

Working Paper

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 would be comparatively more engaged in the exploration of new technological paradigms, as an outcome of market selective pressure, whereas the more institutionalized finance allocation in credit-based systems would give them an advantage in 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 de-linked 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, along criteria of short-term returns. As such, financialization has contributed to compress and somewhat degrade the specific properties of the finance-innovation nexus of both financial system archetypes, deteriorating both static and Schumpeterian efficiency.

Keywords: Evolutionary Theory, Financial Systems, Firm growth, Innovation, Financialization.

JEL: B52, G2, G3, L2, O3

Résumé:

Selon la taxonomie évolutionniste des systèmes financiers proposée par Dosi (1990), les systèmes fondés sur les marchés seraient comparativement plus enclins à l'exploration de nouveaux paradigmes technologiques, résultant de la sélection par le marché, alors que les systèmes fondés sur le crédit apporteraient un avantage en termes d'apprentissage cumulatif. Cet article offre une réflexion préliminaire sur ces conjonctures à la lumière des changements institutionnels incarnés par la financiarisation et le principe de la « Maximisation de la Valeur Actionnariale ». L'empirie suggère que la financiarisation a désolidarisé les performances des entreprises sur les marchés financiers des déterminants de l'innovation et de la croissance. La sélection parmi les entreprises se produit davantage sur les marchés financiers selon des critères de rendements de court terme. Ainsi la financiarisation a contribué à altérer et dégrader les propriétés spécifiques du nexus finance-innovation dans les deux archétypes de systèmes financiers, détériorant en même temps l'efficacité statique et évolutionniste.

Mots clés: Théorie Evolutionniste, Systèmes financiers, Firmes, Innovation, Financiarisation

JEL: B52, G2, G3, L2, O3

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Introduction

Innovation concerns processes of learning and discovery about new products, new production and new forms of economic organization. In turn, search efforts by business firms are shaped also by the rates and criteria by which financial markets and financial institutions allocate resources to enterprises themselves. Yet, we still do not know much 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 the age of the innovative firm, as well as the sector and the stage of the life cycle of an industry.

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 not much attention to the institutional details (see for instance Levine, 2003), there is indeed an older literature which tries to identify “ideal types” in terms of 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” versus “credit-based” systems.

We discuss some implications in terms of innovation and evolutionary dynamics of the two systems in 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 in different historical experiences, we also conjectured that the credit-based system might have been more conducive to cumulative learning, while market-based systems might have fitted more the exploration of new technological paradigms.

Yet, 25 years after, financial systems have undergone major transformations, that go 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 recalls the results and conjectures presented in Dosi (1990), centered on an “evolutionary taxonomy” of the two financial archetypes and on their comparative dynamic properties. The second section reviews the evidence on the role of finance in driving industry-level and firm-level innovation and growth. In Section 3 we explore the financialization process and its spread from the

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Anglo-Saxon world also to economies which have been historically nearer the “credit-based” archetype. Finally, Section 4 concludes.

1. The evolutionary properties of different financial systems

In Dosi (1990), one revisited the old question: “Do financial institutions matter in terms of levels and changes in real aggregate variables?” There are complementary sides to the answer. One is more macro and concerns the role of specific financial institutions, or lack thereof, stimulating or impeding long-term economic development (the question dates back at least to Kindleberger, 1984). The other side of the answer regards the modes through which industrial growth is financed. In this respect, Rybczynski (1974) proposed, as mentioned, a taxonomy which differentiates “market-based” systems from “credit-based” systems. In the first system, with the USA and UK as prime examples, corporate growth is more frequently financed through traded shares and retained profits. In the second archetype, which points to 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 suggested to be relatively more important sources of corporate financing. In turn, the particular forms of ownership and finance are likely to affect the microeconomic patterns of production, investment and search and, ultimately, performance outcomes, even when firms face the same set of economic incentives.

