1. Introduction

Inequality has hit the front pages, not only because it has been increasing, but also because of a seemingly inexorable concentration of income at the top of the distribution through boom and bust (OECD, 2008). And it is the concentration of income among the top 1 percent, and even top 0.1 percent, that has become increasingly central to the growth of income inequality. This has put pressure on national and transnational policies, such as those of the European Commission, to focus not only on 'smart' growth, but growth that is also 'inclusive' and 'sustainable'—recognizing that not all have benefitted from the knowledge economy (EC 2020, OECD 2012). However, the battle against increasing inequality has had little success, as witnessed in the failed attempt to curb bank bonuses after the 2008-2009 financial crisis.

A prime reason for this failure is a lack of understanding about how income inequality is connected to processes of wealth creation. Indeed, one of the decades in which growth was the 'smartest' (innovation led)—the 1990s—was a decade in which inequality continued to rise. Or put another way, value was created (in the form of new technologies, like the internet, and sectors), but then extracted and distributed to a small percentage of those who contributed to the process of value creation. And while different approaches have provided interesting insights into the dynamics of inequality, linking it to the welfare state (Wilkinson 2005), globalization (Mazur 2000), de-unionization (Freeman 1992), and the changing skill base (Acemoglu 2002; Brynjolfsson 2011), little attention has been paid to the tension between how value is created and how value is extracted in modern-day capitalism.

In this paper, we argue that to understand income inequality it is critical to focus on its link to wealth creation, and thus with innovation—a key characteristic of capitalism. Innovation, defined in economic terms as the generation of higher quality products at lower unit costs, underpins real per capita income growth, and therefore creates the possibility for higher standards of living to be shared among the population. But investment in innovation is inherently uncertain; if we knew how to innovate when investments in innovation are made, it would not be innovation.

In the first instance – that is before the State seeks to influence the level of inequality through income transfers– one might expect that those economic actors who take the risks of investing in the innovation process would be the ones to reap the rewards when the innovation process succeeds and suffer the losses when it fails. By rooting our analysis of the risk-reward nexus in a theory of innovative enterprise, however, we show how in modern capitalist economies there has been an increasing separation between those economic actors who take the risks of investing in innovation and those who reap the rewards from

innovation. Specifically, we argue that while risk-taking has become more collective—leading to much discussion about *open* innovation and innovation *ecosystems*—the reward system has become dominated by individuals who, inserting themselves strategically between the business organization and the product market or a financial market, and especially the stock market, lay claim to a disproportionate share of the rewards of the innovation process.

A major barrier to the analysis of the relation between innovation and inequality is the division of labor among economists between those who study each of these two phenomena, and their mutual neglect of the role of financial institutions in linking the two. While the relation between the production of output and the distribution of income was a concern of nineteenth-century classical economists such as David Ricardo and Karl Marx, research is now conducted on the basis of a largely segmented division of labor in which labor economists work on inequality, and industrial economists on technology – with both these groups typically ignoring the role of finance in the economy.

Since both innovation and income distribution depend fundamentally on the investment strategies and organizational structures of business enterprises, we need a *theory* of innovative enterprise that can explain both the creation of value and its distribution among participants in the firm. A theory of innovative enterprise must integrate an understanding of the interaction of strategy, organization, and finance in the generation of higher quality, lower cost products than had previously been available (Lazonick 1991 and 2010; O'Sullivan 2000). We need a theory of innovative enterprise to explain how over time the economic system augments its value-creating capability and the potential for higher standards of living. If we do not have a theory of value creation, how can we differentiate value that is created and value that is simply extracted (what some called "rent")? That is precisely what the Risk-Reward Nexus (RRN) approach aims to analyze.

In conceptualizing RRN, we emphasize the collective, cumulative, and uncertain character of the innovation process. Innovation tends to be collective because the development and utilization of productive resources is an organizational process that involves the integration of the skills and efforts of people with different hierarchical responsibilities and functional specialties. Innovation tends to be cumulative because what the innovative organization learned yesterday becomes the foundation for what it can learn today. Innovation, however, is also uncertain because when investments in the collective and cumulative innovation process are being made, there is no guarantee that the enterprise will be able to generate a higher quality, lower cost product.

Yet, notwithstanding this uncertainty, people contribute effort (labor) and money (capital) to the innovation process without a guaranteed return. That is, in the face of uncertainty, they make their own personal calculations about the 'rewards' that may result from participation in the innovation process which induce them to take 'risks'. And, precisely because the outcomes of the innovation process are uncertain, an ideology of who takes the risks can, and we argue in fact does, influence who appropriates the rewards. By embedding our analysis in the collective, cumulative, and uncertain characteristics of the innovation process, we can ask who contributes labor and capital to the process and who reaps the financial rewards from it. Then we assess the equity of this risk-reward nexus, and ask whether it supports or undermines the innovation process. The RRN framework starts with the analysis of the innovation process as it occurs at the level of the product and builds up to the level of the firm, industry, nation, and region (e.g., the EU).

Our explanation is based on how some actors position themselves along the process of innovation to extract more value than they create, while others get out much less than that which they put in. The power to engage in such excessive value extraction does not occur through "exchange" relationships in which the contributions of some economic actors are "undervalued" by the market. Rather *it occurs when certain economic actors gain control over the allocation of substantial business organizations that generate value, and then use product or financial markets on which the enterprise does business to extract value for themselves.*

Indeed, while the recent emphasis on "pre-distribution" focuses on the need to prevent unequal market outcomes which create a "winner takes all" dynamic which redistribution policies must then fix (Hacker and Pierson 2010), we argue that understanding the mechanisms behind "winner takes all" requires distinguishing between the source of the theft and its consequences (e.g., weaker labor unions, low investment in skills). While we recognize that greater investments must be made in education and re-skilling the workforce (policies arising from the "pre-distribution" debate), we claim that the increasingly financialized economy has created incentives for companies to not invest themselves in human capital and innovation, while increasingly depending on those investments to come from elsewhere—mainly the public sector but also from niche "small" firms. State investments and subsidies that are supposed to support and encourage innovation often only serve to permit companies to get off the hook of making these risky investments themselves even as their executives deliberately make no mention of State support. Indeed they invoke "free market" ideology to claim that, having taken all the risks, "private enterprise" needs to reap all the rewards.

Our analysis focuses on the concrete ways that financial interests have been able to position themselves along the investment and innovation curve, reaping excessive portions of the integral under the curve rather than just its marginal contribution. And, as we will argue below, to understand this process, it is fundamental not to confuse value that is created in *organizations* with value that is extracted through "markets".

In Section 2, we lay out the conceptual foundations for understanding how innovation may be related to inequality by focusing on its core characteristics -- the collective, cumulative, and uncertain character of the innovation process. In Section 3, we then sketch out the RRN framework for analyzing the innovation-inequality dynamic. In Section 4, we use this framework to provide an historical overview of how over the past few decades in the United States "financialized" modes of resource allocation have become characteristic of both high-tech startups and established companies, increasing income inequality while undermining the innovation process. In Section 5 we compare the RRN framework to the Skill-Biased Technical Change (SBTC) framework for understanding the relation between, and the policy implications of, "technological change" and inequality.

2. The uncertain, collective, and cumulative character of the innovation process

A theory of the innovative enterprise must begin with the fundamental fact that innovation is inherently uncertain. One cannot calculate a probabilistic stream of financial returns at the time when investments of effort and money in the innovation process are made (Mazzucato and Tancioni 2012). Indeed, since innovation is a learning process that unfolds over time, one cannot even know at any point during the process the total costs of the investments that will be required to achieve financial returns. Yet in the face of uncertainty, investments are made. Investments that can result in innovation require the strategic allocation of productive resources to particular processes to transform particular productive inputs into higher-quality, lower-cost products than those goods or services that were previously available. Investment in innovation is a direct investment that involves, first and foremost, a *strategic* confrontation with technological, market, and competitive uncertainty (Lazonick 2010).

Who, then, confronts uncertainty by investing in innovation? In his oft-cited, and in certain respects seminal, discussion of uncertainty, Frank Knight (1921) assumes that an individual whom he calls the "entrepreneur", and whom he distinguishes from a manager, confronts uncertainty by investing in the production of a good of service. Knight views "entrepreneurial profits" as the reward to entrepreneurial *judgment* and entrepreneurial *luck*, both of which relate to the difference between the market prices that the entrepreneur pays for inputs and the market prices that he receives for outputs. It then becomes possible for economists to

argue that entrepreneurial profits are the result of “imperfect competition”. With “perfect knowledge”, business judgment becomes irrelevant. In the Introduction to a reprint of Knight’s Risk, Uncertainty, and Profit, George Stigler (1971), one of Knight’s successors at the ultra-neoclassical University of Chicago, argued that Knightian uncertainty was just a matter of “luck” (see Lazonick 1991, pp. 175-176). Going even further in eliminating Knightian uncertainty from economic analysis, endogenous growth theory assumes that R&D can be modeled as a lottery, in which one can calculate the probability of “getting lucky” (Romer 1990).

