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Financing the capital development of the economy: A Keynes-Schumpeter-Minsky synthesis

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Institute of Economics
Scuola Superiore Sant'Anna

Piazza Martiri della Libertà, 33 - 56127 Pisa, Italy
ph. +39 050 88.33.43
institute.economics@sssup.it

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Financing the Capital Development of the Economy: A Keynes-Schumpeter-Minsky Synthesis

Mariana Mazzucato °
L. Randall Wray *

° University of Sussex, UK
* Levy Economics Institute of Bard College, US

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Financing the Capital Development of the Economy: A Keynes-Schumpeter-Minsky Synthesis*

by

Mariana Mazzucato†

University of Sussex

L. Randall Wray‡

Levy Economics Institute of Bard College

May 2015

* London and New York are the most important financial centers; the euro area has also experienced similar problems, made more complicated by the unusual monetary arrangements (each member-state is responsible for its own financial institutions but with limited fiscal and monetary policy independence).

† m.mazzucato@sussex.ac.uk

‡ wrayR@umkc.edu

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Topics: Banking; Financialization; Capital development; Finance; Global financial crisis; Financial innovation; Hyman Minsky; Joseph A. Schumpeter

Meta Description: This Levy Institute working paper by Mariana Mazzucato and Senior Scholar L. Randall Wray discusses the role that finance plays in promoting the capital development of the economy, with particular emphasis on the current situation in the United States and the United Kingdom.

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Abstract

This paper discusses the role that finance plays in promoting the capital development of the economy, with particular emphasis on the current situation of the United States and the United Kingdom. We define both "finance" and "capital development" very broadly. We begin with the observation that the financial *system* evolved over the postwar period, from one in which closely regulated and chartered commercial *banks* were dominant to one in which financial *markets* dominate the system. Over this period, the financial system grew rapidly relative to the nonfinancial sector, rising from about 10 percent of value added and a 10 percent share of corporate profits to 20 percent of value added and 40 percent of corporate profits in the United States. To a large degree, this was because finance, instead of financing the capital development of the economy, was financing *itself*. At the same time, the capital development of the economy suffered perceptibly. If we apply a broad definition—to include technological advances, rising labor productivity, public and private infrastructure, innovations, and the advance of human knowledge—the rate of growth of capacity has slowed.

The past quarter century witnessed the greatest explosion of financial innovation the world had ever seen. Financial fragility grew until the economy collapsed into the global financial crisis. At the same time, we saw that much (or even most) of the financial innovation was directed outside the sphere of production—to complex financial instruments related to securitized mortgages, to commodities futures, and to a range of other financial derivatives. Unlike J. A. Schumpeter, Hyman Minsky did *not* see the banker merely as the ephor of capitalism, but as its key source of instability. Furthermore, due to "financialisation of the real economy," the picture is not simply one of runaway finance and an investment-starved real economy, but one where the real economy itself has retreated from funding investment opportunities and is instead either hoarding cash or using corporate profits for speculative investments such as share buybacks. As we will argue, financialization is rooted in predation; in Matt Taibbi's famous phrase, Wall Street behaves like a giant, blood-sucking "vampire squid."

In this paper we will investigate financial reforms as well as other government policy that is necessary to promote the capital development of the economy, paying particular attention to increasing funding of the innovation process. For that reason, we will look not only to Minsky's ideas on the financial system, but also to Schumpeter's views on financing innovation.

Keywords: Banker as Ephor of Capitalism; Capital Development; Finance; Global Financial Crisis; Innovation; Minsky; Schumpeter

JEL Classifications: B5, B51, B52, G, G1, G2, H6, L5, N1, O1, O2, O3, O4, P1

1. INTRODUCTION

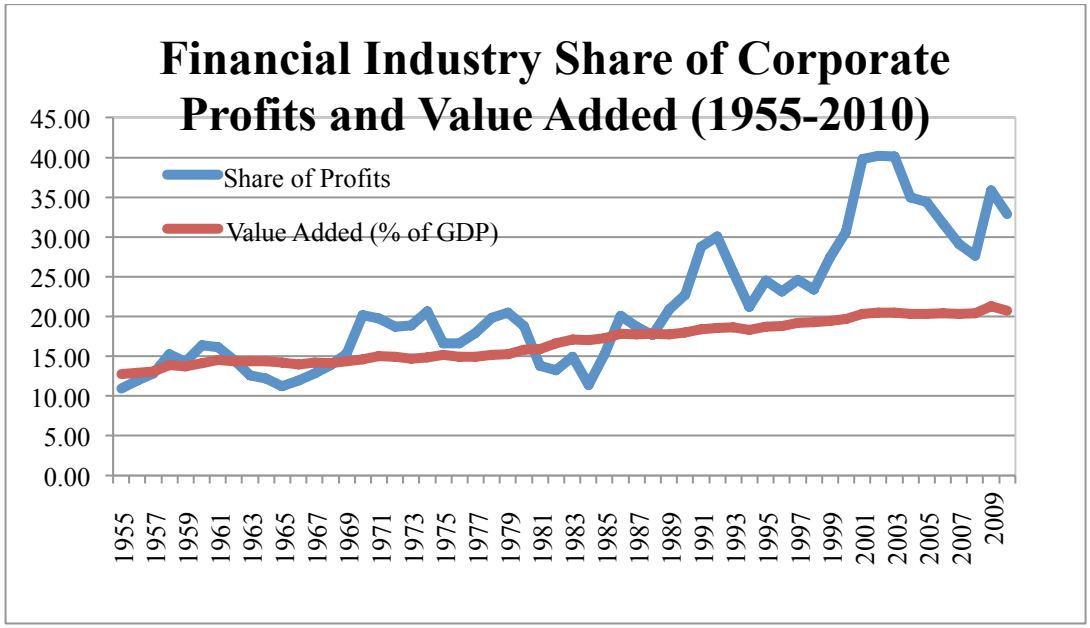
This paper discusses the role that finance plays in promoting the capital development of the economy, with a particular emphasis on the current situations of the United States and the United Kingdom.[1] "Capital development" is a term defined by Hyman Minsky to refer to a broad measure of investment that goes beyond privately owned capital equipment and to include technology, human capital, and public infrastructure. This paper will provide a brief synthesis of the main contributions of three of the twentieth century's greatest thinkers: J. M. Keynes, Josef A. Schumpeter, and Hyman P. Minsky.

We define both "finance" and "capital development" very broadly. We begin with the observation that the financial *system* evolved over the post-war period from one in which closely regulated and chartered commercial *banks* were dominant, to one in which financial *markets* dominated the system. Over this period, the financial system grew rapidly relative to the nonfinancial sector, rising from about 10% of value added and a 10% share of corporate profits to 20% of value added and 40% of corporate profits in the US (see below). This was, to a large degree, because instead of finance financing the capital development of the economy, it was financing itself.

The speed at which the financial sector grew was boosted by these high profits, growing capital more quickly than non-financial firms. Indeed, the origins of the financial crisis and the massive and disproportionate growth of the financial sector began in the early 2000s when banks increasingly began to lend to other financial institutions via wholesale markets, lending mainly to hedge funds, private equity, and subprime mortgages because the returns were higher than those garnered from lending to industry or government. They further magnified the return on equity by raising leverage ratios, and multiplied their capital gains through speculative purchases using funds borrowed in very short-term markets (such as commercial paper), endangering their liquidity and solvency. The risks escalated, but were severely underpriced. The result was that banks' assets ballooned, but success was based on outcomes that were unlikely to be realized. When asset prices fell, the margin of error was so small that even a small loss ratio would have led to a bust.

[1] London and New York are the most important financial centers; the euro area has also experienced similar problems, made more complicated by the unusual monetary arrangements (each member state is responsible for its own financial institutions but with limited fiscal and monetary policy independence).

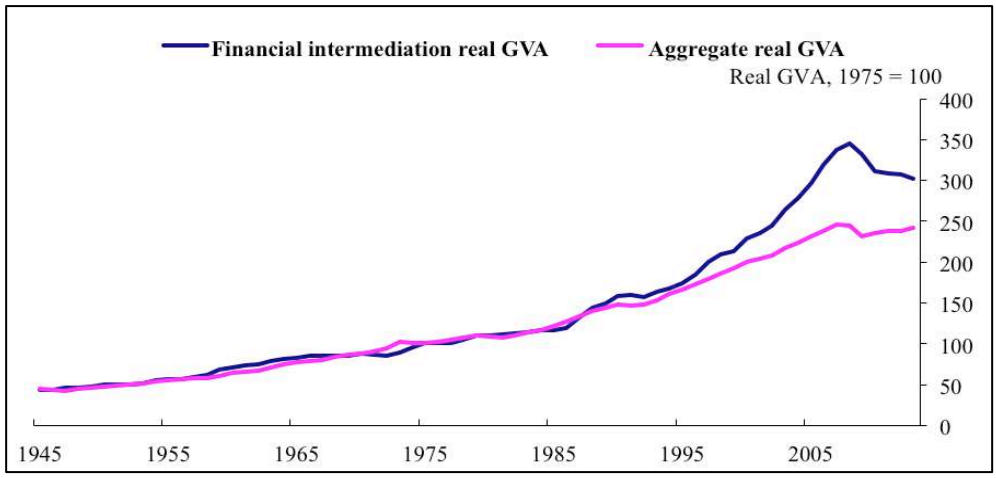
Figure 1 US Financial Sector Share of Corporate Profits and Value Added



Source: Bureau of Economic Analysis.

But before that happened, bank assets and profits expanded relative to the rest of economy, which also led to an increase of their value added contribution in the national accounts. Unlike other industries, banks' value added contribution depends on the margin between the interest rates charged on their loans and those paid on their deposits (for the UK, see Grovell and Wisniewski 2014; for the US, see Hood 2013). Figure 2 shows this trend for the UK.

Figure 2 Gross Value Added (Indices 1975=100)—UK 1945–2013



Source: Alessandri and Haldane 2009 (2009–2013 extended by authors with data from the Bank of England).

Further, as has been noted by many commentators, the nonfinancial sector became highly *financialized* by many measures, including debt ratios, as well as the proportion of income generated by financial activities (even industrial powerhouses like GM and GE created financial arms that generated much of their profits, and most large firms began to treat cash balances as a financial asset to generate revenue).

At the same time, the capital development of the economy suffered perceptibly. If we apply a broad definition to include technological advance, rising labor productivity, public and private infrastructure, innovations, and advance of human knowledge, the rate of growth of capacity has slowed. Admittedly, this is a difficult claim to demonstrate. In some areas, advances have come at a very rapid, almost revolutionary, speed. However, the US and UK are falling behind in many basic areas, including universal education, health improvements, public and private infrastructure, and poverty alleviation. The American Society of Civil Engineers' (ASCE) infrastructure report card awarded an overall D+ in 2013 to the US, estimating that $3.6 trillion of infrastructure investments are needed by 2020. Almost none of the infrastructure needed to keep the US competitive in the global economy received a grade above a D.

Table 1 ASCE's 2013 Report Card for America's Infrastructure

Water & Environment		**Transportation**		
Dams	D	Aviation	D	**A** = Exceptional
Drinking Water	D	Bridges	C+	**B** = Good
Hazardous Waste	D	Inland Waterways	D-	**C** = Mediocre
Levees	D-	Ports	C	**D** = Poor
Solid Waste	B-	Rail	C+	**F** = Failing
Wastewater	D	Roads	D	
		Transit	D	
Public Facilities				
Public Parks & Recreation	C-	**Energy**	D	
Schools	D	Energy	D	

Source: American Society of Civil Engineers.

Further, even as the financial sector experienced serial booms (and busts), the infrastructure situation has actually worsened across most of these categories, as the estimate of the spending required nearly tripled over the years, rising from $1.3 trillion in 1998. Although the grades have risen slightly in recent years, this is mostly due to private investment in infrastructure, which is a welcomed trend but an insufficient one nonetheless. As the 2013 report notes, "We know that investing in infrastructure is essential to support healthy, vibrant communities. Infrastructure is also critical for long-term economic growth, increasing GDP, employment, household income, and exports. The reverse is also true – without prioritizing our nation's infrastructure needs, deteriorating conditions can become a drag on the economy."[2]

The capital development of the economy advances in two ways—and the US and the UK are failing in both across most categories. First, we can improve the quantity and quality of investments that promote capital development using state-of-the-art knowledge, techniques, and processes. Since new investment in physical capital as well as in human development will generally utilize the newest knowledge, techniques, and processes, new and replacement investment will usually promote the capital development of the economy. This is essentially what the ASCE grade report is highlighting, although it focuses on the needed public and private infrastructure investments to improve quantity and quality of infrastructures.

Second, quality can be improved through Schumpeterian innovation and "creative destruction": new technologies come along that "destroy" the productivity of old technologies (not always in a physical sense, but in a profitability sense). Schumpeter did not just mean physical investments in manufacturing plants and equipment, but also new ways of doing things. For Schumpeter, economic development can be the result of innovation, characterized as the carrying out of new combinations of materials and productive forces or productive means. It includes the introduction of a new type or quality of commodity, the introduction of a new method of production, the opening of a new market, obtaining a new source of supply of raw materials or intermediate goods, or the carrying out of a new organization of industry (e.g., the creation or destruction of monopoly power). This innovation is the product of the entrepreneur (or, in Schumpeter's later writings, the entrepreneurial corporation), who swims against the stream, putting inventions into practice.

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[2] http://www.infrastructurereportcard.org/a/#p/overview/executive-summary, accessed on 5/20/2014. Note that President Barack Obama addressed the infrastructure problem in his 2015 State of the Union address, and US Senator Bernie Sanders addressed the infrastructure deficit in his report, *Preview of the Congressional Budget Office Budget and Economic Report: Rebuilding the Disappearing Middle Class*, January 24, 2015.

Schumpeter emphasized that innovation must be distinguished from invention; in many cases, the entrepreneur merely borrows inventions that have not been applied precisely because they represent a break with routine. The innovation is to break habits, to break down resistance of groups threatened by the use of the invention, and to get the necessary cooperation of capitalists, managers, workers, and consumers. This is the role of the entrepreneur (or corporation)—a role that cannot be a profession; nor can there be a class of entrepreneurs.

To be clear, even Schumpeter argued that most economic development does not require innovation. However, in the increasingly globalized economy, innovation is critical to retaining and expanding the market share. In the 1950s, a large and relatively closed economy (like that of the US at the time) could rely on investment that improved the quantity and quality of the nation's means of production—the first path to improving capital development is discussed above. However, with relatively open economies today, innovation has become critical for retaining the market share. Growth without innovation is becoming more difficult—at least for the case of private sector-led growth.

Innovation has increasingly become a key to long-run growth. Like all production, innovation must be financed, so finance is central to the innovation process. Indeed, this is why Schumpeter called the banker the "ephor" of the exchange economy (Schumpeter 1934 [1912], p. 74). For Schumpeter, the "money market" is the "headquarters of capitalism." Yet, in recent decades, finance has retreated from serving the real economy: the financial sector serves itself, and companies in the real economy have become "financialised" to an important extent—to be discussed below.[3]

Furthermore, for growth to be not only "smart" (innovation-led) but also "inclusive" (as targeted by growth strategies such as the European Commission's 2020 strategy and the OECD's [Organisation for Economic Co-operation and Development] Innovation Strategy of 2010), it must be growth that produces employment and less inequality. The key goal of this paper is to reconsider and discuss the role of finance in this way, that is, how to restructure it to serve the "real" economy, rather than itself, in order to produce *both* innovation-led growth *and* full employment. This requires bringing together the thinking of Keynes, Minsky, and Schumpeter, as well as understanding the role of the public sector as doing much more than fixing static market failures (Stiglitz 1989).

