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Inhalt

Abstract

This paper addresses the relationship between technological innovation and the process termed as "financialization". So far, less has been written on the interdependencies between the dynamics of the financial market, patterns of corporate finance and governance on the one hand and company innovation strategies on the other hand. The paper takes up these open questions. It analyses the transformation process of the German industrial innovation system due to the dynamics of financialization in the last decades. The main finding is that because of these dynamics the formerly relatively homogeneous German industrial innovation system shows a growing diversity of different innovation segments. In conclusion, some general insight into the relationship between finance and innovation beyond the German context will be provided. The paper is based on an extensive literature research in the fields of economic sociology and innovation studies, and preliminary findings of an ongoing empirical research project.

Zusammenfassung

Thema des vorliegenden Papiers ist der Zusammenhang zwischen technologischen Innovationen und dem Prozess der als „Finanzialisierung" bezeichnet wird. In der sozialwissenschaftlichen Innovationsforschung finden sich bislang nur wenige Studien, die sich mit den Interdependenzen zwischen der Entwicklung des Finanzmarktes, den vorherrschenden Mustern der Corporate Governance auf der einen Seite und den Innovationsstrategien von Unternehmen auf der anderen Seite befassen. Dieser Zusammenhang wird mit der vorliegenden Argumentation aufgegriffen. Die Analyse richtet auf die Frage, inwieweit sich das deutsche industrielle Innovationssystem unter dem Einfluss des internationalisierten Finanzmarktes in den letzten Dekaden wandelt. Es wird die These formuliert, dass sich auf Grund dieses Einflusses das früher relativ homogene industrielle Innovationssystem Deutschlands einen zunehmend fragmentierten Charakter aufweist und sehr verschiedene Segmente erkennbar werden. Abschließend werden einige konzeptionelle Überlegungen zum Zusammenhang zwischen der Entwicklung des Finanzmarktes und den Verlaufsformen technologischer Innovationen formuliert. Die vorliegenden Befunde basieren auf einer ausführlichen Literaturrecherche und ersten Ergebnissen aus einem laufenden empirischen Forschungsprojekt.

1. Introduction

This paper addresses the change process of the German industrial innovation system caused by the dynamics of global finance termed as "financialization" in social science research (Van der Zwan, 2014). The empirical focus is on the relationship between the dynamics of the financial market, the modes of corporate finance and the course of company innovation strategies. Therefore, it refers to central development factors of capitalist societies, namely the interdependence between the financial market and the courses of technological innovation. The relevance of these factors for societal and economic development had been already theoretically highlighted by Schumpeter in his analysis of the dynamics of capitalism. However, this issue has currently been analyzed only marginally in the social theory debate on the dynamics and transformation of capitalism as well as in innovation research (e.g. O'Sullivan, 2005; Tylecote and Visintin, 2008).

The debate in social sciences emphasizes that the course and the scope of technological innovations correlate with the given social-institutional conditions. This is instructively shown by innovation studies that examine different kinds of innovation systems from the perspective of institution theory. The key idea here is that the different social-institutional arrangements, which vary not only in the different countries but also in sectors and regions, shape the process of technological innovations. In this context, the concept of "national innovation systems" and its many variations has gained particular scientific and political prominence (cf. Lundvall, 1992/2007; Nelson, 1993; Edquist, 2005). The comparative capitalism literature, in particular the Varieties of Capitalism concept, argues in a similar way. This research points to the significance of institutional factors such as the scientific system, the educational system and the labor market, industrial relations and the financial sector, which in the interplay with the structures and strategies of relevant organizations (in particular of enterprises) shape the focus areas and process of innovation (e.g. Hollingsworth, 2000; Hall and Soskice, 2001; Whitley, 2007; Hancké, 2009; Werle, 2012; Allen, 2013)

These studies reveal the interplay of all of the institutional factors that shapes an innovation system and the therein embedded corporate strategies. Furthermore, the literature points to the fact that the financial market must be regarded as a fundamental structural condition of the capitalist method of production and innovation, inasmuch as it is here that decisions are made on capital allocation to enterprises. As is shown also by the comparative capitalism literature (e.g. Hall and Soskice 2001; Tylecote and Visintin, 2008), the different conditions

of the financial market decisively shape "the logic of the whole political economy" (Lane, 2003, p. 80). More specifically, the different financial market conditions correlate with different forms of corporate financing, specific patterns of the system of corporate governance as well as divergent latitudes for enterprise strategies.

However, less has been written on the interdependencies between the patterns of corporate finance and governance and company innovation strategies: Only the international comparative studies of Andrew Tylecote, Paulina Ramirez *et al.* (e.g. Tylecote and Conesa, 1999; Tylecote and Ramirez, 2006) have to be mentioned in this context. In a broadly based study Tylecote and Visintin (2008) examine how systems of corporate governance and finance vary in different nations and how these variations affect the technological performances of these nations. This international comparative analysis provides some insights into current trends and future prospects of the divergent systems. Lazonick (Lazonick and O'Sullivan, 1996; Lazonick, 2003/2007) delve into the connection between the (likewise) financial market conditions of the US and the structural characteristics of innovative enterprises particularly with regard to innovations in high-tech sectors. This author explicitly formulated the hypothesis that the internationally more and more dominating American shareholder-oriented financial market conditions retard rather than promote innovations.

This hypothesis can be linked with the current debate on the recent dynamics and transformation of capitalism conceptually termed as the emergence of "Financial Market Capitalism" as a new production regime (Windolf, 2005) and, in a broader perspective, "financialization" of a whole society (Van der Zwan, 2014). Only very hypothetically some scholars refer to the consequences of the new financially oriented guiding principles of corporate strategies summarized in the strategic concept of shareholder value and the increased financial orientation of non-financial corporations (ibid, p. 107). They argue that this strategic concept with its dominating principles as short termism, shareholder orientation, high yield returns and performance-based executive compensation undermines and restricts company innovation activities. Doubts are highlighted if these criteria shape the right conditions to stimulate long term growth and innovation. It is argued that successful innovation projects rely on the costly and time consuming freedom for generating ideas, mutual learning and sufficient time to deal with failures. Company innovation strategies are uncertain regarding their outcome and their development process which makes success difficult to predict – especially when the innovation project has a high degree of novelty and radicalness. Therefore, it is assumed that investors try to avoid these uncertainties and risks

in order to secure and gain profits. In the end they don't invest in risky innovations which reduces the general scope and perspectives for differentiated innovation strategies (Lazonick, 2003; Deutschmann, 2008).

However, there is a lot of evidence that these preliminary hypotheses should be adapted more closely to the different conditions and courses of technological innovation. This evidence in particular points to the situation of different economic sectors which is characterized by various needs and modes of financing innovation (Tylecote and Visintin, 2008, p. 31). Furthermore, different systems of corporate governance and types of companies have to be taken into consideration which may be characterized by likewise different modes of financing innovation; e.g. the relations between listed companies and the financial market may be quite different compared to those of family owned companies (Hirsch-Kreinsen, 2011). In conclusion, the consequences of the assumed general process of financialization of company innovation strategies may differ between various sectors and types of companies.[1]

The following argumentation takes up these debates and open questions. It starts with a brief summary of the various country-specific patterns of interdependencies between finance and innovation outlined in the aforementioned studies. These country-specific patterns are taken as reference point for the next steps of the argumentation: On the basis of these traditional patterns, the developmental dynamics of the relationship between finance and innovation in the course of the internationalization of the financial markets will be analyzed in three steps. Firstly, the underlying mechanisms of the dynamics of the financial markets will be outlined by referring to the ongoing debate on the emerging financial market capitalism in economic sociology. Secondly, the consequences of this change process will be analyzed with regard to the development of the German innovation system. Germany can be regarded as a particularly interesting case for this issue because its financial market structures and the system of corporate governance have been subject to substantial transformation processes in the last two decades (see e.g. Beyer, 2009; Streeck, 2009; Windolf, 2014). The paper will conclude with some general insights into the relationship between finance and innovation beyond the German context.

