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Financial regimes, financialization patterns and industrial performances: preliminary remarks♦

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Abstract: The evolutionary taxonomy of financial systems, outlined by Dosi (1990), argued that market-based systems are comparatively more engaged in exploring new technological paradigms, due to selective market pressure, whereas in credit-based systems their more institutionalized financial allocation provides an advantage for cumulative learning. This article offers a preliminary assessment of those conjectures in light of the institutional change associated with the financialization process and the "maximizing shareholders value" principle. The available evidence suggests that financialization has disconnected the performance of firms on the financial markets from the determinants of firm-level growth and innovation. Selection among companies increasingly occurs on financial markets according to criteria based on short-term returns. As such, financialization has contributed towards compressing and somewhat degrading the specific properties of the finance-innovation nexus of both financial system archetypes, simultaneously deteriorating static and Schumpeterian efficiency.

Keywords: Evolutionary theory, financial systems, firm growth, innovation, financialization.

JEL: B52, G2, G3, L2, O3.

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Introduction

Innovation is concerned with processes of learning and discovery involving new products, new production methods and new forms of economic organization. In turn, research efforts by business firms are shaped by the rates and criteria that financial markets and financial institutions use to allocate resources to enterprises. However, little is known about the specificities of the links between finance and the microeconomics of innovation. While the widespread belief is that innovation needs finance, its role varies widely according to the size and age of the innovative firm, as well as the sector and the stage within the industry's life cycle.

While the great majority of studies have focused on the links between finance and growth from a very stylized macroeconomic perspective, relying on international comparisons with little attention to the institutional details (*see for instance* Levine, 2003), there is indeed older literature, which attempts to identify "ideal types" in terms of the specificities of the main financing channels (banks, stock markets, private equity), pioneered by Rybczynski (1974) and Zysman (1984) who distinguished two archetypal financial systems, namely "market-based" or "credit-based" systems.

This article discusses some of the implications in terms of innovation and the evolutionary dynamics of these two systems proposed by Dosi (1990). Distinctive features include the relatively "impersonal" relations of the market-based archetype as opposed to the more institutionalized ownership/control relationships in the credit-based system. Mapping the distinct archetypes across different historical experiences, it is conjectured that the credit-based system may have been more conducive to cumulative learning, while market-based systems may have been a better fit for the exploration of new technological paradigms.

25 years later however, financial systems have undergone major transformations, which fall under the rubric of *financialization*, possibly challenging the current relevance of the distinction between the two archetypes. In what follows, we offer a preliminary assessment of the recent changes in financial systems and their impact on the nexus between financial set-ups and industrial dynamics.

The first section revisits the results and conjectures put forth by Dosi (1990), centered on an "evolutionary taxonomy" of the two financial archetypes and on their comparative dynamic properties. The second section reviews evidence related to the role of finance in driving industry-level and firm-level innovation and growth. In the third section, we explore the financialization process and its spread from the Anglo-Saxon world to those economies that have historically more so resembled the "credit-based" archetype. Finally, the fourth section concludes our findings.

1. The evolutionary properties of different financial systems

Dosi (1990) revisits the old question: "Do financial institutions matter in terms of the levels and changes within real aggregate variables?" There are two complementary ways of answering such a question. The first is predominantly macro and concerns the role of specific financial institutions, or lack thereof, in stimulating or impeding long-term economic development (the question dates back at least to Kindleberger, 1984). The second regards the modes through which industrial growth is financed. As mentioned, in this respect Rybczynski (1974) proposed a taxonomy which differentiates "market-based" systems from "credit-based" systems. In the former, taking the USA and UK as prime examples, corporate growth is more frequently financed through traded shares and retained profits. In the latter archetype, which heralds the experience of continental Europe (especially Germany) and Japan, long-term bank loans and long-term ownership claims by banks and other financial institutions are considered to be relatively more significant sources of corporate financing. In turn, particular forms of ownership and finance are likely to affect microeconomic patterns of production, investment and research and, ultimately, performance outcomes, even when firms are faced with the same set of economic incentives.

1.1 The evolutionary taxonomy of financial systems

Within the more orthodox contributions to the literature, real aggregate dynamics are unaffected by the specific blend of financial institutions catering to business. Rational agents have access to all available information and succeed in exploiting all the available opportunities. Thus aggregate dynamics are solely influenced by the exogenous dynamics of economic fundamentals. However, it is sufficient to relax the assumption of perfect information to show that specific institutions do actually matter, as they convey information, generate incentives and guide the allocation of resources. This entails certain outcomes, as (i) incentives, allocations and performances rely on the institutional set-up of each system; (ii) equilibria depend on specific information flows and the beliefs of agents, and may yield Pareto dominated allocations with resource rationing and an absence of market clearing; and (iii) learning processes generally engender non-convexities, multiplicity and even non-existence of equilibria.

The monumental work by Stiglitz and Greenwald (2014) amply discusses these ubiquitous properties, which even more so apply to evolutionary environments in which previously unknown states of the world are themselves the result of the innovative activities of agents.

Innovative processes in such non-stationary worlds are characterized by knowledge tacitness, and are path-dependent and institution-dependent (Nelson and Winter, 1982; Dosi, 1988; Dosi and Nelson, 2010). Agents search within the grounds of what they already know or believe they know, making mistakes and obtaining unexpected successes. Collectively, product markets and financial markets operate as selection devices among different firms embodying different technologies. Aggregate performances of the system change over time much like self-organizing collective

properties resulting from the interactions amongst diverse agents typically under disequilibrium conditions.

Ultimately, innovative environments are driven by two processes, namely *learning* and *selection.* Indeed, the differences in structures and performances across industries can be understood as the result of the different balances between, and modes of, such processes. Finance of course matters in so far as it has an impact upon firms' learning patterns, the allocation of resources to different organizations employing different technologies and strategies, and finally upon the various competitive dynamics across firms.