[3] A good example is the leveraged buyout, where a corporation with little debt is viewed as a "cash cow" that can be taken over, heavily leveraged with debt, and then sliced and diced so that profitable pieces can be sold.

Hence, from Schumpeter we borrow two insights: (1) it is critical to understand the innovation process in order to begin to analyze the dynamics of the capitalist economy, and (2) part of this understanding concerns the fact that innovation needs appropriate types of finance. In Schumpeter's view this is because innovation must be financed *before* it can generate revenues. While in his early work (Schumpeter 1912) he focused on the need for finance to allow new entry (into the "circular flow" through start-ups), in his later work (Schumpeter 1942) he focused on the importance of internal finance for financing large R&D laboratories of established corporations. Either way, the point of finance is that it is tightly related to the ability to allow new things to happen.

From Keynes we borrow two central insights: the theory of effective demand and his argument that when the "capital development of a country becomes the by-product of the activities of a casino, the job is likely to be ill done" (Keynes 1964, p. 159). Keynes's theory of effective demand can be stated succinctly as follows: firms hire the resources they think they will need to produce what they think they can sell. What this means is that employment is not determined in labor markets—but rather by the level of sales expected. Indeed, the concept of "animal spirits" in Keynes is not only useful for behavioral finance (Shiller 2005), but also for Schumpeterian economists that have focused on entry and investment behavior as being driven by the "perception" of where the future technological and market opportunities are (Dosi and Lovallo 1997; Pavitt 1984; Mazzucato 2013a/b).

Keynes also argued that saving is not the source of finance, as he rejected the loanable funds theory that a flexible interest rate allocates a scarce supply of saving to investment. Keynes reversed the causation: spending creates income and it is the spending on investment that creates the income that is saved. This means that we must look elsewhere to find the source of finance for investment.

Chapter 12 of Keynes's *General Theory* (GT) (Keynes 1964) details the second insight: "speculation" can come to dominate "industry." What Keynes meant is that the financial system (especially) might direct its efforts toward creating short-term profits generated by rising asset prices (speculation) rather than toward profits generated by productive activities that create income flows. If we look to the stock market, for example, "enterprise" would mean purchasing stocks with a view to the long-term prospects of the issuing firm. "Speculation," however, would be indicated where share purchases are undertaken on the belief that others think share prices will rise. The goal is to buy just before prices rise, and to sell just before they fall. In the

modern period, as we will discuss, top management has the incentive and the capacity to boost stock prices through legal manipulation. A large share of compensation takes the form of stock options. To increase compensation, management focuses on policies to increase share prices, including the use of share buybacks.

From Minsky we borrow the recognition that the dynamics of the capitalist system are not necessarily stabilizing, and that when finance is brought into the analysis, the dynamics become destabilizing. Minsky broadened Schumpeter's view by distinguishing between external and internal financing of investment (whether innovative or not).[4] Indeed, all spending must be financed—out of income flows, sales of accumulated assets, or borrowing. What Minsky made explicit is that the source of finance matters—using external finance commits future income to debt service. He also extended Keynes's "investment theory of the cycle" to include a "financial theory of investment." In other words, he provided an alternative to the loanable funds theory that Keynes had rejected.

As mentioned, Minsky insisted that all production in a monetary economy must be financed (the process "begins with money to end up with more money"—as both Marx and Keynes said), and it is not sufficient to presume that income flows in general, and retained earnings in particular, can be used to finance production. In the first place, that would mean that growth is not possible (if spending must be financed out of income, it could not exceed income flows). In addition, even a static economy would need finance because the income may not flow into the right hands. Most importantly, there is an infinite regress problem involved—similar to the problem with loanable funds identified by Keynes: how was the first income flow generated if spending has always been financed out of income?

For all these reasons, we need to understand the role played by finance in allowing spending to proceed. In addition, Minsky argued that finance itself is subject to innovation. Finally, he warned that "stability is destabilizing," which mainly has to do with the innovations in finance that are encouraged by the appearance of stability.

The past quarter century witnessed the greatest explosion of financial innovation the world had ever seen. Financial fragility grew until the economy collapsed into the Global Financial Crisis (GFC). At the same time, we saw that much (or even most) of the financial

[4] See Minsky 1986, 1990, 1991, 1992a, 1992b, 1993a, 1993b, 1996; Minsky and Ferri 1991; Minsky et al. 1994; Wray 1991, 1993, 1994, 1995, 2009, 2010, 2012; Wray and Papadimitriou 1997; and Papadimitriou and Wray 1998 for links between the approaches of Schumpeter and Minsky.

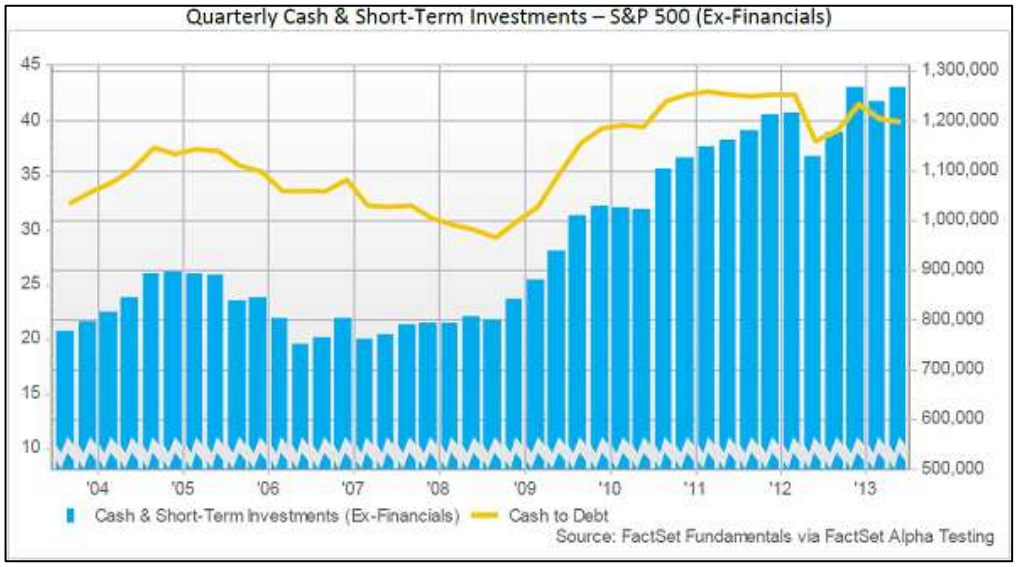
innovation was directed outside the sphere of production—to complex financial instruments related to securitized mortgages, to commodities futures, and to a range of other financial derivatives.

Unlike Schumpeter, Minsky did *not* see the banker merely as the ephor of capitalism, but as its key source of instability. This comes from his understanding of finance as having a dynamic of its own—beyond a medium of exchange, an insight which, of course, derives from Marx's theory of capitalism.[5] Furthermore, due to "financialisation of the real economy," the picture is not simply one of runaway finance and an investment-starved real economy, but one where the real economy itself has retreated from funding investment opportunities; rather, either hoarding cash or using corporate profits for speculative investments such as share buybacks (Lazonick 2013). As we will argue, financialization is rooted in predation; Matt Taibbi has famously argued that Wall Street behaves like a giant blood-sucking vampire squid.[6]

According to a recent financial newsletter, the Standard &Poor (S&P) 500 companies (excluding banks and other financial institutions) were sitting on $1.3 trillion as of the 3rd quarter of 2013, up by 13.5% from the previous year.[7]

[5] Marx had argued that the mainstream economists of his time, whom he called vulgar economists, misunderstood production as C-M-C', starting with commodities to exchange for other commodities, with money only playing a role as a medium of exchange. Instead, he viewed capitalist production as M-C-M'; that is, Marx's argument is that production begins with money to produce commodities to be sold for more money. We might view modern finance as starting with money (M) to make more money (M') without the production of commodities.
[6] See http://www.rollingstone.com/politics/news/the-great-american-bubble-machine-20100405.
[7] Nathan Slaughter, *Street Authority Daily*, 2014, https://www.streetauthority.com/research/3/item/9734.

Figure 3 Investments by S&P 500 Corporations (Excluding Financial Firms)



Source: Nathan Slaughter, https://www.streetauthority.com/research/3/item/9734.

Financial investments—as opposed to productive investments (e.g., in R&D)—became key sources of profit for a great proportion of American corporations (Krippner 2005). In some industries, like pharmaceuticals and oil & gas, firms invest more on share buybacks and paying dividends than on R&D and innovation (Lazonick 2015; Lazonick et al. 2013). We position our project around five central issues:

1. The distinction between quality vs. quantity of finance;
2. The mismatch between demand and supply of finance;
3. The issue of public vs. private finance;
4. The question "where does finance come from?"; and
5. How to promote finance for innovation *and* employment.

In the remainder of this paper, we begin to address these issues, focusing on promoting the capital development of the economy. In the next section, we turn to a more detailed discussion of the Keynes-Schumpeter-Minsky framework used for the analysis. We then turn to the connection between finance and innovation, arguing that the current system is failing us. We close with suggestions for reform. Other papers prepared for our project will extend the analysis of the five issues enumerated above.

2. THE KEYNES-SCHUMPETER-MINSKY FRAMEWORK

This paper integrates two research paradigms that have strong policy relevance in understanding the causes of the recent financial crisis, and also in identifying the paths toward a post-crisis, long-run recovery. The first one might be called the Keynes-Minsky vision, which puts effective demand front and center of economic analysis; and the second is the Schumpeter-Minsky vision, which focuses on innovation and competition. This paper brings the two visions together to provide rigorous analysis of competition in the financial sphere and how it interacts with competition in the industrial sphere.

The first paradigm is concerned with understanding how effective demand is determined under uncertainty. Expectations may not be met, resulting in a different equilibrium. Macroeconomic identities and investment-determined saving allow us to avoid fallacies of composition at the macro level. The identities also constrain individual behavior. Kalecki augmented Keynes's framework by distinguishing between the capital- and consumer-goods sectors. He showed how (in contrast to neoclassical analysis) investment generates profits at the macroeconomic level, competitive firms' pricing (and profit) can be a function of their internally financed investment target, and innovation can determine the growth rate of capital through its negative impact on the profits of existing capital stock.

However, Kalecki and some of his followers imply that the demand for investment finance generates its own supply, without examining the active role of the financial sector. Minsky adopted Kalecki's approach, but formulated his financial theory of investment to introduce financial decisions and conditions into the determination of the point of effective demand. Attempts to introduce growth dynamics have been made, but have so far not coalesced into a complete theory. At best, the Keynes-Minsky vision provides reason to believe that growth will not be steady and that it will normally be demand constrained.

A framework for analysis of growth needs to turn to the Schumpeter-Minsky approach that is concerned with the evolution of the structure of the economy over time—those factors that disturb equilibrium and can spur growth. Schumpeter emphasized how the introduction of innovation into the analysis of competition caused the traditional theory of the firm, as well as the theory of industry structure, to fall apart. Innovation introduces differences between firms so that the "average" firm is not relevant, and the feedback between innovation and industry structure also causes the *linear* structure-conduct-performance (SCP) approach of industrial

organization to fall apart. The Schumpeterian approach to competition is thus centered on understanding the coevolution of those mechanisms that create differences between firms, and the mechanisms of competitive selection that winnow in on the differences, allowing only some firms to survive and grow. Innovation, births, and deaths of firms are engines of growth and structural change. While some innovations allow incumbents to maintain their lead, most *radical* innovations tend to destroy it. This is the essence of Schumpeter's famous term "creative destruction."

The banker, Schumpeter's ephor of capitalism," plays an important role in helping to get innovations financed. The idea is that innovations cannot be self-financing because they do not yet exist. The banking ephors need to provide finance first, to let the innovation proceed. The innovations then are rewarded with profits (allowing the finance to be repaid) even as they destroy competitors.

Minsky extended Schumpeter's creative destruction innovation to the financial sector itself. Like any other firm, a bank continually seeks to reduce costs and increase revenues, with innovations helping to do both. But these innovations also change the structure of the financial system and hence the structure of the nonfinancial system, the behavior of which is heavily influenced by the structure of finance. Innovating banks finance innovating firms. The first—innovation in finance—can create a more fragile financial system even as it finances creative destruction in the nonfinancial sphere. The implications are even more disruptive than Schumpeter's work implies.

Minsky developed the "investment theory of the cycle" and the "financial theory of investment" to put the Keynesian model in the context of the business cycle. The first part of this is Keynesian; the second brings in Schumpeter's ephor. Over the cycle, the structure of the economy and, most importantly, the structure of its finance, changes in a manner that makes it fragile. All of this is the best-known part of Minsky's approach to financial regimes—what he called hedge, speculative, and Ponzi structures.

But Minsky realized this is far too confining, with regard to both timescale and capital structure, since large firms tend to pass over banks for bond and equity markets for cost-saving reasons, and most innovative smaller firms rely on equity because debt is unaffordable. Minsky therefore moved beyond cyclical analysis to the analysis of the transformation of an economy over stages or epochs—an evolution that results from changes of expectations and behavior, that itself changes the environment in which economic agents must operate (which induces further

behavioral changes). He returned to and updated Rudolf Hilferding's "finance capitalism" work from the early twentieth century, describing the transformation that led to the return of a version of finance capitalism—what Minsky called "money manager capitalism."

There are structures that are conducive to what Minsky called the capital development of the economy—which, as stated in the first section of this paper, is broadly defined to go beyond privately owned capital equipment and to include technology, labor productivity, and public infrastructure. Minsky believed that a high wage, high employment, "big government" economy would be more stable and would tend to channel finance in the direction of capital development. Further, finance needs constraints because of the inevitable thrust to innovation; that, in turn, is a problem because the "market" forces that direct finance toward capital development of the economy are not always operative, so the innovations in finance can actually hinder capital development. Indeed, in spite of strong corporate profitability before and after the GFC of 2007–08, this did not translate into strong investment outside of the financial sector (whose own share of value added and corporate profits rose sharply and whose indebtedness grew on trend).

The one recent phase of investment in real-sector innovation, which excited the "new economy" commentary of the late 1990s, ended with a "dot-com" stock market bubble which burst. Subsequently, low interest rates generated a highly leveraged Anglo-American investment boom that was almost entirely confined to the financial sector, real estate, and commodity trading—the bubble of which burst, triggering a recession, as consumer spending financed by borrowing against real estate fell once housing prices stopped rising. The GFC has led to tremendous interest in Minsky's work. Many have called the GFC a "Minsky crisis." But it is necessary to go beyond a Minskyan "cycle" analysis and to Minsky's money manager stages approach to study the unsustainable processes that ultimately led to the crisis. This can be supplemented with Wynne Godley's early warnings that relied on his sectoral balances approach (Wray and Godley 2002).

