tax rate is on the "slippery" side of the Laffer curve, then the government is unable to raise more tax revenue through higher tax rates" – which then causes default. (*italics added*.)

The Laffer curve is named after Arthur Laffer, who claimed that if taxes are too high, people will lose the incentive to work and therefore tax revenue will actually decrease. The Laffer curve is one of the flimsiest ideas in economics – there is simply no credible evidence to support Laffer's claim. But the Laffer curve is a political idea, strongly favored and kept alive by conservatives, to justify tax cuts for the rich. An overwhelming majority of economists rejects the idea. An IGM survey of economists (of June 26, 2012) found that not a single economic expert on its panel agreed that a tax cut will increase revenue. Weighted by each expert's confidence, 96% of the panel strongly disagrees or disagrees with Laffer's claim. As David Autor says: "Not aware of any evidence in recent history where tax cuts actually raise revenue. Sorry, Laffer." And Austan Golsbee writes:

"Moon landing was real. Evolution exists. Tax cuts lose revenue. The research has shown this a thousand times. Enough already."

So, what we have here are three perfectly *micro-founded* DSGE models, used by Banco de España, the ECB and Bundesbank, which are supposedly Lucas-robust (see fallacy #5), in which an *unfounded* and *zombie* relationship between tax rates and tax revenues constitutes the key model mechanism to assess the sustainability of SARS-CoV-2 public debts in the Eurozone. This sort of nonsense constitutes a deliberate, conscious attempt by central bank economists to use their DSGE models for ideological story-telling. The model outcomes, of course, indicate that high debts are 'bad', because 'taxes' have to be raised to repay them – but tax revenue cannot be raised because of the Laffer-effects, and hence, governments default. These conclusions are fully predetermined by the model assumptions. No large-scale official models are needed to tell this story. At least Laffer was not hiding behind the scientism of DSGE models, as he (as rumor has it) sketched out the idea on a cocktail napkin.

Let me return to the issue of micro-foundations. There is no theoretical or empirical reason to regard the axioms preferred by DSGE modelers as representing a higher order of truth than any alternative set of (non-optimizing) micro-foundations which may be observationally equivalent, or even superior, in aggregate terms. Let us suppose that there is a variety of particular micro-foundations which would lead to the observed aggregate macro relationships From this, we can conclude, following Simon Wren-Lewis (2012), that the macro model is "robust to alternative micro-foundations. In these circumstances," Wren-Lewis continues, "it would seem sensible to go straight to the aggregate model, and ignore micro-foundations." I concur: if the macro model is robust to alternative micro-foundations, why waste time going through yet another derivation of Euler's equation, with all its special conditions (see Robinson 1934)?

The 'micro-foundations' approach is not just utterly reductionist, but also partial, because it is blind to the fact that the rules of individual behavior are influenced by what happens at the aggregate – macro – level. For example, econometric findings on U.S. business investment by IMF economists Kopp, Leigh, Mursula and Tambunlertchai (2019, p. 4) show that there "appears to be little unexplained component of business investment beyond the expected demand effect. Other factors, such as reductions in the cost of capital, thus appear to have played a relatively minor role." Demand, to be clear, is a macro variable – and business' *expectations* of future demand are socially constructed, and often dependent on conventions.

Here is one further reason to reject standard DSGE micro-behavior: it is unable to meaningfully deal with money in an uncertain world. As John Maynard Keynes, channeled by James Crotty (1994), explains, the demand for liquidity is not based on optimization, but on necessity (the transactions demand for money), insurance (the precautionary demand for money) and speculation (the speculative demand for money). The speculative demand for money is socially determined – because it depends on the 'confidence' with which financial investors hold their expectations to inform their own decision-making. This 'confidence', in turn, depends on what Keynes called conventions, including falling back on general opinion, because "worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally" (Keynes 1936, Chapter 12, p. 158). This is another macro variable (general opinion) driving micro behavior. Note

that in a 'rational-expectations DSGE world' (in which all future states are known in a probabilistic sense), there is no reason for agents to hold on to large precautionary and speculative cash balances – as is done by the superrich and the big corporations in our times. Either the extreme liquidity preference of the superrich and the big firms is irrational (which looks a bit of a stretch), or the rational-expectations hypothesis holds no water (we're back to fallacy #3). [*Disclaimer: The super-rich and the big firms do not invest the cash in the real economy, because they understand that there is a shortage of aggregate demand. They use the cash to speculate, which is rational from their selfish individual point of view, but it is disastrous for the macro-economy. See Storm 2018; Taylor 2020.*]

Fallacy #5: Macro-models must pass the Lucas critique

The Lucas critique targeted Keynesian macro-econometric models (such as the Klein-Goldberger model) that used fixed behavioral parameters, such as the marginal propensity to consume or the parameters of the Phillips-curve. Lucas argued that the estimated 'macro' parameter values of these models are unstable and may change with shifts in policy regime, because they depend on the economic policy pursued during the estimation period – and by implication, such macro-econometric models are useless for counter-factual policy analysis. Lucas' point is, in fundamental ways, much ado about almost nothing.

A first way to interpret the Lucas critique is to see it as a *positive statement* concerning model application (Goutsmedt, Pinzon-Fuchs, Renault and Sergi 2016; Sergi 2016) – that is, as a critique of macro models used for out-of-sample counter-factual analysis. Lucas' *positive* point was by no means a new one. Macro-econometricians such as Ragnar Frisch (1938) Jakob Marschak (1953), Jan Tinbergen (1956) and Lawrence Klein (1985) had already explicitly recognized the problem of producing 'policy-consistent' expertise for policy-makers through econometric modeling. All cautioned against drawing out policy conclusions when it could be reasonably expected that policy changes would cause changes in the structural model relationships. But Marschak, Tinbergen and Klein were also agreed that very few changes in policy-making are capable of changing the macro relationships included in their models. Econometricians including Sims (1982), Sagan and Hendry (1992) and Ericsson and Irons (1995) conclude, after empirically investigating the policy-instability of model parameters, that the scope of the Lucas critique is very narrow indeed: the impact of changes in policy regime on model parameters is mostly negligible and traditional macro-econometric models still perform well for policy evaluation (see Sergi 2016; Hendry and Muellbauer 2018). In an ironical twist, micro-founded DSGE models are found to fail the self-imposed Lucas-test. For instance, Estrella and Fuhrer (2003) provide evidence that some DSGE models, based on optimization and rational expectations, may be less stable in the face of monetary regime shifts than their better-fitting backward-looking macro-econometric counterparts. Hurtado (2014) shows that most of the parameters in the benchmark DSGE model of Smets and Wouters (2005), including those characterizing preferences and technologies, are actually not stable across time.