1.1 The evolutionary taxonomy of financial systems

For the most orthodox part of the literature, real aggregate dynamics is 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 is just influenced by the exogenous dynamics of the economic fundamentals. Yet, it is sufficient to relax the assumption of perfect information, to show that specific institutions matter in that they convey information, generate incentives and guide the allocation of resources. This entails some consequences: (i) incentives, allocations, and performances rest on the institutional set-up of each system; (ii) equilibria depend on the specific information flows and on the beliefs of agents, and may yield Pareto dominated allocations with resource rationing and absence of market clearing; (iii) learning processes generally engender non-convexities, multiplicity or even non-existence of equilibria.

The monumental work by Stiglitz and Greenwald (2014) amply discusses these ubiquitous properties, which, just more so, apply to evolutionary environments, whereby previously unknown states of the world are themselves the result of the innovative activities of the 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 on the grounds of what they already know or believe to know, make

mistakes, obtain 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 as self-organizing collective properties of 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 outcomes of the different balances between, and modes of such processes. And finance of course matters in so far as it affects firms' learning patterns, the allocation of resources to different organizations carrying different technologies and strategies, and different 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 into the efficiency of the selection rules used by financial investors. It could well be that departures from criteria of efficiency based upon past and present environments might 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 turn out to be fitter in that future environment). In other words, there exist trade-offs 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 will probably fall between two extreme scenarios whereby in one, the technological winner today would be with probability one also the winner of tomorrow, and in the other, today's winners are going to be for sure tomorrow 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 gamble on unexplored opportunities on the other side.

In Dosi (1990), one explored the two "market-based" and "credit-based" archetypes of financial systems in such an 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 possibility 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 might involve specific competencies, especially in credit-based systems, wherein learning is going to be relatively more important than selection. On the other side, market-based systems seem to lead more easily to the exploration of new technological paradigms, under the important caveats that innovative opportunities must be high and innovative capabilities must be quite diffused throughout the economy.

No matter in which system, long-term dynamism requires the persistent exploration of new potential paradigms and new technological trajectories. In some market-led systems, allocation of resources to innovative search have become institutionally disconnected from the “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 competences of "specialized investors", and reduces uncertainty by spreading risks over investment portfolios. In credit-based countries, the financing channel historically has been much less split up. Banks have been important for both processes of support to the growth and learning of incumbents and exploration by new entrants. Moreover, in countries like Japan the exploration of new products, processes, and organizational arrangements has been historically inbuilt within the *dynamic capabilities* of large established companies.

Note also that whatever the nature of the financial system (whether nearer the idealized credit-based system or the pure market-based system), a great part of business-performed innovative search has historically gone on (and continues to do so) in established firms. In turn, incumbent firms access external financial resources, when they need it, as whole entities, on the grounds of their global performance, and not with respect to individual projects.

To sum up, and with the foregoing caveats in mind, in a Schumpeterian perspective the differences between the two systems of financial allocation is based on the relative importance of learning versus selection; voice versus exit; discretionary versus non- discretionary allocative rules.

1.2 Dynamic properties

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

- i) The more knowledge is asymmetric, appropriable and scarce, the more institutionalized processes of finance allocation will be conducive to evolutionary viability. Formal bank-industry relationships have historically appeared to be the general case in industrializing countries, which require long-term commitments of resources to the accumulation of technological competences which often in catching-up countries are not there yet.
- 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 on or near the technological frontier.
- iii) Financial institutions in credit-based systems, *in primis* banks, in order to be dynamically viable need not only to be “patient”, but need to acquire a relatively detailed knowledge about the trajectories of progress of individual industries and also about the internal competences and the innovative projects of individual firms.

Table 1 presents some 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).

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

Generally, the “Schumpeterian” implication of 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 bear this conjecture, also in the light of the institutional transformations in the international financial sector? The next section shall review the empirical nexus between finance, innovation, and industrial dynamics, drawing on evidence produced in the last 25 years.

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

Let us begin with 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 the degrees of “financial development”, as done by Levine (1997) and references therein, has been criticized from within the very mainstream camp that generated it. Champonnois (2010) argues that the indicators of 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 to codify 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 allows to increase the efficiency of investments (Rousseau and Wachtel, 2011): on the contrary it may even be harmful, e.g. because 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 the acknowledgment that more developed financial markets are neither a sign of a higher level of development, nor a harbinger of more growth in the future (see also Levine, 2003). Indeed any reasonable observer of the links between financial innovation as “weapon of mass destruction” (Warren Buffett *dixit*) and the 2008 crisis witness that the statement is just non surprising common sense.