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[1] *See also in a more general perspective the recent debate in the research of comparative capitalism about the institutional diversity of economic systems on the sectoral and regional level and, therefore, different ways how institutions foster or forestall corporate strategies (for a summary Allen, 2013).*

The following argumentation is based on extensive literature research in the fields of economic sociology and innovation studies, on the analysis of the public debate on the prospects of the current economic and technological development in Germany and preliminary findings from an ongoing research project on financial market and company innovation strategies in Germany.[2] Therefore, the paper does not present final research findings but rather puts reflections from research in progress up for discussion.

2. Relations between finance and innovation

The term innovation is – in Schumpeterian sense - taken to denote technological innovations, i.e. the genesis, development and diffusion of new marketable products, services and techno-organizational processes. Well known characteristics of technological innovations are the uncertainty with regard to the attainable technical and economic success, the risks of the usually fairly unpredictable course of the innovation process with its ex ante almost incalculable intermediate steps and unexpectedly arising decision-making situations and, finally, the difficulty to predict innovation costs (e.g. Fagerberg, 2005). These features entail specific requirements regarding their financing, in a nutshell: "Innovation is an expensive process; significant resources must be expended to initiate, direct and sustain it. It is a process that takes time, which means that the resources that support it must be committed until the process is complete. Finally, its outcomes are uncertain so the returns to innovative investments are not assured." (O'Sullivan, 2005, p. 240) Furthermore, as economic theory stresses, there is often a high degree of information asymmetry between the financier and the innovator which may lead to opportunistic action on the side of the innovator and adverse risk selection on the side of the financiers. Because normally the innovator has a better understanding of the opportunities, risks and uncertainties of an innovation process than the external financier (Rammer, 2009). Therefore, according to Giovanni Dosi, the financier of innovation always needs "…some sort of 'heroic trust' in unexplored opportunities" (Dosi, 1990, p. 307). In other words, a financial system must allow for the possibility of numerous gambles on unexplored opportunities, about which little is known ex ante, but which can reasonably be expected to be, on average, failures (ibid.).

Due to the different social-institutional conditions the financing problem of innovation is solved in different country and time-specific ways. To analyze this in an international comparative perspective one can refer to the well-known differentiation between "insider-

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[2] *See: http://www.finn-project.de/index.php?id=31*

dominated" and "outsider-dominated" financial systems (Franks and Mayer, 1997). Based on this approach (see in particular Rajan and Zingales, 2003; Tylecote and Visintin, 2008) the following country-specific conditions become apparent:[3]

2.1 Insider-dominated system

The German innovation system with its sophisticated incremental innovations is seen to be linked to an institutional context of a system of networked corporate governance dominated by universal banks and industrial cross ownership (Streeck, 1991/2009). In the literature on finance and innovation, this system is generally referred to as "insider-dominated" (Mayer, 2002; Tylecote and Visintin, 2008) or "relationship-based" (Rajan and Zingales, 2003). According to Tylecote and Visintin, this type comprised all non-English speaking countries until at least the 1990s most notably due to the concentrated ownership of debt and equity and a dominating consensus-seeking culture between the different groups involved in the governance of a company. Taking into account the role of employees and the strong influences of co-determination on corporate governance in Germany, they regard the German situation as a specific subtype of the insider-dominated system, described as "stakeholder-system" (Tylecote and Visintin, 2008, p. 64). A dominating consensus-seeking culture between the different groups involved in the governance of a company is being regarded as a general feature of this German system. Concerning the typical mode of financing, the authors speak of "relational banking": Typical of this type is a high degree of enterprise-oriented commitment of the banks and external capital providers and their relatively detailed knowledge of the situation and the activities of the enterprises they finance; in other words, they show a "firm-specific understanding" (ibid., p. 83). Concerning innovation activities, ongoing learning processes between the involved actors from inside and outside of a company are characteristic for this system as well as the on "participation" and "voice" oriented role of external investors (Dosi, 1990). The funding of innovation is characterized by a broad spectrum of features:

On the one hand, a main feature of the German system is that external financing of innovation is less acceptable for the companies and it is less available than in other countries (Rammer, 2009). Particularly the owners of family-controlled firms very often refuse a real stock exchange listing of their companies for fear of losing control. This holds for the huge

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[3] *The fact that in a historical perspective various forms of solutions for the financing problems of innovations were found within the different national contexts is for the moment neglected here. On the long-term development in the US, see, for example, the research study of Perez (2002) and the bibliography in O'Sullivan (2005); for a differentiated analysis see Block (2002).*

amount of unlisted firms in Germany which can be assumed to be mostly family controlled; as is known unlisted firms are much more important in Germany than in other countries.[4] But this may also hold for a certain percentage of publicly-traded German firms because many of them are family-controlled. Referring to data summarized by Tylecote and Visintin (2008, p. 78) for the late 1990ies 64.6% of publicly-traded firms in Germany are family-controlled, in contrast to the UK with a resp. percentage of 23.7%. On the other hand, the dominant means of financing of firms and thus of innovations are external resources, namely the loan from the firm's bank. This holds true in particular for medium-sized and family-owned companies ("Mittelstand") because of their limited equity (Vieweg, 2001). Hence a specific form of economic rationality results: It is not in the interest of the lending banks that their debtors, i.e. the enterprises, pursue short-term strategies of profit maximization and thus take high risks regarding their long-term existence. If these risks are avoided, the repayment of the loans and the profits of the creditor banks are assured. Paul Windolf (2005, p. 22) describes this as follows: "The loans of the banks were patient, controlling and risk-averse capital".[5]

With regard to innovation processes, this implicates a strong and long-term commitment of external capital providers to an innovating company on the basis of a relatively exact knowledge of the processes that have to be financed. This also implicates that the investors' access to the free cash flow of the companies is limited. In other words, the management can dispose of internal funds for innovation decisions. Consequently, innovation with a long-term perspective proceed incrementally along fairly established technological trajectories, as the accumulated skills of the involved actors and the well-oiled organizational routines in the context of the long-term oriented relations are prejudicial to radical innovations and their risks and uncertainties. In this regard, firms that work on radical innovation are at a disadvantage because, given these financing modalities, the availability of risk-oriented venture capital for such innovation strategies is limited (e.g. Caspar *et al.*, 2009; for a critical perspective on this see Taylor, 2009).

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[4] Cf. Tylecote and Visintin (2008, p. 77) who present figures for the low stock market capitalization in Germany compared to the U.S.A. and Japan for the second half of the 1990ies.

[5] *Translation from German to English by the authors.*

2.2 Outsider-dominated system

In contrast**,** the prominence of high-tech-oriented radical innovations, typical for the US innovation system, is seen in close conjunction with market-regulated financing conditions. The basis here is capital market financing, the central instrument is the share which goes hand in hand with a high degree of flexibility and willingness to take risks. Based on these institutional conditions a dominating financing segment can be identified. The main players of this financial market segment are pension funds, insurance companies, mutual funds and the "asset management houses", which manage investment portfolios. The objectives of the firms and their investors center on a maximization of the short-term profit and on continuously rising share prices. These organizations are likely to own shares of several firms of a sector, and thus to have a general understanding of this sector as a whole which is an important precondition for their investment decisions. Also private equity firms play an important role in this segment. They invest in large control-oriented equity stakes on behalf of other financial institutions such as pension funds (Tylecote and Ramirez, 2005, p. 12).