The alternative is to interpret the Lucas critique not in a positive, but in a *prescriptive manner* (Goutsmedt, Pinzon-Fuchs, Renault and Sergi 2016). In this interpretation, the Lucas critique

represents a 'purist' methodological norm and a theoretical absolute: "no policy evaluations without deep parameters!" With ideology triumphing over common sense, micro-founded DSGE models are claimed to be Lucas-robust. The extreme 'purist' position is well expressed by Christiano, Eichenbaum and Trabandt (2017) who write: "The *only* place that we can do experiments is in dynamic stochastic general equilibrium (DSGE) models", adding that people "who don't like dynamic stochastic general equilibrium (DSGE) models are *dilettantes*. By this we mean they aren't serious about policy analysis." (*italics added*). Using a standard rhetorical trick, Kehoe *et al*. (2018, p. 164) add: "[Macroeconomists] agree that a disciplined debate rests on communication in the language of dynamic general equilibrium theory", while Chari (2010, p. 32) adds insult to injury, stating: "If you have an interesting and a coherent story to tell, you can do so within a DSGE model. If you cannot, it is probably incoherent." Chari forgets to mention that one can also tell a lot of uninteresting and incoherent stories within a DSGE model.

But these specific claims do not logically follow from the general critique. The reasoning used is tautological:

Premise 1: Lucas-robust models feature deep model parameters which are invariant to changes in policy regime.

Premise 2: Only macro-models which are Lucas-robust, are useful.

Premise 3: Let us assume that the parameters of DSGE models are deep parameters.

Therefore: DSGE models are Lucas-robust and useful.

The conclusion is, to say the least, not very surprising. It is also wrong, because premise 3 is incorrect: the parameters of micro-founded DSGE models are not deep enough, because DSGE preference and technology parameter estimates are found to be unstable in the face of changes in policy regime.

This failure has strengthened efforts to identify even deeper and/or more 'micro-foundations' for DSGE models, but these efforts are pointless – driving macroeconomics further down a dead-end street. In reality, the estimated model parameters of economic systems are continuously changing and evolving and, as Boulding (1981) argued with deep insight, one "cannot predict the future without changing it." This is the crux of the matter: Lucas-robust models do not exist, because – for reasons of performativity and reflexivity – individual rules of behavior may change in response to a change in policy regime. Human beings are, as far as I know, not mechanical robots, closed algorithms or *Digesting Ducks*.

The bottom line is that it is not rational to insist that macro-models must be Lucas-robust. Is this a problem? No, not at all: the impact of changes in policy regime on parameters is generally negligible and traditional macro-econometric models still perform well for econometric policy evaluation. What is needed, is an awareness that practitioners must be cautious drawing out policy conclusions when it could be reasonably expected that the estimated coefficients will be upset by policy change. Therefore, for all practical purposes, we can ignore the Lucas critique – and get on building relevant macro models, rather than continue to use the critique as "a cross you are supposed to use to hold off vampires: Just waving it at an opponent defeats him" (Lucas 2012).

Macroeconomics can only progress, after it has given the Lucas critique its proper place – in the *Museum of Impractical Economic Critiques*.

Fallacy #6: Macro-models don't need to include money in a meaningful way

Wrong again. As argued above, our economies are monetary production economies and money matters, as I argued under fallacy #2 and fallacy #4. Money disappeared from macroeconomics during the 1990s and early 2000s with the development of DSGE models. In the past decade, DSGE modelers have tried to bring money into their models by introducing a fractional reserve banking system, financial frictions, liquidity constraints or a housing sector. But these additions resemble adding further epicycles to the flawed Ptolemean model. For instance, having an exogenous-money based fractional reserve banking system in the model means that DSGE households are no longer 'savings-constrained', but rather 'credit-constrained'. This means, in turn, that the choice how much to consume today versus how much to save in order to consume tomorrow, is no longer relevant – because households can borrow, for instance, to invest in education, which gives them a higher income in future, out of which the loan can be repaid while living standards are raised.

These ad-hoc amendments may or may not capture credit-market imperfections at the micro-level (in *Just-So* fashion), but they certainly fail to capture the macro-economic role of money. To illustrate this point, consider the past 10 years. Growth of the real economy was slow and highly inegalitarian – after taxes and transfers, the top-20% richest U.S. households claimed 51% of the increase in U.S. real GDP during 1979-2017 (calculated based on CBO data). Empirical evidence shows that savings rates are higher for the higher-income classes (Taylor 2020). As a result, by raising savings, higher income inequality in an already slow growing economy reduces demand growth and output growth even further. Crucially, the higher savings by the rich were not invested in the (stagnating) real economy, but stored, as liquidity (cash pools), in the shadow banking system (Storm 2018). The excessive liquidity preference of the rich (and big corporations) is caused not by any ad-hoc change in their preferences to hold cash, but by the economic stagnation itself. The rich wealth-holders are unwilling to invest in the real economy and to hold real assets (or claims on real assets), exactly because the real economy is stagnating. Instead, they hire money managing firms to speculate on asset-price movements (not yields) in financial markets, while safeguarding their cash (via over-night collateralized lending via the repo market). Money is making it possible for the super-rich to have their cake and it eat – and it is the defining feature of our time, extreme liquidity preference, which DSGE models cannot incorporate or explain, because of their core assumptions.

Fallacy #7: DSGE models can safely ignore the impacts of distribution on growth

The canonical New-Keynesian DSGE model belongs to the class of representative-agent models. These models are called RANK DSGE's: 'representative-agent New Keynesian'. The representative agent is both worker and employer, consumer as well as producer, and depositor and

banker, and may be infinitely lived or, like Zeus, capable of giving birth out of the skull to a next-generation representative agent. This agent, helped by being endowed with the superpower of having 'perfect foresight' on average, solves all co-ordination problems, which could possibly haunt the macro-economic system in real life, in her/his/its mind, not unlike the authoritarian central planner in a centrally-planned economy. Finding the social (which is also the private) optimum may still be mathematically daunting, but the task is greatly simplified by dodging the central macro-economic challenge: how to co-ordinate decentralized economic decision-making in an uncertain and unstable world. The DSGE model thus resembles Hamlet without the Prince of Denmark.

