

A paper to be presented on 10th April 2009 at the Cold War Politics and Social Science Workshop, Heyman Centre for the Humanities, Columbia University

PRISTINE EQUATIONS, TAINTED ECONOMICS AND THE POST-WAR ORDER

Or how the Cold War fashioned a formalist economics whose dominance remains inversely proportional to its explanatory power and functional to an irrational global order

by

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Abstract: Economics was in deep crisis well before the world economy buckled in 2008. Students had been turned off in droves by its relentless formalism; economists of renown were lambasting its irrelevance; and the informed public grew increasingly indifferent to the profession's intellectual output. And yet, a delicious paradox hovers over formalist economics: *The greater its theoretical failure the stronger its dominance*, both in the corridors of power and in academia. Tracing the history of this most peculiar failure to the early years of the Cold War, this paper tells a story of how the post-WW2 global design spawned a 'dance of axioms' which keeps economics both dominant and irrelevant. Its narrative on the evolution of Cold War economics is projected against the background of a particular account of the two phases of United States economic hegemony (1945-1971 and 1975 to date) and concludes with some thoughts on economic formalism's decisive contribution to the Crash of 2008.

Acknowledgments: This paper borrows many ideas that I developed jointly with Joseph Halevi (see Halevi and Varoufakis, 2003a&b). It has also benefitted from extensive discussions with George Krimpas, David Laibman. Joseph Halevi and Nicholas Theocarakis provided copious comments and suggestions. Property rights over all error and absurdity are retained by the author.

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1. Introduction

A tale of two equations in the post-WW2 order

Though equations are ill equipped to tell stories, this paper begins its speculative account of the post-WW2 order with two of them.

$$\vec{x}^* = \underbrace{\operatorname{argmax}}_{\vec{x}} \left[\prod_{i=1}^N U_i(x_i) \right]$$

$$\Pr(T_A < 1, T_B < 1) = \Phi_2[\Phi^{-1}(F_A(1)), \Phi^{-1}(F_B(1)), \gamma]$$

The first equation is due to mathematician John F. Nash Jr. It was the centrepiece of a brief paper published in 1950 by *Econometrica* and was largely responsible, forty four years later, for the Bank of Sweden's decision to bestow its Nobel Memorial Prize upon Nash. The second equation was created by David X. Li and appeared in 2000 in the relatively obscure *Journal of Fixed Income*. Li too is a mathematician and, until recently, his equation put him on the Bank of Sweden's unofficial roster of potential Nobel winners. Alas, this prospect now seems extremely remote as Li's equation has been blamed, not without good cause, for playing a vital role in the recent collapse of the global financial system.

This paper is not about equations. It is about the post-war global order and its interaction with the highest form of mainstream economics. Central to its thesis is the portrayal of the post-war period as comprising two distinct phases (1945 to the early 1970s and thereafter), each linked (at the level of theory, practice and ideology) with one of the two equations above. While both emerged as natural products of their time, with clear connections to work done prior to their inception, they nonetheless represent mathematical innovations which marked deep and immensely significant historical discontinuities.

Nash's equation surfaced shortly after United States policy makers had developed their grand plan for a new world order and the Cold War was gathering pace (see Section 2). The year was 1950 and US based economists fell roughly into two categories: (a) the *New Dealers* busily planning at a grand scale in Washington, excited by the possibilities before them for a new American Age, but also burdened by memories of the Great Depression and weighed down by the responsibility of designing global structures that would promote global effective demand (while immune to 1929-like shocks); and (b) the *Scientists*; a large number of engineering-minded mathematical economists who, having risen through the ranks of the wartime military-scientific establishment, were busily pursuing projects determined by the demands of the creeping Cold War. From 1945 to 1950 these two camps, though clearly at odds, seemed to carry on in isolation, cheerfully ignoring one another.

Common sense, at that time, might have predicted that these two groups would eventually clash for academic dominance, possibly along the lines of some version of the 'science vs humanities' dualism, of the sort that typified earlier intellectual contests (e.g. marginalism vs the German historical

school).¹ And yet this clash never came to pass. Instead, *both* strands lost out to a third strand of economics. The catalyst was (I contend in Section 3) Nash's little equation or, to be more precise, the method and the mathematics underpinning it. When Nash presented his short paper at a Cowles Commission Seminar in Chicago, he unwittingly put a juggernaut into motion. The calendar read 12th October 1950 and in the audience sat three mathematically trained economists (a Frenchman, a Dutchman and an American; all of whom eventually won their economics Nobel Prizes decades before Nash). Judging by the papers they wrote soon after, they ran with Nash's idea (without ever involving him in their research), abandoning in the process their own previous projects and methods for a new, exciting mantra: the so-called General Equilibrium approach to economic theory, whose structure owed everything to Nash's effort. It was the beginning of the comprehensive takeover of economics by mathematical formalism. At the cost of practical irrelevance, the Cold War's ideological demands backed an economics which, nevertheless, provided a solid foundation for a free market faith made of the highest form of mathematical abstraction.

Within a few short years (1954 to 1959), the General Equilibrium (GE hereafter) juggernaut had steamrolled over both hitherto prevailing economic approaches; that of the *New Dealers* and of the *Scientists*. By the end of the 1950s, the two types of economics that had seemed dominant in the forties were confined to the margins, cowed into intellectual subservience by the new type of mathematical, axiomatic, formalist economics; by GE-oriented economic theory. Over the next decades, formalist economics showed stupendous staying power, retaining its dominance to this day. Even after GE ran out of steam as a research program (sometime in the 1970s), it retained a role as the mainstream economists' legitimising narrative-of-last-resort. While only a small percentage of them possess simultaneously an interest in and/or an aptitude for GE, all mainstream economists turn to GE for solace and justification when pushed to reveal the analytical foundation of their belief system, hypotheses and models. From the diligent high school economics teacher, to the professorial staff at Ivy League departments, as well as to the standard mainstream economist working at the high echelons of some merchant bank, GE economics is an intellectual Siloam pool; the holy texts to which believers and practitioners alike are beholden.

What is quite astonishing is the sharp contrast between the stupendous staying power of GE-based formalist economics, unprecedented in the social sciences, and its negligible scientific value-added. Having made no contributions whatsoever to our understanding of real economies,² one might have expected it to recede, a victim of the evolutionary pressures which ought to catch up with degenerate research projects. In fact, a curiously different evolutionary mechanism seems to be at work: For this is an economics whose profound failure to enlighten us *viz.* the real economy only helps reinforce its dominance over the economics profession. How can this be?

The answer(s) to this question, I shall be arguing in Sections 4 and 5, operate at two quite distinct levels. First, at the level of theory, axiomatic,

¹ See Mirowski (1988,1989) for an illuminating account of the way in which physics-inspired marginalism came to dominate economic thinking at the end of the 19th century onwards.

² This paper will, in fact, be making the point that economic formalism's contribution in this regard has been distinctly negative.

formalist economics acquired a capacity to absorb all criticism and turn it into a source of strength. Section 4 refers to this ‘manoeuvre’ as the *Dance of the Axioms*: Whenever some real world observation (that the existing mathematics, by design, made no room for) was offered as a critique of the theory, one of the latter’s foundational meta-axioms was altered to accommodate the critic. But then, surreptitiously, and in a move to preserve the mathematics’ purity (and tractability), a suitable ‘tightening’ of another meta-axiom was performed. Invariably, this ‘tightening’ involved assumptions which fly in the face of reason and assume away, rather than explaining, the phenomenon under study. But since this was a flight hidden from public view by a wall of algebra (excepting a handful of theoretical insiders whose careers were built upon such abstract gymnastics), the criticism had been absorbed. Thus economic formalism not only became immune to criticism but, to boot, emerged more imposingly with every criticism that bounced off its gleaming, malleable, axiomatic shell.

The second level at which an explanation of the new economics’ staying power must be sought is that of global political economy. When President Nixon stunned the world on 15th August 1971 with the news that the dollar-gold convertibility was to cease, the post-war’s first phase had come to an end and a second radically different phase was beginning. Early on during that second phase, hegemonical political and economic power was re-configured on the back of an extraordinary reversal of global capital flows. Section 5 relates the story of how the US overcame its trade deficit by magnetising capital from abroad. Along with this reversal of capital migration came stagflation, the concerted attacks on the welfare state, the generation of a monstrous Third World Debt, the (re-) emergence of the (New) Right in politics (as well as in the social sciences, including political philosophy), etc. During that the new phase, a buttressed form of the economics shaped in the 1950s (and in reaction to Nash’s equation) rose as the dominant economic creed. Not only had Cold War-era economic formalism survived the end of Bretton Woods but, in fact, new life was breathed into its old equations through a mutually reinforcing relation with the neoconservative project and, of course, the rise and rise of financialisation.

While historians are understandably more interested in the real world effects of that era, and their continuing impact today, Section 5 returns the reader to the level of theory. It argues that the *New Classical Macroeconomics* of the 1970s³ was no more than a logical extension of Cold War-era formalism (as was the second equation above which, more recently, contributed copiously to the bubble whose bursting brought the global financial system down in 2008). In this account both the neoliberal turn of the late 1970s and the frenetic financialisation of the past decade are traceable to Nash’s little equation above. Indeed, the more we analyse the neoliberal economist’s models of the past thirty years the less *new* theory we find in them. The formalist tools of the 1950s were simply recycled, coming fully into their own after Bretton Woods passed away. With the *New Dealers* out of the picture, and with memories of 1929 fading, economic formalists (often unwittingly) provided the theoretical justification for sweeping away almost

³ Which provided the theoretical ammunition to the Reagan and Thatcher administrations, among many others.

every (Keynes-inspired) institutional constraint set up in the Great Depression's reformist aftermath. A good majority of academic economists even proclaimed the end of macroeconomics...

Meanwhile, a tsunami of European and Japanese capital (explained in Section 5) was gathering strength during the 1980s, rushing with a vengeance across both oceans and ending up in Wall Street. The financial sector quickly took up the challenge of cooking up new, outlandish schemes for handling the inflows. By 1990 the end of the Cold War amplified these flows as new capital extracted from the guts of the ex Soviets was added to the torrents already gushing in. While the rest of the world was experiencing a paradoxical combination of relative growth and underlying structural stagnation, and American wages remained stuck at their mid-1970s level, the Anglosaxon financial miracle was feasting on a surge of foreign capital and domestic profitability. And when China (and to a lesser degree India) joined in, intent on growing by lending the US the monies it needed to buy their products, the torrent of financial capital became a flood.

Thus, from the mid-1990s onwards, assisted by the demise of the last vestiges of 1930s-inspired regulation, the financial sector embarked on an unfettered quest for new 'products' that would commodify both the incoming capital as well as the home-grown mountains of profit and debt. All futures' contracts (from next year's oil output, to next month's GM income and, of course, sub-prime mortgages) were spliced into tiny little packets, bundled up in various combinations, laced with 'stochastic contingencies' and readied for a roaring new derivative trade. *Pricing the risks involved was the only impediment*. At least, that is, until David X. Li came up with the second equation above which offered an ingenious way of assigning a single price to each of these 'products'. It is arguable that without that equation (as well as the rating agencies that used it) the (by now infamous) toxic derivatives would have never been unleashed into the world of finance.

The trouble was that this equation, just like Nash's 1950 contribution, is a fine piece of mathematics founded on a deep disconnection with the real economy. But while Nash's equation only occasioned a formalism that acted at the level of ideology, Li's equation was pressed into manic service by countless well-remunerated technicians, overlooked by clueless bosses and regulators, each desperately lacking in the economics education that might have caused them to question Li's underlying axioms. Without a hint of a smidgeon of any doubt regarding the axiomatic basis for their actions, they used Li's abstraction so as to build up a financial behemoth of a market whose monetised value dwarfed that of the real global economy while, in the process, earning them untold fortunes. It took a few patterned defaults on subprime loans to expose the fragility and hubris of Li's equation before, tragically, bringing the financial sector to its knees and throwing the global economy into a vicious tailspin.

Section 6 completes this morality tale by posing a twofold question: Will economics be forced to return to the social scientific fold in response to the current crisis it helped cause? And if not, will the rest of the social sciences find the courage and ingenuity necessary to rein economists in?

2. A Grand Design for a Shattered World

The discursive economics behind the post-war global design (1945-1971)

The United States came out of WW2 as the major and, in fact, if one excludes Switzerland, the only creditor nation. For the first time since the rise of capitalism, all of the world's trade relied on a single currency and financed from a single epicentre. Recognising a remarkable opportunity at achieving unhindered dominance, especially in the context of the fledgling Cold War, American policy makers got down to work on the basis of pragmatic, discursive economic thinking.

Their brazen project soon acquired two aims: First, to end the dollar's monopoly as the world's single convertible currency. Burdened by memories of 1929, they feared it was an unhelpful monopoly because a world trade system relying on a single currency is inherently unstable and prone to major upheavals during the unsavoury parts of the business cycle. The Bretton Woods global monetary system, that Keynes was helping design, and which would formally endorse the dollar's primacy, required at least one more healthy currency to achieve minimal stability. Initially, they toyed with the idea of propping up the sterling and setting it up as a potential shock-absorber for the dollar-zone. However, with sterling's collapse in 1947, some radically different Plan B was in order.

The new plan involved a *tabula rasa* creation of two new monetary pillars for the dollar: one in Europe (the Deutschmark) and one in Japan (the Yen). The three main protagonists in this design were also the architects of the Cold War (see also Schaller, 1985): Secretary of Defence James Forrestal (previously Secretary of the Navy), Secretary of State James Byrnes, and, of course, the 'prophet' of Soviet containment, and director of Policy Planning Staff at the State Department, George Kennan. In their pragmatic view, American hegemony demanded generous augmentation of external sources of both effective demand and stability.⁴ Thus, they favoured the extension of credit to Europe and Japan with a view to enabling these zones to buy the requisite technology and energy products, fundamentally oil (see Rotter, 1987), as well as to attract and utilise (often) migrant labour.

The choice of Germany and Japan seemed entirely logical. Both countries had been rendered dependable (thanks to the overwhelming presence of the US military), both featured solid industrial bases (including oodles of human capital), and both offered considerable geo-strategic benefits *vis-à-vis* the USSR. Britain had to experience the Suez Canal trauma (and the undermining of its colonial rule in Cyprus by the CIA) before realising this turn in US thinking.⁵

⁴ There is ample evidence that US policy makers were well aware of the importance of generating high foreign effective demand for US output *by political means* since at least the last decade of the 19th century. See US State Department memorandum circa 1895, quoted in Zinn (1998), p.5.

⁵ It was at that point that successive British governments began clutching at straws; namely, the 'Special Relationship', which turned the UK into a minor executor of US policy in exchange for privileged access to the US market for British multinationals and the City of London.