Generally, this mode of financing is characterized by a loose relationship between investors and individual enterprises; a few specialized long-term oriented private equity funds are the exception. Successful corporate financing depends on the public proof of the profitability of the company activities. The basis for this are – frequently standardized – cost accounting methods which abstract from the concrete context of a company and its activities. Therefore, this form of corporate financing and of corporate governance is labelled as "outsider-dominated" system. Its "arms-length relationships" are also characterized by a high pressure for shareholder value (Tylecote and Visintin, 2008, p. 92). With regard to innovation processes, this implicates a loose commitment of external capital providers to an innovating company on the basis of a low company-specific expertise. The strategies of the investors are seen as selection processes based on "entry" and "exit-mechanisms" (Dosi, 1990). Tylecote and Ramirez summarize the consequences for innovation strategies as follows: "…R&D intensity will not be a positive function of pressure for shareholder value, but rather a negative one,…shareholders who do not understand the value of spending on innovation…will impose short-term pressure which discourages it." And they go on to say: "Moreover, innovation which promises a return somewhat less than the cost of capital will certainly be discouraged by pressure for shareholder value – whereas a management free of such pressure will favour it…" (Tylecote and Ramirez, 2005, p. 27). Innovations in established firms therefore usually proceed with a short-term orientation, aim at rapid economic successes and develop the available technologies at a very slow pace. Evidence for

this is the decades-long dominance of traditional manufacturing technologies in the US and the non-advanced automotive technology of American automotive manufacturers (e.g. Hirsch-Kreinsen, 1992).

The prominence of high-tech oriented radical innovations in this innovation system can primarily be put down to the existence of a second, institutionalized segment of the financial market for risk and innovation-oriented venture capital. The driving power is the high availability of risk-oriented capital. Venture capital can be regarded as a subset of private equity that is invested in new or young firms in high growth mode, usually high-technology sectors pursuing risky innovation strategies (Tylecote and Ramirez, 2005). This segment of the financial market plays an important role in financing high-risk innovation strategies fraught with uncertainties (Dosi, 1990). The providers of venture capital are characterized by their high willingness to take risks in conjunction with a detailed knowledge of the innovation project. Hence, venture capitalists expect to participate in company management as well as in finance and there is a close relationship between investor and the innovating company. In other words, the strategies of the capital providers are based on "voice-mechanisms" and less on "entry/exit-mechanisms" of pure selection. Of course this segment is linked to the "outsider-dominated"-segment of corporate financing in specific ways: For one thing, venture capital normally finances the particularly risky early phases of an innovation which the majority of investors avoid. For another thing, venture capitalists ultimately aim at selling their interest in firms with successful radical innovations at a high profit. Preconditions for this are the market processes of an "outsider-dominated" financial market as well as the possibilities to sell the shares to large established firms (Rajan and Zingales, 2003).

To clarify this comparative perspective, central features of the two types of innovation systems are summarized in the following table 1.

Table 1: Types of Relations between Finance and Innovation

	Insider-dominated	Outsider-dominated
Basic finance tool	Loans and cash-flow	Stocks and cash-flow
Investor orientation	Long-terminism	Short-terminism
Investor's expertise	Company-specific	Finance-oriented and industry-specific
Basic agency conflict	Insider vs. management	Shareholder vs. management
Relations between investor and innovating company	Tightly coupled; normally distinct company-specific expertise	Loosely coupled; low company-specific expertise
Investor strategy	Dominance of learning processes – "voice"	Dominance of selection processes – "exit"
Venture capital market	Only relevant for specific new technologies	Key role for high tech innovation
Dominant pattern of innovation	Traditional/incremental/in part radical	High-tech/radical
Typical countries	Germany: stakeholder-dominated system	U.S.A.: shareholder-dominated system

3. Dynamics of the financial market

Recent research – in particular in the field of economic sociology - emphasizes the fact that the boundaries between the different country-specific innovation systems have begun to blur since the 1990s due to the internationalization of the financial markets (e.g. Deeg, 2009). It furthermore points out that the in Anglophone countries dominating forms of corporate financing are asserting themselves while the "insider-dominated" forms of corporate financing and of corporate governance are eroding. According to the research findings, this is especially true for Germany, where the dissolution of the traditional networked system of the "Deutschland AG" is very conspicuous. The researchers highlight that in Germany – like in other European countries as well – the process of financialization of economic activities and company behavior has taken place (e.g. Beyer and Höpner, 2003; Windolf, 2005; Streeck, 2009; Windolf, 2014; Van der Zwan, 2014). The main consequence is that the networked system of long-term lending by universal banks tends to be replaced by an internationally oriented system based on Anglophone capital market and corporate financing norms, which leads to lasting changes in the system of corporate governance. The transformation processes in the interlinked levels of financial market and the system of

corporate finance and control can be regarded as central features of this new production regime.[6]

On the supply side of investors, a changing constellation of actors is discernible: First, mention must be made of the growing influence of new economic institutions and actors such as various forms of investment funds as well as analysts and rating agencies. Second, research findings point to the worldwide greatly increased importance of not publicly regulated international forms of capital allocation within the scope of various kinds of private equity funds. Third, changes in the structures and strategies of banks are emphasized by research. These changes lead to an increasing importance of profit-oriented and short-term oriented investment banking at the expense of long-term oriented lending to firms. Analysts and rating agencies play a key role for the investment decisions of the capital providers, as the investors expect an assessment of the risks and the future profitability of an investment from them (Windolf, 2005). This change is accompanied by changed regulations of credit rating and financing modalities (so-called Basel-Regulations) which are primarily driven by the evaluation of default risk on various forms of debt. This primarily concerns the firm's cost of capital structure of the balance sheet and variance of cash flow and therefore these regulations strongly influence the financial scope of companies.

On the demand side of the companies, complementary changes can be observed: Studies point to a stronger financial market orientation of the top management of many companies, which occurs even without the direct influence of the financial market and its actors. The prevalence of a general principle that can be described as shareholder value conception of the firm is often emphasized (Fligstein, 2001). Also incentive pay systems, stock options and bonus systems for executives that generate massive additional income for managers in the case of a successful financial market-oriented reorganization of the enterprise are regarded as an important driving force for this phenomenon (e.g. Kädtler, 2011). A further reason for the prevalence of the shareholder value conception is that a new manager type has begun to predominate in many German industrial enterprises since the 1990s. This new manager type, that is to a great extent recruited from across-the-board qualified generalists and from managers from the areas of finance and controlling, is increasingly replacing the former type of the technical/scientific specialist with a long-standing commitment to the company. In addition, the fluctuation and the mobility of these new top managers are markedly higher (Höpner, 2004; Freye, 2009). Furthermore, the dissemination and implementation of new

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[6] *For similar development trends of the Swiss production system see Widmer (2011).*

international accounting and financial reporting standards in the companies plays an important role for the growing financial market orientation. These standards aim at making an as profitable as possible use of the financial resources of a company. Available research findings show that cost structures are thus made more transparent, previous scopes for financing are constricted and profit potentials are easier to identify than in the past (Botzem and Quack, 2009).