Aglietta and Scialom (2010), for instance, illustrate very well how financial innovations have 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, let us move on to assessing the differences in Schumpeterian efficiency, in any, across different archetypes of capitalism and “forms of regulation” (Boyer, 2005).

2.2 Radical innovation across varieties of capitalism

Building upon older approaches in comparative economics and upon the French “Regulation” School – with degrees of acknowledgment - the literature on the “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 along 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 foregoing 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 would indirectly testify to the higher propensity of economies with market-based financial systems to explore new technological paradigms.

Tests of the Hall-Soskice hypothesis 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 is an artifact of including 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). They claimed that LMEs enjoy a comparative advantage in radical innovation is only confirmed in some industries; some CMEs specialize in industries that are in their “radical” life-cycle stage.

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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 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 one can cite quite a few examples of Anglo-Saxon firms having a relation with finance akin 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 need not be 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 in 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 across industrial sectors.

Bottazzi et al. (2006) exploited a financial rating index (ranked according to the expected ability to repay debt) to analyze a dataset of Italian firms in the period 1996-2003. Both very small and very large firm sizes are concentrated within high risk and less solvable firms. The same firms experience much more unstable growth records. While smaller firms are more likely constrained in raising external finance, 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 should profitability and productivity records be. Yet, one finds that badly rated (i.e. potentially credit-constrained) firms need not be 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 positive effects from diversification. A loss reinforcing effect is observed at two levels: on the one hand, firms who are already witnessing a reduction in sales see their performance worsen in the presence of financial constraints. On the other hand, firms experiencing positive growth rates are likely to see their growth potentials depressed if they meet their financial constraints (“pinioning the wings” effect). This evidence is more common across younger firms and results in a net loss in growth opportunities.

It is however illuminating to learn that the same evidence as Bottazzi et al. (2010) is found in countries as diverse as France, Germany, UK, and the USA by Dosi et al. (2015). Market selection forces – as mediated by differential profitabilities - are weak in market-oriented systems (UK, USA) just as 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, concerning 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 not taking it as supporting evidence for the far-fetched Modigliani-Miller theorem, 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 rather to occur within firms, under different operational channels (for instance the replacement of older production processes by better ones).

Further evidence on 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 among companies. Yet, since Pagano et al. (1998), it is rather clear that capital raising is not the main reason behind the going public decision (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, in technological synergies and business contacts, as well as 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 US and UK playing the lion's part, as shown by Revest and Sapio (2012) and references therein. However, VC may flourish in systems more inclined to foster learning if VC plays a *coach* function, while a positive effect of VC funding on firm growth may be due to VC acting as a *scout*, which would be more expected 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 of venture capital funds on employment and sales growth, despite controlling for endogeneity and unobserved heterogeneity. Works by Baum and Silverman (2004) on Canada (a market-based system) and by Colombo and Grilli (2010) and Bertoni et al. (2011) on 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 the average firm, but not for the 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, but increasingly also in (ex?) credit-based systems, financial markets may perform fast and deep, but 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 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 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 shown the strategic use of patent applications, sometimes 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 may be also a part of a “signaling strategy” for the financial markets, irrespectively of the intrinsic innovative value

of patents themselves. Few recent studies deserve to be mentioned in this respect as they provide insights on the “ultimate” role of patents. Recent results tend to show that the latter 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 side of the story refers to the interactions between patents and stock market valuation. Bernstein (2015) examined the impact for innovative firms of being listed on the Nasdaq². 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, the new listed firms are often faced with the departure of the most competent inventors, and with a decline of the productivity of the investors that stay. Finally, the 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 already that weak form of financialization implied by “going public” has an effect - and a negative one indeed - on the innovative efforts. While Bernstein (2015) interprets this as evidence of agency costs and the related managerial incentives, in our view this evidence illustrates very well 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 more likely flows 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. The 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.