But even when, as in Knight’s original argument, it is admitted that business judgment is a factor in leading an entrepreneur to confront uncertainty in the business world, it is assumed that the risk of investing in a business enterprise remains in the hands of one particular type of individual – the “entrepreneur” – while it is market processes, not business organizations, that determine whether these investment yield financial returns. By ignoring the collective and cumulative – or “organizational” – character of the innovation process, Knight’s notion of entrepreneurial profits ultimately prepared the way for the Chicago School application of agency theory to corporate resource allocation in which the shareholder is substituted for the entrepreneur as the only economic actor in the corporation who makes a contribution without a guaranteed market-determined return, and is hence the only bearer of risk (Jensen and Meckling 1976; Jensen 1986). It then follows (as we discuss below) that, of all participants in the corporation, it is only shareholders who have a claim to the “residual” (i.e., profits) if and when it occurs. For the sake of maximizing the residual, according to this highly influential view of the economic world, corporations should be run to “maximize shareholder value” because, in a market economy, it is only shareholders who take risk (for critiques, see Lazonick and O’Sullivan 2000; O’Sullivan 2000).

Once we recognize the collective character of the innovation process, it becomes evident that it is not only, or even primarily, entrepreneurs or shareholders who bear risk. For high fixed cost investments in physical infrastructures and knowledge bases that have the character of public goods it is generally the government (representing the collectivity of taxpayers) that must engage in this strategic confrontation with uncertainty (Mazzucato 2011). In effect, the government assumes part of the risk that households and businesses would not be willing to bear if they had to invest in the innovation process on their own.

Moreover, within business enterprises, workers, and not just financiers, bear risk when they exert effort now with a view to sharing in the future gains from innovation if and when these gains materialize. The exertion of this effort on the part of individual workers is critical to the

process of organizational learning that is the essence of the innovation process. This learning generally requires the organizational integration of a complex hierarchical and functional division of labor within the firm and often across vertically or horizontally related firms. Besides being uncertain, the innovation process is therefore collective, and it is the collectivity of taxpayers, workers, and financiers who to different degrees bear the risk of innovative enterprise.

The "national innovation system" approach has highlighted the roles in the innovation process of different actors (financial institutions including banks and venture capital, government agencies, universities, shop floor workers, engineers, users) and the important relationships among them (Freeman 1995). As a collective process, innovation involves many different actors operating in many different parts of the economy. Academic researchers often interact with industry experts in the knowledge-generation process. Within industry there are research consortia that may include companies that are otherwise in competition with one another. There are also user-producer interactions in product development within the value chain. In these interactions, we would argue that it is generally organizational relations, not market relations, that mediate the risk-reward nexus.

More generally, workers with a wide variety of functional specialties and hierarchical responsibilities contribute time and effort to the innovation process with the expectation of sharing in the gains from innovation if and when the firm is successful (Lazonick 1990 and 1998). To be sure, firms have to pay workers wages today even for work that may only pay off tomorrow. But, as is generally recognized by business executives who declare that "our most important assets are our human assets", the key to successful innovation is the *extra* time and effort that employees expend interacting with others to confront and solve problems in transforming technologies and accessing markets, above and beyond the strict requirements of their jobs. Anyone who has spent time in a workplace knows the difference between workers who just punch the clock to collect their pay from day to day and workers who use their paid employment as platforms for the expenditure of creative and collective effort as part of a process of building their careers. We posit that the productivity differences between the two types of workers can be enormous, and that it will only be firms within which the latter culture predominates that will have a chance of innovative success. Yet, in a world where it has become commonplace to terminate the employment of experienced workers, how can workers who risk their time and effort for the sake of innovation ensure that they will reap the rewards from innovation if and when they occur?

The State is a leading actor in the collective innovation process. While many economists have recognized this role of the State for countries in their development stage (Chang, 2002), few have focused on the state as a leading actor even in the most developed regions of the world, such as Silicon Valley. Block and Keller (2010) have documented how government investments have been the backbone of the most successful innovations of the past few decades, from the Internet to nanotech. Mazzucato (2011) argues that it is especially in those technological areas with high capital intensity, and high market and technological risk that the State has played an active 'entrepreneurial' role, and Lazonick (2011) argues that in sectors that require high fixed-cost investments in physical infrastructures and human capabilities, the innovative enterprise requires the 'developmental state'.

Neoclassical economists construe this state involvement as fixing ‘’market failures". From the perspective of the theory of innovative enterprise, however, a more apt description of government's role is "opportunity creation". Mazzucato (2011) has argued that the State's willingness to dare to invest in the most high-risk uncertain phase of a new sector's development can be understood in terms of *making and shaping markets*, not just *fixing* them. This particular role of the State has been ignored in the debate about "picking winners" which assumes that government agencies and business enterprises are engaged in the ame types of investment activities, but with latter better at it because it is driven by the profit motive. The failure to recognize the State's risk-taking role, and the "bumpy" landscape on which it invests, makes it impossible to measure its success (Mazzucato, 2012a). Nanotech would not have come about without the visionary strategy of civil servants in the U.S. National Science Foundation and National Nanotechnology Initiative (the type of "crazy-foolish" behavior that the late Apple CEO Steve Jobs has said is essential for innovation). It is plainly wrong to assume that the willingness to invest was there in the business sector, and all government had to do was to create the right "framework conditions". The State led, putting its capital at risk, at a time when the business sector was not willing to engage. Thus, while Keynes emphasized the need for the State to inject demand into the down side of the business cycle, the reality is that without the State even in periods of growth the capitalist machine will not take off.

The State also subsidizes the investments that enable individual employees and business enterprises to participate in the innovation process. In effect, taxpayers fund these inputs into the innovation process as part of a societal effort to augment the future wealth of the nation. There is an expectation on the part of taxpayers that if and when innovation is

successful, a share in the gains will flow back to society through taxation, job creation, and generally higher standards of living.

Besides being collective, the innovation process is also cumulative. What one learns about how to transform technology and access markets today provides the foundation for what the different (collective) actors learn about transforming technology and accessing markets tomorrow. At the firm level, innovation is one of the variables that (unlike growth) exhibits the most "persistence" as successful innovators today are often the successful innovators of tomorrow (Demirel and Mazzucato 2012; Geroski et al. 1997).

The cumulative character of the innovation process creates a need for committed finance – or what is often called "patient capital" – to sustain the innovation process from the time at which investments in innovation are made until the time at which those investments can generate returns. This cumulative character makes the innovation process highly dependent on access to financial resources that will sustain the innovation process from the time at which investments are made until it can generate financial returns.

Cumulativity enhances the power of those who control sources of finance needed to sustain the process, and, in ways that we describe below, positions them to reap rewards of innovation for themselves for which taxpayers and workers took some of the core risks. Taxpayers and workers often make investments in the innovation process years before and in different locations from the times at and places in which the returns from those investments are realized.

Indeed they may have made these investments with the expectations that if and when those investments would be successful, they would share in the returns. In the event, however, their ability to share in the gains of innovation may be undermined by powerful actors who are able to change the "rules of the game". The State may be deprived of tax revenues that would represent returns on its investments in innovation by changes in tax regimes (for example the "Bush tax cuts" in the United States). Workers who had the expectation of reaping returns through a career with a company may be laid off by profitable companies, perhaps with their jobs offshored to low wage areas of the world. What taxpayers and workers lose, financial actors (including top executives) often gain (Lazonick 2012a).

3. The Risk-Reward Nexus

By focusing on the collective, cumulative, and uncertain character of the innovation process, the Risk-Reward Nexus (RRN) framework asks who contributes their labor and capital to the innovation process and who reaps the financial rewards from it. Then we assess the equity of this risk-reward nexus, and ask whether this nexus supports or undermines the innovation process.

The collective character of the innovation process makes it difficult to measure the contributions of different actors to it since their contributions are intertwined. The cumulative character of the innovation process creates a time-lag between the bearing of risk and the generation of returns that can enable some economic actors to "position" themselves strategically in order to extract more value from the returns to the innovation process than the "value-added" that their contributions of labor and capital create. The uncertain character of the innovation process makes it difficult to posit a tight connection between the bearing of risk and the generation of returns.

