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# **The Crash of the Knowledge Economy\*.**

**WORKSHOP**

**“The complexity of financial crisis in a long-period perspective:  
facts, theory and models”**

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## 1. Introduction.

The automobile industry is hardly associated with the knowledge economy. It has been around for more than a century and has been sometimes regarded as a mature industry which could be moved to developing countries which were far from the frontier of knowledge. Nonetheless on [the financial times](#) of March 6<sup>th</sup> we can read that:

*“Our impression is that Opel has not freed itself from GM’s influence and that it is not being serious about becoming more autonomous as a business,” the insider said, confirming that both Mr Guttenberg and Ms Merkel were losing patience with the companies.*

*Berlin has refused to assist Opel without cast-iron guarantees that the money will not flow to GM or be lost in the wake of a GM insolvency. Officials say Opel’s restructuring suggestions so far have failed to provide this guarantee.*

*The government suspects GM has provided some of Opel’s patents as collateral to the US Treasury in exchange for financial assistance. Berlin therefore doubts Opel would be shielded against an GM insolvency.”*

In other words, without some of its patents, Opel is worth nothing and cannot be saved even by substantial funding of the German State.

The Opel story is insightful. It clarifies the importance that IPR play in shaping the investment opportunity of a company. Even if we put aside the overwhelming importance of trade-marks, the deprivation of other forms of intellectual property can completely block investment opportunities. In the case of Opel, the deprivation of patents occurs in a situation where the skills of the engineers and of the other employees, who developed them, are still in the company together with its physical capital. In general, the situation is even worse. Lacking IPR protection all the other resources, such as the related skills and physical resources, are unlikely to be developed. Investment opportunities are then closed by the absence of a multiple set of factors.

In other less mature production sectors, the limitation of investment opportunities, due to intellectual property, has been even more evident.

In the following section we will argue that a progressive closure of investment opportunities has characterized the knowledge economy. This closure has contributed to the investment famine that has manifested itself as a saving glut firstly for the American economy taken as a whole and later mainly for American consumers.

In the third section we will argue that the present institutions of the global economy tend to diminish the role of open science. In our view this has negative consequences for both open markets and the overall level of economic activity. The institutions of open science, which allowed the blossoming of industrial development, should have a more important role in the architecture of a future post-crisis global economy.

The final section focuses on short run policy suggestions. We will argue that one can stimulate aggregate demand by moving knowledge from the private sphere of intellectual monopoly to the public domain. Keynesian policies can be joined with the capacity of knowledge to be used an infinite number of times and, in this way, can generate an investment super-multiplier which may contribute to a successful exit from the present crisis.

## **2. The origin of the crisis: saving glut vs. investment famine.**

Unsurprisingly (Stiglitz, 2008), the immediate cause of the crisis has been generated in the financial sector. The subprime crisis and the debts of American consumers have certainly been the most evident cause of the crisis. For this reason, the immediate causes of the crisis are often seen as being the lack of regulation and the expansionary policies of the Fed, which by keeping interest rates artificially low, has provoked an excessive supply of saving. As amply explained by the well-known models of adverse selection, the latter has in turn produced a growing pool of toxic debt, with the consequences by now evident worldwide.

Also, according to [an article in the \*Economist\* of last January](#), a beneficial “flow” of saving has turned into a disastrous “flood”, but, according to the article, the flood is more due to “global imbalances” generated abroad than being an endogenous product of the American economy and policies.

Following a similar argument, [Governor Bernanke has long argued](#) that the role of the Fed in credit expansion has been marginal, and that the prime cause of the crisis has been a saving glut forced on the United States by massive inflows of savings from other countries.

There is something appealingly infantile in Bernanke's argument. For many of us (and for me at my mother's), 'bellyfuls' and the indigestion which they cause are due to the excellent and over-abundant food that is served. Like me, at mom's house, Bernanke does not feel guilty and does not see the many original sins of the Anglo-American variety of capitalism. Indeed, until few months ago, this model, as well as its unrestricted philosophy of maximizing shareholder value were supposed to be so virtuous to mark "The End of History in Corporate Law" (Hansman and Kraakman 1997) to set final a benchmark which all countries should rush to imitate. However all the warnings and the dangers of repeated, and somehow compulsive indigestion, had been given well in advance. The financial instability of unregulated capitalism had already been accurately diagnosed by Minsky (1986) while the continuous generation of market bubbles had offered to George Soros (2008) numerous occasions for fruitful philosophical and financial speculation. In in this context the exogenous availability of savings was only an infantile justification for the sick stomach of the American economy. Piece by piece all the institutions of its digestive systems had been taken away. Like in my mother house, bad digestive systems and poor judgment were the true causes for the failure of the entire body of the Anglo-American financial system.