Financial selection should plausibly satisfy some weak efficiency criterion and reward/punish according to revealed performances. Nevertheless, in non-stationary evolutionary worlds, long-term aggregate performance might not be monotonic within the efficiency of the selection rules used by financial investors. It could well be that departures from efficiency criteria based upon past and present environments may be necessary in order to nurture future innovativeness. Consequently, financial systems may face permanent dilemmas between efficiency and evolutionary viability (allowing that some innovation will emerge in the future and ultimately be more fit for that future environment). In other words, trade-offs exist between static efficiency (the opportunity costs of given resources at any one time) and Schumpeterian efficiency (the ability of economic systems to continuously generate innovation and adapt to unforeseen changes). Empirical environments are most likely to fall somewhere in between two extreme scenarios whereby in the first, the technological winner today would also be, with probability one, the winner of tomorrow, and in the second, today's winners will surely be tomorrow's losers. Hence, the financial system is permanently facing a dilemma between making the best use of today's information and resources on one side, and gambling on unexplored opportunities on the other side.

Dosi (1990) has explored the two "market-based" and "credit-based" archetypes of financial systems from this evolutionary perspective. A market-based system can be described as a relatively "impersonal" system of exchanges of ownership titles. Credit-based systems involve more "institutionalized" ownership/control relationships. Using Hirschman's dichotomy, market-based financing relies more on *exit* mechanisms, while credit-oriented systems rely more on *voice* mechanisms, based on the possibilities for partners to exchange information, discuss, and negotiate (Hirschman, 1970). Taking into account the features of the innovation process (collective, cumulative, tacit, uncertain), the financial allocation mechanism itself may involve specific competencies, especially in credit-based systems, at which point learning becomes relatively more important than selection. On the other side, market-based systems seem to lead more easily to the exploration of new technological paradigms, through important caveats that innovative opportunities must be high and innovative capabilities well diffused throughout the economy.

In either system, long-term dynamism requires the persistent exploration of new potential paradigms and new technological trajectories. In some market-led systems, the allocation of resources

to innovative research has become disconnected institutionally from “normal” credit activities with the emergence and development of venture capital markets. Venture capital is an institutional innovation that, in principle, ought to increase the allocating capacities of "specialized investors", and reduce uncertainty by spreading risk over investment portfolios. In credit-based countries, the financing channel has historically been much less divided. Banks have been important for both the processes of support for the growth and learning of incumbents and the exploration by new entrants. Moreover, in countries like Japan the exploration of new products, processes and organizational arrangements has historically been inbuilt into the *dynamic capabilities* of large established companies.

Note also that whatever the nature of the financial system (whether it more closely resembles the idealized credit-based system or the pure market-based system), a great part of business-performed innovative research has historically taken place (and continues to do so) in established firms. As such, incumbent firms access external financial resources, whenever they have the need, as whole entities, based on the grounds of their overall performance and without respect to the individual projects.

In summary, and with the aforementioned caveats in mind, in a Schumpeterian perspective the differences between the two systems of financial allocation are based on the relative importance of learning versus selection; voice versus exit; and discretionary versus non-discretionary allocative rules.

1.2 Dynamic properties

As a way of assessing the properties of the different architectures of the finance-industry nexus, Dosi (1990) put forward three conjectures, based on historical evidence:

i) The more knowledge is asymmetric, appropriable and scarce, the more institutionalized processes of financial allocation will be conducive to evolutionary viability. Formal bank-industry relationships have historically appeared to be commonplace in industrializing countries, requiring long-term commitments of resources to the accumulation of technological capacities that are often not quite up to speed in catching-up countries.

ii) A necessary, even if not sufficient, condition for the “Schumpeterian efficiency” of a market-based system is that it operates in a country which is either on or near the technological frontier.

iii) Financial institutions in credit-based systems, *in primis* banks, need not only be “patient” in order to be dynamically viable, they also need to acquire relatively detailed knowledge about the progress trajectories of individual industries, in addition to the internal competences and innovative projects of individual firms.

Table 1 presents some of the distinctive properties of different stylized financial systems.

Table 1: An evolutionary taxonomy of financial systems and their properties

Properties systems	« Market-Based systems »	« Credit based systems »
Selective pressure on the grounds of revealed performances	Higher	Lower
Trial-and-error processes through birth of new firms	Higher	Lower
"Voice" versus "exit" processes of change	Exit	Voice
Opportunities of cumulative learning	Lower	Higher
Discretionality of allocative processes	Lower	Higher
Specialisation of competences by financial allocators	lower	Higher
"Specialisation" versus "diversification" of incumbent firms	More specialisation	More diversification

Source: Dosi (1990, p. 315).

As for selection, similar financial indicators across financial systems may produce different implications for dynamic performances. All things being equal, it would also be expected that in credit based systems industrial growth would occur to a greater extent via the diversification of existing companies, while in market-based systems the pressure to specialize in highly profitable activities would be greater. One can presume that the more financial markets matter and the more efficient they become, the higher the pressure against uncompetitive activities and firms will be.

Generally, the "Schumpeterian" implication regarding the distinction between market-based and credit-based economies is that the former ought to be comparatively more engaged in technological exploration and be relatively more exposed to market selection pressures. Does the evidence also bear this conjecture in light of the institutional transformations in the international financial sector? The following section will review the empirical nexus between finance, innovation, and industrial dynamics, drawing on evidence produced over the last 25 years.

2. An empirical overview on the relationship between financial conditions, and firm-level innovation and growth

Let us begin by reviewing some both reasonable and misleading proxies for "market-basedness".

2.1 The elusive proxies for financial development

The common practice of equating stock market capitalization with degrees of "financial development", as done by Levine (1997) and the references therein, has been criticized from within the very mainstream camp that generated it. Champonnois (2010) argues that indicators of an aggregate financial structure are endogenous to the firm ecology and the associated patterns of financing decisions. Koetter and Wedow (2010) remark that most studies in this field are unable to measure the quality of financial intermediation. Far from being merely an econometric issue, this difficulty is rooted in the impossibility of codifying all the relevant information, a problem (roughly) addressed by credit-based systems through long-term networks of relations between financial agents and firms. Arcand *et al*. (2015) have observed a negative finance-growth nexus for high-income countries, motivating them to talk of a "vanishing effect of financial development". High income countries may have reached the point at which financial depth no longer enables the efficiency of investments to increase (Rousseau and Wachtel, 2011). In contrast, it may even be harmful as, for example, it diverts talented individuals from innovative industries. As argued by Arcand *et al*. (2015), "There are several countries for which smaller financial sectors would actually be desirable".