Secondly, the creation of the two non-dollar currency zones was to be underpinned by political measures to ensure the parallel creation of free-trade areas within these zones so as to carve out crucial vital space for the real economies 'growing around' the new currencies. This strand of the Design developed quickly into what eventually became the European Union. However, with regard to Japan, Mao's victory threw a spanner in the works, denying the yen its vital economic space on the Chinese mainland – until it was too late (see Schaller, 1985, Forsberg, 2000). Mindful of the problem, successive US administrations attempted to make amends, even if it meant turning American and European markets over to Japanese interests.⁶ Significantly, the wars in Korea and Vietnam filled in the gap adequately by engendering an imperfect, yet still significant, zone within which Japanese trade found space to grow for at least forty years (see Rotter, 1987).

The post-war reconstruction of the capitalist world, once these two vital zones (Europe and Japan) had been set up, was based on the ability of the United States to extend credit and finance, partly through American multinationals, particularly to Europe and to Japan (Britain was an exception for reasons alluded to in a previous note). The main function of this generous credit policy was to allow Europe and Japan to overcome what was then termed the 'dollar shortage'; a problem that was not eliminated until the mid-1950s (see Halevi, 2001). At that point, the US realised that it was not enough to have 'stabilised' Europe⁷ and Japan.⁸

Having provided sufficient capital to these two zones for the purposes of purchasing necessary inputs,⁹ Washington felt the need to mobilise in order to guarantee low prices and a constant flow of such inputs (mainly energy and raw material) to these two zones. The loss of China, the trials and tribulations of Latin America, the liberation movements in south east Asia (against the French), the stirrings in Africa – all these developments enticed the US into developing an aggressive stance against liberation movements in the Third World which Washington soon came to identify with the threat of rising input prices for its allies.

In short, the US took it upon itself to relegate the periphery, and the Third World in toto, into the role of supplier of raw materials to Japan and Western Europe. In the process, American multi-nationals in energy and other mining activities counted themselves among the beneficiaries, as did many sectors of the US domestic economy. Indeed, domestic demand was kept up at a healthy level (particularly during the 1960s) through three large public expenditure programs, two of which were closely related to the Cold War: The ICBM program and the Vietnam War (the third being President Johnson's *Great Society*). Both strengthened US corporations connected to the military-industrial establishment and each contributed heftily to the development of the

⁶ A good example is Japan's application to join the Organization for Economic Co-operation and Development in 1964. Washington went out of its way to sign a dozen trilateral treaties allowing European countries greater access to U.S. markets—provided they waived the right to use GATT's clause thirty-five against Japan.

⁷ With the persecution of the Greek civil war, the appeasement of Franco and the Portuguese regimes, and the safeguarding of the iron curtain's impenetrability

⁸ Through a long and comprehensive occupation involving the writing of the country's new constitution.

⁹ Through the Marshall plan in Europe and war-financing during the Korean conflict in the case of Japan (see Hart-Landsberg, 1998).

Aeronautic-Computer-Electronics complex (ACE); an economic powerhouse largely divorced from the rest of the US economy (see Markusen and Yudken, 1992; Melman, 1997).

Despite the sizeable positive impact of the Grand Design on the domestic American economy, this may well have been a mere (however hugely desirable) *by-product* of Washington's *main policy*; namely, of the policy to prioritise energy and input supplies (at favourable prices) for the reconstruction and development of Europe and Japan. As Forsberg (2000) confirms, the United States did not hesitate to introduce harsh regulations that ultimately discriminated *against* American multinationals. Their top priority was not to benefit them directly but, rather, to integrate them into a global plan whose priority was the augmentation of the deutschmark and the yen through the reinforcement of German and Japanese industry.

Clearly, such bold policies must have had some theory behind them. What was it? One answer which suggests itself readily is that the Grand Design was the work of individuals belonging to a generation who had experienced the Great Depression first hand and were determined to ensure that global effective demand was managed rationally and in a manner that transcended simplistic monetary and fiscal policy tinkering. What makes the story fascinating is the combination of their sophisticated, discursive Keynesianism, their audacious initiatives, and the interaction of their economic planning with the demands of the Cold War.

While Cold Warriors in the Pentagon and elsewhere had their own agenda, Washington's economic planners approached the wars in Korea and Vietnam from a quite distinct perspective: At one level, they saw them as important in maintaining a continual supply of cheap raw materials to Europe and Japan. At another level, however, they recognised in them a great chance to bring into being, through war financing, the vital economic space that Mao had robbed 'their' Japan of. Arguably (see Rotter, 1987), the south east Asian 'tiger economies' (which were soon to become for Japan what France and Spain were to Germany) would never have emerged without these two US-financed wars, leaving the US as the only sizeable market for Japanese industrial output.

The post-war order, in this account, far from being the spontaneous outcome of free markets performing their miracle, was heavily planned by policy makers steeped in a pragmatic Keynesianism, raised in (or around) the wastelands of the Depression, and trained to plan at a grand scale during the heady days of the War Economy. Meanwhile, a wholly different kind of economics was evolving right under their noses: in the seminar rooms of the Cold War linked institutions whose aim was to harness, the military-scientific establishment that had proven so helpful to the United States during WW2.

3. Formalism's Unexpected Triumph

How a new mathematical formalism expunged from economics the discipline's New Dealers and the Cold War's scientists

3.1 The New Dealers

The Great Depression shattered the economists' certainties and rendered their (hitherto dominant) Newtonian view of capitalism insupportable. The idea, which had prevailed until 1929 in the respected US departments, of an harmonious market system where self interest provided the gravitational field guaranteeing equilibrium and, supra-intentionally, serving the public interest, had gone down the tubes, along with people's savings, stock values, prices, wages etc. The grapes of wrath had taken their toll not only on the multitude's life prospects but also on formalist, neoclassical (or marginalist) economics. The notion that a drop in interest rates would revive investment, and the diminution of wages would restore employment, had disintegrated in the face of cold, hard reality.

In that climate, Keynes' influence on the New Dealers, who were summoned to tackle the Depression, was inevitable. He was, after all, the one who had warned the world about the consequences of the Versailles Treaty; ridiculed the conventional economic wisdom (according to which 1929 was impossible); and outlined a 'model' of macroeconomic management in which the state, rather than appearing as the markets' foe, comes to their rescue when they stumble and fall. While Roosevelt's policy makers were struggling to apply Keynes' ideas, the younger and more academically minded amongst the New Dealers immersed themselves in his *General Theory*.

A good example is a spontaneous reading group formed just before the war by three Rockefeller Fellows at Harvard. They were John Kenneth Galbraith, Robert Marjolin and Paul Samuelson. Galbraith was to spend the war as Roosevelt's 'price czar', determining the price of all major commodities; Marjolin was to become initially Jean Monnet's deputy at the French *Commissariat au Plan* and then the first Secretary of the *Organisation of European Economic Co-operation* (the OECD's precursor) whose ambit was, at first, the management of the Marshall Plan and, later, the co-ordination of the political efforts to forge that which is known now as the European Union; Samuelson was the first ever non-Scandinavian economics Nobel winner and the author of the most famous economics post-war textbook of all time.¹⁰

While these three were scrutinising Keynes' magnum opus, other Harvard contemporaries were busily drafting policy papers. Paul Sweezy, for instance, was already publishing papers on particular aspects of the crisis, prognosticating new trials and tribulations for American capitalism. Most New Dealers had been hoping that the post-Depression recovery would feed on itself until full employment was restored. Alas, it was not to be. The sharp recession of 1937 violated such hopes as unemployment leapt once more from 14% to 19%. Both Sweezy and his mentor, Joseph Schumpeter, were

¹⁰ Samuelson is the odd one out in this group. His 'espousal' of Keynes was of the 'more honoured in the breach than in the observance' type. See below for a partial account of Samuelson's role in emptying economics of useful content.

exercised by the new crisis. In 1938 Alvin Hansen, then the most prominent Keynesian economics professor at Harvard, published his *An Economic Program for American Democracy*.¹¹

In that climate of heightened intellectual activity, both Schumpeter and Sweezy, put forward different explanations of capitalism's tendency toward stagnation; Schumpeter's explanation focused on the system's political constraints while Sweezy's Marxist take concentrated on the contradictions embodied in capitalist economic development.¹² Clearly, for anyone interested in debates regarding the response of the New Deal generation to the challenges of the Depression and its aftermath, Harvard was the focal point and Keynesianism, laced with doses of Schumpeter and Marx, was the mind-frame.

The war added new urgency and layers to these men's thinking. Some of them went straight into public service as planners, analysts etc. Galbraith, as mentioned above, became the fixer of all major relative prices in the US War Economy. Sweezy joined the army in the fall of 1942 and was assigned to the Office of Strategic Services (the CIA's precursor), serving under his former Harvard professor and colleague Edward Mason. He was soon to be dispatched to London to join the Research and Analysis program of the OSS there, under economist, Chandler Morse, with a view to keep an eye on British economic policy on behalf of the US government. In this context, he was meeting regularly with James Meade (another famous economist with the British economic warfare agency).

By that stage, it was clear to all that WW2 would lead to a major re-organisation of global capitalism, in which the US would claim a leading role. The young New Dealers were destined for significant roles in this Grand Design. Indeed, the politicians and policy makers above them, whose hands were on the levers of real power, were practical men for whom the peace ought to be planned just as meticulously as the war had been. They themselves had felt the Depression in their bones and were marked for life by it. They had joined the Roosevelt administration with a clear commitment to economic planning whose aim was to guide markets to socially desirable outcomes. That sentiment combined marvelously with the later experience of running a fully planned war economy to produce a mindset ripe for the demands and challenges of the post-war era.

Take for instance the architects of the post-war Grand Design: James Byrnes, who was to become the Secretary of State behind the Marshall Plan, had risen within the law profession the hard way (without even receiving a law degree) and was exasperated by the demise of many of his peers after 1929.¹³ His visionary position on the Marshall Plan, including his insistence

¹¹ Paul Sweezy and his wife, Maxine Yapple Sweezy, were among the authors and signatories.

¹² Many years later Samuelson recalled "the interchange of wit, the neat parrying and thrust, and all made the more pleasurable by the obvious affection that the two men had for each other despite the polar opposition of their views." Galbraith too was to refer to Sweezy as 'a dominant voice' in the debates on stagnation and the future of capitalism of the 1930s.

¹³ In his 1936 electoral campaign he said: "I admit I am a New Dealer, and if [the New Deal] takes money from the few who have controlled the country and gives it back to the average man, I am going to Washington to help the President work for the people of South Carolina and the country."

that the Europeans must put forward specific developmental plans for their own backyards, was directly caused by his conviction that planned capitalism was the only alternative to catastrophe. James Forrestal, despite having personally weathered the storm rather well (making CEO at *Dillon Read* by 1938), repeatedly explained how the Depression had turned him into a passionate New Dealer. His wartime experience of running, and planning for, the Navy was crucial to his post-war contribution to the Grand Design (see Section 2). Finally, George Kennan, whose rise to prominence is credited to the longest telegram in history,¹⁴ became another strong advocate of direct US investment in Europe's and Japan's industries because of a combination of (a) his experience of the Depression (and its stubborn resistance of market solutions), (b) a careful study of the war economies of the Soviet Union, Germany and the US, and (c) a deep appreciation of the importance of European economic development for the US.

In summary, the US came out of the war with New Deal policy makers at the helm whose plans for Peace coincided with those for winning the Cold War. These plans were founded on the sophisticated Keynesianism of prewar Harvard and on the practical Keynesianism which emerged through experience of running the War Economy, foreshadowing the post-war effort to manage effectively global demand and investment.

3.2 The Scientists

While the war economy was being planned at the top by Keynesians, a group of mathematicians-turned-scientists were busily solving practical problems on behalf of the military. One such scientist was a Dutchman named Tjalling Koopmans. Having embarked on a distinguished mathematics career at age 17, Koopmans penned a famous theorem in theoretical physics in 1934 (still referred to in the literature as the *Koopmans Theorem*) before completing his physics doctorate in 1936 at the University of Leiden. When WW2 broke out, Koopmans moved to the US where he was immediately employed by the US Air Force to write algorithms for allocating shipments between sources and destinations in a manner that minimized cost and delays. Koopmans based his work on a previous formulation by John von Neumann (the doyen of European mathematicians working closely together with the US military) and the practical solutions he offered were the beginning of what mathematicians today refer to as 'linear and dynamic programming'.

Soon after the war began, it now seems, a wartime US military-scientific establishment came into being, brimming with mathematicians and scientists whose technical skills were finding immediate applications. In addition to Koopmans, George Dantzig is another of many examples. Also employed by the US Air Force on linear programming projects, Dantzig later delivered the definitive method (called 'simplex') for planning the efficient

¹⁴ In February 1946 Kennan sent a long telegram from Moscow, where he was number two at the US embassy, with an intricate analysis of the Soviet Union. It concluded that Soviet power had to be contained. A year later he published (in *Foreign Affairs*) an article entitled *The Source of Soviet Conduct*. Together with his telegram, this piece is thought of as the beginning of Cold War 'containment' doctrine which was to dominate, albeit not in a manner that Kennan approved, US policy for decades to come.

allocation of given resources.¹⁵ However, Koopmans' significance (at least from the perspective of this paper) lies at a higher level: On the basis of his programming work, Koopmans was inducted into the Cowles Commission¹⁶ whose dictum was 'science is measurement' and its purpose to put mathematics, statistics and the 'hard' sciences in the service of economic policy. Koopmans, as it will transpire below, in his capacity as Cowles' heart and mind, played a leading, albeit unsung, role in the transformation of economics during the Cold War, if only because of the people he hosted at the Cowles Seminars. First and foremost amongst the latter was no other than John von Neumann himself.

Before discussing von Neumann's Cowles Seminar, a few points are in order regarding his background and contribution prior to 1944. Von Neumann was probably the most gifted mathematician ever to have graced both pure and applied mathematics. A Hungarian of Jewish origin, von Neumann was awarded two doctorates simultaneously at the age of 23 – one in mathematics (set theory) and one in chemistry. By his mid-twenties he had achieved celebrity status in the mathematics community of Central Europe. Influenced by the popularity of formalisation in the 1920s, he pursued the line first advocated by David Hilbert, his tutor at Göttingen, in 1900; namely that a mathematician's proper task is to pinpoint the axioms on which all of mathematics rests. In that vein, von Neumann tried, with considerable success, to axiomatise theories ranging from set theory in mathematics (1926) to quantum mechanics in physics (1927).¹⁷ Every year he would publish a number of papers on diverse topics but with a common concern for establishing an axiomatic, formalist foundation for the issue at hand. One of these papers, in 1928, effectively invented Game Theory (and was later to become the foundation of his 1944 classic text of the same title, co-authored with Oskar Morgenstern).