What is relatively lacking in Minsky's approach is the innovation and dynamism in the nonfinancial sector. Nonfinancial firms are profit seeking, they rely to varying degrees on external finance, they are encouraged by stability, and they can be constrained or encouraged by public policy. Aggregate profit (more accurately operating income before depreciation— from which depreciation, rents, interest payments, and taxes on profit must be paid) available is constrained by the same factors that determine the level of effective demand. These are investment, deficits, net exports, saving out of wages, and consumption out of profits—mostly

the autonomous components of demand that result from the millions of decisions made by government, entrepreneurs, and other economic agents. Individual entrepreneurs are seen as engaged in a competitive struggle to obtain their share of that aggregate pool of profits. Innovation is one of the ways that they win a share. Beyond this, one will not find much analysis by Minsky of nonfinancial innovation.

However, there is emerging literature that does build on Schumpeter's work to examine innovation and structural transformation of the "real" sector: the new evolutionary approach to economics and innovation, as exemplified in the seminal work of Richard Nelson and Sydney Winter and their followers is increasingly recognized as providing the possibility of a new theory of the firm, as well as a more dynamic treatment of market structure. Furthermore, recent work in this tradition has linked Schumpeterian analysis to finance, such as the works of Perez (2002), who has looked at the central role of finance in allowing new technological paradigms to take off, and the work of Mazzucato (2013b), who has looked at how financial markets react to the Knightian uncertainty embodied in innovation, as well as the role of the State as leading the risk-taking process (see also Mazzucato and Perez 2014).

Thus, while Schumpeterian evolutionary analysis provides insights into the dynamics of structural/technological change in the real economy, Minsky's insights can provide a theory of money and financial fragility, which is virtually lacking in Schumpeterian models. Our synthesis between these approaches seeks to link the real economy with the monetary economy and provide a theory of innovation in both the financial and non-financial sectors.

3. A BRIEF OVERVIEW OF SCHUMPETER'S THEORY OF ECONOMIC DEVELOPMENT

Schumpeter begins with the model of an economy operating in the neighborhood of a "general" equilibrium in which all industries, firms, and households are individually in a state of equilibrium in the Walrasian sense (Schumpeter 1944). In this state, the economy can be analyzed as a circular flow, where purchases of the output of the flow are undertaken on the basis of sales of labor, products, or services, and where purchases without sale or sales without purchases are ruled out. In this case, the circular flow could continue unchanging like "the circulation of the blood" (Schumpeter 1949, p. 61). While money might be used, it would merely facilitate an exchange that would take place anyway.

Within this circular flow model of an economy, individuals act promptly and rationally; outcomes are assumed to occur with a certain frequency and uncertainty reduces to risk that can be calculated. The capitalist is merely a manager, reacting to the "data" ground out by the circular flow economy.

This model does not correspond to observed economies. Model economies that account for change see it arise in three ways. First, there are "outside factors," including changes of consumer tastes, and changes induced by nature, political factors, and so on; second, there is natural growth, for example, of population, work force, or natural resources. Schumpeter argued that outside factors and growth merely change the data of the system, inducing an adaptive response by individuals, including capitalists. Such changes can be analyzed as continuous, infinitesimal shocks to the circular flow that leads to new points of equilibrium. In this case, the "static" analysis of Walrasian economics is sufficient.

However, Schumpeter's focus is on "that kind of change arising from within the system which so displaces its equilibrium point that the new one cannot be reached from the old one by infinitesimal steps" (Schumpeter 1949, p. 64). Hence, adaptation becomes impossible and routine must be abandoned. His analysis thus concerns those points where economic life itself changes its own data by fits and starts—changes in economic life that arise by its own initiative. This is what he calls economic development, which is contrasted with change that results merely from outside factors or growth—which he calls noneconomic development (Schumpeter 1949).

As noted earlier, Economic development is the result of innovation, characterized as the carrying out of new combinations of materials and productive forces or means. It includes the introduction of a new type or quality of commodity, the introduction of a new method of production, the opening of a new market, obtaining a new source of supply of raw materials or intermediate goods, or carrying out of a new organization of industry (e.g., creation or destruction of monopoly power). This innovation is the product of the entrepreneur,[8] who puts inventions into practice. Schumpeter had argued that the entrepreneur plays the role of debtor in capitalism, however, by the late 20th century one could say that it was largely the consumer that had taken over that role.

Schumpeter emphasized that innovation must be distinguished from invention; in many cases, the entrepreneur merely borrows inventions that have not been applied precisely because

[8] In his later work, Schumpeter allowed for innovation within corporations.

they break with routine. This is the role of the entrepreneur, a role that cannot be a profession; nor can there be a class of entrepreneurs (Schumpeter 1949). Entrepreneurship is a function performed only at the initial stage of introduction of new combinations. Entrepreneurial innovation breaks the norm of the circular flow as it requires purchase without sale. The innovation needs to be financed before output can be produced and sold. It requires use of money as a "claim ticket" on productive resources without use of money as a "receipt voucher" for sale of commodities or services (Bellofiore 1985, 1992). Just as the circular flow is broken by innovation, the neutrality of money is broken by entrepreneurial activity; indeed, economic development—as he defined it—requires non-neutrality of money.

As Schumpeter argues, a "non-exchange" (or non-market) economy may experience change and growth, but this would come without violating the neutrality of money. For example, in a command or socialist economy, change would be directed by "authority"; resources would be redirected as required by command to generate growth. Money might be used—but it would be used mainly as a unit of account for budgeting purposes, but also as a medium of exchange. However, in an "exchange" economy, resources can be redirected to the innovating entrepreneur only through provision of new purchasing power, that is, provision of money as a claim on social resources.[9] The innovator cannot rely on purchasing power that arises from sales of output within the circular flow; rather, resources must be first directed to the new and revolutionary activity.

Schumpeter's strongest case can be made on the assumption that within a circular flow, all resources are fully utilized in producing consumption goods. This means that the innovator must draw already-employed resources from the circular flow and direct it toward the revolutionary activity. "The carrying out of new combinations means, therefore, simply the different employment of the economic system's existing supplies of productive means..." (Schumpeter 1949, p. 68). This makes it clear that economic development cannot be a result of "saving and investing"; it occurs not through volitional saving, but through creation of new purchasing power that would give innovators command over previously utilized resources. Schumpeter argued that "saving and investing" would merely lead to a slow and continuous increase of productive capacity—to adaptive behavior within the circular flow.

[9] Schumpeter presumed full employment—see the next paragraph.

Economic development, however, is not a slow and continuous increase of productive capacity; the new combinations cannot be financed out of returns from previous production. Instead, economic development requires creation of new purchasing power, which can only come from credit creation. Credit allows "detaching productive means (already employed somewhere) from the circular flow and allotting them to new combinations" (Schumpeter 1949, p. 71). Credit forces the economic system into new channels; "To provide this credit is clearly the function of that category of individuals which we call 'capitalists' " (Schumpeter 1949, p. 69). Further, "the capitalistic credit system has grown out of and thrived on the financing of new combinations in all countries" (Schumpeter 1949, p. 70).

In a capitalist society, "credit is essentially the creation of purchasing power for the purpose of transferring it to the entrepreneur" (Schumpeter 1949, p. 107). Thus, innovation requires a credit system, and the credit system is a result of this necessity. The banker is the "capitalist par excellence," the ephor of the capitalist system, as he/she produces "the commodity 'purchasing power'" that makes it possible to carry out the new combinations associated with innovation (Schumpeter 1949, p. 74).

Since credit allows a purchase without sale (of previously produced goods and services), it can be inflationary in situations of full employment of resources. The purchasing power placed in the hands of innovators allows them to outbid mere capitalists for resources in order to use them in new combinations. The "old" firms will command fewer resources; their output may fall.

In that case, purchases of resources by the innovators maintain aggregate demand even as aggregate supply falls; inflation of current output prices results—a phenomenon Schumpeter calls temporary credit inflation. After some period (which can take several years), the new combinations can finally provide output to the market. These may displace other (older) products and services, making them obsolete and generating a process of liquidation, readjustment, and absorption of "old" firms. At the same time, the sales receipts of new firms enable them to retire the credit initially advanced to allow the innovation to proceed. As a result, loans and deposits ("money supply") contract toward the initial position, and spending power and prices also fall back toward initial levels (Schumpeter 1944 p. 9). Thus, the credit inflation is only temporary, and the innovation can even lead to a longer-term deflationary trend or bias as it reduces the costs of production (Schumpeter 1949, p. 111).

This is what Schumpeter calls the "primary wave" as the economy first moves away from the circular flow in an expansion, but then contracts back toward the initial equilibrium of the circular flow even with no expectational errors. However, as firms are likely to react to rates of change, the initial expansion of purchasing power (and inflation) can lead to a boom driven by what Keynes called "mass psychology," while the contraction can degenerate to a recession as the economy overshoots the circular flow on the way down. These "secondary waves" increase the instability that is inherent in the capitalist economy. According to Schumpeter, only innovation can generate the business cycle, and the cycle "seems to be the statistical and historical form in which what is usually referred to as 'economic progress' comes about" (Schumpeter 1944, p. 7).

Innovation, itself, is endogenously generated by the apparent tranquility of the circular flow. That is, within a circular flow, the capitalist is sure of his ground and can adjust conduct in response to economic data. This confidence, however, raises entrepreneurial spirits, inducing experimentation and encouraging innovation.

Innovation, in turn, generates expansion and disrupts conventional behavior patterns; it becomes too difficult to make predictions and entrepreneurial spirit is depressed. The innovation "changes social and economic situations for good" as it alters the data of the system and moves it away from equilibrium, and makes it impossible—even for the new entrepreneurs—to predict the outcome of actions (Schumpeter 1951, p. 217; Bellofiore 1992).[10] New innovations stop coming forward and the economy slows; it eventually returns to a circular flow of reproduction. Lack of inventions is never the barrier to innovation; rather, it is the lack of entrepreneurial spirit that would put the inventions to use in innovative ways that is the barrier to economic development. Once a circular flow has operated near equilibrium for a sufficient period, confidence will be restored sufficiently that innovation may reappear.

4. MINSKY'S CRITIQUE AND EXTENSION OF SCHUMPETER'S VISION

Hyman Minsky wrote his dissertation under Schumpeter's direction (he switched to Leontief following the death of Schumpeter). Although Minsky wrote several articles himself that detail

[10] Some evolutionary economists following the Schumpeterian tradition explained this issue as a cognitive problem that arises when new technological trajectories and a socio-techno-economic "paradigm" emerges as a result of radical innovations, yet economic actions are still based on the previous trajectory and paradigm (Dosi 1982; Perez 2002).

his links to Schumpeter, there has not been much work in this area (exceptions are Bellofiore 1992 and Wray 1994). As Minsky was also heavily influenced by Keynes, as well as by the Chicago institutionalist tradition, he made major advances over Schumpeter in his analysis of financial institutions and the macroeconomic relations among investment, saving, profits, and money.

While Minsky's early work on innovation in the financial sector is well recognized, his related work on the capital development of the economy is not. This is, in part, because most of it came after his famous 1986 book; indeed, the best work was either published as Levy Institute working papers, in rather obscure edited volumes, or was left unpublished at Minsky's death in 1996. As Minsky argued in that later work, financial innovations can be conducive to capitalist development, but they also might be regressive. He argued that many of the recent financial innovations did not contribute to capital development and that policy reform was necessary to redirect finance to serve this public purpose.

Minsky's criticism of Schumpeter's approach is not widely known. This is important with respect to recent work on innovation in the Schumpeterian tradition by neo-Schumpeterians. Somewhat surprisingly, much of this recent literature puts money and credit into the background, contrary to Schumpeter's own emphasis on the role credit plays in financing innovation. Indeed, some modern work emphasizes the use of retained earnings, or savings as the source of finance—something at odds with Schumpeter's view, which we explained above, and also contrary to the views of Keynes and Minsky.

Minsky argued that Schumpeter's vision was undermined by the acceptance of too much of the methodology of the neoclassical approach—including the adoption of the notion of an economy that is equilibrium seeking. He proposed to modify Schumpeter's approach by incorporating Keynes's vision. This gives a role to aggregate effective demand. Further, he introduced a deep understanding of modern finance to develop a Schumpeterian theory of capitalist development, albeit without the weaknesses of neoclassical theory. Unfortunately, like their New Institutionalist counterparts, some modern Schumpeterians and evolutionary economists seem to ignore both modern financial relations as well as the role played by aggregate effective demand.

According to Minsky (1992), Schumpeter's vision of capitalism as a dynamic system that endogenously generates instability and cyclical behavior was similar to that of Keynes; however, Schumpeter's technique was essentially that of Walras and therefore inconsistent with

this vision. In contrast, according to Minsky, Keynes's technique—particularly that of his GT—was appropriate to the Keynesian-Schumpeterian vision.

Further, Minsky (1993) notes that Schumpeter integrated money into his theories of innovation, economic development, and business cycles; however, he was not able to link money to "normal" capitalist production, to position-taking in assets, and to the formation of asset prices. Indeed, Schumpeter denied that money plays a role except in innovation. As such, his circular flow analysis was severely flawed, his analysis of banking was inadequate, and his theory ignored asset pricing. By rectifying these shortcomings, we are better able to understand developments in our financial system over the past three decades.

Keynes developed a theoretical apparatus incorporating non-neutral money and liquidity preference as a determinant of the price system for assets. In Keynes's theory, money is used in an entrepreneurial, private property economy because uncertainty exists; given that future events cannot be "known," and given that production and sale always require time, all production for market involves fundamental, existential uncertainty (Wray 1990, 1993a). Any time-dated contracts in such a society will be written in terms of a money of account. Because virtually all contracts in any private property economy will be written in (and legally enforceable in) money terms only, money matters and it can never be neutral. Furthermore, given uncertainty and nominal contracts, liquidity always has value—holding money-denominated liquid assets reduces uncertainty regarding one's ability to fulfill future commitments, as well as whether one's income flows will be sufficient to meet expenditures.

In Chapter 17 of his GT, Keynes provided a theory of asset pricing that was founded in his approach to money. We will not go through that in detail. According to Keynes, in equilibrium, prices of assets will adjust so as to equalize expected returns. As the liquidity preference rises, prices of illiquid assets must fall sufficiently to raise the expected returns on these so as to equal the new, higher, subjectively evaluated return to liquid assets. In the case of producible assets (e.g., capital assets), the demand price (the price the purchaser of capital assets is willing to pay) must exceed the supply price (the price at which the supplier of capital assets can cover costs and profits) in order to induce production. As the liquidity preference rises, the demand prices of illiquid capital assets fall, and supply prices are likely to rise—so that fewer capital assets will be ordered.

As Minsky argued, there is another price system for current output, whose prices are determined not as a function of liquidity preference (and expected returns), but so as to recover

costs and realize profits. As a first approximation, one could characterize the Keynesian theory of current output prices as a "wage plus markup" approach. (This is consistent with the findings of Blinder et al. 1998, as well as many other empirical studies that demonstrate that many prices do not react to changes in "supply" or "demand.") At the individual firm level, the markup will be a function of market power; according to Minsky, at the level of the economy as a whole, the markup is a function of aggregate demand. This, in turn, is partially a function of the relation of supply prices of capital goods (determined by the price system for current output) and the demand prices of capital goods (determined by the liquidity preference and expected returns).