Basically, even in the mainstream quarter there is an acknowledgment that increases in developed financial markets are neither a sign of a higher level of development, nor a harbinger of further growth in the future (see also Levine, 2003). Indeed, any reasonable observer of the connections between financial innovation as "weapon of mass destruction" (Warren Buffett *dixit*) and the 2008 financial crisis, can testify that the statement is just straightforward common sense.

Aglietta and Scialom (2010), for instance, illustrate very well how financial innovations generated predatory behaviors and triggered the 2008 crisis. "In the so-called 'subprime' crisis, a powerful pro-cyclical dynamic was engineered by the intimate interaction of a host of financial innovations: mark-to-market of a wide range of financial assets that has enhanced credit against collateral, widespread use of credit derivatives that has allowed the securitization of about any type of credit, internal models of credit risk control based upon the Value-at-Risk (VaR) principle that has immoderately propelled leveraged trading portfolios" (p. 43).

Granted that this description sums up well our analysis, let us move on to assessing the differences in Schumpeterian efficiency, if any, across different archetypes of capitalism and "forms of regulation" (Boyer, 2005).

2.2 Radical innovation across varieties of capitalism

Building upon older approaches to comparative economics and the French "Regulation" School – with varying degrees of acknowledgment - the literature on "varieties of capitalisms" (Hall and Soskice, 2001) draws a distinction between liberalized market economies (LMEs) and coordinated market economies (CMEs). In LMEs, the coordination of individual decisions is mainly entrusted to markets, whereas non-market mechanisms, entailing a higher degree of centralization, characterize CMEs. Following Hall and Soskice (2001), economies can be clustered according to two dimensions: stock market capitalization (higher in LMEs) and employment protection (higher in CMEs). Credit-based economies tend to fall within the CME category, whereas market-based financial systems are typical of LMEs[1]. Hall and Soskice (2001) went on to hypothesize a mapping between varieties of capitalism and technological comparative advantage. Specifically, they claimed that LMEs specialize in radical innovation, whereas CMEs have a comparative advantage in incremental innovation. This resonates somewhat with our previous discussion on evolutionary taxonomy.

The first test of the Hall-Soskice hypothesis was provided by the authors themselves in their 2001 book. They compared the aggregate number of patents granted to German and US firms in "radical innovation" industries (biotechnology, semiconductors, software, telecommunication equipment) and in "incremental innovation" industries (machine tools, consumer durables, engines, specialized transport equipment). LMEs were found to prevail in terms of patents granted to firms operating in "radically innovative" sectors. Relying on similar notions of "radicality", Allen *et al*. (2006) and Schneider and Paunescu (2012) found that LMEs export more heavily in high-tech industries. These results therefore indirectly testify to the higher propensity of economies with market-based financial systems to explore new technological paradigms.

The Hall-Soskice hypothesis tests were subsequently refined, partly refuting the original results. Taking the CME-LME taxonomy for granted, the analysis was recast at the industry level of aggregation, and arguably better indicators of radicality were proposed. Taylor (2004) contended that the higher radicality of innovation in market-based systems resulted from the inclusion of the US in the sample, and showed this through data on patents and scholarly publications (both simple counts and citations-weighted). Along with patent citation counts, Akkermans *et al*. (2009) compared CMEs and LMEs using measures of generality (the "breadth" of innovation) and originality (the extent to which the innovation drew knowledge from other innovations). The claim that LMEs enjoy a comparative advantage in radical innovation was only confirmed in some industries, in the same way that only some CMEs specialize in industries that are in their "radical" life-cycle stage.

[1] A third group of countries is also identified by Hall and Soskice with a mixed market economy (MME) model, or "Mediterranean capitalism". These too bear similarities with credit-based economies.

The uncertain status of the Hall-Soskice hypothesis hints at the role of firm-level heterogeneity in making technological comparative advantage not only industry- but also firm-specific. Jackson and Miyajima (2007) argued that country-specific firm-level heterogeneity – in size, industry experience, capabilities, etc. - is so wide, that different varieties of capitalism (e.g. different financing patterns) can coexist within the same economy. Goutas and Lane (2009) showed that Anglo-Saxon models of corporate governance have been adapted by different German firms in quite idiosyncratic ways. And quite a few examples can be cited regarding Anglo-Saxon firms having a relation with finance akin to the "corporatist" type.

2.3 The myopia and weakness of market selection

In credit-oriented systems, the existence of a tangled web of financial relationships suggests that product and financial markets should play a marginal role in selection across firms. The most productively efficient and profitable companies are not necessarily those enjoying faster growth. Indeed, Coad (2007 & 2010) found, through panel data analyses of French firms, that while employment growth and sales growth precede the growth of profits, higher profits do not translate to faster growth. Bottazzi *et al*. (2010) investigated the links between productivity, profitability and growth on panels of Italian and French manufacturing firms, to similarly find that the estimated relationships between firm growth and profitability appear to be weak or not significant across countries and industrial sectors.

Bottazzi *et al*. (2006) made use of a financial rating index (ranking the expected ability to repay debt) to analyze a dataset of Italian firms in the period 1996-2003. Both very small and very large firms are concentrated within the high risk and less solvable categories. The same firms experience much more unstable growth records. While smaller firms are more likely to be constrained in raising external financing, larger firms face problems only when they are highly leveraged. Bottazzi *et al*. (2008) found non-trivial relationships between risk class and firm performance in a sample of Italian firms. The worse the credit conditions, the worse the profitability and productivity records would supposedly be. Yet, it was found that badly rated (i.e. potentially credit-constrained) firms are not necessarily among the worst performing, confirming the inefficiency of the credit market as a selection mechanism.