In 1930, at a conference in Königsberg, whose stated purpose was to celebrate thirty years since the commencement of David Hilbert's grandiose project of pinpointing *the* single set of axioms on which all of mathematics would sit, Kurt Gödel delivered a now infamous paper.¹⁸ The so-called *Incompleteness Theorem* at its heart singlehandedly demolished Hilbert's project by proving arithmetic to be incomplete; put differently Gödel proved the unsustainability of the law of excluded middle, which is that a statement is

¹⁵ In 1946, as mathematical adviser to the U.S. Air Force Comptroller, he was challenged by his Pentagon colleagues to see what he could do to mechanise the planning process, "to more rapidly compute a time-staged deployment, training and logistical supply program." In those pre-electronic computer days, mechanization meant using analog devices or punch-card machines. ('Program' at that time was a military term that referred not to the instruction used by a computer to solve problems, which were then called 'codes', but rather to plans or proposed schedules for training, logistical supply, or deployment of combat units. The somewhat confusing term 'linear programming', Dantzig explained in the book, is based on this military definition of 'program'.)

¹⁶ The latter was founded in 1943 by Alfred Cowles III in order to develop mathematical and statistical methods for informing economic policy, with particular emphasis on finance.

¹⁷ Indeed, to this day, a considerable portion of the formalism that von Neumann introduced remains the standard framework for most mathematical expositions of quantum mechanics.

¹⁸ The paper was entitled "On Formally Undecidable Propositions of Principia Mathematica and Related Systems".

either true or false.¹⁹ Perhaps out of incredulity at the young man's audacity, no one in the audience grasped the significance of Gödel's momentous result. Except, that is, for another young man: Von Neumann, who immediately understood the meaning of that which he had heard. Reportedly, he left that auditorium a changed man, having recognised the pointlessness of his engagement with formalism. Judging not only by his own account but also by the direction of his work thereafter, it is clear that Gödel's paper had had a profound effect on him, so much so that he instantly lost interest in formalist mathematics and turned his attention to practical problems where mathematics could prove genuinely helpful.

Between 1930 and 1933 von Neumann was oscillating between Europe and the US, teaching mathematics and physics intermittently at Princeton but also retaining several appointments in Germany. By 1933, Hitler's rise to power in Germany and his appointment to one of the six mathematics chairs at the newly founded Institute for Advanced Study in Princeton²⁰ conspired to keep him in the US, and at Princeton, for the rest of his life. From then until the beginning of WW2 von Neumann focused on algebras that now bear his name. Things changed rapidly with Pearl Harbour.²¹

Von Neumann entered the military-scientific establishment on the back of his hydrodynamics, a branch of mathematical physics crucial to the modelling of explosions. His preoccupation with hydrodynamics predated the war and originated in the interesting demands it placed upon his mathematical skills (as explosive events required solutions to complicated non-linear partial differential equations) and soon led to his involvement with the design of the atom bomb. Indeed, von Neumann became a major participant in the Manhattan Project and then, during the beginnings of the nuclear arms race, played a central role both in the development of the rocket technology necessary for delivering nuclear warheads, of the hydrogen bomb. As if the above were not enough, he singlehandedly supervised the planning of nuclear strike scenario (MAD, standing for Mutually Assured Destruction, was his idea). In all this, his non-linear mathematical skills came in particularly handy

¹⁹ Samuel Delaney recruited Shakespeare to offer an interpretation of the theorem: "There are more things in heaven and earth than are dreamed of in your philosophy". In *Mind Game* (1987), Rudy Rucker observed, "...Gödel's Theorem shows that human thought is more complex and less mechanical than anyone had ever believed..." The Incompleteness Theorem has many profound implications, not just for mathematics but for philosophy as well for it implies that there exists no level of analytical sophistication which prevents certain ideas from straying outside the bounds of the resulting axiomatic system. In an article that appeared in *The Guardian* (April 26, 2001), Keith Devlin reported that some scientists such as Roger Penrose use the Incompleteness Theorem to argue that the human brain does not operate like a computer, and that artificial intelligence is impossible. According to Penrose's interpretation, the Incompleteness Theorem proves that mathematics possesses a creative edge that is irreducible to formalisation.

²⁰ The other professors were J. W. Alexander, A. Einstein, M. Morse and O. Veblen.

²¹ Interestingly, in 1940 von Neumann mediated (together with Einstein and Veblen) to appoint Gödel to one of the Institute's chairs, as well as to sponsor his application for US citizenship. Gödel, an Austrian refugee from the Anschluss, took up the appointment and spent, also, the rest of his days at Princeton.

as did his readiness to seek numerical solutions; a readiness that was to lead him to major contributions to computing science²² and artificial intelligence.²³

Quite remarkably, in his 'spare' time, von Neumann found the energy and time to make contributions to economics that would have been considered worthy of adulation even if their initiator had accomplished nothing else. Setting aside, for the moment, his contribution to Game Theory, von Neumann penned a short-ish paper in 1937 (re-printed in 1945) by which he staked a worthy claim to classical economist status. The paper presents a mathematical model of a complete economy comprising multiple sectors and specifies the conditions under which such an economy would grow at a sustainable pace. The paper's title refers to this steady-state growth as a 'general equilibrium'.²⁴ At the risk of over-simplification, von Neumann's model was the contribution of an applied mathematician who, unburdened by the concerns of Harvard Keynesians, was exploring the mathematical properties of a crisis-free economic system. Having done his job, von Neumann moved on to other projects as part of his submersion first in the wartime US military-scientific establishment, and, later, in its Cold War offspring.

3.3 The formalists

In May 1945, Tjalling Koopmans invited von Neumann to present a seminar at the Cowles Commission in Chicago. Von Neumann accepted the invitation and delivered a paper based on his game theoretical magnum opus (*Theory of Games and Economic Behaviour*) which had seen the light of day less than a year before (co-authored with Oskar Morgenstern). The Koopmans-von Neumann bond was twofold: they had both originated from a European mathematical (but also cultural) milieu and utilised linear programming as part of the war effort. Moreover, they had both entered the field of economic analysis through that particular entry point.²⁵

Von Neumann's paper made a great impression on the mind of young participants and led, a few years later, to a series of seven follow up papers

²² In fact, the first computer to be built *in situ* at RAND, where von Neumann spent many years, was affectionately named Johnniac.

²³ At Los Alamos von Neumann was very taken with electrically stimulated jellyfish, which he appears to have viewed as doing some kind of continuous analogue of the information processing of an electronic circuit. In any case, by about 1947, he had conceived the idea of using partial differential equations to model a kind of factory that could reproduce itself, like a living organism.

²⁴ Perhaps controversially, von Neumann is presented here as a classical, as opposed to a neoclassical or Walrasian, economist. In this, however, I am supported by Kurz and Salvatori (1993) who have also argued that von Neumann adopted the classical assumption that growth is determined by surplus generation. Of course, in contradistinction to the classical economists, von Neumann did not posit any restrictions on the profit rate which might explain capitalism's crises. Unlike Harvard economists, von Neumann brought to the field an engineer's attitude, abstracting fully from the social constraints that Keynes and the classical economists paid attention to.

²⁵ Arguably, von Neumann's two economic contributions (his 1928, 1944 game theoretical work as well as his 1937 equilibrium growth models) started life as applications of linear programming; a field where Koopmans had also excelled. Indeed, his own inaugural seminar presentation at Cowles was entitled "Dynamic economic systems, linear programming and transportation problems". See the Cowles Commission Archives at <http://cowles.econ.yale.edu/archive/reprints/index.htm>

consistent with von Neumann's type of analysis. They were delivered in 1949 by five different scholars.²⁶ Of these papers two were by Kenneth Arrow and remained faithful to von Neumann's game theoretical type of modelling. This is significant, for reasons that will become apparent below. At this stage, it suffices to note that Arrow, despite a strong interest in Game Theory (evidenced by these two, back-to-back Cowles seminars), never published anything on Game Theory. Instead, he made his name as the profession's wizard of general equilibrium theory (recall the term's appearance in von Neumann's 1937 paper), in conjunction with a Frenchman named Gerard Debreu who had also ensconced himself at Cowles by 1949.

My contention in this section is bound to be controversial and, for this reason, it is important to state it clearly and simply: I start from the uncontested observation that John von Neumann's scientific approach dominated for a number of years the mindset of technically minded economists (in the Cowles Commission, later at RAND, and elsewhere) who were invariably connected with the wartime military-scientific establishment. Game theory, linear programming and general equilibrium growth, precisely as outlined by von Neumann, were all the rage during the first five post-war years. My potentially controversial claim is that everything changed in October 1950 with a paper that John F. Nash Jr presented at Cowles; that, unbeknownst to Nash, two members of his audience, Kenneth Arrow and Gerard Debreu, were inspired by him to dispose of von Neumann's practical approach and espouse, in its stead, a formalist project whose purpose was to present *complete* (albeit static) theories of everything economic.

Let's look at this claim in more detail: By 1945 John von Neumann had paved the ground for two types of glamorous, impressive, and potentially useful applications of mathematics to economics: (a) Game Theory, and (b) General Equilibrium Growth models for economies consisting of multiple sectors.²⁷ Both fields reflect his break from formalism (*circa* 1930) and exclusive focus on mathematical applications of a distinctly practical value. More precisely, his Game Theory was intended solely as a source of good advice to decisions makers operating in strategic contexts (from chess players to businessmen, generals, government etc.). It was *not* meant as an all encompassing theory of strategic behaviour.²⁸ Similarly, his growth model was not at all about explaining *all* economic variables endogenously but, rather, strived to outline the general conditions for equilibrium growth, leaving important variables (e.g. wages and rents) outside the analysis' scope (just as David Ricardo, to mention a classical economist, would have done). In short, *incompleteness* was the price von Neumann was prepared to pay for practicality. Moreover, he understood well that it was not a daunting price since incompleteness is, unavoidably, part and parcel of all analytics (recall his 1930 encounter with Gödel).

²⁶ These seven papers came out all at once, presented as they were between January and April of 1949. The order in which they were presented was: Savage (6/1), Arrow (20/1,17/2), Marschak (3/3), Girschick (10/3), Savage (31/3) and Simon (14/4). Of these, Arrow and Simon collected Nobel economics prizes.

²⁷ Note that both (a) and (b) involved the methods of linear algebra and linear programming.

²⁸ In fact, von Neumann's game theory can only provide advice to players engaged in constant-sum games. See below for a discussion of whether this is a weakness of the theory or not.

The Cowles Commission participants were quite happy to go along with von Neumann's research agenda, as the early 1949 string of papers on his type of game theory (see note 25) confirms. Kenneth Arrow, in particular, explored facets of von Neumann's game theoretical models (in his two early 1949 presentations) ably, enthusiastically and diligently. Nothing in that work, however, prepares the reader for the work that was to make him famous. In contrast, there were plenty of such signs in the case of Gerard Debreu; the Frenchman who never actively toed the Neumann line and who seems only to have been energised immediately after hearing John Nash's 1950 Cowles Commission Seminar presentation. I shall now assert that, following the Nash seminar, Debreu saw an opening for a type of formalism which suited his intellectual makeup down to the ground and proceeded to make the most of it, recruiting Arrow in the process.

Evidently, Debreu is the next key protagonist in this tale. Unlike both von Neumann, who had long given up on formalism, and Arrow, who had never taken it up previously, Debreu came to the US and to Cowles (on a Rockefeller fellowship) with a strong background in the mathematics of the French Bourbaki tradition (see Weintraub and Mirowski, 1994, for an excellent account). Bourbakist mathematicians chose willfully to ignore Gödel's incompleteness theorem by interpreting mathematics as a self-contained, self-referential discipline and their own role as cartographers whose purpose was to proceed from basic axiomatic structures to more derivative ones ('binmen of mathematical knowledge', was an unflattering term used by competing mathematicians to describe them). In this vein, they sought to create axiomatic theories of some abstract 'structure'. This boils down (a) to the deduction of the logical consequences of the axioms that define that 'structure' and (b) to the exclusion of all hypotheses inconsistent with these axioms.

When Debreu was studying mathematics during the war at the *Ecole Normale Supérieure*, his favourite instructor was Henri Cartan, one of the Bourbaki school's founding members. Upon arriving at Cowles a few years later, he was greeted by Marshall Stone who, in addition to holding the econometrics chair at the adjacent University of Chicago, was also the primary devotee and propagandist of the Bourbakist school in the US. Given Stone's key influence with the Cowles crowd, Chicago was probably the most hospitable town for a young Bourbakist like Debreu. Moreover, the Cowles Commission at the time was experiencing an intellectual existentialist crisis: Having started in 1943 as a hub of mathematical statistics and econometrics, it soon became obvious that the application of such means to economics is fraught with difficulties. To cut a long story short, the statistical models they were building failed to procure useful estimates quite spectacularly. By 1949, the year of Debreu's passage to the US, Koopmans was already re-orienting Cowles away from statistics and toward mathematics. This re-orientation created useful elbow room for a mathematician schooled in the Bourbaki tradition who also happened to have some interest in economics.²⁹

However, it was not until October 1950 that Debreu could breathe a sigh of relief and feel sufficiently energised to stamp his imprint on economics.

²⁹ While still in Paris, Debreu came across a rare copy of an early mathematical economics text authored by Maurice Allais. Since then Debreu always kept an eye out for interesting mathematical depictions of economic relations.

For until then, the mathematics that prevailed at Cowles was of the Koopmans and von Neumann, practically minded, type. Everyone at Cowles, including his friend Kenneth Arrow, was mimicking the great Hungarian's method which precluded, by design, any ambitions to build universalisable, complete theories. All this changed, as this paper is claiming, with Nash's presentation. What did Nash say in that seminar that had such a profound effect? The answer is twofold: At one level, Nash's presentation marked a complete break with von Neumann's idea about the very purpose of mathematical modelling. At a second level, it ushered in a particular type of topological mathematics which opened up the road to complete formalism. Let's delve into these two 'levels' in a little more detail.

Starting with the purpose of mathematical modelling, von Neumann cared for it to the extent that its application provided firm advice to decision makers. For example, consider the so-called bargaining problem (which was Nash's seminar theme at Cowles). Two or more people bargain over how to divide some notional pie (an asset, a resource, or simply a sum of money). If they come to an agreement, each collects the agreed portion. If not, no one benefits. This problem is central to economics since all trade involves potential gains which, depending on the agreed price, are distributed differently between buyer and seller. Von Neumann studied the bargaining problem but concluded that it cannot be 'solved'. By this he meant that mathematical analysis could not recommend to a bargainer how to bargain with a view to maximising her portion.

Unfazed by von Neumann's conclusion, Nash began his Cowles presentation by announcing that he had cracked the bargaining problem. To an astonished audience, he outlined an unquestionably brilliant solution (which takes the form of the first equation in Section 1). Nevertheless, Nash's 'solution' was of a wholly different type to what von Neumann would have described as a solution. In fact, Nash 'solved' it by first declaring that he will *not* be studying the bargaining process at all. Instead, he stated a number of axioms (which he believed a rational agreement ought to respect) and then proved that only one potential agreement (the one in his equation in Section 1) respects all these axioms at once. Note that the 'strategic neglect' of the bargaining process is tantamount to a radical absence of any advice on how one ought to bargain. In this sense, Nash solved the bargaining problem by divorcing the analysis from any meaningful, practical advice that the theory could offer a... bargainer.