For example, proponents of agency theory, which is a branch of neoclassical financial economics, assume common shareholders are the only contributors to the economy who do not have a guaranteed return (Jensen 1986). It is indeed this assumption that underpins the justification, in academia and the media, for shareholders (and those actors who have the most shares) getting so rich in periods of innovation-led growth. The argument assumes that shareholders are the "residual claimants" to whom net income belongs after all other economic actors – workers, suppliers, distributors, creditors – are paid their "guaranteed" returns via market-determined prices. While, according to this theory, all the gains belong to shareholders, by the same token, as the only risk-takers in the economy, they have to bear all the losses as well. Hence the need, so the argument goes, for business corporations to "maximize shareholder value" to encourage risk-taking and the possibility of superior performance of the economy as a whole (Lazonick 2007 and Lazonick 2012b).

The problem is that shareholder-value theory lacks a theory of innovative enterprise that can explain why and under what conditions, and with whose participation, the taking of risk results in innovation, i.e., higher quality, lower cost products. This perspective fails to comprehend the implications of the collective and cumulative character of the innovation process for the distribution of risk among economic actors and the distribution of rewards required to incentivize this risk-taking. In short, the ideology of maximizing shareholder value (MSV) fails to comprehend the risk-reward nexus in the innovation process.

Indeed, it can be argued that public shareholders generally do not risk their capital by investing in the innovation process. Firstly, insofar as public shareholders simply buy and sell shares on the stock market, they invest in outstanding shares that have already been capitalized. They do not invest in the innovation process. Secondly, they are generally willing to hold shares because of the ease with which they can liquidate these portfolio investments, and as a result bear little if any risk of success or failure of an innovative investment strategy. It is only those shareholders who actually commit their capital to the innovation process until, through the generation of higher quality products at lower unit costs it yields returns, who risk their capital on that success or failure of the innovation process.

In contrast, it can be argued that taxpayers and workers often invest their capital and labor in the innovation process without a guaranteed return. When the State makes early high-risk investments that enable the business sector to enter a new industry, the States does not have a guaranteed return on that investment. When workers provide time and effort to the innovation process beyond that required to reap their current pay, they generally lack a guaranteed return on that investment. From this perspective, the agency-theory argument that shareholders are the only economic actors who invest in the economy without a guaranteed return may serve as an ideology for those who claim to be representing the interests of public shareholders to appropriate returns that, on the basis of risk-taking, should be distributed to taxpayers and workers.

In a world dominated by MSV ideology, we contend that a major source of inequality is the ability of economic actors to appropriate returns from the innovation process that are not warranted by their investments of capital and/or labor in it. Indeed, we argue that by diminishing the incentives and even the abilities of certain economic actors (taxpayers and workers) to contribute to the innovation process, inequality that derives from misappropriation in the risk-reward nexus can undermine the innovation process itself.

The collective character of the innovation process provides a foundation for inclusive growth; the very participation of large numbers of people in the innovation process means that *inherent in the innovation process* is a rationale for the widespread and equitable distribution of the gains to innovation. These gains from innovation can either be reinvested in a new round of innovation or, alternatively, distributed to stakeholders as returns to labor or capital. Insofar as government agencies have used public funds to invest in innovation, the State has a claim to a share of the returns to innovation if and when they occur. As we discuss in the conclusion of this paper, the exercising of these claims can take the form of special

levies on those business enterprises that make the most use of, or gain the most from, government investments in innovation.

The State can allocate these gains to support innovation through infrastructural investments or through subsidies to businesses and households designed to encourage innovation. Alternatively the State can distribute the gains to innovation to the citizenry (whose tax payments funded the government investments in innovation) in the forms of tax cuts, tax credits, or government-provided services. An understanding of the risk-rewards nexus in the innovation process is critical to the formulation of these government policies.

The cumulative character of the innovation process creates a role for finance to sustain the innovation process from the point in time at which investments are made until the point in time at which those investments generate financial returns. While “financial commitment” is a condition of innovative enterprise, the cumulative character of the innovation process can also provide an opportunity of those who control access to finance to withdraw that access before returns can be generated, even though from the perspective of those engaged in organizational learning the continuity of finance could result in innovative success (Lazonick and Tulum 2011). Particularly in the United States stock repurchases, justified by MSV ideology have functioned as a mode of value extraction that generally undermines investment in innovation (Lazonick 2012a, 2012b).

It is customary for economists who are critical of distributional outcomes to call such value extractors “rent-seekers”. But the use of the term “rent” implies that the gains that these actors appropriate derive from gaining control over *inherently scarce resources*. The point of the innovation process, however, is to overcome scarcity by generating higher quality, lower cost products than were previously available; that is, by *creating new sources of value*. From this perspective, so-called rent-seekers are engaged in *value extraction*. They insert themselves strategically in exercising control over the returns from the innovation process, extracting a share of returns from the expanding economic pie that is in excess of their contribution to the process that generated that expanding pie. In doing so, they – i.e., top executives, venture capitalists, Wall Street bankers, hedge fund managers – make the claim, explicitly or implicitly, that they are the risk-takers who were responsible for making the contributions to the innovation process that justify their high returns.

When, driven by innovation, the economic pie is growing, workers may share in the gains through higher wages and better promotion opportunities while the States may receive higher corporate and capital-gain tax revenues from a booming economy. Even then there

may be questions about whether the returns to workers and taxpayers are high enough to reward them for their prior investment in the innovation process. But in the subsequent economic decline, in part induced, we would argue, by the success of the value-extractors in concentrating returns in their own hands, workers and taxpayers typically lose out permanently even as the value-extractors use their control over corporate resource allocation to continue to look for ways to consolidate their gains. For example, in the Internet boom of the late 1990s, when, through stock-based remuneration, top corporate executives and high-tech venture capitalists were becoming extremely wealthy, tight labor markets resulted in rising real wages while the Clinton Administration ran budget surpluses in large part because of capital gains taxes on stock-market transactions. It was on the basis of these budget surpluses that in 2001 the incoming Bush Administration formulated the possibility of dramatic cuts in tax rates on dividends and capital gains – all in the name of innovation (e.g. Ortmans, 2012). Then when the boom turned to bust, the U.S. government found that it now had large deficits while many workers whose remuneration had benefited from the boom now found themselves without jobs. Meanwhile the value-extractors sought to restore their gains of the late 1990s through, for example, implementing the Bush tax cuts, offshoring of jobs to low-wage areas of the world, and massive stock repurchases (Lazonick 2009a). During the 2000s, we would argue further, the success of these means of value-extraction ultimately undermined the innovation process itself.

Our RRN framework seeks to analyze the ways in which risks and rewards can be aligned among contributors to the innovation process so that the sharing of the gains to innovative enterprise is equitable (and hence forms a foundation for less inequality) while promoting the growth of innovative enterprise. Given the need for business-government collaboration in funding the cumulative innovation process, those in the collaboration who exercise strategic control over the allocation of resources need to have a framework for assessing the ongoing risks of investments in innovation, with key participants in the organizational learning process involved. A risk-reward nexus understanding of innovation provides strategic decision-makers in business and government with a more inclusive and less financialized approach to the relation between economic performance and income inequality than the dominant MSV paradigm. This understanding of the risk-reward nexus in the innovation process will enable the relevant stakeholders to make collaborative decisions to invest in innovation in the first place and sustain the process until it can generate returns on an equitable basis to the different types of economic actors who participate in the process.

4. Financial Actors and Value Extraction

If, as we have argued, the collective character of the innovation process provides a foundation for an equitable distribution of income, how is it that certain economic actors are able to extract for themselves disproportionate amounts of the value that the innovation process creates? They accomplish this feat by positioning themselves along the cumulative curve of innovation, and extracting at a given point in time much more than that which they have contributed. This value extraction is done through various institutional mechanisms such as political lobbying for de-regulation, lower tax rates, and special subsidies, inside control over speculative stock issues and other financial deals, stock-based compensation, and legal manipulation of the stock market through stock buybacks.

The proponents/beneficiaries of these institutional mechanisms extol the virtues of a "free market" economy. Yet it is organizations, not markets, that create value in the economy. Historically, well-developed markets are the result, not the cause of economic development that is driven by organizations in the forms of supportive families, innovative enterprises, and developmental states (Lazonick 2003, 2011). Well-developed markets in inputs and outputs can enhance the ability of the possessors of capital and labor to extract value. But markets do not create value. Any economy requires both the creation (i.e., production) and extraction (i.e., distribution) of value. For example, whenever a worker gets paid a wage he or she extracts value.