RANK DSGE's fell from grace following the financial crisis of 2008, when real-world income and wealth inequalities became too large to ignore – as real people in real economies began to protest against footing the bills of the unconditional and generous bailing, by governments, of big banks and big financialized corporations, the bad behavior of which had led to the crisis in the first place. Popular anger grew further and (right-wing) populist politicians began to make electoral headway, as the high inequality (and insufficient demand) led to a sick and slow recovery from the crisis of 2008. The canonical DSGE had to be tweaked and twisted so as to create room for at least a second agent (in Two-Agent-New-Keynesian (TANK) DSGE models) or more agents (in Heterogenous-Agents-New-Keynesian (HANK) DSGE's).

Unfortunately, these tweaks and twists create practical trouble for model builders. The biggest problem of HANK models is that "solving for the equilibria requires the use of nontrivial computational techniques, given the need to keep track of the distribution of wealth, and the hurdles arising from the presence of occasionally binding borrowing constraints. The reliance on numerical techniques for the analysis of those models often presents a challenge when it comes to understanding the mechanisms underlying some of the findings, and may thus limit their use in the classroom or as an input in policy institutions" (Debortoli and Galí 2017). In non-DSGE speak, this means that HANK DSGE models are pretty useless, but that people who manage to solve them must be pretty smart.

These TANK and HANK DSGE models can – at most – tell *stories* about how monetary policy decisions may affect inequality and why the poor stay poor and the rich get rich – as in Leonard Cohen's song "*Everybody knows*":

> "Everybody knows that the dice are loaded
> Everybody rolls with their fingers crossed
> Everybody knows the war is over
> Everybody knows the good guys lost
> Everybody knows the fight was fixed
> The poor stay poor, the rich get rich
> That's how it goes
> Everybody knows"

Generally, it is assumed that one of the agents is for some unspecified reason credit- or cash-constrained, due to which this agent cannot adjust his/her/its consumption in response to changes

in interest rates or variables other than current income. *Oh, irony of ironies*, the attentive reader will understand that this is nothing less than the return of the much-maligned Keynesian assumption of a fixed marginal propensity to consume! Higher consumption inequality (euphemistically called 'consumption heterogeneity') complicates the task of central banks, because stabilizing inflation may further increase inequality. Adding nominal rigidities and labor market frictions into the mix, TANK and HANK DSGE's may even be able to generate 'endogenous unemployment risk'.

These examples illustrate the profoundly paradoxical, if not tragic, nature of RANK, TANK and HANK DSGE modeling. The more the optimizing 'core' of a DSGE model is kept intact, the more ad-hoc tweaks, twists and wedges have to be incorporated in the 'toy' model if the model has to generate outcomes with a minimal semblance of reality. DSGE practitioners are consigned, like Sisyphus, to an eternity of useless efforts, tweaks, and unending frustration – they are constantly behind the curve and mostly only going through the motions. Luckily, and unlike Sisyphus who had to labor in the Underworld, those who persevere in tweaking TANK and HANK DSGEs are lavishly rewarded in the form of publications in *Very Respectable Journals* and by academic prestige in this world. They just cannot reliably predict very much.

The distributional *Just So stories* told by DSGE modelers are also one-sided: they consider only the impact of exogenous shocks ('meteorites hitting the earth') on (consumption or wealth) inequality, but cannot – by their construction – analyze the impact of (rising) inequality on economic growth. Ignoring the role of (income and wealth) inequality, *as cause*, in the financial crisis, in the poor recovery and in the secular stagnation of economic growth makes RANK, TANK and HANK DSGE models irrelevant to understanding our current economic plight and to policy advice – as I elaborate under fallacy #9.

Fallacy #8: Multiple equilibria are a big step toward greater 'realism'

In the MEADE paradigm, DSGE models should be rethought so that these models can generate several different self-reinforcing equilibria instead of one unique equilibrium path, around which the economy fluctuates. Martin Sandbu (2021), writing in *The Financial Times* (January 28, 2021), calls this proposal 'revolutionary', because he thinks that multiple-equilibria DSGEs will transform forecasting and policy advice. Instead of forecasting one single 'central tendency', multiple-equilibria DSGEs will generate scenarios presenting multiple "central" outcomes, and enable "a discussion of the factors that could bring the economy to one or other equilibrium. Such a change would do wonders for an informed economic policy debate." As for policy advice, Sandbu continues,

> "a focus on multiple equilibria is transformative. The standard model, smooth and self-rectifying as it is, invites economists to see their role as identifying marginal policy changes to improve trade-offs, speed up the pace at which the economy returns to its natural equilibrium, and even nudge that equilibrium itself to a slightly better place. Once we acknowledge multiple equilibria, and that the economy can jump from a good to a bad state or vice versa, it becomes clear that by far the most important policy question is equilibrium

selection: how to get the economy out of a self-reinforcing bad state, or prevent disruptions that tip it out of a good state."

Sandbu recognizes that this is something economists are not well-equipped to advise on. But his claim that multiple-equilibria DSGEs would do wonders for an informed economic policy debate must be taken with not just one, but a few pinches of salt.

Firstly, adding more complexity to a flawed model will not improve the model. Borrowing a concept from computer science, if one further complicates a model, such as the DSGE model, that is already fundamentally flawed and unrealistic, then the GIGO principle applies: '*garbage in, garbage out*'. There is simply no reason why 'more complexity' would mean 'better suited' for forecasting or policy advice.

Secondly, Sandbu's conclusion that by far the most important policy question is equilibrium selection, appears to be at odds with the logic of rational expectations, which is deeply entrenched in DSGE modeling. Agents endowed with rational expectations know the 'true' model. If the 'true' model features multiple equilibria, agents will know this by assumption. Since these agents are capable of distinguishing a bad state from a good state, they will immediately opt for the good state. Hence, the only ways in which to force the 'all-knowing' automatons populating the DSGE universe to settle in a bad state (rather than a good state), in response to some exogenous shock, is by (*a*) imposing external constraints, such as borrowing restrictions, on their actions; (*b*) introducing market imperfections such as asymmetric information; or (*c*) forcing them to make (temporary) expectational errors.