Though there is no hard evidence on this, one can easily imagine how the Bourbakist Debreu must have felt in the face of this delicious departure from the scientific, almost engineering, attitude of von Neumann to a world where economic problems are dealt with in the context of axiomatics alone. Add to this the fact that Nash had based his proof on a fancy piece of topology (a version of a fixed point theorem due to Shizuo Kakutani³⁰) and a clear picture of the seminar's effect on Debreu surfaces. Though Debreu never refers to Nash, it is instructive to read what he had to say, many years later, on how he came to spearhead the retreat from von Neumann type mathematical economics to his own brand of radical axiomatic formalism:

³⁰ A Japanese mathematician working at Princeton, where Nash was a doctoral student

“The benefits of [the] special relationship [between physics and mathematics] were large for both fields; but physics did not completely surrender to the embrace of mathematics and to its inherent compulsion toward rigour... In these directions economic theory could not follow the role model offered by physics theory. Being denied a sufficiently secure experimental base, economic theory has to adhere to the rules of logical discourse and must renounce the facility of internal inconsistency.” [Debreu, 1991, p.2]

This is as close one can come to a UDI (unilateral declaration of independence) from an economics whose purpose is to deal with the incongruities of real economic relations, involving really existing humans. It is, moreover, wholly consistent with Debreu’s roots in the Bourbaki mathematical tradition, derivative of Nash’s approach to Game Theory, and diametrically opposed to von Neumann. In May 1951 Debreu presented his first seminar paper at Cowles. Its central contribution is the transplantation of Nash’s axiomatic approach from Game Theory to economics-proper. The resulting model sketches Debreu’s axiomatic foundation for a new, Bourbakist, formalisation of an economy which finds itself in a static ‘general equilibrium’.³¹

By 1954, he and Kenneth Arrow (who had, after Nash’ presentation, also abandoned once and for all von Neumann-like models), produced their famous proof that, in the context of such an axiomatic competitive economy, under several axioms or conditions that this economy must respect,³² there exists a unique set of non-negative prices (one per commodity) which (were they to prevail) would equilibrate supply and demand in every market. This is known as the proof of the existence of a General Equilibrium or, more grandly, the *First Fundamental Theorem of Welfare Economics*. It was to be the main of three theorems which changed economics forever, ushering in the currently dominant type of mathematical formalism which typifies the ‘good’ economics departments. By 1957 Koopmans had also jumped on the bandwagon (with a famous paper entitled *Three Essays on Economics*), two years before Debreu would publish his definitive book with the weighty title *Theory of Value*.

Philip Mirowski (2002) offers an engaging account of John von Neumann’s continuing influence in economics. However, in the present paper von Neumann is the tragic figure of the plot (with John Nash in a supporting, and differently, tragic role).³³ Teachers of game theory and economics

³¹ Mirowski and Weintraub (1994) refer to Debreu’s following conception of an ‘economy’ as ‘visual’ evidence of his Bourbakism: “Economy E is defined as follows. \forall agent $i=1,\dots,m$, \exists a non-empty subset $X_i \subset \mathfrak{R}^l$ completely pre-ordered by, and at least as desirable by i , such that \forall agent $j=1,\dots,n$ a non-empty subset $Y_j \subset \mathfrak{R}^l$ and some point $w \in \mathfrak{R}^l$ is an $(m+n)$ -tuple of points $\subset \mathfrak{R}^l$.”

³² Recall that this was precisely Nash’s method for ‘solving’ the bargaining problem. Just as Nash abstracted from (that is, ignored) the bargaining process that leads to the final agreement or bargain, Debreu abstracted from (that is, also ignored) the process by which prices are formed. And like Nash had simply posited certain conditions or axioms that the final agreement must be characterised by, so did Debreu posit conditions or axioms which ‘ought’ to typify an economy in general equilibrium. Last, but not least, Debreu’s proof utilised the same fixed point theorem as the one Nash had used in his paper.

³³ Unlike von Neumann, whose tragedy was minor and rather figurative, Nash’s was real and due to a psychiatric condition (see *A Beautiful Mind*, by Cynthia Nasr, 1994). Because of it, one may speculate, he did not have the opportunity to become involved in the uses of his method to economics-proper (that is, to the General Equilibrium results of the 1950s). Nevertheless, it is still rather unseemly how very few people, even among leading

mention von Neumann's name reverentially but never fail to add that the great man, despite having invented all the ingredients of 'modern scientific economics', failed to take them to their logical conclusion; that this task was left to younger men like Nash, Debreu and Arrow who fashioned what today passes as the last word in economic analysis (the mighty combination of Game Theory and General Equilibrium Theory). They often point out, for instance, that when the young Nash visited von Neumann at his Princeton office, bearing a copy of the famous paper that he was to present at Cowles in 1950 (and publish in the well respected *Econometrica* soon after), the great professor made some polite noises about its calibre but, in effect, dismissed it as trivial. This dismissal is given one of two interpretations: Either von Neumann failed to recognise its importance, or he did recognise it but lacked the grace to acknowledge that the young Nash had surpassed him. It is the contention of this paper that neither interpretation holds water.

Starting from the second allegation, there is considerable evidence that von Neumann had what it takes to acknowledge another intellect when it was appropriate to do so. It is well known, for example, that, upon hearing Gödel's presentation in 1930, he was furious with himself for not having proven the incompleteness theorem himself. Nonetheless, this 'fury' never stopped him from acknowledging, assisting, and even celebrating, the man who had beaten him to it. As for the claim that he did not recognise the importance of Nash's result, anyone who has read both Nash's paper and any of von Neumann's work will be hard pressed to maintain that his reaction was due to miscomprehension.³⁴

So, why did von Neumann dismiss Nash's result as trivial? My answer is simple: Because it was his considered opinion that it *was* trivial. Moreover, I think he was completely justified in reaching that conclusion. For, unlike the young Nash who was, at the time, struggling to make an impression, and thus gain a PhD, in the cut-throat Princeton environment, von Neumann was immersed in practical projects (even though many of them were particularly objectionable) and had no time for formalist gymnastics. To him, Nash's solution to the bargaining problem could offer no advice to bargainers and, therefore, it was a trivial result. He may even have felt, justifiably, that, had he cared enough, he could have produced this result on the back of an envelope between main course and desert during some dull dinner party.

economists, know of his pivotal influence on the General Equilibrium work by Debreu and Arrow. It is, however, my private view (which derives from a personal conversation with Nash) that he was, in the end, far less convinced than those who utilised his method (jettisoning von Neumann's) of the superiority of his approach to that of von Neumann's. Those of a romantic disposition may even read something of significance in the heart-wrenching description of John Nash, at the height of his illness in 1959, wandering around the Princeton campus insisting that he be addressed as Johann von Nassau...

³⁴ Von Neumann was particularly familiar with the mathematics behind Nash's solution; the so-called Kakutani fixed point theorem. The latter was a generalisation of another fixed point, by Brouwer, which Neumann had used extensively, and with good effect, in his own game theoretical work many years before. Indeed, von Neumann had met with Kakutani at the *Institute for Advanced Study* before the war, while Kakutani was being hosted by German mathematician Hermann Weyl. In 1948, at the behest of von Neumann, Kakutani returned to the *Institute* before being appointed to a chair at Yale in 1949. The notion that von Neumann did not comprehend the Kakutani theorem and its implications in Nash's 1950 paper seems to me absurd.

Von Neumann's candidature for tragic status transcends the allegations regarding some alleged failure either to follow or to acknowledge Nash's game theoretical achievements. Consider his 1937 growth model which gave new meaning to 'general equilibrium'. It has been utterly eclipsed by the glamour of the GE of Debreu and Arrow, courtesy of Nash's unconscious prodding. Save for a few polite references to his contribution to GE (including some kind words from Arrow), these days few, if any, students know of its existence. Instead, as mentioned in Section 1, economists treat the Arrow-Debreu GE model as the ultimate source of theoretical legitimacy for all types of mainstream economics (pure and applied). Is this proof that Arrow and Debreu succeeded (just as Nash did) where von Neumann had failed (despite having built all the building blocks that these 'upstarts' needed to build their models)?

I have no doubt that this is not how von Neumann would have seen it. Success in economics, since 1950, is inversely related to genuine enlightenment. Von Neumann's version of GE was all about the growth path of a multi-sector economy. He was not interested in some thin-as-a-needle, nebulous, axiomatic economy which lasts for a fraction of a second, and whose equilibrium is therefore static and only of interest to a seminar of Bourbaki-minded mathematicians. Cognizant of the vengefulness of incompleteness, he would rather have a workable, dynamic model with many sectors which does not explain all prices at once, than a GE model that explains everything as long no one dares ask questions such as: How will these prices materialise? What are the forces that guide, in real, historical time, an economy onto its potential equilibrium growth path?

In summary, something at once interesting and supremely worrying happened to economics in 1950. Instead of a momentous intellectual battle that one might have expected within economics between New Dealers (e.g. Galbraith) and Scientists (e.g. von Neumann), a short paper published by a young mathematician (John F. Nash Jr) was taken up by two other mathematical formalists (Gerard Debreu and Kenneth Arrow) and confined both New Dealers and Scientists to the profession's margins. The next section continues this story with an explanation of how formalism won the day. The assertion is that formalism took economics over because of a powerful coalescence of (a) the particular ideological demands of the Cold War during the 1950s and 1960s and (b) the sociology of academic economics.

Foreshadowing the next section, the next big question concerns the process by which the usefulness of the New Dealers' sophisticated macroeconomics *and* of the Scientists' practical approach to problem-solving was jettisoned in favour of an obscurantist, formalistic type of economics which, though entirely useless for all practical purposes, provided the ideological legitimacy that the Cold War demanded and which academic economists have been trading in since then.

4. The Dance of the Axioms

Formalism's imperialism in the Cold War age

It would be, of course, absurd, to pin the radical transformation of post-war economics on some seminar presentation at Cowles in October 1950. The stature and combined intellectual prowess of the New Dealers and Scientists was such that only a mighty alliance of social forces could have caused their theoretical defeat at the hands of some newfangled formalism. This section presents a joint hypothesis concerning economic formalism's crushing success during the first two decades of the Cold War. It consists in four sub-hypotheses, each operating on a different plane:

- (a) The decoupling of policy making from high-end economic theory at a time when the Cold War was developing particular ideological demands
- (b) The dexterity with which the new formalist economics could absorb criticism, and expand its domain, by relaxing and, at once, tightening its axioms (i.e. the 'dance of the axioms' in this section's title)
- (c) The sociology of academic economics; and
- (d) A new type of economics textbook that provided formalism with the necessary mass appeal.

4.1 Cold War economics vs Cold War economic policy

Unlike the US military, which utilised the best scientists available during both WW2 and the Cold War, the US government showed no similar penchant for entrusting economic policy to the 'best' academic economists; at least not to those practising in the top Universities or their derivative high powered institutions (such as Cowles, RAND and the like). A quick perusal of those serving on the President's Council of Economic Advisers (CEA) is instructive on the matter. From 1946, when the CEA was instituted by President Truman, to the end of the 1960s, it was usually headed by New Dealers (see the previous section) immersed in the type of activity associated with the planning of the post-war international order (see Section 2).

The CEA's first chairman, Edwin G. Nourse, was initially an engineer who specialised in agricultural economics with little or no schooling in the finer aspects of high end economics. Nourse famously advocated that the US reduce its production of armaments and shift productive resources toward civilian projects. On this 'guns versus butter' issue, he was opposed by his vice-chairman, Leon H. Keyserling (a New Deal lawyer with some economics graduate work under his belt). Keyserling argued that such a tradeoff was a dangerous mirage since military expenditure, at a vast scale, would permit the US economy to expand, thus effecting an overall improvement in living standards. Keyserling's position was fully in tune with that of the grand planners of the time: the trio mentioned in Section 2 (Byrne, Forrestal, Kennan) as well as Dean Acheson, who had just taken over as Secretary of

State. Nourse's position, in contrast, was at odds with this Grand Design and led Acheson unceremoniously to replace him with Keyserling.³⁵

It is quite telling that Acheson, a lawyer, saw it fit to make momentous decisions about, amongst other, purely economic matters (e.g. the design of Bretton Woods, the Marshall Plan, the recommendations of CEA etc.) with only cursory advice from the mighty economists of the time (with Keynes being the solitary exception). The post-1949 years were a fascinating age for economic policy at a grand scale made all the more interesting by the marginalisation of academic economists.³⁶ Perhaps an explanation lies in the massive blow that 1929 had delivered on the discipline's stature; as well as in the New Dealers' confidence which grew during the war as employment and growth were being restored without a great deal of help from academic economics.

Acheson's career is illuminating in this regard: Having entered the administration in 1941, as Roosevelt's Assistant Secretary of State, he spent three years coordinating economic warfare against the Axis.³⁷ In 1944 he made use of this accumulated experience to play a leading role in the Grand Design of Section 2. He emerged as the commander-in-chief of the Marshall Plan, and, by 1949 (after making Secretary of State) held the unofficial title of the Cold War's master architect.³⁸ Meanwhile, scientists-*cum*-economists, like von Neumann, were better employed at RAND (developing anything from computers to the hydrogen bomb) while the more theoretically adept New Dealers had returned to their university careers. In none of their grandiose projects did men like Acheson feel the absence of academic economic wisdom.

Keyserling was replaced in 1953 by Republican appointee Arthur F. Burns, who had (as the Korean War was receding) advocated a shift away from the Grand Design toward less extravagant spending on defence and a departure from Keynesianism. However, the 1953 recession put paid to his proclamations and, thus, Keynesianism (albeit of a specific ilk) acquired bipartisan status. Though Burns was a Columbia economist, with some research in business cycles, his tenure at CEA, but also in the Federal Reserve later (which he headed from 1970 to 1978), bears only a weak connection with his economics. Like his predecessors, his policy positions

³⁵ Rather obligingly, once Keyserling succeeded Nourse to the CEA's chairmanship, he pushed for National Security Council Resolution 68 which, in April 1950, asserted that increasing the military budget would not affect American living standards or risk the "transformation of the free character of our economy."

³⁶ And when an academic economist was included, it was in spite (rather than because) of the fact that he was an economist.

³⁷ Acheson had conceived and implemented the American/British/Dutch oil embargo that cut off 95 percent of Japanese oil supplies and escalated the crisis with Japan in 1941, in the full knowledge that it might incite war between the US and Japan.