The source of inordinate income inequality is not value extraction per se, but rather the positioning of people who have control over large amounts of finance capital to make use of financial markets or product markets to extract far more capital than they create. Rather than income being distributed equitably (which of course does not necessarily mean equally) according to the value that different economic actors create, certain types of economic actors are able to make use of both the reality and ideology of markets to extract disproportionate amounts of value for themselves.

It has long been recognized that financial fortunes are generated suddenly, ostensibly through the capitalization of future profit potential into the market price of an asset, rather than patiently through the accumulation of re-invested capital income (e.g., Thurow 1975). Financial deregulation and the spread of stock-related pay have enabled investors (especially of private equity) and top corporate executives to secure ownership of assets just before major innovation-related gains are capitalized into them. Capital gains tax reduction has served to augment those gains. When financial markets become more speculative, the moment of capitalization has tended to move forward in time, so that it can often occur

before any marketable products have been unveiled or a profitable business established. IPOs and acquisitions are commonly the moment of capitalization, especially as IPO stock tends to be deliberately underpriced to ensure that IPO insiders will be able to flip their shares while outsiders try to gain from the speculative fervor. Sometimes the strategic announcement of a technological breakthrough is enough to cause a jump in the stock price of companies exposed to it, enabling those strategically positioned to cash in.

Let us give two important examples based on the U.S. experience of how this excessive value-extraction process works. One comes from the world of high-tech startups, and the other comes from the world of established business corporations.[1] In effect, we will be arguing that people like Mark Zuckerberg of Facebook, one of the world's richest people with the company's IPO in May 2012, or John Chambers of Cisco, who as CEO had total remuneration of $12.9 million in 2011 and $662 million from 1995 through 2011, have used financial markets to extract far more value than they create. In making this argument, we are not criticizing these individuals per se but rather a set of institutions that, while enabling, and even extolling, the ability of these individuals to extract value, fails to recognize the relation between risks and rewards that creates value.

4.1 Value extraction through high-tech startups

In October 1980 Genentech, founded in 1976 by venture capitalists and scientists, was the first dedicated biopharmaceutical company to do an IPO. In December 1980 Apple Computer, a company that had been founded in a garage just four years earlier, did the largest IPO since Ford Motor Company (then over a half century old) had gone public in 1956. Since then in the United States venture-backed IPOs have become a distinguishing feature in both the biopharmaceutical and information and communication technology (ICT) industries (Kenney and Florida 2000; Lazonick 2009b, ch. 2; Lazonick and Tulum 2011). An IPO capitalizes value gains that have been generated over many years by many people – and hands those gains to a tiny group who often were not the original innovators or risk-takers but who nevertheless are currently positioned to appropriate much or all the profit. This type of value extraction also happens with IPOs of companies that were previously mutually- or family-owned, as their "trapped equity" is suddenly capitalized and paid out to the people who devised the flotation. That equity is the summation of other people's ingenuity and risk-taking, often captured by people who exhibited little or even none.

[1] We have deliberately chosen examples that draw primarily on the experience of the industrial sector or the economy because much if not most of the popular discussion on the rise of income inequality focuses on the machinations of the financial sector, i.e., Wall Street. While financial services can add value to the economy, the industrial sector forms the foundation for innovation in the types of goods and services that have the preponderant influence on our living standards.

In the ICT industry, high-tech startups have been at the center of a technological revolution that is still being played out in areas such as mobile communications, social networking, and cloud computing. In biopharmaceuticals, a number of high-tech startups from the early 1980s such as Genentech (now part of Roche), Amgen, Genzyme (now part of Sanofi), and Biogen (now Biogen Idec) ultimately generated blockbuster drugs (defined as at least $1 billion in sales in any one year), although through 2009 the number of blockbusters generated by the industry numbered only 30 (Lazonick and Tulum 2011). Since the early 1980s in Silicon Valley, by far the most dynamic industrial district for high-tech startups, tens of thousands of venture capitalists, founders, top executives, and early-stage employees have become multimillionaires.

The huge gains that were already accruing to these economic actors in the IPO boom of the early 1980s set in motion a process of raising the norms for rewards in the economy that would, in ways that we outline below, set off a quest for higher levels of remuneration among CEOs of established companies. Indeed, the new norms of compensation were often set by a small but very significant number startups such as Intel, Sun Microsystems, Oracle, and Cisco Systems that generated huge returns to venture capitalists, founders, and top executives and grew to employ tens of thousands of people. Companies such as these are usually presented as “sui generis” private-sector success stories, whose CEOs deserve their mega-wealth because they took great personal risks in pursuit of daring visions that captured major new industries for the United States. In fact, a set of socially-devised institutions related to corporate governance, stock markets and income taxation have permitted this concentration of value extraction in a few hands.

These high-tech startups would not have been able to come into existence but for decades of investment by the U.S. government in ICT and biotech. As the historian Stuart Leslie (1993, 2000) has documented, the foundation for the emergence of Silicon Valley was the military-industry complex that became implanted in the region during and after World War II, and particularly in the Cold War context of the 1950s. Silicon Valley’s first formal venture capital firm, Draper, Gaither, and Anderson, founded in 1959, was headed by two former generals in the U.S. Armed Forces, William H. Draper, Jr. and Frederick L. Anderson, and the former head of the Ford Foundation, H. Rowan Gaither, whose name is on the secret 1957 report submitted to President Eisenhower on how the United States should respond to the Soviet Union’s launching of Sputnik (Business Week 1960). The high-tech district that was to become known as Silicon Valley (a term that was coined in 1971) was either producing directly for the military or, increasingly from the last half of the 1960s, spinning off

military technology for commercial uses (Lazonick 2009b, ch. 2). In this, Silicon Valley was imitating the previous development of the Route 128 high-tech district in the Boston area, based on military technologies developed at nearby universities, especially the Massachusetts Institute of Technology (Hsu and Kenney 2005)

Military technologies that were later commercialized were developed by tens of thousands of scientists, engineers, and other technical personnel in research labs of larger ICT companies including AT&T, General Electric, IBM, Sylvania, Xerox, Motorola, and Texas Instruments. Some employees left to found startups, but the ability to attract capital to finance startups required a number of other institutional changes that were put in place from the late 1950s. In 1958 the U.S. government's Small Business Administration (SBA), itself set up in 1953, launched the Small Business Investment Company (SBIC) program to provide subsidies to the formation and growth of startups. Many firms in the nascent venture-capital industry of the 1960s availed themselves of funds from SBIC (Rubel and Noone 1970).

Meanwhile, starting with what is known as the "Special Study" of securities markets submitted to the U.S. Congress in 1963, the U.S. Securities and Exchange Commission (SEC) encouraged the National Association of Security Dealers (a), a private non-profit organization charged with regulating the trading activities of its members, to make use of advances in computer technology to establish a national electronic quotation system for Over-The-Counter (OTC) stocks. The result was the creation of the National Association of Securities Dealers Quotation system, or NASDAQ, in February 1971. Unlike the New York Stock Exchange (NYSE), which had stringent listing requirements in terms of capitalization and a record of profitability, NASDAQ, like the OTC markets that it aggregated, afforded startups with low capitalization and no profits the possibility of doing an IPO. With the creation of NASDAQ, there now existed a highly liquid national market in highly speculative corporate securities that provided venture capitalists and other financiers of startups with the possibility of a relatively quick exit from their investments. Thus the development of this speculative stock market attracted venture capital into the ICT industry.

NASDAQ's liquidity is particularly high because, unusually for an OTC exchange, it has hundreds of market-makers, usually more than one per stock. They ensure instant purchase or sale close to the market price, and underwriting for IPOs. Investors, as a result, have very little liquidity risk. The risk is transferred to market-makers who are backed by investment banks which, we now know, are underwritten by government. In effect, through NASDAQ, the profits of innovation have been privatized and its risks socialized (Ellis et al, 1999).

In 1972 Silicon Valley venture capitalists, most of whom came out of the microelectronics industry, began to coalesce into a defined industry when a number of them, including Kleiner Perkins and Sequoia, co-located at 3000 Sand Hill Road in Palo Alto, near Stanford University. Also at that location was the Western Association of Venture Capitalists which in 1973 formed the foundation of the National Venture Capital Association (NVCA), a business lobby that in the late 1970s was in the forefront, along with the American Electronics Association (AeA), which also emanated from Silicon Valley, in convincing the U.S. Congress to lower the capital-gains tax rates from almost 40% in 1976 to as low as 20% in the early 1980s. After riding the wave of State investments, therefore, venture capital proceeded to aggressively decrease the size of the purse that funded it.