All three options are ad-hoc solutions which are inconsistent with DSGE logic. For instance, if option (*b*) is taken seriously, the assumption of rational expectations must be dropped from the model. Likewise, if option (*c*) is taken seriously, we have the curious situation that private agents are myopic (choosing the bad state), whereas the state is omniscient and knows how to bring the economy from the bad state to the good state. Even option (*a*) is inconsistent: if omniscient agents (including banks) know the true model, why would banks impose these (borrowing) constraints on other agents, as they understand that there is a good equilibrium (with fewer defaults) which is superior to the bad equilibrium (with more defaults)?

Finally, incorporating relevant macro mechanisms within the rigid micro-founded structure of a DSGE model is impossible, as argued by Dow (2021), because most of these mechanisms are inconsistent with the axiomatic micro-foundations of this model. But don't worry. One does not need 'perfect foresight' to know what will happen: never mind the inconsistencies, DSGE practitioners will think of new ad-hoc tweaks and squeezes to force their models to produce the desired ('bad', 'better', 'best') multiple equilibria. Hundreds of macro-PhD theses will be written doing this, careers will be built, hundreds of journal articles on these tweaks will be published in Very Respectable Journals, prizes and awards will be bestowed on the most distinguished of these innovations, and after a decade or two and one or two non-trivial macro-economic crises, it will finally dawn on the profession that it was a *cul-de-sac* from the start. History will repeat itself, because in two decades we will hear similar critiques of DSGE modeling as we did hear ten years ago, such as the one by Willem Buiter that all the work on 'state-of-the-art' macroeconomic modeling is "a privately and socially costly waste of time and resources", by Gregory Mankiw that

"the work of the past several decades looks like an unfortunate wrong turn", or by Robert Solow that "I do not think that the currently popular DSGE models pass the smell test." But hey, nothing learned, but also nothing lost – and the Band of Respectable Macroeconomists will (again) move on to greener pastures.

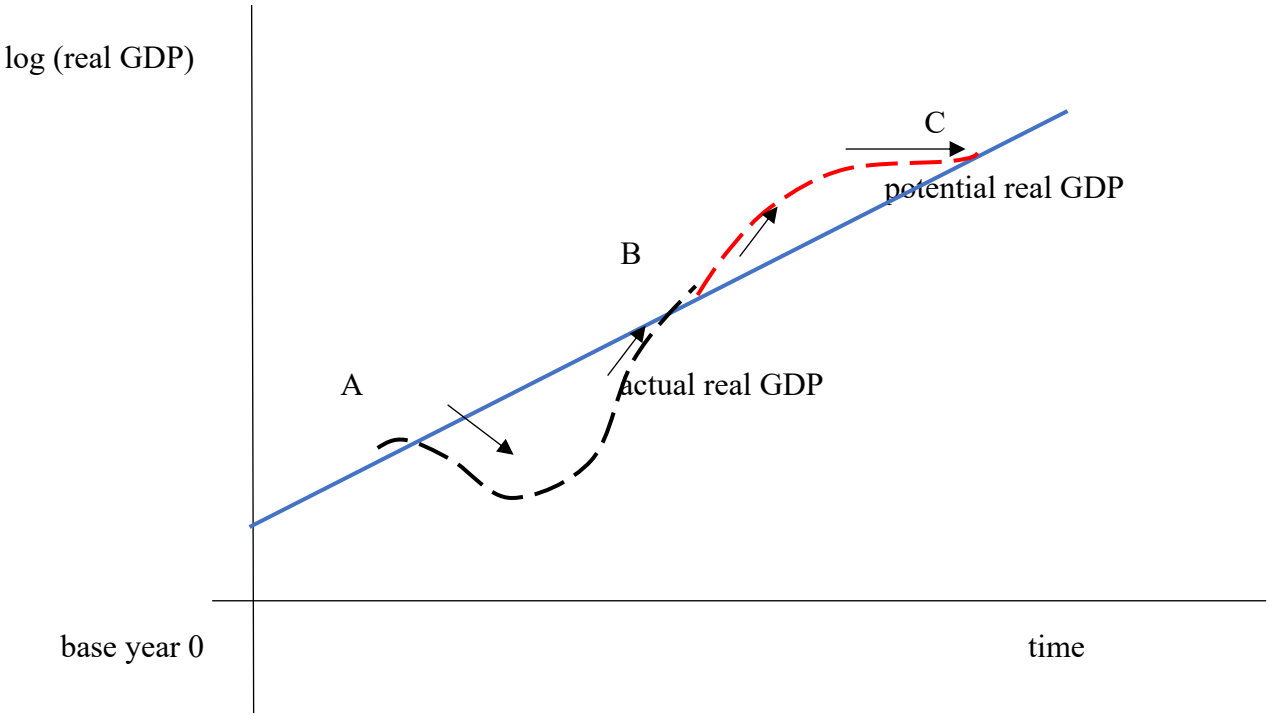
Fallacy #9: The back-bone of any macro-model is the dichotomy between a demand-determined short run and a supply-determined long run

The DSGE economy is – by assumption – a stable system that always returns to its equilibrium (or potential) growth path after a random disturbance. This is illustrated by Figure 1. Actual real GDP is growing along the curve for potential real GDP. At time A, the economy is hit by a negative economic shock and actual GDP drops below potential GDP. Actual unemployment increases, exceeding equilibrium unemployment. As a result, wage growth goes down and inflation declines, allowing the central bank to lower the interest rate. The lower interest rate raises consumption and investment, and actual GDP will start to increase, converging back to potential GDP around time B. The story is analogous for a positive shock to real GDP, as is illustrated by the dashed red line between points B and C in Figure 1.

In the DSGE narrative, actual GDP can deviate from potential GDP in the short run, but is predestined to return to potential in the long run. Potential growth is assumed to remain unperturbed by the short-run fluctuations in actual growth. Potential (or trend) growth itself is assumed to depend on exogenous supply-side factors (Storm 2017a), notably the growth of the labor force ('*demographics*') and the growth of Total Factor Productivity (TFP) ('*technology*'). Neither labor force growth nor TFP growth are affected by demand slumps during recessions or demand booms during the boom phase of the business cycle.

The dichotomy between demand-determined short-run fluctuations and supply-determined long-run growth has two major implications. First, monetary policy can only help to return actual output to its long-run potential, but does not affect potential growth itself. (Note that fiscal policy is of no use even in the DSGE short run, because of the Ricardian equivalence between financing government expenditures through taxes or debts. Agents — equipped with rational expectations — understand that in the non-monetary economy in which they find themselves, when fiscal stimulus is financed by debt, the debt must be repaid with interest in future. They will increase savings now in order to be able to pay the higher taxes in the future, thus leaving total expenditures unchanged.) Second, changes in aggregate demand, caused by changes in income distribution, cannot and do not affect potential growth. Income distribution does simply not matter for long-run growth.