Both the supply side of the financial market and the demand side of the companies are linked by the system of corporate governance. The complex of structures, interests and practices characterizing this system have changed considerably. In particular, the emergence of a market for corporate control is emphasized. It is also assumed that this market has "disciplining effects" on businesses because of changed power constellations and potentially possible as well as actually impending "hostile takeovers" (Windolf, 2005, p. 49). Furthermore, new ownership structures are highlighted as central factor for this change. The funds and other institutional investors have a "control advantage" (ibid.) over other owners such as minor but also major stockholders, as they often only hold limited shares that do not constrain them strategically. Most notably, to assert their interests, they can at all times threaten the other shareholders with their exit and the accompanying stock market losses (Beyer, 2009).

4. Development of the German industrial innovation system

The question arises in which way these changes in the financing conditions of a hitherto "insider-dominated" system like the German "stakeholder economy" influence the innovation strategies of the enterprises. The answer to this question cannot be deduced a priori. On the one hand the changes in financial market conditions may lead to constraints on innovation strategies. On the other hand the influence of new shareholder groups may open new innovation opportunities. Hence, it can be argued that because of the financial market dynamics the formerly relatively homogeneous German industrial innovation system shows a growing diversity of different innovation segments. In the following parts three segments of the German Innovation System are identified which are characterized by different degrees of influence through the financial market and by different degrees of (financial) independency of the companies. These conditions are strongly interrelated with the specific innovation and financing opportunities of the companies.

4.1 Dominance of finance over innovation

4.1.1 The constrained innovative capabilities of firms

A first innovation pattern is characterized by the increasing dominance of finance over innovation that constrains the innovation capabilities and strategies of enterprises. As aforementioned (Deutschmann, 2005/2008; Lazonick, 2007), there is no sufficient stability of guaranteed financial means nor is there strategic room for innovation activities. Moreover, due to the lack of contextual knowledge about sector or technology specifics, neither the dominant financial market players nor changing financing regulations and instruments are able to assess adequately the risks and uncertainties of technological innovations. Accordingly, collective learning processes and knowledge accumulation are curtailed and innovation projects are reduced to calculable activities. Consequently, technological innovations are solely conducted with short-term considerations and the criterion of risk avoidance.

Empirically this situation is most likely to be encountered in the case of large listed firms with a pronounced financial market orientation. As aggregated data show, there has been a clear trend in large German corporations away from bank financing towards more market financing since the beginning of the 1990s (Deeg, 2009). Therefore one can assume that massively increased, short-term oriented profitability criteria and expectations of external investors lead to an abandonment of innovation activities. An empirical example for this trend are large pharmaceutical companies that have in the past few years extensively reorganized their value added chains, in particular their research departments. The innovation activities of this industry are influenced by a lot of specific factors, in particular the governmental health policy. However, there are research findings pointing to the specific influences of financial market conditions (Briken and Kurz, 2006; Kädtler, 2009): For one thing, the innovation processes are streamlined and strictly controlled according to financial performance figures or other indicators in order to detect undesirable developments at an early stage and to reduce development times. For another thing, the linking of innovation processes in the field of pharmaceuticals to criteria of the financial market leads to a focus of their innovation strategies on products with particularly good prospects, blockbuster, i.e. patented key products with a high turnover and profit margin. This innovation focus is based on an ultimately risk-averse preference for limited modifications in the principles of known chemical entities. Parallels can be drawn to the automotive industry, where – under the conditions of a pronounced innovation competition – companies are attempting to generate profitability by means of growing but calculable innovations (Tylecote and Visintin, 2008, p.

40). Characteristics of these innovation dynamics are a marked rise in the overall R&D since the 1990s, the marked reduction of the development times and the massive broadening of the range of products (EFI, 2014). However, these dynamics go along with a continuous reduction of the *in-house* R&D expenditure and a marked rise in *external* R&D since the mid-1990s, whereby the innovation risk in particular regarding the use of new technologies is shifted to external suppliers (Jürgens and Sablowski, 2008).

The takeover of companies by private investment corporations such as private equity funds has similar consequences. The strategy of the corporations is directed at a loan-funded investment in companies, the utilization of the financial potentials of the taken-over company and a rapid exit at a as high as possible sale value – in a nutshell: "invest to sell" (Klier *et al.*, 2009). According to the available literature (e.g. Kamp, 2007), short-term improvements in the efficiency and competitiveness of the enterprises can by all means be achieved by these company takeovers but long-term oriented strategies and investments in research and development are hardly possible anymore. This is shown by a whole range of examined taken-over companies, for instance by medium-sized companies from the capital goods industry: the investors shy away from the financial risk of innovations and are little appreciative of them. Moreover, due to often drastic restructuring measures resulting in the dismantlement of supposedly surplus resources and a reduction of business functions to core competences, the organizational space as well as human resources for innovations are lost (Lembke, 2008).

This restrictive situation for innovation projects also affects non-listed companies such as smaller and family-owned enterprises. This is due to the generally changed structures of the system of corporate financing and of granting of loans (Basel II-Regulations) with its risk-averse and intricate rating and evaluation procedures, which subject innovation projects to a more pronounced and systematic economic control than in the past (e.g. Belz and Warschat, 2005; Springler, 2007). According to available data, this applies in particular to enterprises from traditional sectors. For these companies bank loans are a crucial funding source due to their limited equity capital. Thus in the years 2004-2006 around 30% of the companies from the food and furniture industries as well as from the metal production and metalworking industry financed their innovation plans with loans (in addition to other sources of funding); around 21% of the mechanical engineering companies also availed themselves of bank loans (Rammer, 2009, p. 41). Furthermore, small and medium-sized enterprises in general are probably subject to these restrictions, as their financing is generally largely based on bank loans; as available data show, bank debt as a percentage of balance sheet totals has

remained constant for German small and medium-sized enterprises since the mid-1990s (Hommel and Schneider, 2003; Heimer *et al.,* 2008; Deeg, 2009).

An additional reason for the restrictive situation is the increasing application of international accounting and financial reporting standards which follow the principles of a stronger accountability towards external investors. Generally, with their emphasis on "fair value" accounting principles, these standards reveal the firm's financial reserves and press for the most profitable use of the corporate assets as measured by financial benchmarks. As a result, the return expectations of investors are becoming a dominant target figure of the corporate management, too (Botzem *et al.*, 2007; Deeg, 2009). This might have twofold consequences: For one thing, managers often strictly avoid investments in uncertain and risky innovation projects in order not to unnecessarily weigh down the balance sheets. For another thing, the growing cost pressure, the introduction of rationalization-based forms of work organization and of shorter work cycles in the course of ongoing innovation processes often lead to the already mentioned "good enough-solutions" and "pseudo solutions" (Grewer *et al.*, 2007, p. 78).

A final reason for the growing economic pressure on technological innovation processes are changed conceptions of the relevant actors on appropriate profit objectives and changed management principles with regard to strategies, methods and organization concepts. This applies particularly to the organization and management concepts often favored by financial market players, management representatives and analysts, viz. concepts which focus on the so-called core business. As a consequence, the previous broad and diverse R&D areas and engineering departments are reduced and centralized. Furthermore, the established and (horizontally and vertically) integrated company structures as well as their adherent resources and complex knowledge base are often regarded as cost drivers. As a consequence less profitable or risky company divisions are dismantled. Hence company structures that were previously characterized by a high degree of integration of different functions, synergies, knowledge transfer and learning processes between various competence and knowledge areas as well as by organizational "slack" and redundancies, are streamlined, thus abandoning important preconditions for the innovation capability of companies (e.g. Münch and Günther, 2005).