In Bottazzi *et al*. (2014), financial constraints, measured through low credit ratings, upset the ability of large firms to exploit the positive effects of diversification. On the one hand, firms that already witness a reduction in sales see their performance worsen in the presence of financial constraints (a "loss reinforcing" effect). This effect is more strongly observed amongst older firms. On the other hand, firms experiencing positive growth rates are likely to see their growth potentials deprived if they meet their financial constraints (a "pinioning the wings" effect). This evidence is more common across younger firms and results in a net loss in growth opportunities.

It is however enlightening to learn that the same evidence put forth by Bottazzi *et al*. (2010) is also found in countries as diverse as France, Germany, the UK and the USA by Dosi *et al*. (2015). Market selection forces – as mediated by differential profitabilities - are equally weak in market-oriented systems (UK, USA) as they are in credit-based economies (France, Germany). Moreover, as Bianchini *et al*. (2014) show, persistent high-growth performances do not appear to be correlated with systematically different financial conditions, concerned with interest payments and leverage levels, in a set of countries characterized by different financial systems, such as France, Italy, Spain and the UK. For those who refuse to accept the far-fetched Modigliani-Miller theorem as evidence, this hints at the possible irrelevance of finance below the rationing constraints.

The absence of a solid relationship between profitability and growth is verified in different financial and organizational set-ups and militates against the idea that profits, through investments, feed growth. Selection seems instead to occur within firms, under different operational channels (for instance the replacement of older production processes by improved ones).

Further evidence related to entrepreneurial finance is consistent with the above insights. In stock market segments catering to small caps, IPO companies are assisted by specialized financial intermediaries, called nominated advisers or sponsors, who act as gatekeepers and regulators of the listed companies (see also Revest and Sapio 2013b, 2014; Hornok 2014; Posner 2009). Deregulating the listing process is supposed to magnify the role of markets in selecting between companies. Yet, since Pagano *et al*. (1998), it is rather clear that capital raising is not the main reason behind the decision to go public (see also Brau and Fawcett, 2006). Comparing listed and unlisted US companies, Asker *et al*. (2015) show that listed firms invest less than their privately-held counterparts, and their investments are less sensitive to growth opportunities. Revest and Sapio (2013a) reveal that a "junior" stock market in the London Stock Exchange group (i.e. the AIM) tends to attract companies with higher-than-average growth in operating revenues and assets, and has nurtured the growth of employees of its listed companies; but such growth has not translated into superior value added growth, causing listed companies to underperform in productivity terms. It appears that even when markets pick relatively promising companies, the post-IPO real performance – and the associated learning – can be disappointing.

Reliance on specialized investors catering to startups, such as venture capitalists, apparently has not improved the quality of market selection. One of the defining features of venture capital (VC) is its claimed provision of advice in strategic decision-making, as well as in technological synergies and business contacts and in recruiting key employees (Hellmann and Puri, 2002; Dushnitsky, 2006; Ernst *et al*., 2005; Maula *et al*., 2005). The diffusion of VC is highly asymmetric across financial systems, with market-oriented systems such as the US and UK playing the lion's role, as shown by Revest and Sapio (2012) and the references therein. However, VC can also flourish in systems more inclined to foster learning if VC plays a *coach* function, while at the same time VC funding can have a positive effect on firm growth due to VC acting as a *scout*, which would be more likely in systems

favoring selective pressure. The evidence so far is mixed. In a sample of companies listed on the Euro.NM circuit, Bottazzi and Da Rin (2002) failed to find any significant effect from venture capital funds on employment and sales growth, despite controlling for endogeneity and unobserved heterogeneity. Research by Baum and Silverman (2004) in Canada (a market-based system), and by Colombo and Grilli (2010) and Bertoni *et al*. (2011) in Italy (a credit-based system), show that real performance in venture-backed firms is mainly guided by learning efforts, as they provide evidence that venture capitalists perform essentially a coaching function. According to Engel and Keilbach (2007), German venture-backed firms display faster employment growth than their non-venture-backed peers after controlling for endogeneity, showing that venture capitalists are both coaches and scouts. The quantile regression estimates by Audretsch and Lehmann (2004) on German companies listed on the Neuer Markt reveal that venture capital improves the growth performance for average firms, but not for fast growers.

It is also worthwhile recalling that with dispersed shareholding, even a financial system centered on equity may prove less transparent than a credit-based system to outside investors (Bhide 1993), notwithstanding the formally stronger investor protection offered in the Anglo-Saxon legal frameworks. But then, what selects across firms? The most enticing conjecture, in our view, is that product market selection across firms is there but operates with a lot of noise and relatively weakly, especially when firms are diversified and operate on different markets (more in Dosi *et al*., 2015). Conversely, in market-based, though also increasingly in (ex?) credit-based systems, financial markets may perform fast and deep, however this is according to criteria that are not correlated or even anti-correlated with the performance of firms in terms of growth (and innovation). And this is matched by strategies followed by non-financial firms in order to seek quick returns, no matter the long-term consequences (see Section 3).

2.4 Patenting for finance

One instance of how corporate strategies have shifted their focus from product to financial markets comes from the literature on patents. Firm-level empirical studies dealing with the impact of finance on innovation have multiplied in recent years (see for instance Aghion *et al*., 2013; Chava *et al*., 2013; Ferreira *et al*., 2014), often measuring innovation as the number of patents or the number of patent citations (see also Mann, 2015 and for a review Kerr and Nanda, 2014). Some of the results from this literature are interpreted as supporting the superiority of market-based systems in fostering innovation (Hsu *et al*., 2014). Importantly, though, the literature on Intellectual Property Rights has demonstrated the strategic use of patent applications, at times even highlighting harmful effects from the proliferation of patents, such as the "patent thicket" phenomena (Shapiro, 2001), amplifying *anti-commons dynamics* (Heller and Eisenberg, 1998; see also the analysis in Levin *et al*., 1987; Dosi and Stiglitz, 2014).