³⁸ Acheson played a central role at the Bretton Woods conference, in the design of the Marshall Plan, and was a great supporter of George Kennan and the latter's view on 'containment' of the USSR. Soon after, Acheson spearheaded the Truman Doctrine and designed the US position *vis-à-vis* the French in Vietnam (a strategy of simultaneously supporting and undermining them). During the Cuban Missile Crisis (a while after his formal retirement), he was brought back by JFK to join his inner circle of advisors. Even LBJ utilised his skills by asking him to pen a plan for resolving the Cyprus conflict; a plan whose core (proposed) solution reeks of the Cold War's logic.

reflected a take on the position of the US economy that had little or nothing to do with what was considered, at the time, cutting edge economic theory.

Between 1956 and 1969, the CEA reflected an impressive consensus on economic policy based on practical measures in complete accordance with the post-war, Cold War era, Grand Design. Between 1956 and 1961 the post was held by Raymond J. Saulnier; a Columbia trained economist who had made a career in banking, railroads, the stock exchange and several large companies. In 1961 he was succeeded by Walter W. Heller who had begun his career in the war's aftermath by helping re-establish West Germany's currency, and later as one of the Marshall Plan's designers.³⁹ Perhaps the most accomplished economist to have held that position was Arthur Okun, a Yale professor, well known amongst Keynesians for having studied the relationship between unemployment and economic growth.

To sum up, if one had to infer from the CVs and position papers of the aforementioned CEA chairmen something about the state of economic theory during that time, one's task would be utterly hopeless. Post-war economic policy was, by and large, institutionally (though not theoretically) Keynesian, rooted in the New Deal, and intimately linked to a Grand Design that started life in the ruins of 1945 and acquired a new complexion during the Cold War. By contrast, high end economic theory had, after 1950, shunned both the New Dealers and the Scientists (see previous section). The turn from von Neumann-like dynamic modelling to the timeless formalism of Nash, Debreu and Arrow meant that academic economics was positioning itself as a willfully impractical discipline whose utility had to be sought beyond any applications it might have in designing real policy for really existing economies. What was that utility? *Ideological*, is this paper's answer.

The Cold War pitched not only two sets of destructive nuclear arsenals against one another but also two opposing ideologies. The ideological aspects of the Cold War were, naturally, multifarious, ranging from political philosophy to the arts, but contained one strand that both sides (Washington and Moscow) privileged above the rest: *economic justification*. Lest we forget, the European 'front' was in political flux, with left-leaning parties brandishing impressive economic arguments in favour of planning with a view to achieving, at once, greater efficiency and less inequality (while frequently invoking the memories of capitalism's mid-war collapse). Additionally, the Third World was up in grabs. As the era of de-colonisation was underway, and the superpowers were jostling for position, the liberation movements paid a great deal of attention to the theoretical war between those advocating a socialist central plan and those who favoured capitalist market mechanisms. The elites of Asian and African nationalist movements were genuinely interested in economic theory as a source of insights into the growth and distribution strategies that they ought to adopt once the imperial fist was forced to unclench. Economic models were, in this sense, political instruments almost as sharp as diplomacy and military maneuvering.

³⁹ As CEA Chair he advised President Kennedy and proved quite influential during the Johnson years. He left his mark by pushing, successfully, for augmenting the US domestic economy through tax cuts (accompanied by wage controls for the purposes of controlling inflation). He also suggested to President Johnson a 'War on Poverty', which Johnson enthusiastically espoused and turned into the 'Great Society' initiative.

In this struggle, the formalism that Debreu and Arrow built upon Nash's method proved invaluable during the Cold War. While the global economy was being planned meticulously and energetically by the New Dealers in Washington, the Cold War necessitated a clear *ideological* red line between the two great camps; one that separated, *at the level of ideology*, (a) the grubby authoritarian planning of, Gosplan-inspired, leftists from (b) the spontaneous order generated by decentralised markets where liberty and self-interest combine to promulgate the Good Society. Debreu's and Arrow's new formalism fitted that narrative like a glove.

To see why, consider the essence of Debreu and Arrow's GE model and suppose, for a moment, that a group of Martians were to use it in order to familiarise themselves with the West prior to boarding their spaceship. What would they expect to find upon landing? A tranquil and supremely civil market society; totally free of wasteful conflict; populated by persons who are identical except for their preferences, incomes and endowments. A world in which no one exercises power on anyone, discrimination and exploitation are non-sensical words, and even crying or laughter is pointless. A society where the only relations among persons are pure market exchanges, rationality reduces to the efficiency with which pre-determined preferences are satiated, work is (ontologically) no different to play, and the labour contract is identical to any other kind of contract (so that it makes no difference whether the asset-holding employer is hiring the worker's labour or the worker is hiring the employer's asset). Finally, the economy perpetually produces at its 'frontier', squeezing the maximum welfare out of given resources, without the need for any bureaucrat or recourse to anything other than voluntary and mutually advantageous swaps between free, consenting agents. How terribly cross with the Debreu-Arrow guide to Earth those Martians would have been...

Granted that what they were doing at the office, and in the corridors of power, bore the same relation to the Debreu-Arrow depiction of capitalism as Napoleon's practices to Beethoven's Ninth Symphony, the Cold Warriors' hearts must have been warmed intensely by the Debreu-Arrow perspective. It depicted capitalist reality as an egalitarian, harmonious system worth fighting a nasty Cold War for. To boot, the extremely elegant mathematics it came packaged in added much sought out 'scientific' legitimacy.⁴⁰

Was Debreu responsible for the ideological uses to which his formalism was put? Not guilty, I say. For he never hid his view that GE models built to his own specifications were irrelevant from the point of view of policy making. Whenever lesser formalists than him tried to interpret his work, with a view to making pronouncements on what ought to be done (i.e. on policy), he scolded them for confusing that which is (theoretically) interesting with that which is (practically) useful. Faithful to his Bourbaki roots, Debreu warned his disciples against using his model to guide policy since, in his own words, "...the theory...is logically entirely disconnected from its interpretations".

⁴⁰ Von Neumann's 1937 GE model was also a mathematical gem. But it did not have the same ideological utility since it depicted the economy in a manner that could also apply to a centrally planned, Soviet style, multi-sector economy. Unlike Debreu and Arrow's GE, his model was depicting productive sectors whose inputs and outputs were harmonised in a manner consistent with equilibrium growth. In contrast, Debreu and Arrow paid no special attention to production and, instead, placed consumers at their model's heart. A 'narrative' choice with much higher propaganda value for the West's Cold War corner.

The question thus returns: How did this type of economic theory, which (even according to its founding father) is entirely ill equipped to interpret the real world, come to dominate economics? My answer is: It did so on the back, exclusively, of its ideological utility in the context of the Cold War. Its self-referential nature and total disconnection from the reality of the post-war world counted, in this sense, as an asset (rather than as the liability that it was at the scientific level). It passed the test set for it by the Cold War environment because of its elegant depiction of capitalism as a timeless, 'natural' system founded on an implicit radical egalitarianism and an abundance of free individual choices. Nevertheless, the complete takeover of economics by the new formalism during the 1950s cannot be explained solely by its considerable ideological utility. It took three more ingredients to materialise. The second ingredient concerns the models' capacity to adapt to almost any explanatory demand made of them.

4.2 A quickstep of meta-axioms

In spite of its bountiful ideological utility, the new formalism's incapacity to explain real world economic phenomena detracted from its persuasive power. However, lured partly by the mathematics' elegance and partly by its ideological gravitas, an army of mathematically inclined economists got down to work with a view to extending the theory's scope. Shortly after Nash re-created Game Theory (with four short papers: 1950a&b, 1951 and 1953), and Arrow and Debreu proved their Welfare (or General Equilibrium) theorems, a legion of bright graduate students and colleagues followed in their steps. They refined the models and set out to provide a *complete* explanation of everything social (not just economic) *within* this unitary, formalist research program (see Hargreaves-Heap and Varoufakis, 2004).

Over the next five decades, they produced an abundance of models, faithful to the Nash-Debreu-Arrow template, which seem not only to carry the original method much further afield but, indeed, to explain (almost) everything under the sun: imperfect competition, psychologically complex behaviour, the political economy of vested interests, the formation of social norms, even the rationalisation of revolutionary ideology... Whenever a critic mentions, as this paper does, the new formalism's disconnection from reality, or its ideological bias, a heavy box-set of countless articles, explaining the whole gamut of human behaviour (economic, social and political), is likely to be thrown at her, with a cover letter denouncing the critic's ignorance of the new, ever expanding, frontiers of formalist economics.

Clearly, the mass production of models that expand the theory's reach has done wonders (a) for the career prospects of the bright young minds engaged in this activity, and (b) for dispelling the view that the Nash-Debreu-Arrow project is irrelevant to anyone interested in the real world. So, am I wrong in claiming that the post-1950 dominant economic paradigm never managed to overcome its fundamental divorce from reality? Elsewhere (see Arnsperger and Varoufakis, 2006, and Varoufakis and Arnsperger, 2009), I have argued that the charge of irrelevance is more pertinent today than it has

ever been. However, to see this we need to delve into the three meta-axioms underpinning the formalist program (see the table below).⁴¹

The first two meta-axioms delineate the various assumptions defining the type of human agency populating the formalists' models. They are the meta-axioms which 'fix' the character of agents, the meaning of rationality, the nature of persons' beliefs, the socio-economic and legal rules within which they function etc. In the pioneering models of Nash, Debreu and Arrow, the first two meta-axioms were posed in an asphyxiatingly rigid format. Agents appeared thin as needles, bereft of any of the characteristics that make us human; markets were rarefied; the state was nowhere to be seen; money was conspicuous by its absence; the actions of one person did not influence anyone else directly (no sympathy, no envy, not to mention solidarity were possible), except through the price mechanism; everyone knew everything there is to know; companies could not even add one cent to the price of their product, without losing *all* their customers. And so on.

Evidently, such models had no purchase on reality. Unless something was done to refine and extend the formalist analysis, it would have withered. That 'something' came in the form of a mass production of refinements and extensions which, as mentioned above, led to a proliferation of models incorporating all the missing features. Methodologically speaking, they constituted exercises in relaxing the iron grip of the first two meta-axioms. Alas, there was a hefty price: *Radical indeterminacy*. The relaxation of the first two meta-axioms complicated the mathematics to such an extent that the models became unsolvable. To 'close' them, the theorists had to turn to the third meta-axiom.

The third meta-axiom has, since the beginning, provided formalists with the necessary theoretical 'closure' (the determinate 'solution') to any mathematical-economic model set up in the context of the first two meta-axioms. Invariably, this 'closure' requires the smuggling into the analysis of several constraints on the admitted 'solutions'.⁴² Without these constraints no 'solution' can be arrived at. In other words, the assumed type of agency (including its constraints and capabilities) cannot, in itself, explain the socio-economic outcomes and structures it gives rise to. It is at that point that the third meta-axiom enters the fray and secures 'closure'.⁴³

⁴¹ Not everyone agrees. For instance, Colander et al (2004) and Davis (2006) point out that the percentage of economists engaging in Nash-Debreu style analysis is shrinking fast; that the majority of academic economists are turning to computational methods, behavioural economics, statistics and laboratory experiments. While it is true that the proportion of academics involved directly with formalism is small, I reject the point. My reason is that formalism was always practised by a minority. However, it was this minority that produced the dominant economic paradigm. Despite the proliferation of non-formalist practices mentioned by these authors, formalism is still the source of the dominant economic paradigm. In short, to this day, if you are to ask academic economists how they envision the market mechanism, the vast majority will answer in a manner reflecting Debreu, Arrow and perhaps Nash. For more see Varoufakis and Arnsperger (2009).

⁴² These constraints are smuggled in in the sense that (a) they are often implicit (without being spelled out) and (b) no rational explanation for them is offered.

⁴³ Take for example models of markets in which N firms compete. Neither the assumption of profit driven managers nor perfect information on demand, costs etc. can lead to firm predictions regarding price, output or profit levels. The theorist must introduce constraints on what one firm believes about the other's predictions regarding one's own strategy. Importantly, it is not possible rationally to argue that these beliefs are uniquely rational. They

Thus, once they crashed into a wall of unsolvable mathematics (caused by their refinements and extension of the original Nash-Debreu-Arrow models), it was natural that the 'refiners' would try to slay the dragon that was *radical indeterminacy* by tightening up the third meta-axiom. To this effect, they smuggled into the analysis an array of (increasingly indefensible) assumptions about the 'outcomes' until some sufficiently narrow band of predicted 'outcomes' would result. In the end, they arrived at 'solutions' that were all but axiomatically imposed (and the phenomenon the 'refiners' were trying to explain was, thus, assumed away).

1st meta-axiom – Methodological individualism: All explanations are to be synthesised from separate, autonomous, and prior explanations at the level of the individual. A *strict explanatory separation* of *structure* from *agency* is imposed, with an analytical trajectory that moves unidirectionally from full explanations of agency to derivative theories of structure.

2nd meta-axiom – Methodological instrumentalism: Behaviour is driven by some assumed function which maps the combination of all feasible behaviours to some homogeneous index of individuated 'success'. The latter reflects agents' preferences which are *given, current, fully determining*, and *strictly separable both from*: (a) *belief*⁴⁴ (which helps the agent evaluate the alternative future outcomes), and (b) the *means* employed.

3rd meta-axiom - Methodologically imposed equilibrium: Once the set of equilibria is deduced from the available primitive data (e.g. motivation, constraints, production possibilities, adaptation mechanisms etc.), the focus of study is restricted (usually by some hidden axiom) to that set and only behaviour consistent with it is admitted. Sensitivity analysis is then introduced to discern the equilibria at which small, random perturbations are incapable of creating centrifugal forces able to dislodge behaviour from that state or path.⁴⁵

Why did they do it? Because, the short answer is, formalism without formal results is pointless and none of the prestigious technical journals of the time (e.g. *Econometrica*) would have succumbed to its charms. How did they get away with the sleight of hand buried inside the third meta-axiom? My contention is that their success hinged on keeping its tightening up well hidden.⁴⁶ Taking a leaf out of the magician's book, the audience's eye was

could have been otherwise. By smuggling into the analysis the **assumption** that **these** are the relevant beliefs, the theorist derives a determinate solution; a form of theoretical 'closure'. This 'move' is what I refer to as the operation of the third meta-axiom.

⁴⁴ The strict separation of belief from preference can be (and has been) relaxed, as in the case of psychological game theory - see Hargreaves-Heap and Varoufakis, 2004, Chapter 7.

⁴⁵ While the degree of technical sophistication has taken off since the 1950s, one truth remains: stability analysis is a fig leaf to cover up the fact that it is not just *difficult* to demonstrate how a market equilibrium will emerge on the basis of historically situated acts of self interested buyers and sellers; rather, it is *impossible*! (See Mantel, 1973, and Sonnenschein, 1973, 1974.) Analogously, in game theory, the theorists' favourite equilibrium concept (subgame perfection) is also impossible to rationalise logically except under very special, and atypical, circumstances. (See Varoufakis, 1991, 1993).