Poised to reap speculative gains at low tax rates via a quick exit on NASDAQ, the venture capitalists needed to gain access to large amounts of capital. By the early 1980s workers' pensions provided the biggest source of venture-capital funds. During most of the 1970s, however, the huge reserve of unions' defined-benefit pensions, most of which were managed by major corporate employers, had been unavailable to the venture-capital industry. The passage in 1974 of the Employee Retirement Income Security Act (ERISA) had provided government guarantees for workers' pensions and had ruled that pension-fund managers could be personally liable if they did not follow the "prudent man" rule in investing workers' money. Pension-fund managers were, as a result, reluctant to invest in venture-capital funds. Intense lobbying by the NVCA and AeA as well as the managers of big corporate pension funds (for example, General Electric), however, helped to convince the U.S. government to issue a clarification of ERISA that stated that pension-fund managers could put as much as five percent of the fund into risky assets such as venture-capital funds, and still be deemed to acting prudently. As a result, from the second half of 1979 vast amounts of workers' capital poured into the venture capital industry.

While there are different ways in which a venture-capital firm can be organized, by the 1980s the limited partnership became the dominant form. The limited partners are the pension funds or other outside investors who entrust their money to the venture capitalists who, as the general partners, decide how to invest the closed-end (usually ten-year) fund capital. The venture capitalists typically receive a management fee equal to 2 percent of the entire fund plus 20 percent "carried interest" of all the fund's profits.

The vast majority of venture-backed startups fail, and the returns to venture capital have been quite volatile across the business cycle (Gompers and Lerner 2002). Nevertheless, many venture capitalists and founders of high-tech firms have emerged since the 1980s as

members of the super-rich. The lowering of the tax rate on capital gains and dividends to 15 percent, i.e., the Bush tax cuts of 2003, made them even richer.

To be sure, venture capitalists and other private-equity holders take risks, although even then mostly with other people's (primarily workers') money. But they have a vested interest in encouraging stock market speculation in the companies that they bring to market either through an IPO or, as an alternative mode of exit, an M&A deal. The allocation of access to shares in an IPO favors insiders, including the Wall Street banks that underwrite the deals., By keeping the float small, under-pricing the stock issue, and hyping the stock, the banks encourage a post-IPO run-up in stock prices as the investing public clamors for the listed shares. Insiders then flip their holdings to make huge short-term gains. As was shown in a 2002 *Fortune* article entitled "You Bought. They Sold", when the stock market is at a peak, insiders tend to cash in their own shares while encouraging outsiders to buy (Gimein et al. 2002).

The foundation for the emergence of the U.S. venture-capital model was the rise of the microelectronics industry in Silicon Valley from the late 1950s (Kenney and Florida 2000; Lazonick 2009b, ch. 2). Given the investments in microelectronics by the U.S. government and established business corporations in the post-World War II decades as well as the characteristics of both microelectronics technology and markets, it was possible for an ICT company to generate a commercial product within a few years after being founded, as indeed was the case for companies such as Intel, Microsoft, Apple, Electronic Arts, and Cisco. With the founding of Genentech in 1976, however, the U.S. venture-capital model was extended to the biopharmaceutical industry in which it would generally take at least a decade to generate a commercial product, with no certainty that in the end a viable drug would be developed.[2]

As Pisano (2006) has argued, the U.S. venture-capital model would seem to be ill-suited to the biopharmaceutical industry. Venture capital looks to exit from its investments in at most five years. But it typically requires at least twice that amount of time to generate a biopharma drug that, having gone through phase 1, 2, and 3 clinical trials, the U.S. Food and Drug Administration may deem effective and safe enough to market. Yet, as Pisano also

[2] In 1975, Robert Swanson, a young partner at the Silicon Valley venture-capital firm of Kleiner Perkins, approached Herbert Boyer, co-inventor of gene splicing and a professor at the University of San Francisco, about doing a biopharma startup. Boyer's main contributions to the new venture, Genentech, were his name and $500. Swanson became the CEO of Genentech, and in 1978 his former venture capital firm was renamed Kleiner, Perkins, Caufield and Byers, with Brook Byers as the biotech specialist.

recognizes, there are hundreds of publicly listed biopharma firms in the United States that have done their IPOs and then remain in business for years on end without a product. At best, these PLIPOS (product-less IPOs) generate revenues from R&D contracts with established pharmaceutical companies that also typically take equity stakes in them. In addition PLIPOs have been able to raise huge amounts of finance through IPOs and secondary stock issues (Lazonick and Sakinç 2010).

Indeed, it is NASDAQ, i.e., the speculative stock market, that has enabled this business model to survive. Speculators, including hedge funds, are willing to buy and sell on news about R&D contracts won or cancelled and clinical trials that succeed or fail. The speculators do not expect to make their money because a biopharma firm has produced a successful drug, but rather through buying and selling stock (Lazonick and Tulum, 2011). Given that over its 35-year history, the biopharma industry has generated some 30 blockbusters, speculators can always rationalize their demand for biopharma shares on the grounds that they are betting on the next blockbuster. In fact, however, by buying and selling stock, they can make or lose money on these bets irrespective of whether a successful drug is ever forthcoming. Given the massive amount of funds that have flowed into the U.S. biopharmaceutical industry and the relatively small number of successful drug discoveries, the overall returns in terms of drug development have been small while financial interests, including highly remunerated biopharma executives, have done very well for themselves.

The foundation for this speculative system of biopharma finance is U.S. government spending on the life sciences knowledge base. Since the founding of its first research institute in 1938 through 2011, the National Institutes of Health (now made up of 27 centers and institutes) has appropriated $804 billion in 2011 dollars to fund this knowledge base. More than half of these funds have been appropriated since 1998. At an annual average of $31 billion for 2009 through 2012, the appropriations are about twice their level in real terms than in the early 1990s and about three times their level in the mid-1980s. Between 1998 and 2003 the NIH budget increased by an average of $2.7 billion, or 14.7 percent per year. Without this spending, the United States, and probably the world, would not have a biopharmaceutical industry.

Yet for all this government spending and the business funding that has flowed into the biopharmaceutical industry through private equity (including venture capital), IPOs, secondary stock issues, and R&D contracts, the biopharmaceutical industry has not been very productive (Demirel and Mazzucato, 2012; Pisano 2006). Most of the blockbuster biotech drugs that generated huge returns for both big pharma and biopharma companies

reflect control over patent rights to the “low-hanging fruit” that became available to these companies in the 1980s as a result of decades of NIH funding. Meanwhile our research has shown that, in PLIPOs, economic actors who have invested in biopharma companies have been able to reap substantial returns for themselves even in the absence of a successful product (Lazonick and Sakinç 2010; Lazonick and Tulum 2011). The same applies to top executives of these companies who not only draw healthy salaries but also receive stock-based rewards that can bring them millions of dollars. Meanwhile U.S. taxpayers keep funding these companies through the NIH. With tax rates low and few successful drugs that in any case bear prices that are about double those in any other country, however, taxpayers are seeing little in the way of a return.

In U.S. high-tech startups, gains from an IPO and subsequent stock price boosts are shared with employees through broad-based stock option plans. Prior to the rise of Silicon Valley startups, employee stock options were largely reserved for top executives to enable them to secure some of their remuneration at the capital-gains tax rate, which at 25 percent in the 1950s was far lower than the top marginal personal-income tax rate of 91 percent. In the 1960s and 1970s, however, the U.S. Congress scaled down this tax privilege of top executives until it was eliminated completely in the Tax Reform Act of 1976. At the same time the capital-gains tax rate was, as already mentioned, raised to almost 40 percent. Although, as we have also seen, the NVCA and AeA lobbied successfully, in the name of innovation, to get the capital-gains tax rate back down, this change was virtually irrelevant for options of employees exercised from broad-based plans because these options are almost always taxed at the personal-income tax rate. In 1980 the top marginal personal income tax rate still stood at 70 percent. By 1988-1990 the Reagan “supply-side” revolution has brought it down as low as 28 percent.

Especially during the PC boom of the early 1980s, high-tech startups used broad-based stock options plans to induce professional, technical, and administrative employees to leave secure employment with established companies for inherently insecure employment in a new venture. If the startup would be able to make it to an IPO or an M&A deal, employees who had been granted stock options could do quite well, even though they might receive only a very small fraction of the stock-based gains going to venture capitalists, founders, and top executives. Indeed, in the Internet boom of the late 1990s, large numbers of employees at some of the leading companies did exceedingly well. As the most extreme case, at Microsoft in 2000, across some 39,000 employees (but not including the five highest paid executives), *the average gains from exercising stock options were almost $450,000* (Lazonick 2009b, ch. 2).