4.1.2 New scope for innovation

However, the changed financial market conditions also lead to the emergence of new and extended scopes for innovation strategies.[7] This second innovation pattern can be summarized as follows: Firstly, investors such as industrially oriented private equity funds pursue a long-term investment strategy and open up new scopes of action for increases in productivity and innovations (Achleitner *et al.*, 2008). Secondly, venture capital to finance risky product innovations in high-tech sectors plays an important role in this context. Apart from the new economy boom in the second half of the 1990s, venture capital in its various forms plays, compared to the US, a relatively subordinated role for the funding of innovations in Germany (EFI, 2014). Moreover, the volume of venture capital dropped significantly after the new economy bubble burst at the beginning of the 2000s. While approx. 2.5 billion Euros of venture capital were invested in 2000, this amount decreases to 0.75 billion in 2003. The investments in 2010 only amounted to a bit more than 0.7 bn and in 2012 to about 0.6 bn Euro (EFI, 2014, p. 162). Therefore the literature points to large funding shortfalls in the high-risk seed and start-up phase of innovation and business start-ups in Germany (e.g. Achleitner *et al.*, 2010; EFI, 2014).

However, the German venture capital market causes structural changes in the innovation system because it opens new opportunities for financing innovations. This development is stimulated especially by innovation policy and public support for venture capital (Achleitner *et al.*, 2010). Furthermore, the market for venture capital is a highly internationalized market segment and it offers global funding opportunities for companies which help to overcome the existing national restrictions (Klagge and Peter, 2009). And finally, venture capital becomes more and more important in the context of regional agglomerations of specialized high-tech companies. As studies from economic geography show during the last years several regional areas with networked finance-innovation linkages have been established in Germany (Klagge and Peter 2009, Wallisch 2009).[8]

In some high-tech sectors, therefore, venture capital plays an indispensable and vital role in Germany, too. This applies in particular to the IT and biotechnology sectors as well as to medical engineering, communication technology, automation and control as well as feedback control systems. It is estimated that around a fifth to a quarter of the R&D expenditures in

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[7] *See also findings by Brown and Petersen (2009) that provide evidence for string stock market effects on the increase in R&D intensity especially of young firms in the US.*

[8] *This regional agglomeration of venture capital can be regarded as a distinctive feature of the German innovation system e.g. in comparison to the situation in UK (Klagge and Martin, 2005).*

the biotechnology sector is financed by venture capital (KfW-Research, 2006, p. 121; Champenois *et al.*, 2006).[9] Additionally, "*Business angels"* represent an often underestimated sub-segment of the market for venture capital. These are wealthy and highly specialized private persons who are sufficiently able to assess the risks and uncertainties of specific innovations and to offer not only corresponding financing options but also their advisory skills to the innovating companies (Carpenter *et al.*, 2003; Tylecote and Ramirez, 2006). Although the available data so far are based on estimates, this segment of the capital market is, in an international comparison, still very small in Germany but it is extremely important for high-tech companies, especially for research-intensive spin-offs from the field of science (Fryges *et al.*, 2007). One also has to point to a further subsector of the market for venture capital: corporate venture capital. Therewith large-scale enterprises fund innovation projects of other smaller companies of interest to them by means of specifically founded companies. The financing strategy has a long-term orientation and is normally coupled with consulting services for the innovating company. This form of financing can mainly be found in the pharmaceutical sector. Despite the current crisis, this small segment of the financial market is evidently growing in the pharmaceutical industry due to their high pressure to innovate (FAZ, 2009).

Similar to the VC-segment in the American system (see above)[10] a basic characteristic of these forms of financing of innovations are the often strong personal ties between the innovating firms and the capital providers. On the basis of their detailed knowledge about the respective technological field, the investors often have close connections to the company they fund and take an active part in the business operations by means of various executive functions they hold within the company. Thus, the executive management is more closely controlled by the venture capital givers than is the case for other forms of external innovation financing (Rammer, 2009, p. 37). It is thus worth noting that a reconfiguration of the insider system is observable in the segment of venture capital. Its central characteristic is the close tie between individual innovating companies and financial market actors. Latter have a strong interest in short-term and high profits which they want to realize based on their influence and their intimate knowledge of technological requirements, risks and uncertainties of innovation processes. As aforementioned, the strategies of the venture capitalist can be characterized as both "voice- and exit-mechanisms" (Dosi, 1990). The

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[9] *This figure does not comprise the volume of foreign venture capital which plays an important role in the German biotechnology sector (KfW-Research, 2006: 121).*

[10] *Concerning the strong and coordinating influences of venture capitalists on innovation activities see Ferrary and Granovetter (2009) and their network-theory based findings of IT innovations in Silicon Valley.*

consequences for innovation processes are mixed: On the one hand, these investors act as insider; they stimulate and push company innovation strategies to maximize their profits. On the other hand, this "informed capital" significantly promotes the innovation capabilities of the companies (DIW, 2005).

4.2 Stabilization of existing innovation patterns

A third innovation pattern can be discerned which shows a significant path dependency and stabilization of the traditional innovation patterns. It is characterized by only minor influences of finance over innovation, resp. loose coupling between the conditions of the financial market and company innovation strategies. This can be proved by available data about the funding methods of companies. Data of the German innovation survey for the years 2004-2006 show that industrial enterprises in Germany use various financing sources for innovations: According to these data, many innovating enterprises make exclusive use of internal financial resources from ongoing business activities. Just as many enterprises combine internal with external financial sources; the exact figures are: 82% of all enterprises use internal financial sources, 41% of the enterprises make exclusive use of these while 41% of the enterprises combine them with external financial resources (Rammer, 2009, p. 41). On the one hand, this large share of self-financed investment is not a new phenomenon it was already of great importance in the past. On the other hand, there has been a marked rise in the share of internal financing since the 1990s (Deeg, 2009, p. 558).

In general, this means that enterprises are not often directly dependent on the increasingly restrictive financial market conditions to finance innovations but are at the most loosely coupled with them. This becomes even more apparent from the finding that research-intensive companies ("medium- and high-tech") in particular use internal financing sources, this strategy is pursued by about 95% of these enterprises (ibid.). It can be assumed that the enterprises thus wish to secure room for manoeuver, for risky and far-reaching innovations. The enterprises also want to avoid a drain of relevant knowledge to potential competitors which are also owned by an external investor. Especially small and medium sized family owned enterprises pursue this strategy (Achleitner *et al.*, 2010, p. 66).

It can also be assumed that under otherwise equal conditions, non-listed companies can secure room for manoeuver vis-à-vis the changed financial market conditions because of their financing and ownership structures which are decoupled from the financial market. Quite large family-run companies are often cited as examples for this. These companies have sufficient own capital resources and their productivity is generally considered to be very high

(e.g. Kamp, 2007). Shareholder loans are a typical form of financing in this case. According to the above-mentioned data, approx. 18% of all innovating enterprises draw on these to finance their innovations (Rammer 2009: 42). But listed companies with a distinct financial market orientation can also try to maintain their autonomy and pursue innovation strategies independently, provided that their overall economic situation and their profitability are good.

Finally, at the level of working processes, the structural conditions of research, development and design processes have to be taken into account. Their far-reaching and financial market-driven rationalization would block essential innovation opportunities. As has been convincingly shown by work process studies (Wolf *et al.*, 1992), it is hardly possible to standardize and formalize innovation work due the ever present risks and uncertainties, i.e. the functional logic of these work processes in many cases counteracts such attempts. This is also true for the cases in which the innovation processes were effectively reorganized as a result of new organization and management concepts and the introduction of new computer-aided systems. These systems have to be well adapted to the respective requirements, a task that only the experts on the operative level can accomplish, given the always occurring risks and uncertainties. A precondition for this is the "appropriation" of the respective systems, i.e. the competent adaptation of these systems to the given conditions by their users. Hence, structural barriers to the rationalization of innovation processes and a substantial amount of power on the part of the involved scientists and development engineers are the result.