When demand prices exceed supply prices, investment can occur, which raises aggregate demand so that a larger aggregate markup on prices of consumer goods over wage costs can be supported. Competition among capitalists then determines the distribution of aggregate profits realized through individual markups. (All this is related to Kalecki's profit equation, which shows that aggregate profits—the aggregate markup over costs—identically equals investment plus the budget deficit, plus the current account surplus, less saving out of wages, and plus spending out of profits. As Kalecki put it, "capitalists get what they spend"—investment plus spending out of profits. Minsky would say that this spending is what allows firms in the consumption goods sector to realize a higher aggregate markup over costs.)

Alternatively, given a price, an entrepreneur can increase her individual markup by lowering costs. Through innovation that lowers costs, a firm can force a greater share of aggregate profits to be allocated in its direction. Schumpeter did not appear to recognize that innovation (or cost-cutting) by itself does not generate aggregate profit; rather, profit is generated by aggregate markups (which, following Kalecki, are strictly the result of spending in excess of the wage bill of the consumption sector); instead, innovation only reallocates profits toward innovators. Indeed, innovation can even reduce the aggregate of profits to be allocated if, as Schumpeter believed, it lowers costs—which are incomes. Thus, innovation directly affects only the distribution of profits among capitals. It is through this redistribution of profits to innovators that innovation leads to "creative destruction" of "old" capital by reducing its yield.

Schumpeter's circular flow analysis is undermined by the absence of the recognition of this relation between investment and profit and by the absence of a distinction between the two price systems that exist in all capitalist economies. Contrary to what Schumpeter claims, investment, saving, profit, and interest are not absent from a capitalist circular flow. In a capitalist economy, a circular flow must be monetary because the purpose of production in a

private property economy in which uncertainty exists is to realize "more money than it started with" (Keynes 1979, p. 89). A capitalist circular flow must include production of both consumption goods and investment goods; the wage bill paid to produce the investment goods is a source of profits when it is spent by investment sector workers on the output of the consumption sector.

Investment output, in turn, is a function of a divergence of the supply price and demand price of capital assets, which, as discussed above, is a function of liquidity preference. Investment then generates profits and saving (the creation of profits by investment is the Kaleckian view and the creation by investment of equivalent saving is the Keynesian view, but it can be shown that the two are formally equivalent). Any capitalist circular flow thus includes profits, investment, and saving.

Given its time-absorbing nature, capitalist production begins with an advance of "money" and can only later realize "more money." The initial advance of "money" must come from somewhere; and given uncertainty, the advance of "money" is made on the expectation of "more money" later. This is why monetary contracts include interest; and interest requires that monetary contracts are of the nature of "money now for more money later." Schumpeter correctly recognized that "capital" is not really a means of production, but is rather a fund of purchasing power that can be created "ad hoc" as credit.

He also correctly recognized that "money" is not "commodity money," but is "characteristically credit" (Bellofiore 1985). However, he did not recognize that this is as true in the circular flow as it is out of the circular flow during innovation. Even within the circular flow, production begins with credit and must end with "payment" of interest.

According to Minsky, "Schumpeter's banker financed the creative part of creative destruction," but it is necessary to wed this view of banking with Keynes's theory of asset pricing (Minsky 1990, p. 56). The innovative investment requires not only that, from the perspective of the innovator, the demand price exceeds supply price; it also requires that the banker's risk aversion is overcome. In order for an expansion to proceed, portfolio preferences must be such that the banker is willing to take a position on liabilities issued by entrepreneurs even as the bank must issue its own liabilities to finance this position. Up to some point, banks can do this while conforming to normal practice (regarding the liabilities issued to finance the position). Expansion of balance sheets beyond this, however, requires a revision of banker rules

of thumb, changes of conventions regarding prudent behavior, and even the creation of new financial instruments—in short, financial innovations.

Financial innovation is thus sometimes the "monetary" counterpart to Schumpeter's "new combinations" that will require finance so that it might be carried out. These financial innovations require a change in the perception of what is possible.[11] Minsky argues that every prolonged expansion will lead to innovations in finance; such innovations are endogenously induced by success. So long as investment continues to increase, profits increase and encourage greater leveraging of prospective income flows. This leads to a self-fulfilling prophecy as dependence on external finance increases the size of the circular flow such that incomes are even greater than expected, so that margins of safety for the next round of spending can be reduced.

Innovations, whether by bankers or by industrialists, can create market power and change the allocation of aggregate profits so as to reward innovation (Minsky 1990, p. 56). Prospective monopoly profits are incorporated in demand prices of assets—the same capital asset is worth more to the firm with greater market power—and in the market (or equity) price of the firm with market power. This firm can service more debt because sales prices are higher and more secure. Those who recognize this are able to use prospective monopoly profit shares to support liabilities that give them controlling ownership in the firm. This recognition was behind the merger and buyout waves in the US, which dwarfed any previous wave of concentration and must qualify as a wave of Schumpeterian innovation. In other words, the financial innovation—the leveraged buyout (LBO)—financed a merger wage that changed the environment within which nonfinancial firms operated, increasing market power.

Part of the explanation for the burst of innovations that allowed greater leverage and lower margins of safety can be traced to the "perfection" of lender-of-last-resort (LOLR) interventions by the central banks in the postwar period. Each time a financial innovation was tested by a crisis, the Fed and other major central banks intervened to validate it. In fact, the Fed is only the most visible guarantor of private financial instruments; in the US, the government (whether the Treasury or one of many governmental agencies) stands behind one-third of all

[11] An example of a financial innovation is securitization of home mortgages. While seemingly simple, the 30-year fixed rate self-amortizing mortgage is actually a complex instrument. But the innovation of bundling and tranching appeared to create a new instrument with characteristics similar to government bonds. Another innovation was the creation of the credit default swap which appeared to offer cheap insurance against losses without requiring issuers to hold loss reserves because they could hedge risks by taking offsetting positions.

privately issued liabilities. In the GFC that safety net expanded—the total volume of loans originated by the Fed in response to the GFC accumulated to nearly $30 trillion.

Whenever the government promises to substitute legal tender for a private liability, this affects the price of the liability as it increases its liquidity. Clearly, individuals can reduce margins of safety if the government's safety net is extended to cover virtually all liabilities of those with market power. The preference for liquidity is reduced and prices of assets whose returns come from taking illiquid positions are higher. In this way, government backstops for behemoth financial institutions help to promote rising concentration outside the financial sector.

We now turn to the modern Schumpeterian evolutionary approach.

5. THE MODERN EVOLUTIONARY ECONOMICS APPROACH TO ECONOMICS

Evolutionary economics studies the coevolution of mechanisms creating differences between economic agents (e.g., consumers, technologies, firms, industries, and countries), and mechanisms of selection which winnow in on those differences. The evolutionary perspective on innovation and market structure differs from the traditional neoclassical perspective for various reasons.

First, inter-firm variety is not seen as a result of "imperfections" in an otherwise perfectly competitive world (described by a "representative" agent), but rather as the outcome of a fierce competitive process characterized by firm-specific capabilities and innovation activities. Since the latter are a permanent characteristic of competition, there is no reason why variety should disappear, even in the long run.

Second, patterns characterizing industry structure, such as the firm-size distribution and level of instability, are not constrained by notions of "equilibrium" or "optimality" but are instead understood as properties emerging from interactions between heterogeneous agents. These interactions are characterized both by degrees of freedom at the firm level (which create inter-firm diversity) and by structural properties at the industry level (which constrain the degrees of freedom). The object of evolutionary economics—compatible with complexity theory—is to study the coevolution of the degrees of freedom and the structural constraints.

Evolutionary economists make use of metaphors and mathematical techniques from the field of biology (e.g., evolution, mutation, and imitation), as opposed to the use of physics by traditional neoclassical economists (e.g., steady-state equilibrium). For instance, the role of

differences between firms in creating economic change is often modeled using replicator dynamics, borrowed from evolutionary biology, which posit a "distance from mean dynamic": a firm's growth rate depends on how its efficiency characteristics differ from the industry (weighted) average. Thus, contrary to standard microeconomics, where the focus is on the average, in the evolutionary world a universe of average agents would imply no change and thus no growth.

For Schumpeter, finance is fundamental for understanding how technological change occurs. In his analysis, the banker played the most important role, but this role may now also be played by various types of shadow banks, including private equity partnerships and business angels. Perez (2002) argues that the inertia that characterizes incumbents, and what she calls "production capital" more generally, requires *finance capital* to lead the beginning of new revolutions (venture capitalists and banks willing to take on risk), with production capital only taking the lead once the new technological paradigm is deployed.

Yet finance capital tends to enter only after a long gestation period in which it is public funds that are invested in the areas of highest capital intensity and highest technological and market risk. In general, the lessons from biotech, nanotech, and green-tech are that there is a shortage of risk capital in high-risk areas, with many pioneering projects and radical ideas unable to cross the "valley of death," never making the shift from R&D laboratories to markets. This is because radical innovation is not just risky but deeply *uncertain* (Knight 1921), because the price and performance of new technologies cannot be known in advance; nor can the specific consumer preferences and practices. If implemented, radical new technologies also amplify uncertainty over rates of return on traditional technologies, to which investors may already be exposed, creating an "innovators' dilemma" for financial investors, as well as non-financial corporations. As traditional banking was replaced by "originate to distribute" shadow banking, the relationships that are required to build the confidence sufficient to supply credit to entrepreneurial activities seems to have disappeared. It is very hard to see how liabilities of innovators can be pooled to serve as collateral behind high-risk securities—especially since most "managed money" is subject to fiduciary rules on asset quality.

The risks are compounded for "green" innovation, because of uncertainties regarding market demand (consumer willingness to pay for green innovations) and perceived fickleness of public policies. Indeed, the tense relationship between radical change, inertia, and risk taking is at the core of what Schumpeter meant by the term "creative destruction": the necessary

destruction of the advantages of incumbents which radical new technologies bring in. Creative destruction helps us to understand why change is resisted by industry leaders and existing institutions.

Venture capital, for example, is doing with green-tech as it did with the biotech "revolution": waiting for the government to first make the major investments on which it can later ride the wave. Currently, it is only public sector funds that are funding the riskiest and the most capital-intensive projects in green technology. Venture capitalists are increasingly targeting incremental innovations in established technologies to improve energy efficiency, moving away from more radical forms of innovation for energy production. As more pension-fund and other institutional finance flows into venture capital (VC) funds, potentially increasing their scope to finance early-stage innovation, these funds have become more risk averse by refocusing on later stages, and failing to realize that potential. This may have been compounded by the increased scope, through financial markets, for making high and relatively safe returns through restructuring and re-trading existing assets (i.e., corporate equity and property) rather than creating new assets of highly uncertain long-run value.

The reluctance of venture capitalists and banks to fund early-stage developments is highlighted by Mazzucato (2013a/b), where it is argued that in many technological revolutions, key early stage funding has come not from private "entrepreneurs" or private finance capital, but from the State. Block and Keller (2011) argue that this leading role of the State has had to remain "hidden" for political reasons, creating a decentralized network of state agencies. Ironically, this has made the US one of the most interventionist economies in the world, notwithstanding its usual portrayal as the "market model" to follow.

Unfortunately, the most rigorous new evolutionary models of the innovation process have downplayed or ignored altogether the financial aspects of innovation. While there has been some work on the evolution of finance in that area, using case studies (Mazzucato 2013b), the implications of the GFC for finance of innovation have not been sufficiently explored. Finally, the new evolutionary approach has largely ignored the work of Minsky, and in particular the Minsky-Keynes approach that emphasizes constraints imposed by macroeconomic performance and identities.

What are the benefits of synthesizing the two traditions (Keynes-Minsky, Schumpeter-Minsky)? Since innovation is an important part of capital development, we need to understand the innovation process itself, and how it gets financed. The synthesis will help us understand the

money-finance process and how financial innovations have directed finance *away* from the capital development of the economy. In the next several sections, we turn to a more detailed analysis of these topics.

6. FINANCE AND INNOVATION

Finance and innovation are characterized by feedback: different types of innovations (and firms) require different types of finance, but we need to explore what type of finance is received, and how that affects the patterns of innovation (Mazzucato 2013b; O'Sullivan 2004). For example, VC was initially thought to be a good substitute (for innovative firms, at least) for seeking finance from risk-averse banks. However, as VC has increasingly been focused on an early "exit" via an initial public offering (IPO), this has affected the investment patterns in sectors like biotech. Innovation is collective, uncertain, and cumulative (Lazonick and Mazzucato 2013). This defines the type of finance it needs: long-term, committed, patient finance. This is the type of finance that is missing, and it is increasingly hard to find in the private sector (Mazzucato 2013a). It is also important to determine whether the goals of a firm with respect to innovation change when VC enters. Few VC-funded projects are successful, and those that are tend to attract a large share of the funding. Does this mean that many potentially viable innovations are left behind?

Mission-oriented Finance

It is often thought that what is preventing the capital development of the economy or the take-off of green technologies is a shortage of money: there is not enough finance. In reality there is *too much* finance, but it is the wrong type. There is not enough *patient, long-term, committed finance* (Mazzucato 2013b). And it is also not true that there is too little "supply" of finance; it is often that there is not enough "demand": i.e., not enough high-growth innovative companies wanting to invest in innovation (ibid.).

First, corporate profits flows are much larger than investment[12]—indicating that, at least in today's environment, there is no significant shortfall of funds, at least among the big

[12] Note from the Kalecki equation that aggregate profits can exceed investment since they can be generated by budget deficits and current account surpluses; they can also result if saving out of wages is negative and/or consumption out of profits is positive. In the case of the US, current accounts are persistently negative (draining

corporations. In any case, there is evidence that 97% of the firms that seek finance get it (Nightingale and Coad 2014). The problem is whether the missing 3% includes a high concentration of the innovative firms that the economy should be targeting. And the answer is that there is evidence (Bottazzi et al. 2008) that innovative firms are penalized by credit markets precisely because they embody higher risk and, in particular, uncertainty (as innovation is characterized by true Knightian uncertainty).

While orthodox economists point to "market failures" (see Medema 2007 for a review of the concept), the market failure approach does not necessarily explain how the type of finance that has been most effective in nurturing innovation is not only "long-term" but also directed and "mission oriented" (Foray et al. 2012)—and often public (not private) finance (Mazzucato and Penna 2014). While the market failure framework focuses on the need for public finance to fund "public goods," such as basic research, it cannot explain the fact that public finance has been active along the entire innovation chain (from basic to applied to early-stage financing of firms) with budgets focused on big mission-oriented projects, from putting a man on the moon, to tackling climate change. Far from being restricted to the "military industrial complex," such investments have been characteristic of missions across different departments, with the National Institutes of Health (NIH), for instance, being responsible for the funding of most radical new molecular entities, and spending £32 billion for R&D in 2012 alone (Block and Keller 2011; Mowery 2010; Mazzucato 2013a).