The real weakness Bernanke's thesis, however, is not so much its infantilism as the inaccuracy of its content. The saving glut was simply not there. Besides the unregulated digestive capacities of the financial systems, which could create all sorts of bubbles, the problem was indeed an investment famine of good productive opportunities. The impression of a glut of savings, which was eventually reversed the American consumers, was a partial and misleading impression: lack of regulation and poor selection of credit risks implied that a famine of good investment opportunities translated itself into a bubbly over-borrowing glut by American consumers. At global level there was never a saving glut but an investment famine.

As shown by the data set out in [the Bank of France paper by Moec and Frey](#), in recent years, savings have not grown around the world; instead, and especially outside the United States, investments have diminished. In other words, the abundance of food in America has been the result of a blockage in the digestive systems of its neighbours.

It can be argued that, in this situation, the Americans have generously done the digesting on behalf of other countries, and give them transfusions of pre-digested food. Part of the saving absorbed by America, in fact, has been injected in the form of direct investments in countries suffering from blockages in their digestive systems.

Is it therefore not the fault of the neighbours if they have been unable to create suitable investment opportunities and if, moreover, they have poisoned the Americans with their flood of savings?

The problem is that the lobbies for the American multinationals, by applying pressure for the new architecture of international trade founded at Marrakech in 1994, have played a major role in causing the blockages of their competitors' digestive systems.

We may start from 1992, when George Bush Senior concluded a presidency replete with success in foreign policy which saw, among other things, the collapse of the socialist economies and the disintegration of the Soviet Union. Yet the slogan "It's the economy, stupid!" was enough to make him lose the elections against Clinton. The cause was not so much the economic crisis which began in 1990 as the consolidated perception that the "American model" was falling behind the alternative Japanese and German models. In the previous decade, a huge body of studies had described the miracles of Japanese management and suggested various ways in which the Americans could imitate it.

By the end of the 1990s the situation had gone into reverse. The United States (and the United Kingdom) had become the model to imitate, and yesterday's heroes (not only Germany and Japan but, after the 1997 crisis, also all the Asian tigers) strove to restructure their economies on the so-called Anglo-American model. In the meantime the Chinese economy had undergone rapid development. What had led to this unexpected reversal?

The explanation may lie in the standard liberalist refrain: only the Americans (and the British) had suddenly have rediscovered the virtues of the market, thus offering numerous investment opportunities precluded to their rigid competitors.

However, on closer inspection, it was not the virtues of competition, but rather the advantages of intellectual monopoly, which enabled the United States rapidly to catch up with the other

Western economies. Indeed, in the first half of the 1990s, the United States no longer had global military and political rivals. It was thus able to reorganize the world economy so as to enhance its scientific and technological leadership, and above all its monopoly positions, to the maximum.

The salient features of the new world were contained in the [TRIPS](#) agreement signed at Marrakech on 15 April 1994. Significantly, TRIPS was the [1C annex](#) to the agreement founding the [WTO](#).

The preamble to TRIPS states as self-evidently obvious that “intellectual property rights are private rights” like all other private property rights. Yet this obviousness would have been unknown to an innovation economist of Schumpeter’s calibre, and it has been recently disputed in Boldrin and Levine’s fine book [Against Intellectual Monopoly](#). Whilst the granting of property rights (including intellectual ones) constituted the natural basis for free trade, ratification of TRIPS necessarily created an annex to the WTO agreements, and an obligatory requisite for access to international trade. Unlike all previous international agreements on intellectual property, the inclusion of TRIPS in the WTO constitution created an efficient mechanism with which to enforce intellectual property rights. States could now be disciplined through the institutions of the WTO itself; and, in extreme cases, access to international trade by intellectual property “thieves” could be restricted.