⁴⁶ Those who cared about the logical value of the offered analysis, and would have criticised the illogicality of the third meta-axiom's tightening, lacked the formal training to recognise it. Meanwhile, those who had the formal training usually lacked the intellectual interest in the model's value as a piece of social science and, often, had too much riding on maintaining that research program to expose its logical incoherence.

kept off the critical move. A ‘quickstep of meta-axioms’ helped enormously in this regard: Whenever a potential critic would ask questions about the logical path leading to a formalist model’s mathematical solution, its exposition would reply on a simplistic model based on rigid versions of the first two meta-axioms.⁴⁷ In contrast, when criticism of formalism’s disconnection from actual social phenomena was made, the ‘apologist’ would roll out various ‘refinements’ built upon weakened versions of the first two meta-axioms.⁴⁸

This trick works every time provided that the two types of criticism are not waged at once. Thus, the quickstep: When a challenge is issued to formalism’s claims to realism, the first two meta-axioms take a step back, with the third meta-axiom quickly stepping forward. And when the challenge concerns the plausibility of the solution’s derivation, the first two meta-axioms immediately step forward, allowing the third meta-axiom a graceful retreat. Crucially, the scholars who can simultaneously: (a) challenge formalists on both issues at once, (b) remain unfazed by the technicalities involved at these two fronts, and (c) care enough to check formalism’s logical coherence, can be counted in the fingers of very few hands. The quickstep of meta-axioms thus thwarts the *visibility* of this extraordinary subterfuge, guaranteeing that a crushing majority of economists remain unaware of it and enchanted by its, incontestable, elegance.

4.3 A priesthood evolves

The reader may, at this juncture, protest that the paper’s argument is turning conspiratorial; that it presupposes a plot by a large number of practitioners, guided by common interest and persecuted clinically at the individual level through some fancy footwork. Such a claim would be absurd. In this subsection I shall argue that formalism’s domination (including practices like the quickstep of meta-axioms above) evolved spontaneously, without any conscious planning either at the collective or the individual level. In brief, no conspiracy was necessary.

The point here hinges on the earlier hypothesis that the new Cold War environment created considerable demand for an ideological break from any type of economics which lends credence to collective agency, social and economic planning, state interference in the social economy etc. The new formalism (see subsection 4.1) fitted the bill beautifully. In addition, it relied on higher mathematics beyond the grasp of most economists. And since exclusion is the shortest road to discursive power, the small circle of practitioners who were conversant in it saw their careers soar.

Younger economists producing models of that ilk soon found themselves in demand by the top journals and the Ivy League departments alike. The era’s anti-Marxism helped substantially in this regard. The creation of imaginary economies where labour could not be distinguished from other commodities (thus rendering senseless and leftwing-inspired interest in ‘exploitation’); the models’ inherent radical egalitarianism; their constant references to *equilibrium*, *markets*, *welfare* and, above all else, *efficiency*; the

⁴⁷ Since it was that type of simpleton-model which employed the least severe form of the third meta-axiom to defeat indeterminacy

⁴⁸ Neglecting, of course, to elucidate the logically absurd tightening of the third meta-axiom that was now required to reach some ‘solution’.

impressive mathematics deployed both on paper and on the blackboard; these were the ingredients of formalism's success in an academia labouring under the Cold War's clouds.

As for the quickstep above (see subsection 4.2), it too materialised spontaneously: Consider a graduate student who wants to make her mark. Suppose further that she is intellectually honest and curious, so much so that, although she yearns for recognition at one of the top (formalism-dominated) departments, she nevertheless insists on civilising *homo economicus*; on modelling some aspect of social intercourse that has hitherto remained outside formalism's scope. She embarks down that road full of hope, encouraged by the flexibility of the first two meta-axioms which she manipulates for months, or even years, in order to allow into her models the type of phenomenon she wants to study. And here is the rub: Once committed to this type of modelling, she eventually realises that no determinate 'solution' can be had; that the mathematics has become terribly complex; that something radical must be done to get it sorted out; that unless it *is* done, she will never get the paper published or the thesis passed. Only then, in a Faustian moment of moral panic, does our well-meaning theorist realise what the price for 'solving' her model is: it is the loss of its very soul on the altar of 'closure'.

Determinacy is thus bought at the price of tightening up the third meta-axiom and returning *homo economicus* to strict isolation from her brethren, of relinquishing meaningful social norms, and of losing social and historical contingency. In brief, determinacy's imperatives whip our well meaning young economist back to a model that was initially devised by Debreu and Arrow for fictitious pure-exchange economies in which a view of really existing capitalism is as viable as a fire under a mighty waterfall. Once she has invested huge intellectual energy into coming that far down the analytical (and career) track, it takes a brave and tragic theorist to desist and call it quits. Those who do are never heard of again. Those who do not rise through the ranks.

So, she bites the bullet and 'closes' her model through the third meta-axiom. Then, after she gets her teaching position, or is consulted by government officials, she is put on the spot with requests for a commentary on how the real world works. The quickstep of meta-axioms is what she subconsciously does in response to the audience's demands. Her reward is a career in a profession where success is as divorced from the theory's truth status as the theory is from real economies. Before she knows it, she has entered an evolved priesthood, complete with its mystical beliefs and adorned with decorative mathematics, striking rituals and a well determined system of rewards and punishments.

In his attempt to explain why the Azande did not question their mystical beliefs, and their oracle's pronouncements, when the latter clearly failed to predict important events, Evans-Pritchard says this:

[The] Azande see as well as we that the failure of their oracle to prophesy truly calls for explanation, but so entangled are they in mystical notions that they must make use of them to account for failure. The contradiction between experience and one mystical

notion is explained by reference to other mystical notions.
Witchcraft, Oracles and Magic among the Azande, 1937

Economics possesses exactly the same defence mechanism from internal and external criticism. Trading in a completely self-referential belief system, it accounts endogenously for its own explanatory failures.⁴⁹ No empirical test, however skilfully devised, can test the theory's unfalsifiable meta-axioms. So, when some of our theorist's models fail to predict reality (which is more often than not), its failure is accounted for by appealing to a model built on the same meta-axioms which failed to produce a sound prediction in the first place. The meta-axioms themselves are never put on trial, and the profession is thus constantly entangled in a ceaseless search for some new model that fits the data better. In the midst of all this, the idea of discussing the logic of really existing capitalism does not even get a look in.

So, within the profession, and at a personal level, successful economists find it quite natural to continue with their familiar (and personally lucrative) practices, since, in a never-ending circle, their failed method accounts fully for its own theoretical failure. As long as they stay within the meta-axioms, and apply their considerable technical skills to fashioning increasingly fancy models, which push their theoretical weakness onto increasingly higher levels of abstraction (amplifying it in the process), their work will get published in the journals that 'matter', filling up their pages, and the blackboards of the good universities, with equations "...without the need", in the famous words of a recent economics Nobel prize winner, "to find out anything about what happened in the real world" (Ronald Coase, 1978). It is in this sense that no conspiracy is posited by the present paper: formalism's evolutionary fitness is shored up by an automated process which works best when no formalist is aware of.

4.4 The Text

Every creed requires its Text and so the new formalism found its own. The first edition appeared in 1948 by the hand of Paul Samuelson.⁵⁰ During the

⁴⁹ The resemblance between mainstream economists and the Azande is striking: Whenever economists fail to predict properly some economic phenomenon (which is more often than not), that failure is accounted for by appealing to the same mystical economic notions which failed in the first place. Occasionally new notions are created in order to account for the failure of the earlier ones. For instance, the notion of *natural* unemployment was created in order to explain the failure of the market to engender full employment and of economics to explain that failure. More generally, unemployment and excess demand (or supply) is 'proof' of insufficient competition which is to be fought by the magic of deregulation. If deregulation does not work, more privatisation will do the trick. If this fails, it must have been the fault of the labour market which is not sufficiently liberated from the spell of unions and government social security benefits. And so on.

⁵⁰ Samuelson was mentioned above in Section 3, as a member of a small study group of Harvard students whose purpose was the dissection of Keynes' *General Theory*. His textbook which was entitled, simply, *Economics*, is currently in its 18th edition, with William Nordhaus, a Yale economist, as a co-author since the 12th edition. Samuelson soon after earning his doctoral thesis moved to M.I.T. where he built the economics department around him. Having taught there for six decades, the elite ranks of the economics profession are filled with his former students, including Bhagwati and Mankiw, two younger economists destined to write influential textbooks of a mould similar to Samuelson's 1948 original.

Cold War, Samuelson's *Economics* sold countless copies and introduced millions of students to the charms and tribulations of economic theory. While Debreu's and Arrow's General Equilibrium occupied the high echelons of post-war economics, Samuelson's textbook (the Text hereafter) played a similarly powerful legitimising role in University amphitheatres and high school classrooms across the world.

Samuelson is an unquestionably brilliant, prolific and highly energetic participant in every debate that mattered since 1945. He too, like Galbraith, Sweezy and his fellow Harvard students, was deeply marked by the Great Depression. This is how he, quite prophetically (from our current perspective), introduces his reader to economics in Chapter 1 of the first edition:

When, and if, the next great depression comes along, any one of us may be completely unemployed – without income or prospects.... There is no vaccination or advance immunity from this modern-day plague. It is no respecter of class or rank... From a purely selfish point of view, then, it is desirable to gain understanding of the first problem of modern economics: the causes on the one hand of unemployment, overcapacity, and depression; and on the other of prosperity, full employment, and high standards of living. But no less important is the fact ... that the political health of democracy is tied up in a crucial way with the successful maintenance of stable high employment and living opportunities. It is not too much to say that the widespread creation of dictatorships and the resulting World War II stemmed in no small measure from the world's failure to meet this basic economic problem adequately.

Nothing in the above resonates with this subsection's opening remark that the new formalist creed found its popularising Text in Samuelson's book. These are words that prepare the reader for a head on assault on real world economics; for an approach whose purpose is to delve into the workings of capitalism, rather than a journey into some obscure mathematical universe.

Indeed, the Text is replete with statements concurring with the view of its author as a New Dealer; a theorist with centrist views who believes strongly in the need for planning, for state intervention, for collective action that supports, guides or even constrains the market.⁵¹ Though often dismissive of Karl Marx (he once referred to him as a minor post-Ricardian), the Text ostensibly parts ways with the usual Cold War anti-Marxism by expressing the view that: "It is a scandal that, until recently, even majors in economics were taught nothing of Karl Marx except he was an unsound fellow." (9th edition: ix) or that "Marx was wrong about many things – notably the superiority of socialism as an economic system – but that does not diminish his stature as an important economist". (15th edition:7) His courteous attitude to the Cold War enemy even led him to include, in the Text's 13th edition (as later as 1989), that : "the Soviet economy is proof that, contrary to what many sceptics had earlier believed, a socialist command economy can function and even thrive" (13th edition: 837).

⁵¹ In a later edition, he observed, "No longer does modern man seem to act as if he believed 'That government governs best which governs least'" (8:140). In keeping with his Keynesian roots, he writes that a large government provides "built-in stabilizers" to the economy, through taxes, unemployment compensation, farm aid and welfare payments that tend to rise during a recession (8:332-4).

Additionally, the Text explicitly set out to bring Keynes to the lecture theatre; to teach his main contributions in a manner that integrates the great man's insights with the rest of the economics students had to learn. Indeed, the macroeconomic part of the Text can easily pass as Keynesian, at least in terms of its language and emphasis on the employment of fiscal and monetary policy to manage demand and, therefore, stave off the scourge of unemployment.

So, why am I arguing that the Text proved an essential ally to the spread of the new formalism at the expense of *relevant* economic thinking? How could it be that a scholar of Samuelson's ability and predilection for relevance is accused of aiding and abetting the slide toward formalism (the formalism that started with Nash and was made dominant after Debreu and Arrow used it to formulate their General Equilibrium (or Welfare) theorems)? The mere fact that Samuelson was fond of, and good at, mathematical modelling is neither here nor there. After all, John von Neumann was even keener on mathematics (and a vastly better mathematician than Samuelson) and yet this paper exonerates him of any complicity *viz.* the formalist takeover of economics.

The reasons for taking a different view of Samuelson's role, and for presenting his Text as a major accomplice in Cold War economic formalism, can be traced all the way to his doctoral dissertation (published in book form in 1947, a year before the Text's first edition). It is entitled *Foundations of Economic Analysis* and is nothing less than a masterpiece of a combination of mathematics and economic theory. Unlike von Neumann, Nash and Debreu, none of whom had any schooling in economics prior to dabbling in it, Samuelson had an impressive command of all the economics that preceded him; from Adam Smith onwards. His thesis exudes an urge to synthesise all that accumulated knowledge by means of mathematical tools. Its author presents himself as the latest link in a chain that starts, effectively, with the classical economists, moves on to Alfred Marshall (arguably the first textbook writer and purveyor of mathematical-economic reasoning) and continues to Keynes, Marshall's student. Samuelson's ambition was, clearly, to reintegrate Keynes in the Marshallian mathematical method, thus producing a fully integrated economics (in which the transition from micro to macro would be seamless).

But Samuelson differed from Marshall in one important way: Marshall may have used mathematics but was highly suspicious of its influence on economic thinking. In an anxious moment, he had warned that most economic phenomena "...do not lend themselves easily to mathematical expression." Economists must therefore guard against "...assigning wrong proportions to economic forces; those elements being most emphasised which lend themselves most easily to analytical methods." Samuelson chose to ignore Marshall's advice.

In the introduction of his *Foundations*, Samuelson considers Marshall's advice as well as his dictum that the economist ought to avoid putting literary propositions into mathematical form. He rejects this advice stating that "this dictum should be exactly reversed"; that what is wasteful and involves mental gymnastics of a peculiarly depraved type is the effort of converting essentially mathematical propositions into a literary form. It is this interpretation of the role of mathematics in social science that prepared Samuelson for the role he

was to play during the 1950s and beyond as the key legitimiser, at the Economics 101 level, of economic formalism.

To see this, consider briefly the way he presents Keynesian thought in the Text. The belief that genuine insights are to be deduced chiefly from the mathematical depiction of some concept led him to teach Keynes to generations of students as follows: First, we write down the equations and draw the geometry that defines the macroeconomy and only then we prove, as theorems, a number of propositions regarding the importance of government intervention in maintaining a certain level of effective demand.⁵² This is, of course, neither the way Keynes had thought nor the manner in which he arrived at his policy recommendations. For Keynes' greatest contribution was to point out the very real possibility that deep-seeded uncertainty yields self-fulfilling expectations that may cause recession and maintain a depression. By deep-seeded uncertainty Keynes meant the type of intrinsic insecurity that cannot be expressed neatly in terms of some well defined mathematical function. Samuelson, by contrast, directed his readers (to borrow Marshall's words again) towards assigning exclusive emphasis to "...those elements being most emphasised which lend themselves most easily to analytical methods".