Figure 4 below shows the important role that public agencies (in orange) have played across the entire innovation chain, from blue sky research funded by agencies like the National Science Foundation, and more applied research being done by agencies like the NIH and the Advanced Research Projects Agency-Energy (ARPA-E) of the U.S. Department of Energy. As venture capitalists have become increasingly short-termist (seeking to exit via an IPO or buyout in 3 years), early stage risk finance for companies is increasingly coming from public agencies like the Small Business Innovation Research Program (SBIR), or the guaranteed loan scheme of different agencies.

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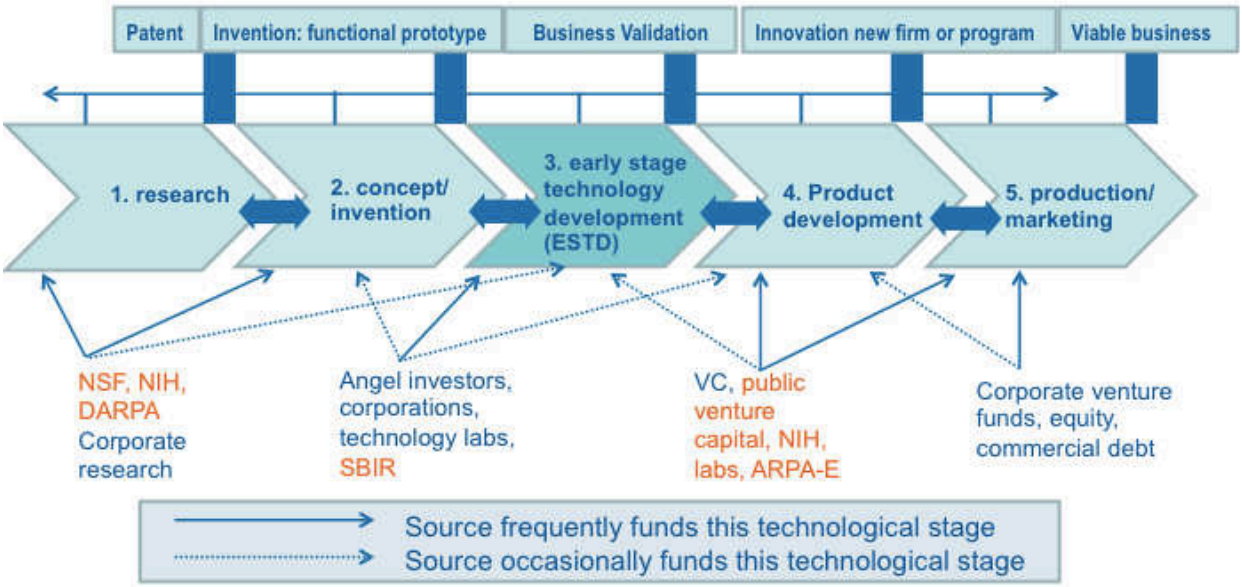
profits), but consumption out of profits is probably positive, and savings out of wages were negative for much of the period from 1996–2006 (adding to profits). Budget deficits were very large after the crisis hit, but have been declining over the past few years; this will reduce the boost to profits in excess of investment. However, if the biggest corporations have substantial pricing power, they might be able to increase their share of a shrinking aggregate profits pie.

Figure 4 Public Financing of Innovation across the Entire Innovation Chain



Source: The author's insertion of public funding in this figure is from Auerswald and Branscomb 2003.

Such mission-oriented investments, like putting a man on the moon or fighting climate change, are not driven by the need to simply "fix" market failures, but are more about shaping and creating new markets. Through these kinds of mission-oriented investments, the state has led in the development of key "General Purpose Technologies" (Lipsey et al. 2005; Bresnahan 2010) such as the US mass production system, aviation technologies, space technologies, information technology, internet technologies, and nuclear power. Indeed, as shown in Mazzucato (2013a), all the technologies that make the iPhone "smart" were publicly funded: the internet, GPS, touchscreen display, and SIRI. In each case, it was not just funding innovation or creating the right conditions for it—i.e., directly or indirectly fixing a market failure—but also envisioning the opportunity space, engaging in the most risky and uncertain early research, and overseeing the commercialization process. Far from the often-heard criticisms of the State potentially "crowding out" private investments, such bold mission-oriented public investments (among decentralized public actors) created new opportunities that private initiative later seized (Mazzucato 2013b).

Such investments are also very high risk. The fact that innovation is inherently uncertain (in the Knightian sense) means that for each success, there are many failures. This is just as true for private venture capitalists as it is for public investors. Most recently, this has been shown by

the guaranteed loans of the U.S. Department of Energy, to companies like Solyndra (a failure, with a $500 million guaranteed loan) and Tesla S (a big success, with a $465 million guaranteed loan) have shown. Indeed, for each Tesla, there are many Solyndras. But rather than bashing government for its failures, it might be more useful to consider how to structure the investments as a portfolio, with the successes being able to cover the failures and the next round. Just like private venture capitalist.

Indeed, while private VC earns a direct return from the successes to cover the failures and the next round of investments, public funds often do not. Why should the state earn a return, through equity or perhaps retention of a "golden share" of the IPR (as argued in Mazzucato 2013a)? Some might say that the government needs the money to continue to finance innovation. But that cannot be correct—the sovereign government cannot run out of its own currency. Sovereign governments frequently—even virtually always—run budget deficits. Governments typically budget spending and set tax policy with some view as to what the budget balance ought to be, however, the budgetary outcome (deficit, surplus, or balance) is not discretionary and will not be known until the end of the fiscal year. Indeed, the view that government "pays for" its spending through tax receipts presents a misunderstanding of how the government actually spends—a topic beyond the scope of this project.

Still, it makes sense for public investment in innovation to earn a return. It is common for certain types of infrastructure projects to match costs against anticipated receipts—toll bridges are an example. This imposes a test on the usefulness of the project: are users willing (and able) to pay for the benefits they receive from the bridge? Or, another example is the allocation of gasoline tax receipts to a highway fund. As drivers pay taxes fairly directly related to use of cars—and hence to roads—it might make sense to tie road building to payment of these user fees. This is not a financial necessity, and should not be carried too far. There can also be a public interest involved in building roads—recall the interstate highway system in the US was justified in the name of national defense. However, in particular cases, holding spending to a source of tax revenue (or other kind of user fee, such as tolls) can be used as a test of the value of a project.

Note that spending does need to be budgeted, and a measure of success is whether a project comes in within the budgeted amount. This is an additional measure to hold public stewards accountable. Government could always have spent more than what was budgeted, but holding managers of projects accountable is good policy.

Another reason to budget is to ensure that the total of government spending does not exceed the real resource capacity of the economy. Ultimately, the true constraint on government spending is the resource constraint. Not only does government compete with private use of resources, but each project undertaken by government must compete with other government projects. If government's share of total resources is limited to, say, 30% (we will not discuss how this is determined, but it is largely a political—not economic—decision), then spending more on a particular project means there are fewer resources available for some other government project. The allocated budget helps to determine how many of the resources available to government will go to each area.

Finally, we cannot ignore politics. Given that innovation is by its very nature highly uncertain, most projects will not succeed. While the voters are willing to accept failures by private innovators, it is much harder for them to accept numerous failures of government-funded projects. If, for example, 90 or even 99 projects fail for every success, voters are likely to find that to be an unacceptable risk. However, if they can understand that the one highly successful project earns returns that cover all the losses of 90 or 99 projects, they can see the benefits of funding risky innovations.

For these reasons, it makes sense for government to share in the rewards of financing innovations—in the same way that it generates revenue from building toll bridges, or charges gate fees to allocate scarce space at airports financed by public spending. By setting aside a revolving fund of finance for innovation, perhaps initially funded by government expenditure but then funded by sharing the rewards from the few successful projects, government holds managers accountable and can assure the voters of the worth of the program. With such a "trust fund" out of which innovative projects are funded, and into which the rewards of risk taking flow, government can be a patient source of finance for innovation. Government does not need to get the quick returns that impatient finance demands; it can therefor finance stages of the innovation process that private finance avoids.

However, to ensure that the revolving fund is *replenished* it is necessary to ensure that the private beneficiaries—say, Apple, for example—share the rewards with government.

Considering the type of patient finance reframes the debate about financial reform. It is not about increasing the quantity of finance, but transforming its quality. What is needed is finance that is less speculative and more committed to long-run goals (Mazzucato 2013a). Long-term committed finance has proven difficult to find in the private sector, not only due to the risk

aversion of banks (leading to VC policies), but also because increased financialization has allowed investors to make "easy" profits. The first problem requires the public sector to enter and be courageous enough to directly fund innovation, which private finance doesn't (this is the entrepreneurial state's role); the second requires the tax system to be reformed so that long term investments (key for value creation) are rewarded over short-term speculative investments (that are focused on value extraction). This latter objective must include tax reform: raising the capital gains tax (making it less profitable to make short-term investments) and also adding a financial transaction tax (penalizing quick speculative trades).

Mission-oriented finance, by public sector institutions, has been the source of most of the radical innovations in the last century (Block and Keller 2011). And note that this is not just public funding of basic research. While private finance is often important in commercializing new technologies, it is not true that the role of public finance is restricted to narrowly defined upstream areas with public goods. DARPA (the Defense Advanced Research Projects Agency) has had its (visible) hand all along the innovation chain—not only in the upstream areas (basic, applied, and even early-stage seed funding of companies). The same is increasingly true of some strategic financing provided directly by public banks.

Retreat of Private Finance and the Rise of Public Finance

The retreat of private finance from nurturing the real economy has triggered state investment banks (SIBs) to increase their role around the world (Mazzucato and Penna 2014). These banks are offering the much needed counter-cyclical credit, as well as credit aimed at capital development (e.g., infrastructure). Also, increasingly, they are funding the cutting edge of innovation. Indeed, in 2012 SIBs offered $80 billion to the renewable energy sector, much more than private agents (BNEF 2012). The China Development Bank, Germany's KfW and Brazil's BNDES are three particularly strategic SIBs that carry out mission-oriented policies which have been leading investors in renewables. (As we will explore in the next section, this is consistent with Keynes's call for socialization of investment [Keynes 1936, p. 346].)

Key to thinking about financing innovation is the question: where does money come from?[13] And does it matter? Money is not just a medium of exchange, greasing the wheels of commerce, but it is also a central driving force since capitalism is essentially a credit-driven

[13] See Wray 2010 for Minsky's views, and Wray 2012 for the Modern Money Theory perspective.

system—or as Minsky put it, capitalism is a *financial system*. In considering the wherewithal that the public sector has to invest in innovation, attention to money creation is fundamental. Indeed, countries in the OECD differ radically in terms of whether innovation financing occurs directly or indirectly, with the latter being primarily through tax incentives. It is the nations that have structured public finance to directly finance innovation that have also succeeded in increasing business expenditures in R&D. This is because private business tends to enter the innovation game only *after* it sees clear returns in sight (technological and market) opportunities (Dosi and Lovallo 1997). Hence, it is countries where different types of public sector institutions have been able and willing to directly finance innovation that have been able to achieve innovation-led growth (Mazzucato 2013a).

When this is done through SIBs, there is a more direct connection to the money created via the Treasury. Does this matter? When it is done via VC, where does the money come from? Does it matter where the finance comes from? Do retained earnings provide more stability than credit-fueled innovation? If not, is the point then simply to find "any sort of finance" for innovation?

In Mazzucato and Penna's (2014) typology of SIBs, they identify four distinct roles: a *countercyclical role*; a *developmental role*; a *venture capitalist role*; and a *mission-oriented role*. While historically SIBs have been a key source of finance for capital development, in recent decades they diversified their roles and increased their investments, thus countering the trend whereby private finance retreated from financing the real economy. Particularly for transformative ambitions (such as creating a sustainable energy system), SIBs became the major source of finance, representing an important alternative to "old" mission-oriented funding mechanisms and to private finance. Mazzucato and Penna (2014) conclude SIBs represent a concrete institutional mechanism that can help reform the "dysfunctional" financial system from within. Furthermore, through the use of an array of financing tools—standard loans, income-contingent loans, equity, grants—SIBs are able to reap a reward for their investments, therefore socializing not only the risks and uncertainties, but also the rewards.

7. SOCIALIZING INVESTMENT

Considering the dynamics of mission-oriented investments brings us directly to a strong, yet unexplored, connection between the neo-Schumpeterian emphasis on innovation policy (and the

implied directionality) and Keynes's objective on the key mission of macroeconomic policy: full employment. Keynes's call for "socialization of investment" in Chapter 24 of the GT directly refutes the idea of economic policy as simply "nudging" or incentivizing the private sector:

> "The State will have to exercise a guiding influence on the propensity to consume partly through its scheme of taxation, partly by fixing the rate of interest, and partly, perhaps, in other ways. Furthermore, it seems unlikely that the influence of banking policy on the rate of interest will be sufficient by itself to determine an optimum rate of investment. I conceive, therefore, that a somewhat comprehensive *socialisation of investment* will prove the only means of securing an approximation to full employment; though this need not exclude all manner of compromises and of devices by which public authority will co-operate with private initiative" (Keynes 1936, p. 346; emphasis added).

This was posed as one of the policies to be adopted to deal with the two fundamental faults of capitalism: an arbitrary and unequal distribution of income and a failure to generate full employment. In the postwar period, this has largely been interpreted as a proposal to "prime the pump" to close the "demand gap." Further, most economists and policymakers who have promoted this idea have pushed for policies to induce private investment—which through the multiplier would raise aggregate demand. In the framework of the GT, this can be accomplished by lowering the interest rate and raising the marginal efficiency of capital.

However, a deeper investigation of Keynes's writings both before and after the GT casts doubt on that interpretation of his preferred policy. Further, at least some economists—including Minsky—argue that relying on a strategy of boosting private investment is not likely to be effective in resolving either of the two fundamental faults identified by Keynes. In severely depressed conditions, it is very difficult to raise entrepreneurial expectations sufficiently to induce investment. When the economy is operating without so much slack, trying to stimulate investment is likely to cause inflation. This is not through a simple Phillips Curve dynamic, but rather because of bottlenecks. As Keynes argued, each sector of the economy has its own elasticity of production, so a general rise of aggregate demand will affect prices differently across sectors. An inflation barrier can be reached long before the economy approaches full employment. Precisely where the demand is directed matters.

As Tcherneva (2008) reminds us, Keynes warned that "'it is easy to employ 80 to 90 percent of the national resources…but to employ 95 to 100 percent is a different task altogether' (Keynes 1982: 409)." Further, there is accumulating evidence that economic growth does not necessarily "raise all boats"—economic growth by itself does not generate full employment and

can even increase income inequality (Tcherneva 2014). Hence, using private investment to close demand gaps by increasing the rate of growth might not resolve either of the fundamental faults—indeed favoring investment might make things worse. Again, if we are concerned with inequality and unemployment, it might be necessary to use *directed spending* rather than general pump priming.

This is precisely what Keynes actually argued. Rather than pump priming and policies that would induce private investment, what Keynes wanted was spending directed toward public investment and job creation. His term "socialization of investment" was largely used to refer to public investment that would simultaneously create jobs and also increase the capacity of the economy to improve living standards. Further, he consistently argued that the measure of success of policy is job creation, not "economic growth" (Tcherneva 2008). Keynes's argument was that we cannot rely on private investment to tend to the level that is required to raise effective demand sufficiently to reach full employment. Even if private investment happened to be at the right level, as Minsky argued, this would probably be a transitory state due to the destabilizing processes set off by external finance. For these reasons Keynes—and Minsky—embraced public finance as a means to postpone or avoid excessive private leverage. And both of them argued that job creation should be placed front and center, *not* simply policy to raise aggregate demand.