Patents may be a revealing, albeit noisy, proxy for product market innovation, but they can also be a part of a "signaling strategy" for the financial markets, irrespectively of the intrinsic innovative value of patents themselves. Several recent studies deserve to be mentioned in this respect as they provide insights to the "ultimate" role of patents. Recent results tend to show that patents are increasingly used as debt collateral in large companies (Mann, 2015; see also Hochberg *et al*., 2014). Since 2003, 16% of the aggregate stock of patents at the USPTO has been pledged as collateral, while companies with patent-backed debt have performed over 40% of USPTO patenting (Mann, 2015). Firms with significant patent activity tend to receive cheaper bank loans than peers (Chava *et al*., 2013). Another dimension of the story points towards the interactions between patents and stock market valuation. Bernstein (2015) examined the impact on innovative firms of being listed on the Nasdaq[2]. He found that the number of patents filed declined after the Nasdaq IPO (compared with otherwise similar private firms). Together, there is a sizable decline of about 40% in innovation novelty, measured by patent citations. In addition, newly listed firms are often faced with the departure of the most competent inventors and with a decline in the productivity of the investors that stay. Finally, listed firms engage more easily in external innovation than privately-held firms, acquiring a substantial number of patents through M&A. These results suggest that the already weaken form of financialization implied by "going public" has an effect - and a negative one indeed - on innovative efforts. While Bernstein (2015) interprets this as evidence of agency costs and the related managerial incentives, in our view this evidence thoroughly illustrates the strategic use of patents to achieve a Nasdaq listing. It is quite remarkable that credit-based economies witness very similar phenomena when market-based institutions are imported. Engel and Keilbach (2007) found that venture capital funding did not enhance post-investment innovativeness in a sample of German firms, essentially because venture capital is more likely to flow to companies with higher ex-ante patent counts.

Interestingly, results in Benfratello *et al*. (2008) on Italian firms prove that innovation can be supported by credit-based systems as well. Relying on firm-level data over the 1990s, the authors underline a positive and significant effect of banking development on the probability that local firms introduce process or product innovation. This effect is more sizable for small firms and for firms in high-tech sectors.

2.5 Finance might matter less matters for industrial dynamics than real factors, but…

Overall, the foregoing empirical results make it hard to discriminate among financial systems with regards to their Schumpeterian efficiency.

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[2] The study covers the period 1983-2006/2009.

Let us start by remarking that a good deal of the expansion activities of incumbent firms is financed via retained cash flows (as shown by Fazzari *et al*., 1988, Fazzari and Petersen, 1993 and follow-ups),[3] and thus are most often R&D activities, even in the US (Hall *et al*., 1998; Brown *et al*., 2009; Brown and Petersen, 2009; see also Hall, 2002 for a review). Consequently, on average, the institutional features of the financial system and the associated advantages and disadvantages of different forms of financing matter little in investment and R&D decisions. Moreover, on average, real factors are also significant drivers of firm growth and firm defaults. So, productivity differentials are an important (though not overwhelming) determinant of differential output growth (cf. Bottazzi *et al*., 2010 and Dosi *et al*., 2015).

Furthermore, as Bottazzi *et al*. (2011) show, when firm default models are made to include both financial variables and real predictors, including productivity, profitability, size and growth variables, one finds, in the case of Italian limited liability manufacturing companies, that defaulting firms are on average more financially exposed, but that they are also less productive and less profitable in all the years before the default occurs. Conversely, higher levels of productivity and profitability reduce the probability of default.

However, in evolutionary worlds, the tails distributions are crucial, and on the tail finance is quite important, both on the good and bad sides. As already mentioned in Section 2.2, a fringe group of "good" well-performing firms is led to bankruptcy due to primarily financial reasons. Moreover, it is the tail of young (and thus generally smaller) firms which are affected by the challenge of getting financed. This has been partly overcome, especially in the last three decades, by resorting to equity finance both in market-based countries (US, UK) and in credit-based ones (Germany), and partly through an increasing institutional variety labelled as "entrepreneurial finance", which includes venture capital, private equity, business angels and crowdfunding (Mina and Lahr, 2015). In any event, the preference for equity over loans does not seem to be a foundational feature of market-based systems. As Berger and Udell (1998) suggest, the prioritized financing that is adopted depends on industry-specific or firm-specific traits, such as experience and collateralizable assets. Moreover, the reliance on equity vs. debt says nothing about the "patience" of the financial investment which, as we shall discuss below, is crucial in shaping the rates and directions of innovative research.

3. Financialization in general, and the Maximising Shareholder Value (MSV) principle, in particular

Since the 1980s, economies have undergone a process commonly known as financialization, revealed at a very first approximation by the rapid explosion of finance in comparison with all real

[3] See also the debate between Kaplan and Zingales (1997, 2000) and Fazzari *et al*. (2000), as well as the review in Whited (2006).

sectors of the economy, alarmingly similar to the spread of a tumor. The financialization process is evidence of "the increasing role of financial motives, financial markets, financial actors and financial institutions" (Epstein, 2005, p.3). Financialization has also been defined in the literature as a "pattern of accumulation in which profits accrue primarily through financial channels, then through trade and commodity production" (Krippner, 2005, p.174), as well as being viewed as a change to the regime of profit accumulation that signals the transition from managerial capitalism to investor capitalism (Boyer, 2000 and 2005; Foster, 2007; Guttmann, 2015; among others).

Although there is increasing evidence that financialization has affected the economy at various levels (expansion of the financial industry, new corporate strategies, new employee compensation schemes), two important issues remain under-explored: i) has financialization transformed the relationships between finance, innovation and growth, and through which channels? And ii) has financialization altered the properties of the two financial system archetypes, credit-based versus market-based, and by what specific means? While our aim is not to offer a wholly definitive answer to these questions, we will however go on to review some facets of the financialization process, and then follow with a discussion on the so-called principle of "maximizing shareholder value" which thoroughly illustrates the impact of financialization on firm-level innovative behavior.

3.1 Financialization patterns

The term "financialization" has several meanings, depending on the level of analysis and the financial mechanism being examined (see Krippner, 2005 and Van der Zwan, 2014 for reviews).