4.4 Development perspectives

If one recapitulates the described developments, the assumed growing diversity can be discerned in the German innovation system. It is noticeable that the formerly relatively homogeneously structured stakeholder-dominated system is increasingly differentiating into various subsystems. One can speak of an emerging "three segment" system structure: On the one hand, there is a segment characterized by increasing constraints for the companies to be innovative. Especially large listed firms but also a fair number of externally financed small and medium-sized enterprises from traditional industry sectors operate under such conditions. The formerly dominating influence of technology-oriented insiders is being replaced by financial-oriented outsiders. Obviously, in this segment the Anglophone oriented pattern of financing innovations emerges. On the other hand, there is a segment featuring venture capital and companies, mainly from new technological fields, that have new scope for innovation. In other words, in this segment the process of ongoing financialization shows

paradoxical effects concerning the consequences for innovation processes. Here, the mechanisms of the financial market have to be regarded as the prerequisites for the establishment of a new insider-segment in the German innovation system.

In between these two segments an additional segment can be found that is characterized by the stabilization of traditional, existing innovation patterns. Here we find a number of non-listed and family-owned firms and in particular companies that primarily use their available internal resources for innovation activities and are thus unaffected by financial market influences. These three segments of the German industrial innovation system can be summarized as follows (see table 2):

Table 2: The emerging "three segments" German innovation system

	Segment 1: Constraints	**Segment 2: New scope**	**Segment 3: Stabilization**
Prevailing type of firms	large listed firms, SMEs	newly founded firms, start-ups	non-listed firms, family owned, SMEs
Available firm resources	limited internal, dependent on various forms of external financing	very limited internal resources, dependent on external financing	distinctive internal
Influence of financial market conditions	- market based financial modes and new investors - Basel-regulations - international accounting and reporting standards - changing management concepts and profitability norms	- specific and focused financial market pressure on innovation - significance of new financial market segments: VC and industrial oriented PE funds	- only limited influences - high significance of firm's internal financial resources
Sector/ technological field	established, R&D intensive industries, low-tech	new, high-tech	established, traditional, medium-tech
Type of innovation	incremental, restricted, more focused	more or less radical	incremental, radical

To be sure, the emerging pillars or subsystems of the German innovation system presented here are schematic and are based on preliminary findings. No attempt was made in this

article to state more precisely or even quantify the types of firms falling into each category. This requires much more empirical research.

To sum up, the German innovation system is certainly not totally eroding and converging with the type of the Anglophone outsider-dominated system. One can rather speak of the emergence of a "hybrid" innovation system mixing new and old structures. Although it is becoming more similar to the Anglophone model, in an international comparison it still features a specific configuration. The institutional change can thus be conceived as "displacement", i.e. "foreign" system elements were integrated into an institutional system without giving up the hitherto existing elements (Streeck and Thelen, 2005). This development results in an opening up of the stakeholder-dominated system to new requirements that ensue from the international integration and the rapid technological change.

5. Conclusion

In conclusion, these preliminary empirical findings suggest some conceptual considerations on the interdependencies between financialization, patterns of corporate financing and innovation progressions. As the institutional analysis shows institutions, firms and emerging technologies co-evolve (Hollingsworth, 2000; Edquist, 2005). Without any doubt, the institutional conditions of the financial market play a key role for the ability of companies to follow long-term strategies as well as for their innovation activities (Deeg and Jackson, 2007). Therefore, the conditions of the financial market can be considered as independent and determining variables regarding the analysis of the course of technological innovations whereas the innovation strategies of enterprises have to be regarded as dependent variables. However, different patterns of interaction between the conditions of the financial market and the innovation strategies of companies have to be taken into consideration. These different patterns are determined by the following intervening variables: *First*, one has to point to the system of corporate governance which is characterized, as shown, by the distinction between de facto publicly-traded companies and independent, family-run companies. This correlates with the extent to which the management is able to pursue autonomously financial market-oriented objectives. *Second*, one has to refer to the type of company and the respective innovation capabilities which determine to which extent innovation strategies can be pursued autonomously. In this context, the opportunities for internal financing decoupled from the financial market are of special importance. As innovation literature shows (e.g. Teece and Pisano, 1994) the aspect of innovative

capabilities is not at all trivial but highly relevant for the specific course of innovation strategies pursued by companies. *Third,* the characteristics of different technological fields and industrial sectors influence the given potentials for innovation, the possible type of innovations, may be incremental or radical, and their interlinked risks and uncertainties, costs and profit prospects. As aforementioned, there are significant differences between various industrial sectors, e.g. between old traditional sectors and new high-tech sectors. In other words, the conditions of different sectors define the financing requirements and needs for innovation strategies (Tylecote and Visintin, 2008).

To sum up, the relationship between financialization, i.e. the changing institutional conditions of corporate finance and firm strategies can by no means be described as unidirectional deterministic.[11] On the one hand, the institutional conditions do not force the companies into a predetermined direction, in fact the situation is characterized by discrepancies; thus, as has been shown, the strategies of external investors can range from short-term takeover ambitions to long-term portfolio-oriented investment strategies. These institutional conditions have different consequences for company strategies because they offer various options for financing innovations. On the other hand, the interaction among actors and their institutional environment has to be conceptualized as a multi-faceted process and it must be taken into account that actors are able to influence and modify institutional regulations (Hollingsworth, 2000). In other words, companies can pursue strategies in their own interest and try to influence capital market conditions; in this perspective one can speak of loosely coupled relations between company strategies and financial market conditions. Therefore, one can hardly maintain the assumption that institutional and regulatory structures as they are caught with the concept of financialization, have clear consequences for technological innovation and economic processes. The assumption that company innovation strategies are the result of the interaction of heterogeneous institutional structures on the one hand and autonomous corporate strategies on the other hand is the more plausible. The question for the consequences of the described institutional change processes for the capitalist dynamics can at best only be answered in a long-term perspective.

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[11] *Concerning this argument see also the critical debate on the homogeneity assumptions of the VoC approach (e.g. Crouch and Voelzkow, 2009; Lane and Wood, 2009; Herrigel, 2010)*

References

Achleitner, A.-K., Andres, C., Betzer, A., Weir, C. (2008) *Economic consequences of private* equity *investments on the German stock market*, CEFS working paper series, No. 2008-0

Achleitner, A.-K., Metzger, G., Reiner, U. and Tchouvakhina, M. (2010) *Beteiligungsmarkt nach der Krise: Optimistischer Ausblick aber Angebotslücke beim Wachstumskapital wird größer*, Frankfurt a. M., KfW Bankengruppe, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1713749 (access 7/12/2011)

Allen, M. M. C. (2013) Comparative capitalisms and the institutional embeddedness of innovative capabilities, *Socio-Economic Review* **11**, 771-794

Belz, J. and Warschat, J. (eds.) (2005) Innovationskraft in KMU – Das Rückgrat der deutschen Wirtschaft*, Impulskreis KMU in der Initiative „Partner für Innovation*", Stuttgart

Beyer, J. and Höpner, M. (2003) The Disintegration of Organised Capitalism: German Corporate Governance in the 1990s, *West European Politics*, **26**, 179-198.