The notion of socialization of investment represents a potential link between Schumpeter and Keynes, which has largely been ignored: when public investments are directed to new sectors developing radical innovations, the Keynesian "multiplier effect" is much larger than when governments "dig ditches and fill them up again." But without a proper framework to discuss and evaluate such "directionality" and its impact in increasing the "animal spirits" of the private sector, the myth that markets will efficiently and effectively do the job of capital development will continue to inform public policy, and expansionary fiscal policy will continue to be regarded as warranted only in the downside of the business cycle. The synthesis of Schumpeterian, Keynesian and Minskyan ideas represent the basis for such a new framework, which must account for how innovation is financed. Tcherneva continues (2008, pp. 15–16):

> "Public works and, more specifically, the sizeable socialization of investment were the answer: 'If two-thirds or three-quarters of total investment is carried out or can be influenced by public or semipublic bodies, a long-term program of a stable character should be capable of reducing the potential range of fluctuation…' (Keynes 1980:322). The provision of full employment should be 'done by the organized community as a

> whole—that is by public authorities' (Keynes 1982: 151)… The benefits of public works are, first and foremost, to be ascertained by their employment-generation effects. Once this is done, Keynes argued 'there can be only one object in the economy, namely to substitute some other, better, and wiser piece of expenditure for it' (Keynes 1982: 146)" (Tcherneva 2008).
>
> "Could we not use more universities, more local schools, and recreation areas, more theaters, museums, and galleries, more cafes or dance halls, Keynes asked. But surely there are many other pressing needs that Britain can address: public works can increase housing, improve the transportation infrastructure, and 'replan the environment of our daily life […] Not only shall we come to possess these excellent things, but […] we can hope to keep employment good for many years to come' (Keynes 1980: 270)" (ibid).

Bellofiore (2014, p. 9) argues that Minsky took a much more radical approach to policymaking than did the American "Keynesians." For Minsky, it is not enough to raise spending, as questions over distribution must be addressed directly: "[w]e are inevitably forced back to the question of for whom should the game be fixed and what kind of output should be produced" (Minsky 1975, p. 164) Hence, policy should be oriented to directed spending not only to achieve full employment, but also to determine what is produced and for whom it is produced.

Such a full employment "mission" requires us to think of the state taking an "entrepreneurial" role in the economy, not only for innovation but also for directly funding what matters the most: a guaranteed job. To do so, the state must not only set the rules and enforce the laws, or simply manage the overall level of aggregate demand. Instead, the state takes a direct role in deciding which projects should be undertaken, and for whose benefits the projects should be undertaken, as well as the distribution of risks and rewards so that it is not only the risk that is socialized but also the benefits to the public that paid for them.

Indeed, another way to consider the risk-reward idea in Section 6 (above) is through the socialization of investment. Minsky suggested that one form that the Keynesian socialization of investments should take is through "community development banks" (CDBs), which were to fill the gap in banking and financial services for small firms and individuals in certain local communities (Minsky 1993; Minsky et al. 1993). The ethos of CDBs was to promote the financial inclusion of certain strata of the society and certain regions, but this is not an end in itself, as would appear from a market failure perspective: Minsky was concerned with the "capital development" of the economy, which he conceived as the development of human capital and social capital.

The next section will recount how the financial sector transformed itself so as to cause the GFC, and the subsequent section one will highlight why neoclassical theory is a poor tool to propose a meaningful reform. After that, we will outline meaningful financial reform based on the Schumpeter-Keynes-Minsky synthesis.

8. THE LONG-TERM TRANSFORMATION OF THE FINANCIAL SYSTEM

In Schumpeter's view, the proto-typical function of the banker is to provide finance for innovative, new, combinations of resources—that is, investment finance. As Minsky notes, this was perhaps true in the early years of the 20th century; Following Hilferding, Minsky calls this stage "Finance Capitalism" (Minsky 1993). This was a period during which long-lived and expensive capital required large investments; investment bankers played an essential role in underwriting new stock and bond issues. The first great wave of mergers, trusts, cartels, and monopolies began during this period—encouraged by the investment bankers—to protect the cash flows that were required to service the substantial debt issued to take positions in the assets. Thus, Schumpeter's view of the investment banker as the ephor of the capitalist system was clearly shaped by this particular period.

However, previous to the finance capitalism stage, bankers primarily provided short-term working capital and avoided equity investments (except as individuals investing their own funds). Minsky denotes this the era of "commercial capitalism"; during this stage, bankers provided short-term loans that generated the surpluses used by individual capitalists to internally finance positions in assets (Wray 1990).[14] Given the relatively inexpensive capital assets of the period, investment could be funded readily out of retained earnings.[15] The late 19th century Schumpeterian waves of innovation (for example, in railroads) ended the period of commercial capitalism because the positions to be financed were too great to be handled in this manner.[16]

[14] Short-term loans to finance wages in the investment sector would be used by those workers to purchase consumptions goods, generating profits in the consumption goods sector. This "surplus" could be accumulated to purchase investment goods.

[15] Note that this does not mean that "savings finance investment" as in the loanable funds story. As the previous note explains, production of investment goods is "financed" by short-term loans from commercial banks; these are then purchased out of the profits generated by consumption out of wages paid in the investment goods sector. This is the "funding" stage of investment.

[16] Many national industrial banks—precursors to modern state investment banks—were formed in that century to finance these construction works (Mazzucato and Penna 2014), for example, Netherland's *Sociéte Général pour*

Minsky argues that the stock market crash ended the period of finance capitalism; it became apparent that the barriers to entry erected by trusts were not sufficient to protect cash flows so that debt deflation could be avoided.

New Deal reforms included the combination of government guarantees of asset prices (in the US, the Fed began to act as LOLR to prevent liquidity problems, and Treasury guarantees by various government agencies—such as Federal Housing Administration-guaranteed mortgages—and so on backstopped asset values to prevent defaults) and potentially large government deficits together eliminated the possibility of debt deflation, ushering in the age Minsky called "managerial (welfare state) capitalism." Further, the profit flows generated at the micro level by huge firms with market position and at the macro level by government deficits, made it possible, again, to use retained earnings to finance investment. Banks returned to the more traditional activity of commercial banking. The megacorp (vertically integrated corporations), not the banker, became the ephor of capitalism. With various policies that promoted high US domestic demand, the megacorp could safely undertake expensive, long-lived projects; in these circumstances, the orientation of capitalists and their management was toward the "long run." With protection from competition, with government intervention to prevent failure, and with bureaucratization, however, the megacorp became complacent; the manager replaced Schumpeter's entrepreneur.

Over the run of good times after WWII, margins of safety were reduced and the level of indebtedness rose. Owners or management that increased leverage ratios could increase the value of the firm; the new innovations were in the financial sphere, where the new entrepreneurs took advantage of the recognition that a greater portion of future earnings could be transformed into debt today. Financial innovations pushed up leverage ratios.

With the growth of pension funds and other "managed money," huge blocks of funds in search of short-term returns were available for leveraging expected income flows (Minsky 1993). In an environment of rising asset prices, capital gains—and expectations of capital gains—came to dominate expected returns. Given the low value assigned to liquidity, liquid assets were not in demand—so liquidity ratios fell as leverage ratios increased.

"Speculation" replaced Schumpeter's economic development because the expected returns from capital assets could not compete with the capital gains to be realized from

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Favoriser I'Industrie National or France's *Crédit Foncier*, *Comptoir d'Escompte*, and *Crédit Mobilier*. There is here a sharp contrast with the case of the UK where the state-"chartered" bank was for state finance.

leveraging firms to increase stock prices. In this stage, "money manager capitalism," the investment bankers became highly leveraged dealers in securities—taking positions and making markets (Minsky 1993). Banks continually lost their share of the commercial market as firms with market power turned to commercial paper and other instruments to raise short-term working capital (again, this was made possible in part by the reduced value assigned to liquidity); when a mini crisis occurred in the commercial paper market in the early 1970s, it became standard practice for such firms to negotiate credit lines with bankers to stand behind the paper.

Banks also provided refinancing for the financial houses dealing in securities. However, commercial banks continued to decline in importance, becoming further removed from Schumpeter's ephor. Many have noted the rise of the "shadow banking sector" that replaced both traditional commercial banking, as well as traditional investment banking. The ephor of money manager capitalism was the shadow bank.

But it is not clear that shadow banks continued to finance the capital development of the economy. It appears that the past two or three decades witnessed the domination of finance over industry, with financial innovations proliferating, but they have been directed to the finance of "trading" in securitized products. These, mostly, are relatively homogenous loans (many guaranteed by government-sponsored enterprises—the GSEs) that were supposed to be easily priced in markets. Since they had to be mostly standardized, they clearly do not finance the idiosyncratic entrepreneurs engaged in Schumpeterian innovation.

Hence, on the surface it would appear that finance has moved away from financing for the capital development of the economy. Much of the financial activity—including credit default swaps and synthetic securities (collateralized debt obligations squared and cubed)—really amounted to gambling bets that paid off if the underlying debt was downgraded by credit raters. As we now know, much of the debt was "Ponzi"—requiring debtors to borrow to pay interest. In the case of many of the subprime mortgages, default could be avoided only if asset prices (houses) rose enough so that borrowers could either refinance at more favorable terms, or sell the assets to pay principle and interest.

The innovations encouraged the development of what Minsky called "fragility"—an increasingly unstable financial sector that carried through to unstable economic relations. Households (and some firms and governments) were too heavily indebted. Financial institutions

were too leveraged. Assets that seemed to be liquid relied on tranquility—at the first signs of crisis, the fictitious liquidity would suddenly disappear.

The whole superstructure collapsed beginning in 2007 (Wray 2010). Soon after the first signs appeared that households were having trouble making payments and that house prices had stopped rising, the financial system froze. The shadow banks could not refinance their positions in assets. While commercial banks could turn to their central banks, they refused to provide liquidity to the shadow banking system. The global financial crisis spread quickly around the world. As it spread, the liquidity crisis morphed into a solvency crisis as the questionable value of the underlying assets was revealed.

9. WHY MAINSTREAM APPROACHES CANNOT PROVIDE A BASIS FOR UNDERSTANDING WHAT IS WRONG WITH THE FINANCIAL SYSTEM

In the mainstream literature, the main justification for government "intervention" is the problem of "market failure." This is based on a particular theoretical and ideological perspective. The belief is that "markets" can organize the production process, and that the market's outcome is preferred over alternative methods of organization. Still, it is admitted that the market can "fail," and this is perceived to be a cause of a "Smithian" allocation problem. Government can resolve this failure by providing the right incentives to reallocate resources. Some orthodox economists even recognize that such "market failures" can generate the "Keynesian" problem of insufficient demand (seen as a "coordination failure"). Again, government plays a positive role through fiscal or monetary policy to increase demand. However, these market failures are thought to arise from imperfections and are of a short-run nature. The market forces are seen as equilibrating. So, again, government intervention aims to fix an imperfection.

However, the mainstream arguments are fundamentally flawed and particularly inapplicable to the innovation process. Let us examine the most important reasons why that view is flawed.

A. As Keynes argued even before his GT (in *The End of Laissez Faire*, for example), the notion of the invisible hand comes from political ideology, not from economic theory. His argument was later confirmed by rigorous general equilibrium (GE) theory, which forced proponents to abandon the search for proof that in a very simple model of a market economy in which an equilibrium price vector exists, market forces would move

toward the efficient allocation of resources. The "Smithian problem" is not due to market failures but rather occurs even where every agent in the model reacts optimally to market signals. The problem is that the market process, itself, does not generally move the economy toward equilibrium. As Keynes argued, this means that the "public interest" is not in fact well-served by the pursuit of the "private interest"—as Smith had proposed. There is no demonstration that "the market" is equilibrium seeking.

B. Note also that these rigorous GE models do not have financial institutions or even money. As Keynes said, production in our economy is organized around money; it begins with money (to finance production) to end up with more money than it started with. As the goal is "money-making" there's no reason to suppose that the production decisions are consistent with "efficient allocations" of resources. In fact, many of the most important financial innovations over the past half century had little to do with increasing the supply of funding to the "capital development of the economy." They largely had to do with financing positions in financial assets (the layering of debt on debt that is a characteristic of the process that many call "financialization") and then with speculating on the movement of prices of those assets. The infamous "synthetic" collateralized debt obligations (and CDOs squared and cubed) are a prime example—these were essentially derivative bets that (derivative) mortgage-backed securities would fall in value as homeowners defaulted on their mortgages. Obviously, this did not promote the capital development of the economy.

C. Markets are outcomes of the way in which different organizations—households, businesses, and public agencies—interact. Understanding how these organizations make decisions and what drives their own investments requires understanding organizational dynamics, and not "market" dynamics. In regards to investments in innovation, it is crucial to understand how businesses understand risk and uncertainty—as most attempts at innovation fail—and how they dedicate the needed resources over long periods of time (Lazonick and Mazzucato 2013). In fact, as we explore in more detail below, innovation trends largely result from, and are guided by, policy. Many of the major innovations in the postwar world were supported financially by government, which

funded the basic research and later guaranteed markets for the resulting products (Block and Keller 2011; Mazzucato 2013a). Policy changes in the past 30 years have fundamentally changed the environment in which innovation takes place—to the detriment of the capital development of the economy. As we discuss, the biggest problem has been the loss of patient finance—which had largely been nurtured by government; in its place, we mostly have speculative finance. This is not conducive to the kinds of innovations that promote the development of the economy.

D. Economies require value *creation* as well as value *extraction*. While orthodoxy presumes that markets determine extraction (supposedly according to productivity of each of the factors of production), the reality is that distribution of the value created is complexly determined. Further, markets do not *create* value—they play some role in extraction, but even extraction of value is largely extra-market. Rather, well developed markets are the result, not the cause, of economic development (Reinert 2007; Polanyi 1944). Markets, themselves, are *institutions*, and there is no single type of market. It is telling that the type of market that dominates rigorous neoclassical theory (the "auctioneer" market) is rare in the real world. In most cases, prices are determined before production or factors of production enter markets. Reward structures have changed significantly—in part due to policy changes—over the past quarter century in a way that allows value extraction by top executives and a relatively small number of financial market players. This has contributed significantly to the unprecedented rise of concentration of wealth and income at the top, and hence to rising inequality of distribution. While orthodoxy focuses on "skills-biased" technological change—supposedly the result of market forces—the reality is that much of the value extraction that has enriched those at the top has to do with (legal) manipulation of stock prices (Lazonick 2013). Minsky was correct to worry about the increasing reliance on the Securities and Exchange Commission (SEC), because rule changes promulgated by that agency have been extremely important in the process of handing control of the value extraction process over to the top management of firms (Lazonick and Mazzucato 2013).