Broadly speaking, financialization can be linked to the increasing economic and political power of a particular class, the "rentiers", sustaining "the equity culture" as documented by Dore (2008), i.e. the active promotion of equity ownership by governments that started in the Anglo-Saxon economies of the 1980s. The ideology supporting such institutional transformation was and still is based on the idea that stock market liquidity and capitalization stimulate innovation and economic growth. A concurrent theoretical support, reinforcing the above, can be traced back to developments in a branch of finance theory, offering a set of sophisticated tools for the valuation of financial assets, notwithstanding their occasional disastrous results well before the 2008 crisis (cf. regarding the Black-Scholes model, MacKenzie and Millo, 2003).

Financialization has left its mark not only on Anglo-Saxon countries but also in other countries where norms, rules and tools typical of market-based systems have been increasingly transplanted (see e.g. Vitols, 2005 on Germany; Campbell and Pedersen, 2007 on Denmark; Jackson and Miyajima, 2007 on Japan). Financial innovation has come in the form of new financial instruments (e.g. increasingly complex derivatives) and new trading venues (such as the multilateral trading facilities instituted by the MiFID directive in the European Union), fostered by innovations in ICT that enable, for example, high-frequency finance. Among financial innovations, securitization

appears to be a striking phenomenon that has also played a major role in the financial crisis of 2008 (see for instance Davis and Kim 2015). "Securitization has notably changed the nature of the relationship between the lender and the borrower, shifting debt from a concrete relationship with an entity (a bank) to an abstract connection with the financial market" (*ibid*, p. 12). This process has occurred alongside an expansion in trading volumes, most prominently in unregulated – and thus opaque – segments, as attested by the expansion of over-the-counter (OTC) trading that amounted to $197 trillion in 2004 and increased to $516 trillion by June 2007 (Dore, 2008).

Simultaneously, the proportion of financial assets, stock equities or mutual funds held by households expanded significantly (Keister, 2005; Fligstein and Goldstein, 2015). In the USA, since the 1980s the increasing involvement of households in stock market trading, either directly or through the intermediation of mutual funds, has been actively promoted (Davis 2008), accompanied by specific measures such as tax deductions for non-listed equity or by the shift from defined benefit to defined contribution pensions (such as 401k plans; see Hacker, 2004). As Van der Zwan (2014) put it, this is the financialization of everyday life[4]. Together, the proportion of profits earned by financial corporations as a total has skyrocketed. In the USA, it was well below 10% in the 1950s, only to reach around 45% in the period immediately preceding the 2008 crisis. Not surprisingly, in recent years the financial industry appears to be the most profitable industry in the US (Kaplan and Rauh, 2010; Philippon and Reshef, 2013).

More closely related to our research aims, and to the above mentioned change in the balance of power, financialization seems to have hampered Schumpeterian efficiency, primarily by influencing the strategies of large firms (for empirical studies see Mazzucato and Tancioni, 2012; Leaver and Montalban, 2010; Lazonick and Sakinç, 2010; among others), whose governance has increasingly embodied the so-called principle of Maximizing Shareholder Value (MSV), ousting other stakeholders from the decision-making processes of large corporations.

3.2 The growing influence of the MSV principle

Currently, several mechanisms interact in the financialization of large firms. Mergers and acquisitions have multiplied since the 1980s (Fligstein, 1993), as well as downsizing and sell-offs, driven by the adage that « the whole was worth less than the sum of the parts » (Davis and Kim, 2015, p. 12). During the same period, in the USA it became easier for external investors to execute takeovers because of less stringent antitrust guidelines, as well as changes in the anti-acquisition laws and financial innovations, leading to a frantic market for corporate control (Davis and Stout, 1992).

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[4] Financialization seems to have also helped the stratification of the US population (Fligstein and Goldstein, 2015) with the upper-middle class active on the financial market in order to maintain a certain life style, and the lower class increasingly hooked on borrowing.

In 1982, American corporations obtained the right to repurchase their own stocks, with disastrous consequences for the use of profits diverted from investment and research uses (Lazonick, 2007; Lazonick and Mazzucato, 2013). In addition, favorable corporate tax deductibility regimes fostered the use of stock options in executive compensation, that in turn boosted the value of the shares. Hence, corporate executives were motivated to manipulate stock prices in order to increase their compensations (Diprete *et al*., 2010; Zheng and Zhou, 2012). As a general trend, financialization has been characterized by a tremendous increase in financial pay-out ratios, in the form of interest payments, dividend payments and stock buybacks (Lazonick and O'Sullivan, 2000). This tendency is labelled by the authors as a shift from "a retain and reinvest strategy" to a "downsize and distribute strategy".

The financialization of corporations goes together with the emergence of shareholder value as the main guiding principle for corporate behaviors. The MSV philosophy became dominant in the 1980s and, putting shareholders at the center of the corporate scene, it was theoretically grounded in Agency Theory *à la* Fama and Jensen (for discussions, see Lazonick and O'Sullivan, 2000; Boyer, 2005; Dobbin and Jung, 2010; among others). As it stands, from this perspective corporate efficiency is indeed equivalent to MSV (Fligstein and Shin, 2007) – needless to say, within the conditions of informationally efficient markets. In such a world, maximizing the value of the firm and protecting investors would be considered the best ways to improve social welfare. Operationally, the MSV principle has also generated particular business practices through the introduction of specific financial performance indicators, such as the return on equity ratio, or the adoption of international accounting standards (see for instance Widmer, 2011).

A crucial issue is related to the impact of the MSV principle on the real economy, especially on firm-level innovative efforts. The growing attention granted to the MSV has influenced industrial organization, the internal organization of firms and their strategies, often at the expense of growth, innovation, and employment. And evidence on the matter has emerged from both sociological and economic studies.

Firstly, several scholars have pointed to the increase in financial portfolio components of non-financial corporations since the 1980s (cf. from the more sociological camp, Krippner, 2005; Epstein and Jayadev, 2005; Tomaskovic-Devey *et al*., 2015). This increase is a consequence of redirecting profits from production toward financial investments (Davis and Kim 2015). The peculiarity of the financialized corporation, indeed, is that financial gains are not re-invested in productive facilities, but distributed to shareholders, through dividend payouts and share buy-backs (Lazonick and O'Sullivan, 2000; Lazonick, 2010).