Block, T. (2002) Financial Systems, Innovation and Economic Performance, *MERIT-Infonomics Research Memorandum Series*, 011.

Botzem, S., Quack, S. and Konrad, M. (2007) Unternehmensbilanzierung und Corporate Governance – die Bedeutung internationaler Rechnungslegungsstandards für die Unternehmenssteuerung. In Jürgens, U., Sadowski, D., Schuppert, G. F. and Weiss, M. (eds.) *Perspektiven der Corporate Governance*, Baden-Baden, Nomos, 358-384.

Botzem, S. and Quack, S. (2009) (No) Limits to Anglo-American accounting? Reconstructing the history of the International Accounting Standards Committee: A review article, *Accounting, Organizations and Society*, **34**, 988-998.

Brown, J. R. and Petersen, B. C. (2009) Why has the investment-cash flow sensitivity declined so sharply? Rising R&D and equity market, *Journal of Banking and Finance,* **33**, 971-984.

BVK (Bundesverband Deutscher Versicherungskaufleute e. V.) (2005) Zur Rolle von Private Equity und Venture Capital in der Wirtschaft Aktualisierte Fassung der im Dezember 2003 erschienenen BVK-Untersuchung „Zur volkswirtschaftlichen Bedeutung von Private Equity und Venture Capital", http://www.bvkap.de/media/file/55.pe_wirtschaft.pdf (access March 10, 2010).

BVK (Bundesverband Deutscher Versicherungskaufleute e. V.) (2010) BVK Statistik. Das Jahr 2009 in Zahlen, http://www.bvkap.de/media/file/300.20090308_BVK_Jahresstatistik_2009_final.pdf (access March 10, 2010).

Carpenter, M., Lazonick, W. and O'Sullivan, M. (2003) The Stock Market and Innovative Capability in the New Economy: The Optical Networking Industry, *Industrial and Corporate Change*, **12**, 963-1034.

Caspar, S., Lehrer, M. and Soskice, D. (2009) Can High-technology Industries Prosper in Germany? Institutional Frameworks and the Evolution of the German Software and Biotechnology Industries. In Hancké, B. *(ed.): Debating Varieties of Capitalism,* Oxford, Oxford University Press*, 200-220*

Champenois, C., Engel, D. and Heneric, O. (2006) What Kind of Biotechnology Companies do Venture Capitalists and Corporate Investors Prefer? *Applied Economics*, **38**, 505-518.

Chesbrough, H. W. (2003) The Era of Open Innovation, *Sloan Management Review*, 44, 35-41.

Deeg, R. (2009) The rise of internal capitalist diversity? Changing patterns of finance and corporate governance in Europe, *Economy and Society*, **38**, 552-579.

DIW (Deutsches Institut für Wirtschaftsforschung) (eds.) (2005) Kredit- und Beteiligungsfinanzierung in jungen innovativen kleinen und mittleren Unternehmen in Deutschland *Wochenbericht des DIW*, **72**, 577-583

Deutschmann, C. (2005) Finanzmarkt-Kapitalismus und Wachstumskrise. In Windolf, P. (ed.) *Finanzmarkt-Kapitalismus – Analysen zum Wandel von Produktionsregimen*, Kölner Zeitschrift für Soziologie und Sozialpsychologie, Sonderheft 45, 58-84.

Deutschmann, C. (2008) *Kapitalistische Dynamik. Eine gesellschaftstheoretische Perspektive* Wiesbaden, VS Verlag.

Dosi, G. (1990) Finance, Innovation and Industrial Change, *Journal of Economic Behaviour and Organization,* **3**, 299-319.

Edquist, C. (2005) Systems of Innovation. In Fagerberg, J., Mowery, D. and Nelson, R. R. (eds.) *The Oxford Handbook of Innovation*, 181-208, Oxford, Oxford University Press.

EFI (Expertenkommission Forschung und Innovation) (2014) *Gutachten zu Forschung, Innovation und technologischer Leistungsfähigkeit 2014*, Berlin.

Fagerberg, J. (2005) Innovation: A Guide to the Literature. In Fagerberg, J., Mowery, D. and Nelson, R. R. (eds.) *The Oxford Handbook of Innovation*, Oxford, Oxford University Press, 1-27.

Ferrary, M. and Granovetter, M. 2009: The role of venture capital firms in Silicon Valley´s complex innovation network. In *Economy and Society*, **38**, 326-359.

FAZ (Frankfurter Allgemeine Zeitung) (2009) *Wagniskapital aus der Konzernkasse*, **85**, 11. April, 17.

Fligstein, N. (2001) The Rise of the Shareholder Value Conception of the Firm and the Merger Movement in the 1980's. In Fligstein, N.(ed.) *The architecture of Markets*, Princeton, PUP, 147-169.

Franks, J. and Mayer, C. (1997) Corporate ownership and control in the U. K., Germany and France, *Journal of Applied Corporate Finance*, **9**, 30-45.

Fryges, H., Gottschalk, S., Licht, G. and Müller, K. (2007) *Hightech-Gründungen und Business Angels, Endbericht für das Bundesministerium für Wirtschaft und Technologie*, ZEW Mannheim.

Grewer, H. G., Matthäi, I. and Reindl, J. (2007) *Der innovative Ältere,* München und Mering, Rainer Hampp.

Hall, P. A. and Soskice, D. (2001) An Introduction to Varieties of Capitalism. In Hall, P.A. and Soskice, D. (eds.), *Varieties of Capitalisms. The Institutional Foundations of Comparative Advantage*. Oxford: Oxford University Press, 1-70.

Hasse, R. and Passarge, E. (2009) Persistance and Change in Coordinated Markets Economies – The Case of venture Capital for Biotechnology in Switzerland. Working Paper 03/09 Kultur- und Sozialwissenschaftliche Fakultät, Universität Luzern.

Heimer, T., Hölscher, L. and W. Mathias (2008) Access to Finance and Venture Capital for Industrial SMEs, *Frankfurt School of Finance & Management Working Paper No. 97.*

Hirsch-Kreinsen, H. (1992) On the History of NC-Technology – Different Paths of Development. In Altmann, N., Köhler, C. and Meil, P. (Eds.) *Technology and Work in German Industry*, London/New York, Routledge, 63-76.

Hirsch-Kreinsen, H. (2011) Finanzmarktkapitalismus und technologische Innovationen, *Zeitschrift für Soziologie*, 40, 356-370.

Höpner, M. (2004) Unternehmensführung im Wandel: Agency-Theorie, Soziologie des Managements und die Interessenlage der Führungskräfte, *Soziale Welt*, **55**, 263-282.

Hollingsworth, J. R. (2000) Doing Institutional Analysis: Implications for the Study of Innovations, *Review of International Political Economy,* **7**, 595-644.

Hommel, U. and Schneider, H. (2003) Financing the German Mittelstand, *EIB Papers*, **8**, 52-90.

Huffschmid, J. (1999) *Politische Ökonomie der Finanzmärkte*, Hamburg, VSA Verlag.

Jürgens, U. and Sablowski, T. (2008) *Sektorale Innovationsprozesse und die Diskussion über deutsche Innovationsschwächen*, Berlin, sigma.

Kädtler, J. (2009) 'German Chemical Giants' Business and Social Models in Transition – Financialisation as a Management Strategy', *Transfer*, **15**, 229–249.

Kädtler, J. (2011) 'Financialisation of Capitalist Economies – Bargaining on Conventional Economic Rationalities', *Historical Social Research*, **36**, 169–191.