Notwithstanding the seductive rhetoric extolling free trade and private property, the Marrakech agreement surreptitiously introduced super-tariffs such that the most extreme protectionism pales into insignificance. Since TRIPS, intellectual property rights have become global monopolies; that is, in a certain sense, customs tariffs of almost infinite magnitude. Not only are competitors of other countries not allowed to export a good to the country of the intellectual monopolist, they are also prohibited from producing it in their own country. The developed country is kicking away the ladder from the developing countries (Chang 2002). When multinationals of some countries organize themselves into “patent pools”, the economic desertification of that sector in other countries becomes inevitable, resembling Britain’s erstwhile levies on its colonies, especially India ([Marcello De Cecco, Money and Empire, Rowman and Littlefield, 1975](#)).

With notable exceptions like [Krugman](#), a chorus of alarm at the dangers of impending protectionism has been raised in recent months. It is claimed that one of the worse effects of financial crises is the disruption of free trade. Yet the relationship between the two phenomena has a chicken-and-egg complexity which does not admit to easy solutions.

It is certainly true that the crisis is generating protectionist attitudes and the resumption of economic nationalism. But it also true that protectionism, by appropriating the blessed principle of private property rights, has helped produce the financial crisis. It initially only reduced opportunities for investment outside the United States, while the latter, thanks to direct investments by its multinationals, for a certain time also 'digested' for others. In fact, as [Moec and Frey](#) show, the crisis was preceded primarily by a fall of investments outside America. This fall was initially attenuated by the direct investments of multinationals endowed with an unbeatable recipe based on American intellectual monopoly and low-cost Chinese labour.

Added to the fall of investments by other countries was a gradual digestive blockage of the American multinationals themselves. Already in July 2005 [an article in the Economist](#) talked of a "corporate savings glut", and its subtitle noted that the great corporations, more than the emerging economies, had become the world leaders of the global switch to thrift<sup>1</sup>.

In conclusion, although the financial crises have provoked protectionism, the super-protectionism of intellectual property has driven down investments. This has happened in two stages (largely overlapping in time) and through two mechanisms.

The first stage after TRIPS saw the launching of the Chinese-American model and a shift to investments designed to consolidate American intellectual monopolies. As new spaces opened up for the American companies super-endowed with these "resources", numerous opportunities for investment were closed to Japan and the former Asian tigers, which had neither America's

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<sup>1</sup> The same article then referred to [Keynes' famous paradox of thrift](#) whereby if everyone wants to save, they must (in the absence of investments) reduce their saving ... though they naturally first go through speculative bubbles and various "financial innovations".

monopolistic endowment nor China's lower costs. This phase culminated in the Asian crisis of 1997.

In the second stage, because of the mechanisms described in the [well-known tragedies of the anti-commons](#), world intellectual monopolies became too pervasive and began to block each other. At this point the accumulation mechanism used by the great "knowledge owners" became jammed as well.

The fall in investments therefore created some of the factors that led to the financial crisis, and the latter in its turn drove investments down to further depths from which it will be difficult to re-emerge without a significant number of economic policy measures. While some policy measures should be related to the lack of regulation of financial markets, which were the evident immediate cause of the crash, some others should deal with the crisis of good investment opportunities of the knowledge economy.

### **3. The Closure of Open Markets and of Open Science.**

In President Jefferson's vivid image, knowledge is like the flame of candle: lighting one more candle is not to diminish the flames of the other candles. By contrast, by allowing others to contribute to the fire, we can increase the brightness of each candle! The non-rival, or better the augmenting nature of knowledge, has been a key-factor in human development since the dawn of our species (Battistini, Pagano 2008) and could be increasingly relevant in modern knowledge economies (Bowles 2004). One could argue that in a knowledge-intensive economy the non-rival nature of disembodied knowledge, and the increasing embodiment of knowledge in the human capital of the individuals, should imply a major shift from the capital-hiring-labour to labour-hiring-capital as well as from large organizations to small units. In this economy, because of the non-rival nature of disembodied knowledge, the costs of using non-human capital would become negligible, large organizations would fade away and agency costs could be saved only by giving the control of the firms to the owners of embodied human capital. Because of the negligible cost of non-human capital, the size of firms could be rather small and markets should be competitive and open to new entrants.

This prediction is far from what has actually happened: as we saw in the preceding section, especially after the establishment of the WTO and of the related TRIPS, the knowledge economy has been characterized by the world-wide diffusion of large global intellectual monopolies.