Figure 1
Potential growth and actual growth: the DSGE model



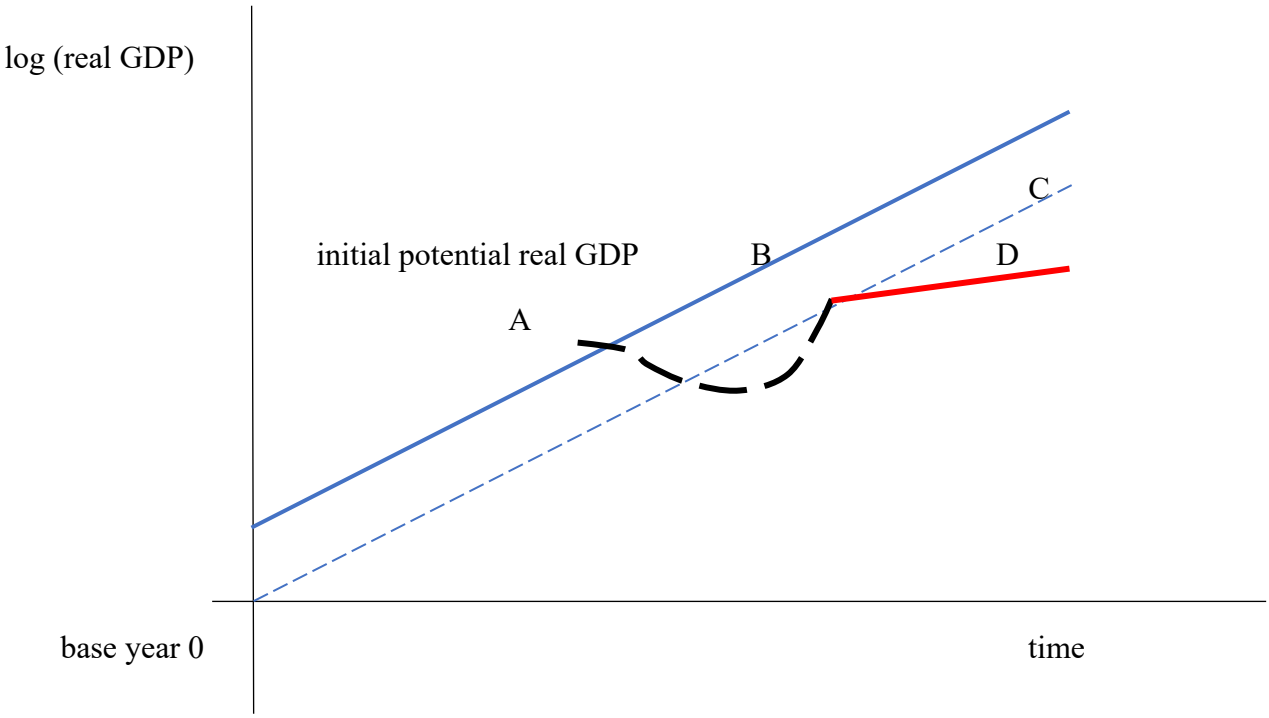
This view of business cycles and long-run growth is so strongly entrenched in the belief system of most macroeconomists that so far the empirical evidence showing that short-run recessions do impact the long-run trend has been placed in the category of *freak events* under the label 'hysteresis'. But the cumulative body of evidence showing 'hysteresis' in macro-economic performance has steadily grown over time, especially following the crisis of 2008, and has now become so large that treating it as a freak event involves a substantial amount of cognitive dissonance on the part of the economics profession.

Hence, it is becoming increasingly clear that the DSGE narrative of Figure 1 is wrong. What actually happens is illustrated in Figure 2. At time A, the economy is hit by a negative shock and actual output goes down. The central bank lowers the interest rate (as actual unemployment rises above equilibrium unemployment) and actual output starts to recover. But the recovery process is weak and actual output does not bounce back to the original potential-growth curve. Instead, the economy may return to growing at the original potential growth rate, but at a permanently lower level of GDP, which is illustrated by the line BC. This outcome is called 'hysteresis'. A worse outcome is that the economy settles at a lower rate of potential growth than before; in this scenario (given by the line BD), the economy is permanently growing slower at a lower permanently lower level of GDP. This outcome has been called 'super-hysteresis'. Blanchard, Cerutti and Summers (2015), Girardi, Paternesi Meloni and Stirati (2020), Fontanari, Palumbo and Salvatori (2020) and Kiefer, Mendieta-Muñoz, Rada and von Arnim (2020) all present empirical evidence that such patterns of hysteresis and super-hysteresis are the rule, not the exception, in OECD countries including the U.S.

These observable patterns of (super-)hysteresis have one or more of the following causes (Storm 2017a; Storm 2019; Taylor 2020):

- cuts in government spending (*i.e.* austerity) reduce demand and slow down growth. The rate of capacity utilization in the economy goes down as a result, reducing the profit rate for businesses. Business investment stalls, which further lowers growth. But stagnating or declining business investment also reduces productivity growth, because the pace at which the economy's capital stock gets modernized goes down. (After all, investment means that new capital goods, embodying the latest technologies, are installed.) Lower productivity growth, in turn, reduces potential growth (as in Figure 2).
- due to rising inequality, aggregate demand goes down (because as the higher-saving rich receive a greater share of the economic pie, the national rate of savings goes up; the rich do not invest their savings in the real economy, but in financial markets.) Capacity utilization goes down, bringing down the profit rate as well. Business investment slows – and as above, productivity growth and potential growth will be hurt.
- higher interest rates (to bring the inflation rate down to its target) lower business investment – and the same causal chain as above starts to operate, with the declining potential growth as the end result.

Figure 2
Permanent impact on potential real GDP of lower demand



Two conclusions follow.

The implication is that the neat dichotomy between demand-determined short-run fluctuations and structural supply-driven long-run potential growth is false. There is ample evidence which shows

that short-run fluctuations have *permanent* impacts on long-run trend growth. And there are sound theoretical reasons why short-run fluctuations carry over into permanently lower or higher potential growth. Macro-models need to take these patterns of (super-)hysteresis, and their underlying causes, seriously.