Kädtler, J. and Sperling, H.-J. (2001) Worauf beruht und wie wirkt die Herrschaft der Finanzmärkte auf der Ebene von Unternehmen? *SOFI-Mitteilungen*, **29**, 23-43.

Kamp, L. (2007) Zum Einfluss von Private Equity- und Hedge-Fonds auf die Wirtschaft, *WSI Mitteilungen*, *11*, 596-602.

KfW-Research (2006) *Mittelstands- und Strukturpolitik Nr. 37*, Sonderband „Innovationen im Mittelstand"; Frankfurt/M; KfW.

Klagge, B. and Martin; R. (2005) Decentralized versus Centralised Financial Systems: Is there a Case for Local Capital Markets. *Journal of Economic Geography* **5**, 387-421.

Klagge, B. and Peter, C. (2009): Wissensmanagement in Netzwerken unterschiedlicher Reichweite, *Zeitschrift für Wirtschaftsgeographie* **53**, 69-88.

Klier, D. O., Harrigan, K. R. and Welge, M. K. (2009) Managing Diversified Portfolios, *Dortmunder Beiträge zur Unternehmensführung*, TU Dortmund.

Lane, C. (2003) Changes in Corporate Governance of German Corporations: Convergence to the Anglo-American Model? *Competition & Change,* **7**, 79-100.

Lazonick, W. (2003) The Theory of the Market Economy and the Social Foundations of Innovative Enterprise, *Economic and Industrial Democracy*, **24**, 9-44.

Lazonick, W. (2007) Shareholder value and the governance of innovative enterprise. In Jürgens, U., Sadowski, D., Schuppert, G. F. and Weiss, M. (eds.) *Perspektiven der Corporate Governance*, Baden-Baden, Nomos, 472-500.

Lazonick, W. and O'Sullivan, M. (1996) Organisation, finance and international competition, *Industrial and Corporate Change*, **1**, 1-36.

Lembke, J. (2008) Interesse an Geld, nicht an Farbe und Design, *FAZ,* **110**, 13. Mai, 27.

Lundvall, B.-A. (ed.) (1992) National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning, London/New York, Pinter.

Lundvall, B.-A. (2007) National Innovation Systems – Analytical Concept and Development Tool, *Industry and Innovation*, **14**, 95-119.

Mayer, C. (2002) Financing the New Economy: financial institutions and corporate governance, *Information Economics and Policy*, **14**, 311-326.

Münch, R. and Guenther, T. (2005) Der Markt in der Organisation – von der Hegemonie der Fachspezialisten zur Hegemonie des Finanzmanagements, In Windolf, P. (ed.), *Finanzmarktkapitalismus. Analysen zum Wandel von Produktionsregimen. Kölner Zeitschrift für Soziologie und Sozialpsychologie Sonderheft 45*, Wiesbaden, VS, 394-417.

Nelson, R. R. (Ed.) (1993) *National Innovation Systems: A Comparative Analysis,* New York/Oxford, Oxford University Press.

O'Sullivan, M. (2005) Finance and Innovation. In Fagerberg, J., Mowery, D. and Nelson, R. R. (eds.) *The Oxford Handbook of Innovation,* Oxford, Oxford University Press, 240-265.

Paul, H. (2009) Der neue Realismus, *FAZ,* **121**, 27. Mai 2009.

Perez, C. (2002) *Technological Revolutions and Financial Capital: The dynamics of Bubbles and Golden Ages,* Cheltenham, Edward Elgar.

Rajan, R. and Zingales, L. (2003) Banks and Markets: The Changing Character of European Finance, *Working Paper No. 9595,* National Bureau of Economic Research, NBER.

Rammer, C., Penzkofer, H., Stephan, A., Grenzmann, C., Heger, D. and Nagel, B. (2004) FuE- und Innovationsverhalten von KMU und Großunternehmen unter dem Einfluss der Konjunktur, *Studien zum deutschen Innovationssystem*, Berlin.

Rammer, C. (2009) Innovationsverhalten der Unternehmen in Deutschland 2007, *Studien zum deutschen Innovationssystem*, Mannheim et al.

Springler, E. (2007) Basel II – Finanzierung und wirtschaftliche Entwicklung, *WSI Mitteilungen,* **12**, 664-669.

Streeck, W. (1991) On the Institutional Conditions of Diversified Quality Production. In: Matzner, E. and Streeck, W. (eds) *Beyond Keynesianism*, Aldershot, Edward Elgar, 21-61.

Streeck, W. (2009) *Re-Forming Capitalism*, Oxford, Oxford University Press.

Streeck, W. and Thelen, K. (eds.) (2005) *Beyond continuity: Institutional Change in Advanced Political Economies,* Oxford, Oxford University Press.

Taylor M. Z. (2009) Empirical Evidence Against Varieties of Capitalism's Theory of technological Innovation, *Hancké, Bob (ed.)* Debating Varieties of Capitalism*, Oxford,* Oxford University Press*, 221-250*

Teece, D. and Pisano, G. (1994), The Dynamic Capabilities of Firms: an Introduction, *Industrial and Corporate Change*, **3**, 537–556

The Economist (2009) *Flight of the locusts*, April 11th, 57-58.

Tylecote, A. and Conesa, E. (1999), Corporate Governance, innovation system and industrial performance, *Industry and Innovation,* **6**, 25-50.

Tylecote, A. and Ramirez, P. (2005) UK Corporate Governance and Innovation, *Sheffield University Management School Discussion Paper No. 2005.*

Tylecote, A. and Ramirez, P. (2006) Corporate Governance and Innovation: The UK compared with the US and „insider" economies, *Research Policy,* **35**, 160-180.

Tylecote, A. and Visintin, F. (2008) *Corporate governance, finance and the technological advantage of nations* London, London/New York, London/New York, Routledge.

Tylecote, A. and Visintin, F. (2009) Corporate *Governance, Finance and the Technological Advantage of Nations,* London/New York, Routledge.

Van der Zwan, N. (2014) State of the art: Making sense of financialization. In Socio-Economic Review 12, 99-129

Vieweg, H.-G. (2001) *Der mittelständische Maschinenbau am Standort Deutschland – Chancen und Risiken im Zeitalter der Globalisierung und „New Economy*", IFO Institut, München.

Wallisch, M. (2009) Unternehmensfinanzierung durch Business Angels, *Zeitschrift für Wirtschaftsgeographie*, **53**, 47-68.

Whitley, R. (2007) *Business Systems and Organizational Capabilities. The Institutional Structuring of Competitive Competences.* Oxford, Oxford University Press.

Werle, R. (2012) Institutions and Systems: Analysing Technical Innovation Processes from an Institutional Perspective. In Johannes Bauer, Achim Lang und Volker Schneider (eds.), *Innovation Policy and Governance in High-Tech Industries*, Heidelberg, Berlin, Springer, 23-47

Widmer, F. (2011) Institutional investors, corporate elite and the building of a market for corporate control, *Socio-Economic Review,* **9**, 671-697.

Windolf, P. (ed.) (2005) Finanzmarkt-Kapitalismus – Analysen zum Wandel von Produktionsregimen, *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, Sonderheft 45.

Windolf, P. 2014: The Corporate Network in Germany 1896 – 2010, Westerhuis, G. and David, T. (eds.) *The Power of Corporate Networks: A Comparative and Historical Perspective,* London, Routledge (forthcoming).

Wolf, H., Mickler, O. and Manske, F. (1992) *Eingriffe in Kopfarbeit,* Berlin, edition sigma.

Seit 2009 erschienene Soziologische Arbeitspapiere;
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