Secondly, firm-level case studies have shown that, during the late 1990s, top executives of major US high-tech corporations supported the speculative strategies of investors, transforming market speculation into capital gains through stock options (Lazonick, 2007). Carpenter, Lazonick and O'Sullivan (2003) have also demonstrated the extent to which the use of stock-based compensation

made companies vulnerable during the crisis (in their case study they consider the Internet bubble). Several studies have focused on the pharmaceutical sector. As Mazzucato and Tancioni (2012) have shown, pharmaceutical companies that invest more heavily in technology turn out to experience more stock return volatility. This comes as an additional justification for diverting resources towards purely financial investments, to the detriment of innovation. In the same sector, Leaver and Montalban (2010) illustrate how Sanofi, the French pharmaceutical company, has in recent years used the stock market in order to perform revenue consolidation, distribution and repatriation. Pisano (2006) emphasizes the unprofitability of the US biotechnology industry throughout its recent history, even though it received large amounts of financial resources (including private and public equity, and R&D contracts). The "Pisano Puzzle" has been interpreted through the role of speculative behaviors on stock markets, especially on the Nasdaq (Lazonick and Tulum, 2011). In the USA, both biotech firms and large pharmaceutical corporations have received huge amounts of government funding through the National Institute of Health (NIH), yet stock market speculation has disconnected the financial resources from their main purpose: innovation. Lazonick and Sakinç (2010) reveal that pharmaceutical firms may remain listed on the Nasdaq for years, raising huge amounts of capital through IPO and seasoned equity offers, without generating new products, while also providing external R&D services.

The negative influence of the MSV principle on innovative practices has been recently interpreted as a tension between creation and extraction in the innovation processes. The increasing separation between actors who take risks and actors receiving the rents from innovation lies behind such tension (Lazonick and Mazzucato, 2013). On the value-creation side, "the collective character of the innovation process makes it difficult to measure the contribution of different actors to it, as their contributions are intertwined" (*ibid*, p. 9), while it is much easier to appropriate value at the end of the process. Complex compensation mechanisms are devised in order to extract value, prominently involving buy-backs (outside the pharmaceutical industry, see Lazonick, 2007 on Microsoft). A highly complementary dynamic is concerned with the development of private equity, a hallmark of a market-oriented financial system. This is visible in the work of Froud and Williams (2007) who interpret private equity as "a rearrangement of claims which allow value capture and value creation for a small number of principals (private equity principals and senior managers)". In a way, private equity helps to institutionalize and normalize value extraction (see also Erturk *et al*., 2010).

One of the key issues concerns the identity of the actors extracting value and the reasons behind their success. According to Lazonick and Mazzucato (2013), actors are highly diversified and can include managers, venture capitalists, bankers and hedge fund managers. These actors rely on the MSV principle: if they take the risk, they should receive a satisficing return on their investments. They act through different modes, such as lobbying behaviors on political decision-makers, in order to access special grants. For instance, they use insider control over speculative stocks and other mechanisms such as stock-based compensation, legal manipulation of the stock market through stock buybacks, IPOs and acquisitions.

One method of identifying more precisely at which level and in what way the value extraction occurs, consists of examining the various functions performed by the stock markets. The "theory of the innovative firm" provides a stimulating conceptual framework, throwing light on the distinct and interrelated functions performed by stock markets (Lazonick, 2007). In particular, the cash and compensation functions (and their interactions) appear to create greater opportunities for value extraction. The cash function operates by providing liquidity, in which case the stock market broadens the array of financial sources available to the listed companies. Compensation is concerned with the use of corporate stock as remuneration for employees and managers. Indeed, in the era of financialization, the "cash with compensation" functions appear to have become dominant at the expense of other functions[5].

3.3 Short termism: what is the evidence?

While the financialization process of the non-financial corporation is grounded on the spread of the MSV principle, it is also likely to yield *short termism*, that is the shortening of the horizon over which corporate strategies are planned. Yet, few empirical studies deal with this subject. Short termism has at least two dimensions, firstly investor short termism, which has been extensively underlined by the literature on financialization, and secondly managerial short termism. Regarding the latter, the vast majority of top executives recognize, in surveys, that they are ready to cut or delay investment to meet short term targets in the same quarter. 80% of survey participants in Graham *et al*. (2006) would decrease discretionary spending to meet an earning target. Meeting and beating earning benchmarks are clearly very important to CEOs. In other words, companies sacrifice long-term value in response to intense pressure from the market. Furthermore, managers who wish to leave the firm tend to be interested by an increase in the stock price as a favorable signal on the job market for executives.

While it is frequently claimed that managers are myopic, not a lot of research has been done on the subject. Edmans *et al*. (2013) find that managerial short termism leads to a reduction in real investments, including R&D, capital expenditures and advertising expenses. To measure managerial short termism, the authors used the price sensitivity of equity vesting[6] over the upcoming year[7]. R&D

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[5] The other functions performed by the market are creation, control, and combination. Creation indicates the ability of the stock market to encourage the flow of financial resources into new firm formation by providing a promise of liquidity at a later point in time. Control refers to the fact that, by affecting ownership, the stock market exerts an influence on the relationship between corporate owners and the managerial staff. Relatedly, combination concerns the property of corporate stock as currency in the transfers of the strategic control of firms, as in mergers and acquisitions.

[6] Vesting is the process by which an employee with a stock option becomes entitled to the benefits of ownership. The vesting schedule determines when an employee acquires full ownership (usually 3 to 5 years in the USA). During the vesting period the employee cannot sell or transfer stock or options.

is shown to be negatively associated with the price sensitivity of stocks and options that vest over the same year. Vesting equity increases the CEO stock price concerns, but it is not correlated with investment opportunities. For their part, Ladika and Sautner (2015) show that the new US accountant regulation FAR 123R encourages firms to accelerate the vesting period of option grants and such vesting leads to a reduction in capital expenditure. Generally, when vesting periods are short, the probability that executives will try and boost short-term performance is higher[8].