Unfortunately the prediction that knowledge intensive economies should show a tendency towards small (possibly workers' managed) firms acting is, indeed, based by referring to only one aspect of disembodied knowledge: its non-rivalry in use. Some other aspects of knowledge are missing in this picture. The first is that, even if knowledge is a non-rival good, the exclusion from its use is possible by forms of secrecy or monopolistic appropriation of knowledge. The second is that, while the cost of additional uses of knowledge does not imply any reduction of the knowledge available to the other individuals, its production is costly and its public availability can generate a typical free riding problem, which cannot be solved by the incentives provided by standard competitive markets. The third is, once the "private ownership" of knowledge is allowed, it can make even more difficult the survival of small competitive firms and turn out to be even more unfriendly than the physical intensive economy to strong organizational rights for most individuals. Privately owned intellectual capital is by definition a form of monopoly capital and most individuals are excluded from its access.

In a real world of costly institutions no standard first best solution is available. This is particularly evident in the case of knowledge. It is impossible to pay the producer of knowledge for the new knowledge and make it public to everybody. As Arrow (1962) pointed out no perfect competitive market can achieve this result in equilibrium fulfill this purpose. It is as Boldrin and Levine (2008), following the Schumpeterian tradition, point out, in real competitive markets the first innovator enjoys a temporary monopoly which can reward him for his innovation. No State or other central planner can ex-ante obtain sufficient information to estimate the value that new knowledge will have for all potential users. A complex mix of real life imperfect institutions has therefore always characterized the production of knowledge. The TRIPS, considered in the first section, are only the last and the most powerful attempt to grant a monopoly for knowledge and its true novelty is that these monopolies have now gained worldwide enforcement. Another tradition, which relies on the institutions of open science, has not gained the same worldwide attention that it deserves.

According to Mokyr (2002), the industrial revolution was made possible by a long period of industrial enlightenment. Before British early industrialization, much "why" knowledge had been accumulated and made easily accessible. A large pool of "why" knowledge made it possible the development of

"how" knowledge in a form such that it was possible to move easily from one technology to another or from one "how" question to another. In situations where the epistemic basis of technology were underdeveloped, technological innovations were isolated answers to particular "how" questions and it was not possible to generate a continuous process of technological innovations. By contrast, once a rich basis of "why" knowledge was made available, it was possible to start a self-feeding interaction between why-knowledge and how-knowledge. The growth of a common pool of basic knowledge is a necessary condition for the continuous growth of technical knowledge. A delicate balance between the global common basic knowledge and the proprietary technical knowledge must exist: the up-streaming of the proprietary arrangements to basic knowledge may imply the self-destruction of the conditions of its growth.

But how could open science develop before the industrial revolution?

We have no ambition to give an answer to this complicated question but we would like to point out how some important global institutions of open science came into being well before the English industrial revolution and even before the revolution of productive methods which took place during the Italian Renaissance. Indeed they emerged as unintended result of the problems and the conflicts of the late middle age.

In the words of Paul David (2004):

*“Rather than emerging and surviving as robust epiphenomena of a new organum of intellectual inquiry, the institutions of open science are independent, and in some measure fortuitous, social and political constructs. They are in reality intricate cultural legacies of a long past epoch of European history, which through them continues to profoundly influence the systemic efficacy of the modern scientific research process”.*

In this respect, the foundations of Universities marked an important change in the production of knowledge. As Berman (1985, 159-60) has pointed out:

*“What has been especially characteristic of Western Science, including legal science, since the twelfth century is its close historical connection with the institution of university; science was born in university and the university bestowed upon it its precarious heritage of freedom of teaching and research..... It takes, more than the progressive translation of the works of Aristotele to explain why in the year 1150, possibly ten thousands students from all over Europe could be found in the town*

*of Bologna in northern Italy studying legal science. They were there because society made it possible - indeed - made it urgent that they were there... ”*

Interestingly enough, Universities did not only emerge well before the advent of capitalism but also well before the emergence of nation-states. They came about in a period when knowledge was conceived as global common good which should also been used in the government of the global institutions which characterized the Western Europe Middle Age. These global institutions had fierce contrasts but they recognized that each one of them had a proper sphere of influence. Good rules should specify the appropriate domain of their power.

The Middle Age was characterized by legal pluralism, that is a common legal order containing diverse legal systems (church vs. crown, crown vs. town, town vs. lord, lord vs. merchant). Legal Pluralism was a source of freedom and of legal sophistication and was a decisive factor in the foundation of Universities and the origin of Western Science. The typical questions, which emerged in this framework of overlapping legal systems were: Which Court had jurisdiction? Which law was applicable? How were different legal differences going to be reconciled? The independence of scholars became a precious asset to solve these disputes.