But DSGE models cannot do this in a meaningful manner, because of their rigid supply-determined micro-foundations. For me, this failure puts the nail in the coffin of DSGE modeling.

Fallacy #10: There is only one (acceptable) over-arching general model of the macroeconomic system – and it is the DSGE model

Sorry, but wrong again. DSGE modelers believe – because that is what they do – that macroeconomics must be derived from microeconomics. By insisting that everything be reduced to 'deep decision rules' of the smallest element in the system (the individual), DSGE modelers try to mimic the research strategy of the natural sciences, but they are oblivious of the fact that the natural sciences have long given up on similar reductionism. As physics Nobel Laureate Philip Anderson (1972, p. 393) writes:

> The main fallacy in this kind of thinking is that the reductionist hypothesis does not by any means imply a 'constructionist' one*:* The ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe." (Quoted in Keen 2017).

Why is it impossible to reconstruct macro-outcomes from micro behavior? The answer is: for two obvious reasons.

First, higher-order outcomes cannot be directly extrapolated from lower-order individual behavior, because the higher-order outcomes are most strongly determined by the *interactions between individuals*, rather than by the aggregation of individual rules of behavior of single individuals considered in isolation. Macro-economic phenomena are, in the language of complex-systems theory, largely *emergent* (Keen 2017). Anwar Shaikh's (2016, Chapter 3) work on micro foundations and macro patterns illustrates the point: in his model, diversity in individual behavior gives rise to statistical distributions of outcomes whose averages are shaped by social and cultural structures. Shaikh derives the major empirical laws using this diversity in micro behavior without reference to any particular model of consumer behavior. Observed macro patterns do not depend on individual choices.

Second, much of individual decision-making is influenced, if not determined, by macro-economic factors – as I explained for the case of money and liquidity preference under fallacy #6. Hence, DSGE models are, by their assumptions, unsuited to function as an encompassing model of the macro-economy.

Does macro-economics need an encompassing theory or model? My answer is that even if it does, it would be futile to directly work on building the Grand Theory – because it may well be true that no such Theory of Everything exists. But if such an overarching theory does exist, it will be

'discovered' only by abandoning attempts to derive macroeconomics from the wrong end—that of the individual rather than the economy— and by proceeding from aggregate national accounting identities, which are true by definition, and then by disaggregating these statements to reflect the technological and institutional structures of the economy. We have to start at the level of the macroeconomy itself. For now, I think that Keynesian macroeconomics (not the Hicksian IS-LM model) comes closest to being the General Theory of macroeconomics.

The way forward

Macroeconomics can only progress if it gets rid of the DSGE albatross around its neck. It is as Joseph Stiglitz (2018, p. 76) argues: "… most of the core constituents of the DSGE model are flawed – sufficiently badly flawed that they do not provide even a good starting point for constructing a good macroeconomic model." This leaves no doubt that DSGE models are singularly unsuited to do what Vines and Wills want them to do, namely "to allow model builders to take a quick first pass at important questions." This is critical, because even while being close to useless itself, the hegemonic DSGE program is having the effect of crowding out alternative macro methodologies that actually do work, as was stressed by Paul Krugman. The sectarian intolerance of DSGE practitioners is well illustrated by the bullying of Christiano, Eichenbaum and Trabandt (2017), Kehoe *et al.* (2018) and Chari (2010).

Space has to be created within macroeconomics for the further development of relevant non-DSGE modeling approaches – and to create adequate space, approaches that do not pass Solow's smell test, should be discarded. It is also better to do it now than to wait for another 20 years, because the question is not whether but when DSGE modeling will be discarded. Even absent rational expectations, DSGE modeling is a story of a death foretold. Before proceeding to what I consider to be relevant alternative macro methodologies, let me emphasize that what is important is the setting up of intellectual space within which different – often conflicting – macro-economic understandings and methodologies can develop in critical exchanges and debates. Let me mention a few relevant alternative macro-economic methodologies. My list is by no means exhaustive.

First, Lance Taylor (2004, 2020) has developed a 'structuralist macro-economic approach', which integrates demand, income and wealth distribution, and production, at the level of income classes and major industries, in an open-economy model. Taylor's (2020) model (with Özlem Ömer) is based on slowly-changing structural – technological and institutional – coefficients, which are macro-founded rather than micro-founded. Consistency is assured because Taylor's structuralist model satisfies the national and social accounting matrix identities.

A second example concerns the 'structural macroeconomics' developed by the Cambridge Growth Project (CGP), led by Sir Richard Stone and Terry Barker. The resulting *Cambridge Multisectoral Dynamic Model of the British Economy* (Barker and Peterson 1987) is still highly relevant. The CGP model is a dynamic demand-driven system, which integrates industrial input-output identities with a stochastic behavioral description of economic agent activity in particular markets. Unlike in DSGE models, the behavior of agents is not submitted to any equilibrium rule. The model presupposes poor informational flows, and general oligopolistic and monopolistic behavior in the

markets of goods and services. The model is designed to analyze and forecast changes in economic growth and *in economic structure* over the medium and long term.

Next, Wynne Godley and Marc Lavoie (2007) propose stock-flow-consistent (SFC) macro-models which integrate the real economy and the financial economy in terms of their exchanges (the flows) and balance-sheet positions (the stocks). These models need no further introduction, as there is a large and productive literature on SFC modeling. Key examples of SFC models that have been successfully applied to forecasting and policy advice, are the SFC model of the U.S. economy of the Levy Institute (Nikiforos and Zezza 2017), the United Nations Global Policy Model, which is used to develop scenarios for the world economy and different regions; and the Dynamic Ecosystem-FINance-Economy (DEFINE) model developed by Yannis Dafermos and Maria Nikolaidi (2020), which is used to analyze the interactions between the global ecosystem (including the climate system), the financial system and the macroeconomy.

Steve Fazzari has done important work examining the links between macroeconomic activity and finance, particularly focusing on the financial determinants of corporate investment spending and on household income, demand and savings. Recently, he has developed (with Piero Ferri and Anna Maria Variato) a model of demand-led growth with endogenous adjustment of labor supply and productivity, an approach that reconciles Harrod's warranted rate of demand growth with supply (Fazzari, Ferri and Variato 2020). The model delivers a range of growth paths and unemployment rates rather than a single 'natural rate'.