At the same time, however, the average gains from exercising options of the five highest paid Microsoft executives were about 100 times that of the average gains of Microsoft employees (Lazonick 2009b, ch. 2). Moreover, employees who were hired in 2000 at the peak of the boom would in the subsequent years obtain zero gains from exercising stock options awarded that year as, like all other ICT companies, Microsoft's stock price plummeted with the Internet bust. Furthermore, in the 2000s all Microsoft employees, and particularly those in a high-wage nation such as the United States, now were in danger of losing their jobs entirely through the globalization of the high-tech labor force. Indeed in May 2009 Microsoft announced that it was laying off 5,000 employees in its high-wage locations – its first mass layoff in its history. At the same time, also for the first time in its history, Microsoft, one of the most cash-rich companies in the world, took on $3.75 billion in debt rather than incur the tax liability of repatriating its profits from abroad (Lazonick 2009a). The main purpose of the $3.75 billion in debt was to help fund Microsoft's stock buybacks which ran to $14.6 billion in 2009 and would be another $18.8 billion in 2010 – which brings us to the way in which the top executives of established companies like Microsoft engage in a massive process of value extraction.

4.2 Value extraction through established companies

In growing from a startup founded by Bill Gates and Paul Allen in 1975 to a company with over 92,000 worldwide employees in December 2011, the stock market was of utmost importance to Microsoft. Unlike many other high-tech companies, the stock market was of little if any importance in inducing startup capital to back Microsoft in its early stages. As a software company with low fixed costs, Microsoft did not need any venture capital, and once it secured the operating system franchise for the IBM PC launched in 1981, Microsoft could expand through its retentions. The stock market was, however, very important for Microsoft in the early 1980s to induce software engineers, computer programmers, and other technical personnel to forego secure employment opportunities with established companies like IBM, Hewlett-Packard, Motorola, and Texas Instruments to work for a still uncertain new venture. The inducement for these recruits to Microsoft to take on the risk of working for a young company was the employee stock option. Indeed, in 1986 when Microsoft did its IPO with about 1,100 employees, $198 million in sales, and $39 million in net income, the prime reason for the IPO was to give liquidity to the stock options that it had begun awarding its employees in 1982.

Microsoft reinvested all its earnings through 1989, and paid no dividends on its common shares until 2003. In 1990, however, when its net income was $279 million on revenues of

$1,182 million, Microsoft did a modest $49 million in stock buybacks. Since then Microsoft has become increasingly addicted to doing stock buybacks with *annual averages* of $316 million in 1991-1995, $2.9 billion in 1996-2000, $6.0 billion in 2001-2005, and $16.0 billion in 2006-2010. In 2011 Microsoft spent $11.6 billion on stock buybacks. The $110.0 billion that Microsoft expended on buybacks in 2001-2010 was second only to ExxonMobil's $174.5 billion, and represented 89 percent Microsoft's net income over the period. In addition the company paid out 49 percent of its net income as dividends, thus distributing a total of 138 percent of its net income to shareholders over the decade.

For U.S. S&P 500 companies, buybacks surpassed dividends in 1997 as a form of distribution of profits to shareholders. In the decade 2001-2010, S&P 500 companies expended $3 trillion on buybacks. They quadrupled from about $300 per company in 2003 to over $1.2 billion per company in 2007 before declining sharply in the financial crisis of 2008 and 2009. Since then, stock buybacks have rebounded, averaging about $800 million among S&P 500 companies in 2011.

Why do corporations repurchase stock? Executives often claim that buybacks are financial investments that signal confidence in the company's future as measured by its stock-price performance (Louis and White 2007; Vermaelen 2005, ch. 3). But the claim is an empty one because companies that do buybacks *never sell the shares at higher prices to cash in on these investments*. The "signaling" argument says that, by repurchasing stock, corporate executives signal the stock market that they think that their company's shares are undervalued. But the signal only works one way; these same executives will never signal the market that the company's shares are overvalued by selling the company's stock.

According to the "signaling" argument, we should have seen massive sales of corporate stock in the speculative boom of the late 1990s, as was in fact the case of U.S. industrial corporations in the speculative boom of the late 1920s when corporations took advantage of the speculative stock market to pay off corporate debt or bolster their corporate treasuries (O'Sullivan 2004). Instead, in the boom of the late 1990s corporate executives as *personal investors sold their own stock* to reap speculative gains, often to the tune of tens of millions (Gimein et al. 2002). Many of these same corporate executives as *corporate decision-makers* used corporate funds to *repurchase* their companies' shares in the attempt to bolster their stock prices – to their own personal gain when they exercised their stock options or sold some of their shares. Given the fact that in the United States companies are not required to announce the dates on which they actually do open market repurchases of their

own shares, there is an opportunity for top executives who have this information to engage in insider trading by using this information to time option exercises and stock sales (Fried 2000 and 2001).

Until the 1980s stock repurchases were relatively unimportant as a mode of distributing profits to shareholders. Buybacks were often done by owner-entrepreneurs of small to medium size companies who had issued shares on the over-the-counter markets to raise funds for expansion but then wanted to have those shares back under their ownership as the company progressed (Vermaelen 1981). Indeed, until November 1982 stock repurchases by established companies on a scale that have now become the norm could be construed by the Securities and Exchange Commission (SEC) as an illegal attempt to manipulate the company's stock price. Specifically section 9(a)(2) of the Securities Exchange Act of 1934 prohibits a person "to effect…a series of transactions in any security registered on a national securities exchange creating actual or apparent active trading in such security or raising or depressing the price of such security, for the purpose of inducing the purchase or sale of such security by others" (Subcommittee on Annual Review 1983, 1247).

In November 1982, however, with the promulgation of Rule 10b-18, the SEC provided companies with a "safe harbor" that it would not file manipulation charges if each day's open-market repurchases were not greater than 25 percent of the stock's average daily trading volume over the previous four weeks, and if the company refrained from doing buybacks at the beginning and end of the trading day. Under Rule 10b-18, during the single trading day of, for example, July 13, 2011, a leading stock repurchaser such as Exxon Mobil could have done as much as $416 million in buybacks, Bank of America $402 million, Microsoft $390 million, Intel $285 million, Cisco $269 million, GE $230 million, and IBM $220 million. And, according to the SEC's rules, buybacks of these magnitudes can be repeated day after trading day.

Indeed, as a complement to Rule 10b-18, which effectively legalized the use of buybacks to manipulate stock prices, in 1991 SEC made a rule change that enabled top executives to make quick gains by exercising their stock options and immediately selling their shares. Under Section 16(b) of the 1934 Securities Exchange Act corporate directors, officers or shareholders with more than 10 percent of the corporation's shares are prohibited from making "short-swing" profits through the purchase and the subsequent sale of corporate securities within a six-month period. As a result, top executives who exercised stock options had to hold the acquired shares for at least six months before selling them. Treating a stock

option as a derivative, in May 1991 the SEC deemed that the six-month holding period required under Section 16(b) was from the grant date, not the exercise date (Rosen 1991). The new rule eliminated the risk of loss between the exercise date and the sale date, and gave top executives flexibility in their timing of option exercises and immediate stock sales so that they could personally benefit from, among other things, price boosts from buybacks.

Prime beneficiaries of this stock-price manipulation are the top executives who make major corporate resource allocation decisions. In 2010, for example, the threshold income for inclusion in the top 0.1 percent of the income distribution was $1,492,175 (Piketty and Saez 2010). Of the executives named in proxy statements in 2010, 4.743 had total compensation greater than this threshold amount, with a mean income of $5,034,000 and gains from exercising stock options representing 26 percent of their combined compensation. Total corporate compensation of the named executives does not, however, include other non-compensation taxpayer income (from securities, property, fees for sitting on the boards of other corporations, etc.) that would be included in their IRS tax returns. If we assume that named executives whose corporate compensation was below the $1.5 million threshold were able to augment that income by 25 percent from other sources, then the number of named executives in the top 0.1 percent in 2008 would have been 5,555 (Lazonick 2012a).

Included, moreover, in the top 0.1 percent of the U.S. income distribution were a large, but unknown, number of U.S. corporate executives whose pay was above the $1.5 million threshold but who were not named in proxy statements because they were neither the CEO nor the four other highest paid in their particular companies. To take just one example, of the five named IBM executives in 2010, the lowest paid had total compensation of $6,637,910. There were presumably large numbers of other IBM executives whose total compensation was between this amount and the $1.5 million top 0.1 percent threshold.