Universities emerged as the locus both independence and fair adjudication of scholarly disputes should emerge. They were different from the classical academies where only one school of thought existed. Universities were based on the idea that there was some way to adjudicate truth that would emerge through proper debates and reference to the appropriate texts. For this reason, in the Western legal tradition, law was conceived to be a coherent whole within which all the disputes among the various authorities could be solved. In the formative era of the Western legal tradition, natural-law theory predominated. It was generally believed that human law derived ultimately from, and was ultimately to be tested by, reason and conscience. This theory had a basis in Christian Theology as well as Aristotelian philosophy. But it had also a basis in the history of the struggle between ecclesiastical and secular authorities, and the politics of pluralism. From this point view the legal doctrines developed in the first European Universities were much more than a simple rediscovery of Roman Law. Roman Law had not the same pretence and the same need to constitute a coherent whole within which the conflicts among authorities could be solved. Indeed, the phrase *corpus juris Romani* was not used by the Romans but by the twelfth - and thirteenth - century European canonists. It was the twelfth-century scholastic technique of reconciling contradictions and deriving general concepts from rules and cases

that first made it possible to coordinate and integrate the Roman Law of Justinian. The same methodology was then applied to other disciplines and paved the way to the emergence of Western Science.

In some respects, the institutions under which Western Science emerged are polar to those of the contemporary economy. They came about in an era dominated by global political powers such as the Church and the Empire, which were supposed to represent the global interests of human-kind and accepted only limits due to their specific function. Local powers were weak, markets were not integrated, private property had still to see the emergence of the enclosure. The why-questions dominated the interests of people and offered a fertile ground to the growth of Universities and, in general, to emerging institutions of open science.

The present world is characterised by an absence of global political powers and by integrated markets, which include knowledge. In this world, which open science has so dramatically helped to create, the institutions which make knowledge a global common are increasingly weaker than those that make it a private good. For a long time our World has been a World of Nations, interested in Science and Culture for the power that they conferred to their States.

The development of markets has certainly favoured the diffusion of knowledge beyond national boundaries. However, this has made open science relatively less appealing in comparison to closed science. While global institutions (WTO and the related TRIPS agreements) have made private intellectual property more profitable, no institution has similarly increased the convenience of public intellectual property. The present (and, even more so, the missing) institutions of the global economy have made it convenient to over-privatize knowledge and over-monopolize the economy by means of a tight web of intellectual property rights (IPR).

While its present institutions are likely to contribute to a prolonged stagnation, the knowledge-intensive economy offers great opportunities for more effective Keynesian policies. Instead of being used inefficiently to nationalize the assets of firms producing private goods, public funds could be used to decrease the monopolization of knowledge and efficiently to transfer knowledge from the private to the public sphere. The institution of a strong WRO (World Research Organization) should balance the WTO, which has increased the relative convenience of intellectual private property to such a great extent. A WRO should create the conditions in which public intellectual property is feasible whenever it is able to foster development. All governments

should acknowledge that knowledge is a non-rival (or even an anti-rival) good which should be treated as the most precious and specific global common of humankind. The institutions of open science, that preceded the advent of Nation States and of the Industrial Revolution should play have an important role in the modern economy and, in some cases, should be funded at global level. Only, in this way, private industry can find again a harmonic with the institutions of open science and contain the erosion of the institutions that created some of the initial conditions necessary for industrial development. Within a new architecture of the global economy, free markets and open science must regain a great deal of the ground that they have lost to monopolized markets and closed science.

#### **4. In the short run, beyond credit regulations: the knowledge-economy super-multiplier.**

A project that increases the space that free markets and open science may sound as a good opportunity to recall the Keynesian skepticism for an uninteresting long run (where we are all eventually dead especially when the crisis requires immediate and effective policies). However, the long-run vision for the future of the global economy suggests also great opportunities for short-run Keynesian policies.

In the current crisis, public funds should not only finance new public research projects but should also be used to acquire immediately well-established IPRs from private firms. The effects of this policy can have immediate effects and go well beyond those entailed by many current anti-crisis measures.

In the first place, this form of public funding does not involve nationalization of the firm or the use of taxpayers money without any returns on it. By contrast, while the IPR is paid at its private value, it is transferred into the public arena where it has a greater public good value and decreases costs for many producers.