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 so are most often R&D activities even in the US (Hall et al., 1998; Brown et al.,

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

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2009; Brown and Petersen, 2009; see also Hall, 2002 for a review). As a consequence, on average, the institutional features of the financial system and the associated advantages and disadvantages of different forms of financing do not matter much in investment and R&D decisions. And, on average, real factors are also significant drivers of firm growth and firm defaults. So, productivity differentials are an important (although not overwhelming) determinant of differential output growth (cf. Bottazzi et al., 2010 and Dosi et al., 2015).

Moreover, 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 they are also less productive and less profitable in all the years before the default occurs. And conversely, higher levels of productivity and profitability reduce the probability of default.

However, in evolutionary worlds, the tails are crucial, and on the tail, finance is quite important, both in the good and in the bad. As already mentioned in Section 2.2, a tail of “good” well-performing firms are led to bankruptcy by 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 met especially in the last three decades by resorting to equity finance both in market-based countries (US, UK) and in credit-based ones (Germany), partly as the outcome of an increasing institutional variety going under the tag “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, which priority of financing is adopted depends on industry-specific or firm-specific traits, such as experience and collateralisable assets. Moreover, the reliance on equity vs. debt does not tell anything about the “patience” of the financial investment, which as we shall discuss below is crucial in shaping the rates and directions of innovative search.

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

Since the 1980s, the economies have undergone a process commonly known as financialization, revealed at a very first approximation by the fast overgrowth of finance as compared to all real sectors of the economy, alarmingly alike the spread of a tumor. The financialization process testifies to “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

See also the debate between Kaplan and Zingales (1997, 2000) and Fazzari et al. (2000), and the review in Whited (2006).

of accumulation in which profits accrue primarily through financial channels, then through trade and commodity production" (Krippner, 2005, p. 174), and as a change in the regime of profit accumulation that signals the transition from managerial capitalism to an investor capitalism (Boyer, 2000; 2005; Foster, 2007; Guttmann, 2015 among others).

Whereas 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? ii) has financialization altered the properties of the two financial system archetypes, credit-based versus market-based, and by what specific means? Without any ambition to offer a full answer to these questions, we first review some facets of the financialization process, and then we discuss the so-called principle of "maximizing shareholder value" which illustrates very well the impact of financialization on firm-level innovative behaviors.

3.1 Financialization patterns

There are several meanings to the term "financialization", depending also on the level of analysis and of the financial mechanism under focus (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, as documented by Dore (2008), "the equity culture", i.e. the active promotion of equity ownership by governments that has started in the Anglo-Saxon economies in the 1980s. The ideology supporting such institutional transformation was and 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 the theory of finance, offering a set of sophisticated tools for the valuation of financial assets, notwithstanding their occasional disastrous results well before the 2008 crisis (cf. on the Black-Scholes model, MacKenzie and Millo, 2003).

Financialization has left its mark not only in 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 innovation in ICT that allows e.g. high-frequency finance. Among financial innovations, securitization appears as a striking phenomenon that has played a major role during 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 gone along with an expansion of trading volumes, most strikingly in unregulated – and thus opaque – segments, as testified by the expansion in over-the-counter (OTC) trading, that amounted to \$197 trillion in 2004 and increased to \$516 trillions 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, 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 in the 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 the recent years the financial industry appears as the most profitable industry in the US (Kaplan and Rauh, 2010; Philippon and Reshef, 2013).

Closer to our research goals, and related 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 decisional 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 off, driven by the adagio 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 has become easier for external investors to execute takeovers because of less stringent antitrust guidelines, changes in the anti-acquisition laws, and financial innovations, leading to a frantic market for corporate control (Davis and Stout, 1992).

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,

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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 life styles, and the lower class increasingly hooked on borrowing.

2007; Lazonick and Mazzucato, 2013). In addition, favorable corporate tax deductibility regimes foster the use of stock options in executive compensation, that in turn boosts the value of the shares. Hence, corporate executives are stimulated 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 the corporation goes together with to the emergence of shareholder value as the main guiding principle of corporate behaviors. The MSV philosophy becomes dominant in the 1980s and puts the shareholders at the center of the corporate scene, 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 known, in that view corporate efficiency is indeed equivalent to MSV (Fligstein and Shin, 2007) - needless to say, under conditions of informationally efficient markets. In such a world, maximizing the value of the firm and protecting the investors are 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 return on equity, or the adoption of international accounting standards (see for instance Widmer, 2011).