Large proportions of these enormous incomes of top executives have come from gains from cashing in on the ample stock option awards that their boards of directors have bestowed on them. The higher the “top pay” group, the greater the average proportion of the pay of the executives in that group that was derived from gains from exercising stock options. For the top 100 group in the years 1992-2010, this proportion ranged from a low of 49 percent in 2010, when the mean pay of the group, $35.9 million in 2010 dollars, was also at its second lowest level in real terms since 1996, to a high of 87 percent in 2000, when the mean pay was at its highest level, $104.0 million in 2010 dollars. In 2000 the mean pay of the top 3000 was, at $10.8 million in 2010 dollars, only ten percent of the

mean pay of the top 100. Nevertheless, gains from exercising stock options accounted for 67 percent of the combined pay of executives in the top 3000 group (Lazonick 2012a).

5. Analytical and Policy Implications of an Organizational Failure View of Inequality

5.1 Analytical Implications

By generating real productivity gains, innovation can potentially increase the incomes of all participants in the process. It is because of this positive-sum potential that the European Union as well as the Obama Administration have shown an interest in policies that can promote innovation-led growth (EC 2020; OECD 2011; Obama *State of the Union* 25/1/ 2011). Given the increases in income inequality in recent decades, however, what guidance do these policy-makers have in ensuring that the gains from innovation will be equitably shared among those parties, including taxpayers and workers, who participate in the innovation process?

The argument we have developed above provides a different interpretation of the relation between innovation and inequality than that offered by economists who have focused on the way that technologies, such as IT, displace the skills of some workers in favor of the skills of others (Brynjolfsson 2011). In this concluding section, we contrast the analysis and policy implications of the RRN framework with the mainstream liberal perspective on growing inequality known as the “skill-biased technical change” (SBTC) approach (Aghion et al. 1999; Acemoglu 2002).

Whereas the Risk-Reward Nexus framework views the prime driver in the increase in income inequality of the last three decades as the result of value-extractors control over resource allocation in business organizations, SBTC sees it in terms of the negative impact of technological change on the demand for “unskilled” (generally non-college educated) relative to “skilled” (generally college-educated) workers on the labor market. SBTC sees increasing income inequality as the result of market forces that change the balance of supply and demand. SBTC proponents argue that the government needs to intervene to correct this “market failure". In contrast, the RRN approach sees the problem as an “organizational failure”. From our perspective, government policy should be designed to make business organizations engage in innovation and distribute the gains from innovation equitably among contributors to the process. At the end of this concluding section, we will offer some general proposals on the types of government policies that may be required.

While SBTC makes “technical change” central to its analysis of the changing income distribution, it has no theory of innovation or even risk-taking. In neoclassical fashion, SBTC assumes that all agents in the economy are rewarded according to market-determined factor returns so that the changes in the wage distribution of income are the result of the impact of exogenous technological change on the demand for different types of labor. SBTC theory looks at the effect of technological change on income distribution in terms of a market exchange between actors. As in market-oriented (i.e., neoclassical) economic perspectives generally, the SBTC approach does not analyze the origins of technological change. That is, it does not attempt to develop a theory of innovative enterprise. Hence when an author such as Aghion (1999) uses the term “innovation”, he is really talking about exogenous technological change that then, because of its assumed skill-biased characteristics, affects the demand for labor.

For the proponents of SBTC, technological change has increased inequality because it has increased the set of complementary skills needed in the workplace and, given the supply of workers with these skills, the price that such skills fetch. SBTC seeks to measure this change empirically by the wage premium that college-educated (i.e., “skilled”) workers receive over less skilled (or “unskilled”) workers with only a high-school education. The critical assumption is that differences in income are determined by the laws of supply and demand in labor markets, with exogenous changes in technology altering the types of skills that are in demand. Given the growth in income inequality in the 1980s and 1990s, SBTC proponents assumed that a growing premium to college-educated workers was caused by the bias of the computer revolution of the time that increased the demand for the types of skills that college-educated workers have relative to less educated members of the labor force.

Equilibrium in this approach is affected by a “price effect”, which encourages the adoption of technologies directed at economizing on scarce factors, and a “market effect”, which leads to the adoption of technologies favoring abundant factors and *complementary* skills. The elasticity of substitution between these factors determines their relative power in determining how technological change (i.e., the diffusion of technology) and factor prices respond to changes in relative supplies. Thus supply and demand forces determine both inequality and returns to skills. The diffusion of technology is understood to occur in response to profit incentives so that when the adoption of skill-biased technologies is more profitable, the diffusion of technology will tend to be skill-biased. Acemoglu (2002) maintains that there has not been a “technological revolution” but simply a change in the type of technologies that are being adopted in response to such incentives.

Thus the key general difference between the RRN approach and the SBTC approach is whether it is organizations or markets that link technological change and income distribution. The RRN approach argues that organizations generate innovation, and that because of the collective, cumulative and uncertain character of the innovation process, certain economic actors can, by gaining control over the allocation of resources within these organizations, appropriate rewards from the innovation process that are disproportionate from the risks that they took in that process. The SBTC approach argues that markets determine both the diffusion of technology and the returns to different types of labor, with the skill-biased characteristics of that technology affecting the demand for labor with different types of skills. We contend that the RRN approach provides a superior explanation to the SBTC approach of the observed facts of income inequality in the United States. For example, we hypothesize that in the United States over the past few decades the problem of declining skills among members of the U.S. labor force is less because of SBTC and more because financialized U.S. companies have failed to invest in the skills of their labor forces, and indeed have thrown valuable human capital on the labor market to atrophy (Lazonick 2012a; see also Cappelli 2012).

The SBTC perspective has no explanation for the concentration at the top of the income distribution because all impacts of SBTC are on the distribution of income between skilled and unskilled workers. Looking at the changes in the percentage shares of the U.S. household distribution of income by quintiles from 1975 to 1995 (the time period that gave rise to the SBTC arguments), the percentage-point changes were -0.8 for the lowest quintile, -1.3 for the fourth quintile, -1.8 for the middle quintile, -1.4 for the second quintile, but +5.1 for the top quintile, including +4.5 for the top 5 percent of the household distribution of income (U.S. Bureau of the Census 2012). The IRS return data analyzed by Piketty and Saez (2012) show a shift of +6.4 percent to the top 1% of the income distribution – from 8.95 percent of all income in 1975 to 15.23 percent in 1995, rising to as high as 22.82 percent in 2008. Put simply, in attempting to offer an explanation of the major shifts in income distribution that were taking place in the 1980s and 1990s, the SBTC approach chose the wrong target. In contrast, the RRN approach, we argue, is right on target in explaining the concentration of income at the top.

The SBTC approach cannot explain inter-industry and inter-firm variations in rewards to given types of labor (see Bernstein and Mishel 2001). From the perspective of the theory of innovative enterprise in contrast, such differences are to be expected. Industries differ in terms of their technological, market, and competitive conditions, as well as the dynamics of technological, market, and competitive transformation. Some industries such as

pharmaceuticals require narrow and concentrated skill bases while others such as automobiles require broad and deep skill bases (Lazonick 1998; Lazonick and O'Sullivan 2002). Some industries such as such as ICT are characterized by rapid technological change while others such as homebuilding rely much more of traditional technologies. Some industries grow much more rapidly then others. Given Schumpeterian competition, moreover, we expect firms within an industry to differ, whereas it is a hallmark of neoclassical theory, and implicit in the SBTC approach, that all firms in an industry adopt the same technologies and have the same cost structures.

Within the collective and cumulative process that characterizes innovation, skills are not exogenously produced but often the result of endogenously created incentives. Returns to labor with different types of skill will reflect to some extent the innovation strategies and organizational structures of the firm. Top executives of certain business enterprises may choose to invest heavily in collective and cumulative learning, while, for the sake of short-term profits, the executives of competitors may decide to underinvest in training and human capital formation.

Like the neoclassical theory of the market economy in general, the SBTC approach ignores power, including in an economy characterized by financial deregulation, the power of financial interests over productive interests. The RRN approach argues that inequality can arise when certain economic actors position themselves along the cumulative process of innovation, and get much more out than they put in, *regardless of their skills*. Strategic decision-making power over the allocation of resources and returns comes from hierarchical position within business organizations, not from education per se (for example, we do not as a rule see PhDs running corporations). In 2010, worldwide, the top 500 U.S. business corporations by revenue generated $10.8 trillion in sales, reaped $709 billion in profits, and employed 25.1 million people. The RRN approach argues that one cannot begin to explain either innovation or the distribution of income in the economy without an analysis of who exercises strategic control in these major business organizations, what types of investments they decide to make, and how these strategic decision-makers influence the allocation of returns.