Secondly, financial support is granted to firms who have proved to be innovative. A powerful stimulus for new investments is given to the most efficient firms. On the one hand, these firms receive fresh funds but, on the other, having sold the old intellectual property rights, they face tough competition. Therefore, they urgently need to invest in the production of new intellectual assets, which boosts aggregate demand.

Thirdly a monopoly price for the intellectual asset is replaced by the lower (zero) competitive price, which again has a positive effect on aggregate demand.

Finally, the “anti-commons” problem is eased; everyone can now invest in new knowledge being aware that complementary pre-existing knowledge is less likely to be owned by other firms and involve costly future negotiations, which may often fail (Pagano, Rossi 2004). Moving IPR into the public domain makes it unnecessary to undertake future risky transactions to benefit from the fruits of innovation. While the immediate funding goes to incumbent innovative firms, which may often belong to the richer countries, new knowledge becomes freely available to everyone and yields widespread beneficial effects, thereby contributing to the overall development of the world economy.

The multiplicative effects just outlined are stronger than those traditionally associated with standard Keynesian policies: they are more powerful both on aggregate demand and on the level of efficiency of the economy. An investment “super-multiplier” can be made to work in knowledge-intensive economies.

## **5. Conclusion.**

Owing to the long-standing academic dominance of neo-liberal ideology, in the present crisis state intervention is seen as a necessary short-run evil which will necessarily produce serious long-run problems. Redressing the balance between public and private knowledge would not only have strong short-run super-multiplicative effects; it would have long-run benefits as well. What makes this policy difficult to implement is that it requires international cooperation and appropriate anti-lobby policies. Different countries should share the funding of a global common-like basic knowledge. Lobbies may exploit the fact that, while a “fair price” can be obtained for

most IPRs, there is no well-defined market price for them. However, the current crisis may create the conditions that enable free-riding to be overcome, and lobbying activities to be restricted.

The present economic crisis looks increasingly similar to the situation of the 1930s. Evidence is accumulating that we are in a liquidity trap where monetary policies have a limited effect, and that massive public investments are going to be necessary to re-launch the economy. In a situation in which most economists have been blinded by an ideological commitment to “market fundamentalism” (Soros 2008), it is not surprising that also the policies and the theories of the 1930s are among the few reliable references to deal with the crisis. However, one should not underplay the extent to which the economy has changed since the great depression. In the 1930s, in order to stimulate aggregate demand, the focus was appropriately on building physical infrastructures. In a modern knowledge-intensive economy (Hodgson 1999), these policies should be integrated with ones exploiting the new opportunities offered by the institutions of contemporary economies for Keynesian-type measures.

The measures considered in this article should, certainly, be part of a package comprising other, more traditional policies.

The multiplicative effects of traditional public works are likely to be transmitted to less knowledge-intensive countries in terms of increased immigration, and their public nature (in terms of non-rivalry and widespread availability) is limited in comparison to knowledge goods. In the current situation, however, some increase of traditional public investments is certainly useful (to alleviate, for instance, the dramatic crisis of the building industry).

Monetary policy should continue to make borrowing as cheap as possible, but a liquidity trap seems close at hand. Financial regulations are going to be very useful in the long run to limit the damage caused by the next bubble, but the dramatic shrinking of employment in that the financial sector is going to be irreversible for some time. Indeed, one of the worst effects of “market fundamentalism” has been that some of the best minds of a generation have been misallocated to bubble production and their jobs have suddenly ‘burst’. The potential investment super-multiplier existing in the knowledge economy can also ease unemployment in the financial engineering sector by increasing demand for more beneficial engineering skills.

Any successful anti-crisis policy must be a complex mix of policies, and it would be very useful to know the correct weight to give to each one of them. Unfortunately, there are no experiences from which we can extract these weights, and there is even less time available for the painstaking accumulation of evidence. In these circumstances, we must accept that the policy mix can only be adjusted by a fallible process of trial and error.

The purpose of this essay has been to argue that some of the causes of the crisis are due the institutions of the knowledge economy itself, which has become a world of closed science and of intellectual global monopolies. However, even if one does not accept this analysis, it would be helpful if the mix which is initially chosen tries to exploit the super-multiplicative features which knowledge has when its use is not restricted in the cage of intellectual monopoly. The main cause for catching a bad flue may be the cold weather but staying closed in a warm house is only one of the remedies.

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