In this sense, the Text paraded a version of Keynesianism that was depleted of Keynes' essential thinking. It discussed government policy but only in a theoretical context that was, ultimately, disengaged from the Keynesian logic which had underpinned the actual policy making of the New Dealers. Consequently, students who would never go beyond intermediate economics were given the false impression that they owned, and had read bits of, a textbook which (a) covered the whole of gamut of economic thinking and (b) was politically broadminded and scientifically rooted to what was going on both at the level of economic policy *and* at the higher echelons of economic theory (e.g. at the postdoctoral level).

However, this false impression was never tested as very few would move on to graduate school. Those who did would soon immerse themselves in the language and rituals of the Nash-Debreu-Arrow analysis and, if they were good at what they were doing, would soon forget the Text's attempts to say something useful about policy, planning and Keynes.⁵³ And when later (in

⁵² Samuelson was much taken by a review of Keynes' *General Theory* published in *Econometrica* by Sir John Hicks. In that review, Hicks presented a geometrical analogue of Keynes' argument. It was meant as a visual tool that offers *some* (but not all of the) insights relevant to Keynes' point. Samuelson transferred this diagram, an improved version of it, in the Text except that he failed to transfer along with it Hick's conviction that not everything of importance in Keynes' argument could be conveyed by the geometry. From that moment onwards, generations of students were educated by Samuelson to think that this type of geometry was the be all and end all of Keynesian thinking. Formalism had done its ugly deed at the level of introductory economics.

⁵³ That Samuelson never seemed to grasp the New Dealers' Grand Design is evidenced from the fact that the Text, while expansive on global aspects of economic development, has very little to say about Germany and Japan; the two economies that, according to Section 2, were such an important element of the Design. From the 2nd to the 14th edition, Samuelson attributes Germany's recovery to currency reform and the removal of price controls (2nd edition: 36; 14th edition: 36). More surprisingly, he offers nothing on Japan, except for a throwaway line in the 8th edition: "Japan's recent sprint has been astounding" (8:796). In the 1980s and 1990s, even as many textbooks offered a more global approach, the Text still, to all intents and purposed, ignored Japan.

the 1970s) Keynesianism was abandoned in Washington, London etc. (see the next section), some of these, by now accomplished theorists, would 'prove' that the Keynes they had known in their youth through the Text was... logically incoherent.

In conclusion, while Debreu *et al* were taking over academic economics, the 'masses' were being educated by Samuelson with a Text that (a) echoed the new mantra of seeking truth in the mathematics (as opposed to von Neumann's determination to use mathematics as tools); (b) exuded a feeling that economics is now a complete mathematical science, with nothing to learn from history, philosophy or the rest of the social sciences; and (c) was sufficiently 'liberal' to pass for an non-ideological, impartial manual. Samuelson's thoughtful participation in debates with those opposing the new formalism's creed (e.g. with Joan Robinson over the so-called 'capital controversies',⁵⁴ or with Marxist economists over the so-called 'transformation problem'), as well as his own research accomplishments at the top end of economics, perpetuated the myth that there was a clear path linking what the beginners were reading in the Text to both (a) the Nash-Debreu-Arrow type formalists and (b) the debates between formalists and dissidents (e.g. Keynesians, Marxists, neo-liberals of the Austrian school). This impression was as false as it was essential for broadening the appeal of the new, formalist, Cold War economics.⁵⁵

⁵⁴ Significantly, Samuelson conceded Robinson's main criticism of the neoclassical theory of aggregate capital. But then tried to snatch victory from the jaws of this defeat by suggesting that the way to restore the neoclassical approach's logical coherence was to turn to a Debreu-like GE rationalisation.

⁵⁵ Samuelson understood well the importance of his Text. Nasar (1995) reports that he once said: "I don't care who writes a nation's laws – or crafts its advanced treaties – if I can write its economics textbooks"

5 The Global Minotaur

The post-war era's second phase and the rise of financialisation (1975-2008)

While formalism was taking over economics in the 50s and 60s, the global economy was preparing for a major transition. Section 2 has already narrated how, while seemingly in competition with Germany and Japan, the US was continually aiding and propping up both, sometimes through painful sacrifices at the domestic front. It was of course not some species of internationalist altruism. At the heart of US thinking was an intense anxiety regarding the inherent instability of a single-currency, single-zone, global system. US support first for European economic recovery, and then integration, was one response. The safeguarding of Japanese export-oriented industrialisation was another.

Of course, even the best laid plans can get unstuck. The trick is to respond creatively to the setbacks; a test that US policy makers often passed with flying colours. The Vietnam War was a catastrophe for everyone caught up in its murderous clasps; but it came, from the US policy makers' perspective, with an unanticipated silver lining: the development of South East Asia. Just as Japan's economy grew on the back of US military spending during the Korean War, so were the tigers of SE Asia the offspring of enormous investment, paid for from the US military budget, during the Vietnam war (see Hart-Landsberg, 1998). Of course, these sums not only turned Korea *et al* into a Japanese vital economic zone, but were also the reason for America's gigantic balance of payments deficit; a deficit that, besides its local effects in South East Asia, provided much of the Keynesian boost that brought us the prolonged post-war boost.⁵⁶

As we all know, this balance of payments deficit grew beyond any sustainable level, reflecting the extent to which the Vietnam War was confounding the US military's best efforts. The Bretton Woods system ostensibly prevented the US from printing more dollars than it could back up by its gold reserves. Once the world market was flooded with the greenback, European leaders began to make unkind noises about America's tendency to build an empire by putting the world financial system at risk. Things came to a head when President De Gaulle sent a destroyer to the East Coast (to redeem French-held dollars for gold) and even the British demanded 3 billion dollars worth of gold from Fort Knox. President Nixon responded, four days later, with the announcement that the dollar-gold convertibility had ended.

In charge of US policy at the time was Texan John Connally.⁵⁷ He visited European capitals officially to explain the policy shift and to ask

⁵⁶ The American quagmire in Indochina was giving rise to two antagonistic effects. On the one hand it was generating the quantitative conditions for global growth but, on the other hand, it was creating acute rivalries between the US and its two major protégés in the context of the former's balance of payments deficit and the ensuing pressure on the dollar.

⁵⁷ Connally, a lawyer, was Texas' Governor from 1961 to 1969. In that capacity, he was, famously, in the car when President Kennedy was assassinated. During the war he had served as Forrestal's deputy (see Section 2 for Forrestal's role in the Grand Design). Later he became close to President Johnson. Though a Democrat, Nixon appointed him Secretary of the Treasury in 1971. By 1972 he stepped down, forming an organisation called *Democrats for Nixon*, thus completing his defection from the Democratic Party.

European governments to assist the USA during its hour of need. Unofficially, however, he delivered a harsh message: "It may be our currency, but it is your problem!", he reportedly told them. The Europeans understood. What Connally had done was to foreshadow the new reality: The US, as long as the dollar remained the world's reserve currency, was to enter a new phase of purposely running monumental current account deficits by issuing debt that the rest of the world would cover. But this was not all.

In his 1982 memoirs Henry Kissinger states categorically that the push to increase oil prices in the 1970s came from the US. It is now well accepted (see Oppenheim, 1976/7) that Kissinger's memoirs impart quite accurately the manner in which US decision makers seized upon the OPEC-imposed embargo to push for a sharp increase in oil prices, well beyond OPEC's planned price rises. The aim was to redress the balance of payments situation between the three major zones: the US, Europe and Japan. The basic assumption of US authorities was that both the Japanese and the Western European economies would find it much harder than the US to deal with a significant increase in oil prices.

While the underlying assumption was spot on, the policy backfired. In the same way that Washington had underestimated in the 1960s the resolve of the Viet Cong, in the 1970s they underestimated the chain reaction that their meddling in oil prices would cause. The ensuing stagflation hit the domestic market hard. Nonetheless, the crisis brought along a major benefit: the elimination of the US balance of payments! Contrary to most economists' expectations, this did not happen because the US tightened its collective belt to limit its balance of trade deficit. Exactly the opposite happened, with imports accelerating faster than exports. No, the balance of payments' crisis was eliminated because the US managed to magnetise sufficient and sustainable capital flows from the rest of the world. This reversal of fortunes was even more extraordinary because it happened as the rest of the world was sinking inexorably into stagflation too. It ensured that the US could, all of a sudden, expand its balance of trade in deficit with no consequences on the dollar. But there was another effect that the reversal in capital movements caused: It set in motion a process that was, within a decade or so, to end the Cold War, handing victory to the US.

The rise in oil prices in the 1970s and the cost-push inflation it caused led to a sharp rise in nominal interest rates after 1975. While everyone suffered, some suffered greatly, as they had borrowed heavily on the international money markets (at the behest of western bankers) a few years earlier. Communist Poland and Yugoslavia, as well as many Third World countries (where national liberation movements had grabbed power, against the better efforts of the US), had turned to heavy borrowing to build up their industries and infrastructure (and, in the case of Poland and Yugoslavia, to attain a degree of autonomy from Moscow). The interest rate hikes therefore started the Third World debt crisis (which still plagues large portions of the planet) as well as the unravelling of communism in Poland and Yugoslavia, a process that was to infect the whole of the Eastern Block.

Through this lens, the ascent of global interest rates in the 1970s coincided with the elimination of the US balance of payments problem and proved *more effective in destroying the enemies of US foreign policy around the globe than any imaginable military operation*. Who would have thought

that the chain of events that led to the end of the Cold War started with the same crisis that reversed the financial flows and led international capital to flee to New York?

The question then becomes: Why did non-American capital seek refuge into the US and continues to flow to this day? The quick answer is that the US economy (although also hit hard by the recession brought on by the rises in the prices of oil and money) absorbed the rise in oil prices and interest rates better than the rest of the world, thus improving its *relative* financial position *viz.* not only Europe and Japan but also the Third World and its Communist foes.

By the early 1980s, under the Reagan administration, US policy fully endorsed this new reality and a consensus emerged that the balance of payments no longer mattered; that what *did* matter was the strength of US finance, founded upon the dominance of Wall Street, of American multinationals (particularly in the energy sector) and, of course, on the ability to retain the dollar as the global reserve currency. These developments effectively transformed the world economy into a periphery from which the United States imports vast quantities of goods which conventional economics might say it cannot afford. Only, of course, it *can* afford them, paying for its deficit (to the rest of the world) by issuing bonds and treasury bills, or by attracting capital through its stock exchanges. When China, and to a lesser extent India, came on stream, this process deepened further and traditional concerns of what to do with the deficit were dealt another blow.

Pivotal to this strategy were three elements: the lower rate of inflation in the US; the denomination of commodity prices (especially oil) in US dollars; and last, but not least, US military dominance.⁵⁸ Lower inflation attracted capital for obvious reasons⁵⁹ and the drive to keep it low explains the administration's and the Fed's efforts (a) to keep domestic wages at rock bottom levels,⁶⁰ and (b) to create a highly deflationary international environment. The latter's importance is gleaned by the observation that the rest of the world has been, since 1980, supplying the US with commodities at non-inflationary prices.

The post-1980 global situation resembles in many ways Britain's dependence on India during the Empire's final phase. From the end of the 19th century until the Great War, Britain ran a huge balance of payments deficit. The way it managed to maintain it was by having India export to the rest of the world and by taxing away, in one way or another, the surplus that India generated through its exports. These capital flows and taxes made it back to the City of London thus clearing the deficit. This is the model that the US have been emulating since 1975. Instead, however, of using this policy *viz.* a single country (as Britain had done), they applied it to the rest of the world (especially so after the collapse of the USSR and its satellites).

⁵⁸ Which works both as a device inspiring confidence in 'markets' of the dollar's reserve currency status and as a source of domestic demand generated by the military-industrial complex.

⁵⁹ For relatively high inflation pushes lower the value of the assets (real and financial) purchased by incoming capital.

⁶⁰ Median real wages in the US were in 2008 at around the same level as in 1975, while profits increased by a factor of around eight during the same period.

A brief perusal of the Fed's research papers over the past fifteen years convinces the reader that the US authorities saw the greenback as a *strategic asset*. The drive to 'dollarise' whole foreign economies, especially in Latin America, is to be understood as part of the same mindset. Dollarisation meant that the US dollar becomes the country's *de facto* local currency. The main effect, from the US perspective, of this move was that the demand for dollars all of a sudden depends not only on the international transactions of other countries but on the domestic transactions of the dollarised economies as well. This lent the US added political leverage and reduced further its pre-occupation with external debt. The reason is simple: As dollars were being increasingly demanded by foreigners *for their own domestic purposes*, the USA's balance of payments played a decreasing role in shaping the dollar's value in the international money markets (see Halevi, 2002).

To recap, the Vietnam War put a great deal of strain on the Grand Design in Section 2. As the cost of waging carnage in Indochina far exceeded its planned levels, the capacity (and willingness) of the US to finance its two creations (the Yen and the Deutschmark zones) began to slip. The balance of payments problem intrinsic to the Design demanded a new solution; one that involved a redistribution of finance capital *away* from the Yen and the Deutschmark zones and back towards the Angloceltic nexus.⁶¹

Continuing with this recap, US officials understood well that the only way the USA could avoid deflating in order to adjust its external balance was to compel the rest of the world to keep financing its deficit. Such redistribution of finance capital resembled London's strategy for maintaining in perpetuity a large balance of trade deficit with India. The simple implication of this is that the US imposed on the rest of the world the role that India played *vis-à-vis* the British Empire. Unsurprisingly, there was a snag: Unlike India, which could export to the rest of the world, and thus generate the balance of trade surplus which the British would subsequently plunder, the rest of the world cannot export to... the rest of the world!

It is for this reason that Washington's New Global Design involved a *policy of global deflation*. For in the absence of inter-galactic trade, the only way that the US can make the rest of the world accept a perpetual redistribution of finance capital is by enforcing, and by recapitulating, its international role in crucial areas.⁶² By the time the Cold War ended, the new driving force behind US policy was to find ways of satiating the voracious appetite of the US economy for foreign capital; a latter day Global Minotaur single-mindedly concerned with its nourishment. China's leadership seems to understand this terribly well today and, like it or not, buys all the debt that the US authorities choose to throw at them.

⁶¹ Of course, the shift could not be (and was not) too sudden since the greenback's two pillars (the Japanese and the European economies) remained essential to the US for their shock-absorbing and effective demand enhancing qualities.

⁶² Two crucial areas in which the US placed much emphasis are, of course, the energy and the environment sectors. In the meantime, much effort was put into maintaining the divide and rule policy (e.g. the project of keeping Europe politically divided while monetarily united) that would ensure US continuing control over the areas that might politically impinge on its domination of world finance, energy and environment. In all these areas, US policy has been ruthlessly to promote American 'comparative advantage', which is shorthand for American supremacy.