5.2 Policy Implications

The policy agenda that flows from the Risk-Reward Nexus approach is fundamentally different from that which arises from a "market failure" understanding of inequality. It is the development of the business organization, not the market, that must be the focus of policies aimed at increasing overall economic performance, and allowing "smart" growth to be also

“inclusive” growth. The need for ”rebalancing” the economy that is being discussed across the world should be less in terms of sectors (e.g., away from financial services towards more manufacturing) and more in terms of the indicators of economic performance that are used in all sectors. Current indicators are not only too short-term, a common complaint, but also steered towards rewarding value extraction at the expense of value creation. Rewarding value extraction has led to useless, or even harmful, capital gains tax reductions. It has also allowed the practice of stock -buybacks to rise at an exponential rate. While of course we believe that retraining those left behind without the necessary skills is important, this core policy of the SBTC approach will not have much affect without the introduction of policies which allow business organizations to be run by the different set of stakeholders who ensure that corporate resources are allocated to investments in innovation and that corporate returns are distributed equitably to contributors to innovation, and a different set of economic performance indicators that reflect increases in productivity, investments in innovation, and long run growth potential.

Indeed by focusing on the risk-reward nexus in the innovation process, we believe the economic system will perform better and generate more tax receipts that can then be used by the State for such retraining purposes for existing technologies as well as investing in the next round of new technologies. Our approach avoids the typical liberal interventionist mistake of allowing business enterprises to continue to be badly managed, and then expecting the State to pick up the pieces of the so-called “market failure”. The more funds that are available in companies for development of human capital (rather than, for example, stock repurchases which in the 2000s devoured well over 50 percent of the profits of the S&P 500 companies in the United States), the less of a burden is put on the State to undertake the investments that business enterprises should have been making.

The type of government policies that flow from the Risk-Reward Nexus approach include:

1. RESOURCE ALLOCATION. By banning, or seriously moderating, stock buybacks, which when done by large established companies are nothing but a manipulation of the stock market, resources will be liberated to reward the economic actors who actually take risks. and thus increase rather than decrease the incentives needed for value creation. In the U.S. case, the sums that could be diverted from buybacks are significant: about $2.6 trillion for 459 S&P 500 companies over the past decade, representing about 54 percent of net income. That is in addition to $1.9 trillion, or 40 percent of net income, distributed as dividends (a legitimate mode of returning value to shareholders since it rewards them for holding stock). For 86 UK companies in the S&P Europe 350 for 2001-2010, buybacks totaled €234 billion, or 26 percent of net income, while dividends were €561 billion, or 62 percent of net income. Stock

repurchases are on the books of the U.S. Securities and Exchange Commission as a possible manipulation of the stock market, although in 1982, as we have seen, the SEC granted companies a “safe harbor” against being charged with manipulation. In many European nations, stock repurchases were illegal until the late 1990s (Sakinç 2012). A renewal of the illegal status of stock repurchases would not only make massive amounts of funds available for investment in human capital, but would also require the recruitment and employment by corporations of top executives who understand how to make such investments in productive capabilities. It is not at all clear that those who currently exercise strategic control in the financialized corporation possess this capability.

2. TAXATION. In the United States from 1976 to 2006 the maximum capital gains tax rate was cut from 39.875 percent to 15.7 percent, and in 2003 the maximum tax rate on dividends was changed from the personal income tax rate of 38.6 percent to the capital gains tax rate of 16.05 percent and subsequently 15.7 percent. The ideology that supports these tax changes is that entrepreneurs need higher after-tax returns to encourage investment in industry. The Risk-Reward Nexus framework can alert policy-makers to the possibility that these low tax rates are simply increasing the rewards to value extraction rather than inducing investments in value creation.

3. MAP/REWARD THE DIVISION OF INNOVATIVE LABOR. The collective nature of the innovation process requires policy makers to have a clear understanding of who the different actors are in the division of innovative labor (different size firms, different types of State agencies and State funded educational and research infrastructure, and different types of financial institutions). And rather than creating myths around certain actors (the hyping up of VC or SMEs), it is fundamental to recognize the stages at which the actors are important, along the risk space. The Jumpstart Our Business Startups (JOBS) Act, passed in 2012 by U.S. Congress, is meant to encourage funding of small business by easing securities regulations. Yet from the RRN perspective, this act is likely to enhance the power of value extractors rather than assist potential value creators. As for Europe, it makes little sense, to try to copy the poorly understood Silicon Valley model (e.g., ‘*Where are the European Googles*?’) by nurturing a venture capital industry without also funding and nurturing the underlying State-funded knowledge base on which VC in the USA has always depended. It is indeed this ”hype” that has underpinned bad policies in Europe, such as in 2002 when the UK Labour Party reduced the time that private equity has to be held from 10 to 2 years, only increasing the short-termism of the VC industry. The changes in tax policy to which we refer above must be focused on encouraging the true dynamic links between the different participants in the innovation process. And understanding that the State’s role is to do what the business sector is not willing to do (engage in high risk) also means that particular policies such as R&D tax credits must be devised in such a way that the subsidy encourages investment in innovation that need to be made rather than simply rewarding investments that have already been made regardless of their potential for generating returns (this critique is applied also to the structure of patent policies in Mazzucato 2011).

4. DISTINGUISHING PRODUCTIVE/UNPRODUCTIVE RISK. Given the uncertain nature of innovation, those companies that spend more on R&D, and other innovation inputs including human capital formation, will inevitably have a higher risk

profile. This high-fixed cost strategy is one of the reasons that innovative companies have a difficult time accessing credit. Aligning risks and rewards involves also considering how ”good” risk – i.e., speculation that is necessary for such innovation investments to be made -- can be valued differently by financial institutions from ”bad” risk -- i.e., pure speculation for its own sake. Credit scores, for example, could be made to better reflect fundamental indicators such as productivity, as well as control for the long-term growth potential of some of the most expensive and uncertain investments such as R&D (FINNOV 2011).

5. DIRECT RETURNS TO THE STATE. Given the State's large and important role in investing in the development of new technologies as well as physical infrastructure and an educated labor force, companies that have tapped these resources as a foundation for successful innovation should be obligated to return a percentage of the gains of innovative enterprise to the State, over and above tax payments at the normal rates. For example, both patents and copyrights should be constructed so that the government can keep a “golden share” of the returns that result from its risky investments, especially in the case of “general purpose technologies”—retaining therefore the benefits of such investments in the public hands. Burlamaqui (2012) has argued that this type of policy would also allow the state to convert a property right previously granted, into a general public license, if/when the owner of the license becomes a pure rent-seeker who refuses to license broadly and fairly. These funds could then be used by the State to renew its investments in the “knowledge economy”. And as we have pointed out, with a banning of stock buybacks, funds would be available for corporate support of government investment in the future of the economy. Such returns could take on different dimensions. Google could give back a return to the National Science Foundation that funded its original algorithm so that the NSF can fund more *Googles* (Block and Keller, 2010); and relatedly different types of income contingent loans could be devised. The structure of national investment banks, such as the KfW in Germany or the Brazilian Development Bank (BNDES), or the European Union's Investment Bank (EIB), could also be used to earn back a *direct* return for those projects funded which are particularly high risk. Indeed, BNDES's investments in biotechnology and renewable have provided the bank with a remarkable 21 percent return on equity, which has been used not only for general redistribution purposes but also to reinvest in the innovation process (Mazzucato, 2012b).

Our argument is that each of these policies can be formulated as part of a coherent agenda to promote equitable and stable economic growth. The agenda is not about ‘fixing’ markets but actively ‘shaping’ them, so that incentives and rewards are aligned with long-run growth objectives. Most importantly, rewarding, not penalizing, those participants in the economy who take on the risks of investing in the development of productive resources. To this extent, the agenda must unite growth policy, tax policy and industrial policy, with a focus on innovation and productivity providing the links among them. Most policy-oriented economists and most economic-oriented policy-makers at least pay lip service to the notion that “innovation” is important to superior economic performance, Indeed, the importance of

'intangible' capital (patents, copyrights, design) appears on nearly every government's growth agenda (OECD, 2012). The Risk-Reward Nexus framework suggests, however, that the rhetoric of innovation can do more harm than good. It is time to take "innovation" seriously, and build economic policy on a theory of innovative enterprise that comprehends how value is created, not only extracted, in economies in which 'intangibles' and innovation are increasingly important.

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