Furthermore, Claudia Fontanari, Antonella Palumbo and Chiara Salvatori (2020) are doing innovative work modeling 'potential economic growth' and 'output gaps' as a function of actual (demand-determined) unemployment – using Okun's Law. Their approach is not just important to the measurement of potential growth per se, but also holds profound implications for macroeconomic policy-making, once their methodology is incorporated within larger – macro-econometric – frameworks.

And finally, stubborn macro-econometricians such as Ray C. Fair (2020) have continued to work on and improve their structural econometric models (SEMs). Fair's main claim is that SEMs, for whatever theoretical purity they may lack, produce far more trustworthy results than DSGE models. These models are capable of tracking historical macro performance much better than their DSGE counterparts and with considerably fewer ad-hoc tweaks and wedges.

These examples of already existing alternatives in macroeconomics, along with other approaches, need to be developed further if macroeconomics wants to become a force of progress and for the common good again. DSGE practitioners, who with a mixture of bluff and bluster act as gatekeeper, judge, jury and executioner in all macroeconomic matters, are a block on the road to progress. The roadblock has to be removed. The failed and failing DSGE modeling has to go.

References

Anderson, P.W. (1972) More is Different. *Science* 177 (4047): 393-396.

Andrle, M., J. Brůha and S. Solmaz (2017) On the Sources of Business Cycles: Implications for DSGE models. *ECB Working Paper Series No. 2058*. Frankfurt: ECB.

Arrow, K. J. (1986) Rationality of Self and Others in an Economic System. *Journal of Business* 59: S385–S399.

Barker, T. and W. Peterson (eds.) (1987) *The Cambridge Multisectoral Dynamic Model of the British Economy*. Cambridge: Cambridge University Press.

Blanchard, O.J. (2008) The State of Macro. *NBER Working Paper 14259*. Cambridge, MA: National Bureau of Economic Research.

Blanchard, O., E. Cerutti, and L. Summers (2015) Inflation and Activity: Two Explorations and Their Monetary Policy Implications. *NBER Working Paper No. 21726.* http://www.nber.org/papers/w21726

Boulding, K.E. (1981) *Evolutionary Economics*. Beverly Hills, CA: Sage.

Burriel, P., C. Checherita-Westphal, P. Jacquinot, M. Schön and N. Stähler (2020) Economic Consequences of High Public Debt: Evidence from Three Large Scale DSGE Models. Working Paper No. 2029. Madrid: Banco de España. https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosTrabajo/20/Files/dt2029e.pdf

Chari, V.V. (2010) Testimony. In *Building a Science of Economics for the Real World*. US House of Representatives, House Committee on Science and Technology, Subcommittee on Investigations and Oversight, June.

Christiano, L.J., M.S. Eichenbaum, and M. Trabandt (2017) On DSGE Models. https://faculty.wcas.northwestern.edu/~yona/research/DSGE.pdf

Cripps, F., A. Izurieta and A. Singh (2011) Global Imbalances, Under-consumption and Over-borrowing: The State of the World Economy and Future Policies. *Development and Change* 42 (1): 228-261.

Crotty, J. (1994) Are Keynesian Uncertainty and Macrotheory Compatible? Conventional Decision Making, Institutional Structures, and Conditional Stability in Keynesian Macromodels. https://pdfs.semanticscholar.org/4121/9943e52e6abd5bd57f9848e2803bd32e8d24.pdf

Dafermos, Y. and M. Nikolaidi (2020) Dynamic Ecosystem-FINance-Economy (DEFINE) model: Technical description and data. https://definemodel.files.wordpress.com/2020/07/define-1.1-technical-description-and-data-july-2020-1.pdf

Debortoli D. and J. Galí (2017) Monetary Policy with Heterogeneous Agents: Insights from TANK models. https://www.crei.cat/wp-content/uploads/2017/09/dg_tank_sep2017.pdf

Dow, S. (2021) The Future of Macroeconomics. https://www.ineteconomics.org/perspectives/blog/the-future-of-macroeconomics

Ericsson, N. R. and J.S. Irons (1995). The Lucas Critique in Practice: Theory without Measurement. International Finance Discussion Papers 506, Board of the Governors of the Federal Reserve System.

Estrella, A. and J.C. Fuhrer (2003). Monetary Policy Shifts and the Stability of Monetary Policy Models. *Review of Economics and Statistics* 85(1):94–104.

Fair, R.C. (2020) Some Important Macro Points. *Oxford Review of Economic Policy* 36 (3): 556–578.

Favero, C. and F.D. Hendry (1992). Testing the Lucas critique: A Review. *Econometric Reviews* 11 (3): 265–306.

Fazzari, S.M., P. Ferri and A.M. Variato (2020) Demand-led Growth and Accommodating Supply. *Cambridge Journal of Economics* 44 (3): 583–605.

Fontanari, C., A. Palumbo and C. Salvatori (2020) *Potential output in theory and practice: A revision and update of Okun's original method*. *Structural Change and Economic Dynamics*, 54, 247–266.

Galbraith, J. K. (2020) Reconsideration of Fiscal Policy: A Comment. https://www.ineteconomics.org/perspectives/blog/reconsideration-of-fiscal-policy-a-comment

Girardi, D., W. Paternesi Meloni and A. Stirati (2020) Reverse hysteresis? Persistent effects of autonomous demand expansions. *Cambridge Journal of Economics*, 44(4), 835–869.

Ferguson, N. (2012) *Civilization: The West and the Rest*. London: Penguin Books.

Frisch, R. (1938). Autonomy of Economic Relations. Statistical versus Theoretical Relations in Economic Macrodynamics. In Hendry, D. F. and M.S. Morgan (1995). *The Foundations of Econometric Analysis*. Cambridge University Press: Cambridge.

Goutsmedt, A., E. Pinzon-Fuchs, M. Renault & F. Sergi (2016) Criticizing the Lucas Critique: Macroeconometricians' Response to Robert Lucas. 2016. *halshs-01364814*.

Hendry, D. F. and J.N. Muellbauer (2018). The Future of Macroeconomics: Macro Theory and Models at the Bank of England. *Oxford Review of Economic Policy* 34 (1-2): 287–328.

Hurtado, S. (2014). DSGE models and the Lucas critique. *Economic Modeling* 44 (Supplement 1): S12 – S19.