E. While neoclassical theory presumes resource scarcity (required to generate a positive price), *finance* is not a scarce resource. Neoclassical theory (as well as neo-

Schumpeterian theory) usually identifies finance with saving and supposes that financial intermediaries specialize in allocating the scarce supply of saving among competing uses (investment, government deficits, and net imports). Keynes's destruction of the loanable funds theory is important in understanding why this is the wrong approach to understanding finance. As Minsky argued, what financial institutions actually do is to accept IOUs while issuing their own. There is no resource scarcity involved; rather, this is an underwriting process. What *is* scarce is good borrowers. Financial innovations reduced the role of underwriting—substituting a "market-based" model in which it was supposed that markets could efficiently price and allocate the risk that would be assessed by essentially unregulated, profit-seeking credit ratings agencies. As it turned out, the new model was not more efficient (in the sense of being less costly—since it required many more players that had to extract value) and it was disastrously poor at risk assessment.

F. In recent decades, the belief that financial markets work best when "left alone" helped to fuel the deregulation and de-supervision movement. While the GFC cast doubt on that, it is clear that financial reform remains focused on the use of market incentives and simple fixes like forcing banks to put "more skin in the game" (so that they would share in losses of bad loan originations—as if they had not done precisely that in the period leading up to the GFC!) and higher capital ratios. This is consistent with the market failure approach of mainstream economics. It does not represent the fundamental reconstitution of the financial system that Minsky advocated to redirect finance to the capital development of the economy. As a result, there have been no fundamental changes, and the entire financial system is—arguably—as fragile as it was in 2007. Further, and this is more important within the scope of this paper, finance has not in any significant way been redirected back toward serving the public purpose of financing the capital development of the economy.

G. Market Failure Theory (MFT) is only able to describe a *steady state* scenario in which public policy aims to correct sources of failures so that markets may continue to do what they do best: efficiently allocate resources. It assumes that, once corrected for its failures, the market will be able to direct the economy to a path of growth and

development. But markets are myopic and are only able to allocate resources along an existing techno-economic trajectory. Therefore, MFT has little to say when policy is needed to *dynamically create and shape new markets*. This means MFT is problematic for addressing innovation and societal challenges because MFT cannot explain transformative, catalytic, mission-oriented public investments. In fact, while markets are able to produce "quantitative change," the *direction* of qualitative change that markets provide often represents suboptimal outcomes from a societal point of view. This is why it is the state—and not markets—that has historically provided the directionality for techno-economic transformations.

H. MFT's tools for evaluating public policy (static cost-benefit analysis) are unable to effectively capture the kinds of transformative change that result, for instance, from mission oriented public policies. Furthermore, in the market failure perspective, public policy must minimize "government failures"; MFT thus calling for a minimal state and for types of public sector organization that are insulated from private sector interests, but that mimic private sector organizations in their strive for economic efficiency. This results in a state apparatus that is unable to engage with experimentation (which is essential for transformative change) and unable to cope with uncertainty (which underlies innovation process). Ultimately, this MFT toolbox leads to a crippling, non-entrepreneurial state.

10. RECONSTITUTING THE FINANCIAL SYSTEM TO SUPPORT CAPITAL DEVELOPMENT

Minsky had warned that

> "The decrease in the weight of banks in financing the capital development of the economy tends to increase the significance of the Securities and Exchange Commission relative to that of the Federal Reserve System. That some major organizations that are chartered as commercial banks operate more like investment banks is an issue bond rating firms are facing, even as our regulatory structure for banks remains frozen and unchanging. The policy problem that emerges from the decline in the relative importance of institutions chartered as banks is whether the existing institutional structure of regulation and supervision of financial institutions needs to be changed in a serious way" (Minsky 1994, p. 2).

In a series of papers written in the early 1990s, Minsky identified several problems with the transformation of the financial system that would lead to the disaster known as the Global Financial Crisis. But he went even further in his argument that we had entered a new phase of capitalism—what he called money manager capitalism (See Wray 2009, 2010, 2012). While we are recovering from the GFC, we have not resolved the more fundamental problems associated with this type of capitalism. In the early 1990s, Minsky began a project at the Levy Economics Institute that he called "Reconstituting the Financial System to Promote the Capital Development of the Economy." As an expert on the financial system and particularly on the financial innovations that had spurred the transformation to the MMC phase, Minsky's insights are essential to understanding how this "reconstitution" can be accomplished.

Minsky emphasized that we face two kinds of constraints to furthering the capital development of the economy. The first is the Smithian problem that resources can be directed to the wrong areas (the allocation problem). The second is the Keynesian problem that insufficient resources are employed (the "effective demand" problem). Both of these can be used to justify a bigger role for the State to play: government can influence the allocation of resources, and it can raise the general level of activity to ensure all resources are employed. Minsky also emphasized that the state plays the roles of regulator and supervisor, which go beyond questions of allocation of resources to include the promotion of the public interest while reducing the social costs of private activity. As the quote above indicates, he was particularly concerned that such activities had (by default) fallen under the responsibility of the SEC (reducing the role of the Fed and also of the Federal Deposit Insurance Corporation [FDIC], and the Office of the Comptroller of the Currency [OCC]).

In the next section we use Minsky's insights to begin to develop an alternative to the mainstream view of the way to reform the financial system.

11. AN ALTERNATIVE VIEW OF THE ROLE OF FINANCIAL INSTITUTIONS

Capitalism is a financial system that requires an array of financial services. Following Minsky we can identify five main functions that need to be provided by "banks," broadly defined: a) a safe and sound payments system; b) short-term loans to households and firms, and, possibly, to state and local government; c) a safe and sound housing finance system; d) a range of financial services including insurance, brokerage, and retirement savings services; and e) long-term

funding of positions in expensive capital assets. (See Wray 2010 for details.) Note that there is no reason why these should be consolidated, nor why all should be privately supplied. We will ignore categories a, c, and d for the purposes of this paper. We want to focus on traditional commercial and investment banking, and how to reform them to promote capital development of the economy.

Historically, commercial banks provided shorter-term loans to firms for wages and other production activities, as well as to finance inventories, while investment banks provided long term loans for firms financing positions in capital assets. Commercial banking needed to be relatively low risk because commercial bank liabilities—deposits—needed to maintain par against currency. With typical leverage of equity and cash (largely reserves) commercial banks could not survive losses on loans above a few percentage points without calling into question their ability to maintain par; questions about the health of a bank generate liquidity problems and runs on cash assets. Risky activities had to be financed by investment banks—which were typically partnerships (until the late 1990s when many of the biggest ones went public) that could survive occasional larger losses (in the old days, partners would have to add capital to cover losses). At the same time, investment banks could play the risk-return tradeoff, making enough profits on their good deals to cover losses on the bad ones.

Note that we have left out of our five main functions of broad banking the financing of innovations. Because innovation is so uncertain and because it requires patient finance, it should not normally be a function of commercial banking. Investment banks might directly finance investment and innovation (holding the liabilities of the innovators), but more typically they arrange for the finance—floating bonds and stocks or arranging mergers and acquisitions.

Innovators generally look elsewhere for finance. Unless the innovators are already well-established firms, they cannot generally issue stocks or bonds. Even established firms can have trouble issuing bonds to finance risky innovations that have uncertain prospects. At least in the US, established firms infrequently issue equity to finance investments or innovations (as discussed below, US firms are typically net purchasers of equity). The main source of funds for innovations comes from government—either directly or through funding for basic research. (This is discussed below.) In recent years, VC has provided finance for innovation, but usually only in the later stages (again, discussed in detail below). Most of the important post-war innovations were incubated in the research arms of big corporations—such as Bell Labs—using retained earnings, and with substantial government funding of research and development and

with government-guaranteed markets for products on a cost-plus-mark-up basis (Block and Keller 2011).

12. VALUE CREATION OR VALUE EXTRACTION?

While neoclassical theory presumes that workers and management are fully compensated for their contributions to the production process through their wages and salaries, it is the entrepreneur who is rewarded for the uncertainty involved in production. Because most important firms are (or will be) corporations, the neoclassical argument goes, it is the shareholder who bears the risks. The idea is that innovations are fundamentally risky so when they pay off, the shareholders who have taken the risks of loss should reap the benefits of the occasional winning innovations. According to this view, the goal of the innovating firm should be to maximize shareholder value (MSV) (Lazonick 2009).

However, innovation is a collective, cumulative, and uncertain process. It is a learning process that unfolds over time. It is the collective that takes the risk: government, workers, universities, financiers, management, and shareholders (Lazonick 2012). Successful innovations create value. But as discussed above, value extraction is not closely related to the contributions made by each member of the collective. In truth, it is difficult, if not impossible, to determine the contributions made because of the collective, cumulative, and uncertain process of innovation. Unfortunately, an ever-larger share of the value extracted is going to a small subset of the collective. For the most part, government and workers are not sharing in the fruits of innovation.

This is because much of the value extraction takes place in the equities markets (Lazonick and Mazzucato 2013). The first method is through the IPO. During the development phase, top management and sometimes top researchers are rewarded with stock options. When the firm is taken public, the shares are initially underpriced, allowing “insiders” to buy at a low price and sell into a rapidly rising market. The second method is through the buy-back of shares. Insiders exercise options before the firm begins a buyback campaign that boosts prices; insiders sell after prices rise. Due to the rules changes, insiders get to count the date of the award of stock options, rather than the date of the purchase, to begin the countdown toward the date on which they can sell out positions. This allows for more certainty of gains, as they can exercise

the options right before the buyback and quickly sell when prices rise—without danger that they have to hold on to stocks after the peak when prices start to fall.

The flipside of this value extraction process is that some actors—namely, workers and the state—that bear a great deal of the risks and uncertainties of the innovation are not rewarded appropriately. Given the important role that public agencies have played in funding breakthrough innovations through mission-oriented investments, why is it that they did not reap a direct reward (Mazzucato 2013a)? While some economists argue that the state is indirectly rewarded through the tax system, tax evasion by companies and individuals, low level of tax rates, and globalization of investment and production chains mean that public agencies financing innovations are less and less capable of benefitting from the uncertainty that was absorbed through high-risk (often early-stage) investments.

This unbalanced system in the short term results in an unsustainable system in the long run. As discussed in Section 6 above, the point is not that sovereign government needs the tax revenue to invest in innovation (no one worries whether sovereign government has enough tax revenue to finance wars. What matter are the real resources available to conduct the war.), but that a more direct reward might allow (a) allocation decisions to be better monitored (success measured); and (b) politically the public to be less worried by the inevitable failures like the Solyndra investment (e.g., if they know that the returns from the successful investment in Tesla can cover it).

The increasingly speculative nature of financial markets has moved the time of capitalization of innovations forward. Well-placed rumors of innovations allow insiders to reap equity price gains long before the innovations actually result in marketable products. Indeed, speculative finance can extract value even where no products are ever forthcoming—so-called PLIPOs (product-less IPOs). Venture capitalists can reap huge gains in this manner, with little investment of their own funds. After modifications made to the Employee Retirement Income Security Act (ERISA) they can team up with pension funds that are limited to partners who typically pay 2% fees plus 20% of profits to the VC general partners. Using IPOs and Mergers and acquisitions (M&As), the venture capitalists extract value as they hype stock prices and then sell—and with the low capital gains tax rates, they shelter most of the gains.

These activities are encouraged by a combination of the changing nature of product innovation, financial innovation, rules changes, and changes to tax laws that treat capital gains more favorably. The NIH has been spending about $31 billion per year, much of it on

BioPharma but with little to show. The top 500 S&P companies spent $3 trillion from 2001–2010 in stock repurchases, equal to well over 50% of profits (Lazonick 2014). Since they never resell stocks, these are essentially one-way bets that benefit insider sales. In other words, there is no benefit to the firms—it is pure value extraction by private sellers of the stocks. (One might justify stock repurchases to benefit from rising equity markets if they were sold at the peak for cash to finance investment and research and development—but that doesn't happen.)

What changes might encourage innovation and reorient it toward the long-term capital development of the economy? We need to improve the national innovation system, which requires participation by financial institutions, venture capitalists, government, universities and academic researchers, shop floor workers, engineers, users, and industry research consortia. These are linked through organizational relations, not through markets, where innovation is promoted through building a culture that promotes security of all the stakeholders that create value. The current system of value extraction increases the insecurity and uncertainty of the innovation process because most of the stakeholders are poorly rewarded, including government, workers, and even users.

Most importantly, patience needs to be rewarded. Early IPOs, stock repurchases, and M&A deals that are designed to downsize the labor force and strip assets for quick sale all reward impatience—pump and dump, quick capital gains over income from production, and fees for VCs over returns to long-term investors. Government needs to play a bigger role in providing patient finance and ensuring markets for products. Capital gains tax rates should be raised to eliminate the incentive for speculative behavior. Mission-oriented finance, as well as to-the-asset financing, would tie financial success to successful product creation.

13. FINANCIAL INNOVATION AND THE GLOBAL SETTING

Over the past three or four decades, we have had substantial policy convergence around the globe, as nations opened their economies to trade and capital flows. This required substantial deregulation and de-supervision to allow domestic banks to compete with international banks. This was at least in part due to the Washington Consensus, and the justification was that this would result in a convergence, as developing nations grew faster to catch up with the rich nations. However, the outcome was greater divergence, as the poor became poorer and middle income nations became trapped (Reinert 2007). Within at least some of the rich nations, the

result was also divergence as the richest became richer and almost everyone else lost in relative terms, and even in real terms as real wages fell. Domestic growth was uneven, with the biggest gains in the Finance, Insurance, and Real Estate (FIRE) sector and in "Big Pharma."

Reduction of government oversight of the financial sector increased competition, however, to an important degree that the deregulation was a reaction to rising competition from the "shadow banks." Higher competition drove rapid financial innovation that contributed to rising leverage and greater use of off-balance-sheet commitments (including derivatives). Many of the innovations appeared to increase liquidity of financial instruments, but it was a fictitious liquidity that disappeared immediately when the system was stressed in 2008.

Much of the global economy was financialized (Krippner 2005). First, it is important to recognize that financialization is not finance. For comparison, consider home mortgages. The simple "Jimmy Stewart" thrifts of the 1970s financed as many home purchases as the Wall Street model of the 2000s. Those old thrifts virtually never failed because the borrowing homeowners rarely defaulted. The thrifts worked with any troubled borrowers to keep them in their homes. The profits were slow coming in, but they were nearly certain; the thrift's success relied on success of the borrowers. Good underwriting plus a favorable macroeconomic environment (rising household income, relatively stable interest rates, steadily but slowly rising home prices) ensured that success. (That model encountered trouble for a number of reasons: Volcker's monetarist experiment that drove overnight rates above 20%; stagnation of income; changing the ownership structure of the thrifts that invited criminals and real estate developers/speculators to take them over; and so on.) Thrifts provided patient and local finance—with the interests of depositors (or mutual share owners), owners, and the community aligned.

The Wall Street model financialized homes—which served as the real asset standing behind a large number of financial assets whose value *derived from* the home. The importance of underwriting declined as expectations of rising home prices increased. Whether the homeowner could service the mortgage as written didn't matter; either the homeowner would default (and the home sold at the appreciated value to cover the mortgage) or she would refinance into a better mortgage. Mortgages were packaged to give value to securities (the value derived from the flow of mortgage payments); and those securities would be packaged into a variety of other derivatives, some of which were offered up as instruments allowing bets for or

against the mortgage market as a whole. Others were supposed to provide "insurance" to those holding the MBSs.