One attempt to establish a connection between financialization, short termism and real investment decisions of firms has been proposed by Orhaganzi (2008) in a study on US firms between 1973 and 2003, which shows that increased financialization affects real investments of non-financial corporations. The effects involve two channels. First, high financial profit opportunities lead to higher financial investments that tend to crowd out real investments and modify managerial incentives. Second, the pressure to increase financial payout ratios (interest payments, dividend payments and stock buybacks) results in lower levels of 'real' investment[9]. In both cases, increased payout ratios and increased financial investments contribute towards shortening the planning horizon of non-financial firms.

Certainly, more research is needed on the subject, going back also to direct measures of *payback* periods, according to which firms decide to undertake (or not) their investments in fixed capital and R&D projects. An early example is found in Mansfield (1988), whose comparative study of R&D in Japan and the USA sheds light on the shorter payback period for Japanese product and process innovations based on external technology.

3.4 Different archetypes do not match the historical evidence regarding investor protection

One major tenet of the MSV, emphasized within Law and Finance literature, is the necessity to protect investors in order to stimulate financial development (La Porta *et al*. 1997; 2000). However, comparative business and institutional history is at odds with such a notion.

Business historians show that in the past, the absence of laws offering investor protection did not impede the emergence and growth of stock markets (Mayer, 2008; Musacchio and Turner, 2013)[10].

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[7]The sensitivity is determined by equity grants made several years before and not linked to current investment opportunities.

[8] Recent empirical studies analyze the impact of short termism on innovation through patent data, but with the limitations of patents as innovation indicators that we have already mentioned (see Gao *et al*., 2014)

[9] The negative effect of increased financial payout ratios is more pronounced for large firms.

[10] See Business History (2013), "Special Issue on Law and Finance: A Business History Perspective", coordinated by Musacchio and Turner.

During the first half of the 20th century, the UK operated a large and dynamic stock market without legal investor protection, and with an already sizable number of acquisitions (Franks *et al*., 2009). UK firms were very active in terms of acquisitions, and while they issued new shares to acquire other firms, they diluted the shareholding of the directors and the founders. Additionally, even without investor protection, insider trading in the UK stock markets was very moderate, and the separation of ownership from control did not harm shareholders (Campbell and Turner, 2011; Braggion and Moore, 2013; Foreman-Peck and Hannah, 2013).

In Germany, at the beginning of the 20th century, the new equity issuance was largely invested in shares taken from other firms, but not in the form of firm acquisitions (Franks *et al*., 2006). Concentration of ownership did not decline, because banks maintained a large weight in the capital of the companies listed on the stock market. Equity finance was intermediated at this period in Germany, both by companies and banks. Another illustration is that of Japan. In the early 20th century, the Japanese stock markets were characterized by high ownership dispersion. Later, under the influence of the United States and following World War II, the legal framework was transformed to represent tougher protection of investor rights (Franks *et al*., 2014). Nevertheless, at the same time banks and companies had preserved cross shareholdings, which rose up against a regulation that strongly favored dispersed ownership.

Overall, Mayer (2008) concluded that at the beginning of the 20th century the development of various stock markets was not stimulated by investor protection, but by institutional set-ups including well-structured boards and, above all, trust relationships. In turn, trust was facilitated by the proximity between investors and directors (Musacchio and Turner, 2013; Braggion and Moore, 2013; Cheffin *et al*., 2013). In the UK, local stock markets and local investors were at the very center of supporting trust and encouraging the growth of the market, while in Germany banks holding capital shares were playing a substantial intermediary role. In Japan, stock market trading relied on respected and prominent members from the business community (business coordinators) and the Zaibatsu families.

Throughout the history of stock markets, the evidence teaches us that the centrality of investors and investor protection has presented neither necessary nor sufficient conditions for the mobilization of financial resources for corporate growth.

Conclusion: some assessments regarding the evolutionary properties of the current financial system

Within this research, we have tried to assess the solidity of certain propositions concerned with the evolutionary properties of different financial regimes, put forward by Dosi (1990), in light of the

last 25 years of financial innovation and institutional reform. Indeed, as it turns out these propositions tend to be more controversial than first believed.

First: *"The more a system is 'market-based', the more it will increase environmental selection".* This proposition appears to be less the case than once thought at the time, or rather, in other words, market selection is highly imperfect even in market-based systems. The empirical micro evidence, unavailable at the time, suggests that irrespective of financial regimes, "learning" dominates "selection" as a determinant of firm growth. Moreover, due to the process of financialization, financial markets may have become more significant than product markets as "selectors" among companies, however if they are, they do so along criteria based on short-term returns. All of this deteriorates both static and Schumpeterian efficiency, an insight that is now palatable by even mainstream economists, and even more so after the last financial crisis.

Second: *"Market-based systems seem to be more conducive to the exploration of new technological paradigms"*. The empirical evidence produced over the last few decades suggests that the radical nature of innovation changes more across industries than across financial systems. In addition, it would appear that innovation outcomes, such as patents, are increasingly conceived as strategic weapons to access financial markets, somewhat reverting the expected causality channel. More generally, there appears to be a disconnection between the determinants of innovation and growth, on one hand, and firm performance on the financial markets, on the other. As argued by Mazzucato (2013) and Lazonick and Mazzucato (2013), value extraction behaviors on stock markets negatively influence the exploration of new technological paradigms, and even research within known paradigms. There is "in modern capitalist economies, an increasing separation between those economic actors that take the risk of investing in innovation and those who reap the rewards from innovation" (*ibid*, p.2). The dominance of the Maximization of Shareholder Value philosophy offers a general blessing to the value extraction process. In addition, short-termist behaviors make the situation worse, because the very nature of the innovation process "creates a time lag between the bearing of risk and the generation of returns" (*ibid*, p. 9).

Third: *"The more knowledge is asymmetric, appropriable and scarce, the more institutionalized processes of finance allocation will be conducive to evolutionary viability*". Historical evidence suggests that in relation to financing innovation and sustaining growth, the distinction between the two archetypes is not so clear-cut. Conversely, the financialization process has contributed towards compressing and somewhat degrading the specific properties of the finance-innovation nexus in both financial systems.

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