Jakab, Z. and M. Kumhof. 2015. Banks are not intermediaries of loanable funds — and why this matters. *Working Paper No. 529*, London: Bank of England. https://jrc.princeton.edu/sites/jrc/files/jakab-kumhof-boewp529.pdf

Keen, S. (2017) *Can We Avoid Another Financial Crisis?* London: Polity Press.

Kehoe, P.J., V. Midrigan and E. Pastorino (2018) Evolution of Modern Business Cycle Models: Accounting for the Great Recession. *Journal of Economic Perspectives* 32 (1): 141-166.

Keynes, J.M. (1933) A Monetary Theory of Production. In G. Clausing (ed.) *Der Stand und die nächste Zukunft der Konjunkturforschung: Festschrift für Arthur Spiethoff*. Munich: Duncker & Humboldt, 123-125.

Keynes, J.M. (1936) *The General Theory of Employment, Interest and Money*. London: Macmillan.

Kiefer, D., I. Mendieta-Muñoz, C. Rada and R. von Arnim (2020) Secular Stagnation and Income Distribution Dynamics. *Review of Radical Political Economics* 52(2), 189–207.

Klein, L. R. (1985) *Did Mainstream Econometric Models Fail to Anticipate the Inflationary Surge*? Palgrave Macmillan UK, London, pp. 289–296.

Kopp, E., D. Leigh, S. Mursula and S. Tambunlertchai (2019) U.S. Investment since the Tax Cuts and Jobs Act of 2017. *IMF Working Paper No. WP/19/120*. Washington, DC: IMF.

Krugman, P. (2016) The State of Macro is Sad (Wonkish). *The New York Times*, August 12. https://krugman.blogs.nytimes.com/2016/08/12/the-state-of-macro-is-sad-wonkish/

Krugman, P. (2021) Stagflation Revisited: Did We Get the Whole Macro Story Wrong. https://paulkrugman.substack.com/p/stagflation-revisited

Lucas, R.E. (2012) Q&A: Robert Lucas on Modern Macroeconomics. https://www.economicdynamics.org/newsletter-nov-2012/

Marschak, J. (1953). Economic Measurement for Policy and Prediction. In W.C. Hood and T.G. Koopmans (eds.) *Studies in Econometric Method*, pages 1–26. *Cowles Commission Monograph* nr. 14. New York: Wiley.

Minsky, H.P. (1986) *Stabilizing An Unstable Economy*. Yale University Press.

Nikiforos, M. and G. Zezza (2017) Stock-flow Consistent Macroeconomic Models: A Survey. *Working Paper No. 891*. Levy Economics Institute of Bard College.

Rizvi, S.A.T. (2006) The Sonnenschein-Mantel-Debreu Results after Thirty Years. *History of Political Economy* 38 (annual suppl.): 228-245.

Robinson, J. (1934) Euler's Theorem and the Problem of Distribution. *The Economic Journal* 44 (175): 398-414.

Sandbu, M. (2021) The Revolutions Under Way in Macroeconomics. *The Financial Times*, January 28. https://www-ft-com.btpl.idm.oclc.org/content/5a92d0f1-e65f-4965-a685-bad83496e40f

Schumpeter, J.A. (1934) *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle*. Cambridge, MA: Harvard University Press.

Schumpeter, J. A. (1947). The Creative Response in Economic History. *Journal of Economic History*. **7** (2): 149–59. doi:10.1017/s0022050700054279.

Sergi, F. (2017) DSGE Models and the Lucas Critique. A Historical Appraisal. UWE Bristol *Economics Working Paper Series* 1806.

Shaikh, A. (2016) *Capitalism. Competition, Conflict, Crises.* Oxford: Oxford University Press.

Sims, C. (1982). Policy Analysis with Econometric Models. *Brookings Papers on Economic Activity* 1982 (1): 107–164.

Smets, F. and R. Wouters (2005). Comparing Shocks and Frictions in US and Euro Area Business Cycles: A Bayesian DSGE Approach. *Journal of Applied Econometrics* 20 (2): 161–183.

Stiglitz, J.E. (2018) Where Modern Macroeconomics Went Wrong. *Oxford Review of Economic Policy* 34 (1-2): 70-106.

Storm, S. (2017a) The New Normal: Demand, Secular Stagnation, and the Vanishing Middle Class. *International Journal of Political Economy*, 46 (4), 169–210.

Storm, S. (2017b) What Mainstream Economists Get Wrong about Secular Stagnation. Paper posted by the Institute for New Economic Thinking https://www.ineteconomics.org/perspectives/blog/what-mainstream-economists-get-wrong-about-secular-stagnation

Storm, S. (2018) Financialization and Economic Development: A Debate on the Social Efficiency of Modern Finance. *Development and Change*, 49 (2), 302–329.

Storm, S. (2019) The Secular Stagnation of Productivity Growth. *INET Working Paper No. 108*. Institute for New Economic Thinking. https://www.ineteconomics.org/uploads/papers/Storm-WP-108-The-Secular-Stagnation-of-Productivity-Growth.pdf

Summers, L.H. (2021) Biden's COVID stimulus is Big and Bold but It Risks Triggering Inflation. *The Washington Post*, February 4.

Taylor, L. (2004) *Reconstructing Macroeconomics: Structuralist Proposals and Critiques of the Mainstream*. Cambridge, MA: Harvard University Press.

Taylor, L. (2016) The "Natural" Interest Rate and Secular Stagnation: Loanable Funds Macro Models Don't Fit the Data. https://www.ineteconomics.org/uploads/papers/Loanable_Funds_Macro_Models_Taylor_120316.pdf

Taylor, L. (with Ö. Ömer) (2020) *Macroeconomic Inequality from Reagan to Trump. Market Power, Wage Repression, Asset Price Inflation, and Industrial Decline.* Cambridge University Press.

Taylor, L. and N.H. Barbosa-Filho (2021) Inflation? It's Import Prices and the Labor Share! *INET Working Paper 145*. New York: Institute for New Economic Thinking.

Tinbergen, J. (1956). E*conomic Policy: Principles and Design*. Amsterdam: North Holland.

Vines, D. and S. Wills (2020) The rebuilding macroeconomic theory project part II: multiple equilibria, toy models, and policy models in a new macroeconomic paradigm. *Oxford Review of Economic Policy* 36 (3): 427-497.

Wren-Lewis, S. (2012) Microfounded and other Useful Models. *MainlyMacro blog*. https://mainlymacro.blogspot.com/2012/03/microfounded-and-other-useful-models.html