Underlying all of this financialization was the homeowner's income—something like Dr. Seuss's King *Yertle the Turtle*—with layer upon layer of financial instruments, all of which were supported by Mack the turtle's mortgage payments. The system collapsed because Mack fell delinquent on payments he could not possibly have met: the house was overpriced (and the mortgage could have been for more than 100% of the price!), the mortgage terms were too unfavorable, the fees collected by all the links in the home mortgage finance food chain were too large, Mack had to take a cut of pay and hours as the economy slowed, and the late fees piled up (fraudulently, in many cases as mortgage servicers "lost" payments). The "new model" was inefficient (too many fingers in the pie, all of them extracting value), highly risky (often Ponzi finance from the beginning with reverse amortization), and critically dependent on rising home prices. Even leaving aside the pervasive fraud, the model was diametrically opposed to the public interest, that is, the promotion of the capital development of the economy. It left behind whole neighborhoods of abandoned homes as well as new home developments that could not be sold.

The MBSs and other derivative instruments had been sold globally, so the crisis quickly spread around the world. As Minsky had argued in 1987, securitization and globalization of finance were inextricably linked—without securitization, the only assets that are sufficiently homogenous to be traded in international markets are the bonds of sovereign governments, or the equities that are traded on the major exchanges. Securitization had turned patient and local finance into highly impatient global finance.

14. FINANCE IN THE AFTERMATH OF THE GFC

While underwriting standards rose in the aftermath of the crisis, and while riskier private label securitizations have disappeared, American homes are still financialized. Indeed, the vacated homes are now sold to hedge funds that are experimenting with bundling them for sale to landlords as rental properties—or to cities that are bulldozing them for green space or urban farming. The troubled securities and individual mortgages are also sold at a discount to speculating hedge funds that sell them on to debt collectors to hound the former owners who do

not realize that foreclosure does not mean debt forgiveness. The "nuclear" mortgages may have destroyed the owners and even the homes, but the financial products and debts remain.

Financialization is rooted in predatory value extraction. In recent years, the US FIRE sector has accounted for 20% of value added and reaped 40% of corporate profits. The on-balance-sheet debt ratio is 500% of GDP—meaning every dollar of income must service five dollars of debts. Those debts not only have interest flows attached to them, but also (increasingly) a variety of fees. As mentioned above, many of the fees are up front, meaning they are paid before income is received to service the debt; often the fees and even interest is capitalized in the debt (which can lead to what Minsky called Ponzi finance). Much of the financialization preys on households (financialized homes, financialized education, financialized health care, financialized automobiles, financialized death—leveraging normal life under layers of debt), increasing insecurity and forcing households to live paycheck to paycheck.

Business is not immune, either, with incentives to take on debt rather than issue equity (interest can be deducted from taxes), and to avoid hostile takeovers through strategic buildup of indebtedness ("cash cows" are prime targets for acquisitions that will strip assets and leave the corpse with layers of debt). While everyone remembers the days of Michael Milken, the LBOs of the 2000s dwarfed the wave of the 1980s. Thus, both the household and the firm live in an uncertain and precarious situation, which weighs against long-term planning.

How can we reverse the process of financialization? It is important to understand that this is not the first time that the developed capitalist economies have faced this situation—the period from the late 19th century to 1929 was also a period of financialization, the period identified by Rudolf Hilferding as "finance capitalism," a term borrowed by Minsky to identify that state of capitalism. Minsky argued that the stage of finance capitalism ended with the Great Depression, the New Deal institutions, the downsizing of finance (through new regulations but also through resolution of the riskiest and most fraudulent institutions), and the growth of Big Government in WWII—what he called "managerial welfare-state capitalism." For nearly two generations after the end of the war, the rich nations grew and developed with a small and closely controlled financial sector; it was *Simple, Safe, and Small.* That was sufficient because economic growth, rising wages, and rising consumption in an environment of the megacorp with pricing power, a favorable trade balance, and government support generated retained earnings to internally finance investment and to fund research and development.

However, finance gradually threw off the constraints of the 1930s reforms, foreign competition reduced pricing power, and government support waned. The economy was increasingly financialized in this money manager capitalism stage—and eventually debt ratios surpassed the previous 1930 peak of 300% of GDP, climbing to 500% on the eve of the GFC. What we learned from the postwar experience is that an oversized financial sector is not necessarily conducive to growth; that is, financialization is not the same thing as finance. Rather, well-directed finance is much more important than the size of the financial sector.

15. AN OVERVIEW OF MINSKYAN REFORM OF THE FINANCIAL SYSTEM

At the end of the 1980s and through the mid 1990s, Minsky's main research project was to reorient finance toward the capital development of the economy. By this, he meant development inclusive of private capital, human capital, and public capital—where capital is also broadly defined to mean productive capacity. In this section, we provide a quick summary of his views.[17]

Minsky argued that in order to reform the system, one must understand it, and that requires a proper framework. He began with the view that capitalism is a financial system. Mainstream, neoclassical theory in all of its guises is not useful because it denies that the financial system matters. Indeed, as Frank Hahn said, the best of neoclassical theory (he meant general equilibrium theory) cannot find a legitimate way to put money into the model. Recently, Charles Goodhart (2008) argued that this is due to the "transversality assumption"—the assumption that no one ever defaults. If that is true, there is no need for a financial system—which is supposed to assess creditworthiness—since savers can lend directly to investors without worrying about risks.

We must also recognize that the financial structure of the economy has become much more fragile over the past half century. In many respects the system looks like it did in the late 1920s when it had become excessively "financialized" (finance capitalism) and was engaging in highly risky activities. Minsky argued that this fragile structure makes it likely that stagnation or even a deep depression is possible. He warned that a stagnant capitalist economy will not promote capital development. However, this can be ameliorated by apt reform of the financial

[17] See Wray 2009 and 2010.

structure in conjunction with apt use of fiscal powers of the government. Hence we need to understand what kinds of financial reforms are necessary, and we need to revise our views about the fiscal powers available to our government.

We also need policies that support innovation, enhancing government's role in many of the stages required to see innovation through to fruition. By itself, that will not be enough. We need to change the environment in which decisions are made by the top management of financial institutions: eliminate support of and actively discourage speculation; raise the capital gains rate significantly to reduce the incentive to "short-termism"; reorient finance away from the financial sector; encourage patient finance; force banks to improve underwriting; reduce the fragility of financial structure; and promote good governance of financial institutions.

According to Minsky, banks are not primarily intermediaries; they don't move savings from those with a low propensity to spend to those with a high propensity to spend. Rather, banks "create money" by lending their own IOUs to borrowers. Extending loans creates deposits. It is best, Minsky argued, to view the business of banking as "accepting" the liabilities of borrowers and making payments for them by crediting the accounts of the recipients of spending. This is a "liquidity creation" business, engaged in by all types of financial institutions. However, the ultimate liquidity provider is the government, usually through its central bank. We can think of all other liquidity creation as "leveraging" that ultimate liquidity—high powered money.

The problem is that the liquidity creation business is highly pro-cyclical: expanding in the boom and disappearing in the crash. Financial crises begin as a rush toward liquidation, finding that what was once considered liquid (almost as good as cash) is no longer liquid. This can be stopped by LOLR activity. However during the liquidity crisis, solvency problems are exposed and made worse. The financial institutions have accepted the IOUs of those who do not have the ability to service them. The liquidity crisis makes matters worse because in the rush to liquidity, entities reduce spending—which reduces income and the ability to service debt. Suddenly the liquidity crisis morphs into an insolvency crisis. That is a much harder problem to resolve. That is why more than a half dozen years into the GFC, the economy is still struggling under unserviceable debt.

As Paul McCulley puts it, private liquidity is highly *endogenous,* and the *ex ante* liquidity is always greater than the *ex post* liquidity.[18] For that reason, bank credit can be highly destabilizing. This is the core of Minsky's financial instability hypothesis (FIH). Minsky argued that reducing concentration plus forcing banks to retain risk can reorient banks back to relationship banking. There is a critical role for government to play in reregulating and re-supervising financial institutions. There are no magic formulas (capital ratios, living wills, "skin in the game"), however. Banks must be supervised by trained and committed professionals from the regulatory agencies.

Minsky argued that there is also a role for government to play in the direct provision of financial services. Possible services to be directly provided include:

- Payments system;
- Direct lending to serve public purpose;
- Guarantees for public-private partnerships; and
- Financing R&D and other parts of the process of innovation.

A variety of types of financial institutions are required. In the next section we focus on the reform of the most important part of the financial system—commercial banks. While this sector has become much smaller (its share of total financial assets has fallen to something like 20% of all financial assets held by USA financial institutions), the crisis showed that they are still important for liquidity provision to the larger shadow banking sector.

16. TOWARD REFORM OF COMMERCIAL BANKING: SIMPLE, SAFE, AND SMALL

Here is a short list of recommended reforms for commercial banks that would direct this class of financial institutions back to performing a role in the capital development of the economy. Note that these are directed at US institutions, although similar reforms could be adapted for other systems.

1. Banks lend directly to borrowers, and then service and hold them. There is no further public purpose served by selling loans or other assets to third parties, but there are substantial costs to government from regulation and supervision of those activities.

[18] Paul McCulley, lecture at the Levy Economics Institute; see here: http://www.economonitor.com/lrwray/2012/06/25/paul-mcculley-mmt-won-declare-victory-but-be-magnanimous-about-it/.

2. US banks cannot contract in London Interbank Offered Rate, an interest rate set externally with a large, subjective component and subject to manipulation. If not for indexing to LIBOR, the rates paid by US borrowers, including homeowners and businesses, would have come down as the Fed intended when it cut the fed funds rate.

3. Banks cannot have subsidiaries of any kind. No public purpose is served by allowing banks to hold assets "off balance sheet."

4. Banks should not be allowed to accept financial assets as collateral for loans. No public purpose is served by financial leverage.

5. US banks cannot lend off-shore. No national public purpose is served by allowing US banks to lend for foreign purposes.

6. Banks cannot buy (or sell) credit default insurance. The public purpose of banking as a public/private partnership is to underwrite and price risk. If a bank relies on credit default insurance, it is transferring that pricing of risk to a third party, which is counter to the public purpose of banking.

7. Banks cannot engage in proprietary trading or any profitmaking ventures beyond basic lending. If the public sector wants to venture out of banking for some presumed public purpose, it can be done through other outlets.

8. Use FDIC-approved credit models for the evaluation of bank assets. Do not allow mark to market of bank assets. If there is a valid argument for marking a bank asset to market prices, that asset should not be a bank asset in the first place. The public purpose of banking is to facilitate loans based on credit analysis, rather than market valuation.

Other policy reforms for the financial sector are needed in order to promote what Minsky called the capital development of the economy. These must go beyond reforming commercial banking, as this type of bank has not traditionally played a direct role in financing innovation.

17. REFORM OF THE FINANCIAL SYSTEM TO SUPPORT INNOVATION

Innovation policy will not work unless the financial system is reformed to provide more patient, long-term committed capital to high-growth innovative firms. This is because what is missing is not simply "finance" (indeed there is plenty of it) but the right kind of finance. Similarly, corporate governance should be restructured to make sure that profits of firms are reinvested in the real economy, rather than in financialized practices like share buybacks, which have escalated exponentially since the late 1990s. In this sense, innovation policy and financial policies must go hand in hand.

The collective, uncertain, and cumulative nature of innovation means that what is required is not just any type of finance, but long-term committed finance—which is no longer being provided by private venture capital that is increasingly exit driven and short-termist. It is also necessary to realize that there is not only a problem of the supply of finance, but also the demand for finance, i.e., there is a deficiency of high-growth innovative companies seeking finance. We propose the following reforms to allow the financial system to better support innovation:

1. Innovation policy must target the entire innovation chain, from early-stage seed financing to commercialization. This is not about "death valley" problems or a lack of finance, but about providing early-stage, patient, long-term, committed capital at the start of the chain, and following it up with support throughout.

2. Given the high risk involved in providing finance to particular companies (as received by Tesla, Solyndra, Apple, Compaq, Intel), it is essential for some of the returns from the upside to be retained by the public funding agencies so that the (inevitable) losses are politically acceptable and the next round of investments is guaranteed. While it can be argued that the government can always afford more innovation, the reality is that the political support for such investments is much easier to gain when they are seen as part of a portfolio with the government socializing not only the risks but also the rewards. Further, as discussed, forcing private beneficiaries to share rewards also provides something like a market test for resource allocation toward such innovations.

3. Currently there is much "piggy back" riding by private venture capital on forms of public seed finance like the SBIR. If SBIR-type grants precede private VC financing, there should be a more concrete way to make sure that the returns earned by VC are proportionate to the actual risk they take, rather than the risk others—including, most importantly, government and shareholders—take (first).

4. Impatient finance should be taxed heavily, hence forms of financial transaction taxes should be used to provide more incentives for long-termism.

5. While the US system of innovation has a decentralized system of public sector organizations that provide funding for mission-oriented innovations, this system resulted in the socialization of risks and privatization of returns. There is, therefore, a role for public banks (e.g., SIBs) to play in the capital development of the economy, because they are able to reform this system from within through concrete financial mechanisms that help rebalance the risk-reward nexus.

18. THE ENTREPRENEURIAL STATE: A POSITIVE ROLE FOR GOVERNMENT

This paper has laid the basis for thinking about how to reform the system along Schumpeterian/Minskyan lines.

Long-run growth is a result of private and public sector actors working together dynamically and symbiotically. What we have today is an increasingly financialized private sector, hoarding cash and/or spending profits on boosting stock prices instead of on long-run areas like R&D and human capital formation of employees; and a public sector too fearful to invest in long-run areas due to the (ideological) pressure to keep government debt to GDP ratios low. Yet it is precisely long-run investments that create the growth of the future, which increases the denominator of the debt ratio. Indeed, the countries suffering most in Europe today are those that had modest deficits, but very few investments in areas like R&D, and hence had low growth (thus increasing only the numerator and not the denominator of the debt ratio).

Past periods of sustained long-run growth have been the result of mission-oriented public spending, which has created new markets around information technology, biotechnology, nanotechnology, and—today—green technology (Mazzucato 2013a). This is not only about

investments in technology, but also in associated policies that allow innovations to be fully deployed, affecting the productivity of all sectors. Indeed, without the policies of suburbanization, the mass production revolution would not have been fully deployed.

What is required today is a similarly ambitious policy centered around, for example, the green economy, where the public sector can invest in those areas of high capital intensity and high technological risk that the private sector is too fearful to touch; as well as in associated policies that make it more desirable for consumers to change their consumption patterns and life style (Mazzucato and Perez 2014).

It is essential to realize that tax incentives create little additionally. Business does not invest until it sees future growth opportunities, regardless of today's current costs (affected by tax or interest rates). For that reason, relying on tax subsidies or low interest rate policy has little payoff in terms of boosting long-term growth. On the other hand, future technological and market opportunities have been strongly correlated with ambitious and entrepreneurial state sector involvement. Government needs to play an active role—not a merely passive role that relies on tweaking market incentives.

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