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

First, several scholars have pointed at the increase of the 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 has been the 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).

Second, firm-level case studies have shown that, during the late 1990s, top executives of major US high-tech corporations supported the speculative strategies of the investors, transforming market speculation into capital gains through stock options (Lazonick, 2007). Carpenter, Lazonick and O'Sullivan (2003) have also shown the extent to which the use of stock-based compensation made companies vulnerable during the crisis (in the case they consider, the Internet bubble). Several works have focused on the pharmaceutical sector. As shown by Mazzucato and Tancioni (2012),

pharmaceutical companies that invest more heavily in technology turn out to experience more stock return volatility. This comes as an additional justification to diverting resources towards purely financial investments, to the detriment of innovation. In the same sector, Leaver and Montalban (2010) illustrates how Sanofi, the French pharmaceutical company, in recent years has 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, while it has 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, raise huge amounts of capital through IPO and seasoned equity offers, without generating new products, while 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 including buy-backs (outside the pharmaceutical industry, see Lazonick, 2007 on Microsoft). A highly complementary dynamics regards the development of private equity, a hallmark of a market-oriented financial system: see 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).

A key issue 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 include managers, venture capitalists, bankers, and hedge funds 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. They use e.g. insider control over speculative stocks and others mechanisms such as stock-based compensation, legal manipulation of the stock market through stock buybacks, IPOs and acquisitions.

A way to identify more precisely at which level and how the value extraction occurs consists in 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 means that by providing liquidity, the stock market broadens the array of financial sources available to the listed companies. Compensation concerns 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 the 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: investors short termism, which has been extensively underlined by the literature on financialization, and 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.

If it is frequently claimed that managers are myopic, but not much research has been done on the subject. Edmans et al. (2013) find that managerial short termism leads to reduction in real investments, including R&D, capital expenditures, and advertising expenses. The authors used the price sensitivity of equity vesting⁶ over the upcoming year.⁷ R&D is shown to be negatively associated

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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.

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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.

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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 induces 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 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 the managerial incentives. Second, the pressure to increase financial payout ratios (interest payments, dividend payments and stock buybacks) results in lower levels of ‘real’ investment⁹. In both cases, increased payout ratios and increased financial investments contribute to shorten the planning horizon of the non-financial firms.

Certainly, more research is needed on the subject, going back also to direct measures of the *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 shed 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 by 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.

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

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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 already a 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 in other firms, but not under 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 concerns 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 after World War II, the legal framework has been transformed towards a 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 very central to support trust and encourage 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 of the business community (business coordinators) and of the Zaibatsu families.

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

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

In this work, we have tried to assess the solidity of some propositions on the evolutionary properties of different financial regimes, put forward in Dosi (1990), in light of 25 years of financial innovation and institutional reform. Indeed, they turn out to be more controversial than one believed.

First: *“The more a system is ‘market based’, the more it will increase environmental selection”*. This appears to be less the case as one thought at the time or, rather, market selection is

highly imperfect even in market-based systems. The empirical micro evidence, then not available, suggests that irrespectively of financial regimes, “learning” dominates “selection” as a determinant of firm growth. Moreover, due to the financialization process, financial markets might have become more important than product markets as “selectors” among companies, but if they are, they do so along criteria of short term returns. All of this deteriorates both static and Schumpeterian efficiency, an insight that is now palatable even to mainstream economists, and more so after the last financial crisis.

Second: *“Market based system seem to be more conducive to the exploration of new technological paradigms”*. The empirical evidence produced in the last decades suggests that innovation radicality changes more across industries than across financial systems; 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 appear to be a de-link between the determinants of innovation and growth, on the one hand, and the performance of firms on the financial markets. 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 search 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 philosophy of Maximization of Shareholder Value offers the 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 order to finance innovation and sustain growth, the distinction between the two archetypes is not so clearcut. Conversely, the financialization process has contributed to compress and somewhat degrade the specific properties of the finance-innovation nexus in both financial systems.

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