The point behind the preceding analysis is simple: The financialisation drive which typified the post-1980 period, and led us to the dire straits of 2008, was predicated upon this tsunami of foreign capital making its way, at dizzying speeds, across both oceans, toward the US. The institutions that received it, naturally, invented new, exciting financial vehicles by which to maximise the already massive gains. High Street banks branched out to merchant banking, car companies (like GM) decided to board the gravy train, and insurers (like AIG) set up investment vehicles whose dealings were kept off the parent companies' books (while still underwritten by them).

With their appetites whetted, they employed more young dealers with the remit to keep pushing the returns onto higher and higher plateaus. It was only a matter of time, as regulation was relaxed by Washington,⁶³ that they would cross a bridge too far: Securitisation of debt was what happened next. Not content to handle capital inflows from abroad, the swarms of young dealers and mathematically well trained 'financial engineers' sought to profit from domestic debt; in particular the debts of the American working and lower middle classes whose incomes were more or less stagnant since 1975 but who, at the same time, were seeking to improve their living standards the only way they could: by borrowing.

The financiers' audacious move was to add together these loans, form horrendously complex and sophisticated financial derivatives out of them,⁶⁴ and sell them on to other institutions as packages of debt. This severance of the traditional link between the initial lender and the borrower rendered the former indifferent to whether or not the loan would be repaid. But even the buyer of those bundles of debt (called securities or derivatives of credit default swaps etc.) cared little about the repayment prospects of the initial debt because they always intended to sell them very quickly, making a profit as this market for these derivatives skyrocketed.

And skyrocket it did: By 2008 the value of such 'securitised' derivatives reached 700 trillion dollars, on a planet that barely makes 50 trillions (of GDP) per annum. The world of finance had, on the back of this Global Minotaur, become too large for planet Earth. In 2008, as the defaults started piling in, the planet's gravitational forces brought the world of finance crashing down. At the time of writing this, the present crisis threatens to surpass the gravity of 1929. But how does this relate to the earlier tale of the takeover of economics by a formalism which started life at the Cowles Commission in Chicago in 1950 and matured fully during the Cold War years? The next section concludes by making the connection.

⁶³ In the context of further reinforcing Wall Street so as to accelerate the capital inflows that kept the balance of payments satiated

⁶⁴ The creation of these derivatives utilised stupendously complex mathematical (stochastic) models which, at any point in time, linked their value to a host of financial events occurring all over the planet. In effect, the derivatives included a series of complex, sequential bets using the initial debt as the starting value; a starting value that changed almost every other second. Is it surprising that, now that no one is buying these derivatives, no one can estimate their true value?

6 Conclusion

For whom the bell tolls?

Irrelevance has its virtues. Neither good art nor good music needs to be 'relevant', 'efficient' or a means to some end. They are created for the sheer pleasure of it. At an optimistic moment in the 1950s, one might have hoped that economic formalism would be a harmless pastime for a host of academics playing intellectual games with one another. An art form even. A latter day version of the ecumenical synods convened to debate how many angels would fit through a needle's eye. A religion with equations that kept imaginative formalists out of harm's way. Alas, things turned out differently.

The current economic crisis is causing immense global suffering of a scale not seen since 1929 – with terrible consequences for world poverty, health, education, housing, the environmental agenda (which is being sidelined) etc. The 700 trillion dollar derivatives' bubble is surely to blame for its magnitude⁶⁵ but economic formalism (of the form I claim surfaced for the first time with the first equation in Section 1) is complicit in this crime against humanity. The reason becomes obvious when we ask: How did the financial derivatives' bubble emerge in the first place? The spectacular growth of the derivatives market required some formula for pricing what constitutes opaque, exquisitely risky, prohibitively complex, financial 'products'. The second equation in Section 2 is that very formula. But how is it connected with Cold War-era economic formalism?

Dr Li's so called Gaussian copula formula did not materialise from thin air. From the second half of the 1950s onwards, a number of attempts were made to deal with uncertainty in ways more constructive than Debreu's and Arrow's contingent commodities ever allowed (another idea that was initiated by Jon von Neumann during the war); but also ways that would finally and irreversibly deny the notion of uncertainty the essential features that Keynes had highlighted. In particular, Harry Markowitz⁶⁶ and James Tobin⁶⁷ introduced a notion of variability that was a total denial of Keynesian ideas of uncertainty. It was a notion that Fischer Black and Myron Scholes would harness, in 1973, to present the first formula that claimed to offer a practical way of pricing derivatives. Their paper was entitled 'The Pricing of Options and Corporate Liabilities' and built on the prior work of Samuelson, Markowitz, Tobin, Treynor, Thorp and others. In it they proved under what conditions the uncertainty surrounding a derivative (as long as the derivative is actively traded) can be assumed away by a relatively simple formula that attaches to it a specific price.

The direct lineage of the Black-Scholes formula in the formalism of the 1950s can be gleaned from its fundamental axioms. Zero transaction costs; continuous trading; and, of course, the assumption of Brownian motion. The latter, in words, means that the model assumes away not only the possibility

⁶⁵ This is not to say that the bubble caused by financialisation is wholly responsible for our economic crisis. Crises have always been intrinsic to capitalist dynamics. The undeniable point here is that the bubble caused the severity of the current crisis.

⁶⁶ See his paper 1952 *Journal of Finance* paper entitled 'Portfolio Selection'.

⁶⁷ In his 1958 *Review of Economic Studies* paper entitled 'Liquidity preference as behaviour toward risk'.

of crises but, incredibly, the possibility that changes in prices are patterned (as opposed to totally random).⁶⁸

In 1997 Scholes shared the Nobel Prize for this contribution (with Bob Merton). Previously, he had started practising what he preached by setting up *Long Term Capital Management*, a hedge fund trading on the strength of his formula. It began operating with \$1 billion offered by investors greatly taken by the professor's formulaic, actuarial approach to financial markets. For a while LCTM went on to make impressive returns on their investment (about 40% on average). Ironically, in the year Scholes was awarded his Nobel, the East Asian and Russian financial crashes conspired to end the LCTM fairytale by revealing the inanity of the Brownian motion axiom buried in the formula's foundations. In one of the markets' most famous collapses, LCTM ceased operations with a \$4.6 billion loss in the less than four months.

Dr Li's Gaussian copula formula, which this paper chooses as a totemic symbol in the introduction, is, naturally, a direct descendant of 1950s formalism and the neoliberal tradition of the 1970s which, in effect, proclaimed the end of genuine macroeconomics.⁶⁹ Moreover, it is chosen here over the Black and Scholes formula because the vast majority of trading in the now famous 'toxic' derivatives (built around middle and working class America's debt) were based on it. Its main innovation is the use of a mathematical theorem (by A. Sklar) to model the joint distribution of two uncertain events. In technical terms, the Sklar theorem allowed Li to separate the dependence structure from the univariate margins of *any* multivariate distribution. The meaning of this is simple: Li had come up with an ingenious way of modelling default correlation which did not require use of historical default data. Instead, he used market data about the prices of specific financial instruments (called credit default swaps).⁷⁰

This method brought tears of joy to the traders' eyes. All of a sudden, and as long as they trusted the formula's underlying assumptions, they could ignore the nearly infinite relationships between the various parts that made up a derivative. They could set aside concerns about what happens when some partial correlations between components turn negative while others turn positive. All they needed was to keep a trained eye on one, single number; one correlation that summed up all the information relevant to pricing the derivative.

The particular ingredient on which Dr Li's formula hinges is the innocuous looking γ on its right hand side and, more importantly, the assumption that it is a *parameter*. In plain English, this assumption means that traders assumed away the possibility of a sudden, unanticipated by the

⁶⁸ In effect, Black and Scholes openly threw out of court an economist's approach, replacing it with an actuarial perspective. But as my colleague Nicholas Theocarakis tells us, the Latins have an apt saying: *Quod ab initio vitiosum est non posset ex post convalescere*.

⁶⁹ Li grew up in rural China in the 1960s. He studied economics at Nankai University before moving to Canada to complete an MBA at Laval University. Then he took an MA in Actuarial Science and a PhD in Statistics, both from the University of Waterloo. By the time the East Asian crisis was destroying LCTM, in 1997, he started working for the *Canadian Imperial Bank of Commerce*. In 2004 he moved to *Barclays Capital* where he proceeded to build from scratch its quantitative analysis department.

⁷⁰ When the price of a credit default swap goes up, that indicates that default risk has risen. Li's breakthrough was that instead of waiting to assemble enough historical data about actual defaults, which are rare in the real world, he used historical prices from the CDS market.

actuarial data, wave of defaults. The mind boggles: Where did Dr Li find the confidence to assume that no such wave would ever gather pace and that his γ 's constancy is safe as houses (rather than a fluctuating variable connected to capitalism's unpredictable whims)? The simple answer is: In the same place that economic formalists derived the confidence to impose the third meta-axiom (see subsection 4.3) every time they needed to 'close' one of their models.⁷¹ That place was no other than a fantasy world in which the economy operates *as if* to confirm the solidity of their axiomatics.

But then the question becomes: Why was Dr Li believed?⁷² Why did numerous smart, self-interested, market operators, whose livelihood depended on the constancy of that γ , never question that obviously far-fetched assumption? The answer is twofold: First, because they were captives of herd-like behaviour and would have risked their jobs if they moved against the pack.⁷³ Secondly, because during the Cold War era (and especially after the end of Bretton Woods and the demise of the original post-war Design) economics had ridden its textbooks and leading research programs of all dissident voices which might have warned against such assumptions.

The rot, naturally, had set in much earlier with heavy casualties throughout the post-Bretton Woods period. In the late 1970s, behind the 'New' Classical Macroeconomics which wiped out Keynesianism and all other dissident voices, lurked no more than a touched up version of Nash's and Debreu's Bourbakist axiomatics.⁷⁴ It exalted the joys of monetarism (pushing unemployment, in the early 1980s, to heights unprecedented since 1929), cultivated the Washington Consensus, justified the 1980s and 1990s IMF and World Bank policies, and underpinned the Maastricht Treaty (on which the euro was built⁷⁵). The difference today is that the crisis' victims are not confined geographically to the north of Britain, to Third World countries straining under the misanthropic SAPs (structural adjustment programs), or to North American rustbelts.⁷⁶ Today's victims are spread thickly all over the globe and belong to a rich variety of social classes.

While policy was in the hands of the New Dealers, formalism was confined to academia and did little harm, save perhaps to provide an ideological fig leaf for the Cold Warriors and render students of economics incapable of subjecting capitalism to critical scrutiny (for the simple reason

⁷¹ Tellingly, unless γ was assumed to be a parameter, Li's formula could not assign a determinate 'value' to the derivative under scrutiny.

⁷² It has been reported that Li, after the Crash of 2008, commented about his formula that: "The most dangerous part is when people believe everything coming out of it."

⁷³ Doubt about the constancy of γ would have cost them their jobs, especially so given that their supervisors did not really understand the equation but were receiving huge bonuses while it was being used.

⁷⁴ By the time I went to university in the late 1970s, Keynesianism had been displaced by the so-called *Rational Expectations Macroeconomics* that Robert Lucas, of the University of Chicago, had introduced. By assuming that no agent's beliefs could be systematically wrong, he 'proved' that all forms of government intervention in favour of boosting employment are doomed. Years later, when reading Nash's 1950 and 1951 papers I realised that Lucas had simply copied the third meta-axiom behind Nash's equilibrium concept. See Varoufakis (1991) and Hargeaves-Heap and Varoufakis (2004).

⁷⁵ Which, quite foolishly, lacks any mechanism, comparable to that of the dollar, for fending off crises like the present one.

⁷⁶ Whose wages have remained unchanged in the face of inconspicuous profiteering by those somehow connected either to finance or to the military-industrial complex.

that they would not have recognised capitalism even if it hit them with a stick). That capitalism became invisible to the graduates of the best economics departments was not catastrophic as long as the policy makers themselves held a clear vision of capitalism and remained cognizant of its propensity to stumble and fall. However, in an unhappy coincidence, the New Dealers were being pensioned off at the time their post-war Grand Design was unravelling, quickly transforming (in the mid-1970s) into the Global Minotaur of the previous section.

Increasingly, policy making, on both sides of the Atlantic, was being influenced (a) by politicians whose only whiff of economic wisdom came from Samuelsonian textbooks, and (b) economists inducted at a young age into formalist graduate work. Indoctrinated by a view of the world in which capitalism is a meaningless term and markets are the epitome of freedom-in-action, they were suddenly asked to help steer a vessel whose dynamics they are entirely innocent of. Following at least two decades of purges of dissident voices, the Ivy League economics departments no longer contain fertile minds capable of genuine insights into the workings of globalisation and, more pressingly, of recommendations for dealing with its discontents.⁷⁷

To recap, the Cold War, despite its many faults, at least built a post-war order (1945-1971) to a rational Design. Its originators were policy makers educated by the Great Depression, the New Deal and wartime planning. Ironically, at the same time, the Cold War's ideological demands were buttressing the evolution of a mutant, economic formalism whose academic success would prove inversely proportional to its explanatory power. While the Global Design was holding up, economic formalism could be tolerated as a harmless, even aesthetically pleasing, intellectual pursuit. But when it frayed, and the Global Minotaur replaced it, formalism began to play a highly misanthropic role.

In the absence of the New Dealers' restraining presence, economic formalism entered the corridors of power in an unholy alliance with unfettered financial capital, contributing to policies that rendered the global economy increasingly irrational and its crises deeper and more violent than ever. Anyone who dared challenge these policies was admonished as 'old hat' and was instructed to step aside. The impressive mathematics it brought to the New Order's marketing department lulled politicians into thinking that this was, indeed, a new, scientific paradigm; that everything could, indeed, be doubling in value for ever, at the same time that median wages were stuck to their 1975 level. The legitimiser of an irrational order has become its hypnotist.

Every once in a while the world astonishes itself. The crash of 1929 was one such moment and the crash of 2008 will surely prove to be another. But will it produce a generation of minds as brilliant as those that emerged after the Great Depression? Given that all critical thinking has been bleached out of academic economics, how will our policy makers manage to transcend economic formalism? Will they find guidance from the rest of the social

⁷⁷ Whatever dissident voices do exist in respectable departments, they have long been forced to confine themselves to fields like experimental economics, behaviourism, or evolutionary game theory: fascinating in the own right but quite irrelevant to a serious debate on how to deal with an economic crisis. It is indicative that the Obama administration must steer a course in stormy waters with no assistance from a Keynes, a Schumpeter, a Galbraith or a Sweezy.

sciences? Or will something awfully worse than economic and social misery prove necessary in order to liberate the world from the mirages and ideological straitjackets that the economics profession has been fashioning since the eruption of the Cold War?

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