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Corporate Governance and Innovation: An Organizational Perspective

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Abstract

Traditional economic studies of innovation, built on the contribution of Schumpeter, cannot explain why firms of the same size and market power can show largely different innovation performances. Contrastingly, the literature on corporate governance provides some useful insights for understanding corporate innovation activity, to the extent that such literature examines the economic consequences of different modes of coordination between firm participants. The process through which individuals integrate their human and physical resources within the firm is indeed central to the dynamic of corporate innovation. This paper provides the first survey of the literature on this issue. We start by discussing why a theory of the firm must be put at the base of an economic analysis of corporate innovation. We then describe three main channels – corporate ownership, corporate finance and labour – through which a system of corporate governance shapes firm innovation activity. Finally, we examine the recent literature on national structures of governance.

JEL classification: D23, G30, O16, O31

Keywords: corporate governance, innovation, theory of the firm, specific investments.

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1. Introduction

What makes a firm innovative? For a long time, the traditional economics of innovation, inspired by Schumpeter (1942), dominated the ways through which economists approached this question. The firm was treated as a production function and innovation was considered as a direct consequence of profit maximizing behavior. In particular, firm size and market power were assumed to be the only two relevant dimensions for corporate innovation. Nevertheless, both theoretical models and empirical analysis along these lines of research left unexplained a large part of the picture, while they were perhaps most accurately described as fragile.² Persistently, traditional studies were unable to explain why firms with similar *external* conditions could show (as they often do) largely different innovation performances.

A second and heterogeneous body of studies has suggested that what the traditional theories were lacking is the understanding of the “organizational foundations” of innovative enterprises. Indeed, the process through which individuals integrate their human and physical resources within the firm is central to the dynamic of corporate innovation. This line of research builds on an idea that dates back at least as far as the Coase’s (1937) contribution: the firm is not a black box, rather it is an institution that organizes the relationships between those who contribute labour and capital inputs to the production, so providing a mode of coordination alternative to the market. Thus, from this point of view, to ask what makes a firm innovative means that we must ask what are conditions *internal* to the firm conducive to innovation and to ask how systems of corporate governance affect firms’ investment strategies.

Surprisingly, unlike traditional studies on the economics of innovation, such a field of research has not benefited so far from a systematic discussion and review of its major contributions. This paper is aimed at filling this gap.

Studies that link corporate governance to innovation form a corpus of research that is difficult to disentangle for two interrelated reasons. Firstly, as Lazonick (2003) noticed, a theory of the innovative enterprise is still missing, which implies the absence of a theoretical base of research on this issue.

² For a comprehensive survey of theoretical and empirical research on Schumpeter’s hypothesis see Kamien and Schwartz (1975), Cohen and Levin (1989), and Van Cayseele (1998).

Secondly, lacking such a theory, contributions to the organizational determinants of innovation relate, in a disorganized puzzle, to various and different aspects of corporate governance.

However, in this stream of work, it is possible to identify three main dimensions of corporate governance that are deemed relevant for innovation. A first dimension concerns the distribution of control rights and residual profit rights within the corporation, essentially the corporate ownership structure. How these rights are allocated shape the control power of a firm's decision-makers over resource allocation and these decision-makers' incentives to invest in the innovation process. A second dimension relates to the ways through which corporations finance innovative production. How and to which extent corporations are able to commit financial resources to irreversible investment strategies is crucial in order for the innovation project to be completed. A third dimension is that of labour. This dimension has been somewhat neglected by the traditional corporate governance research, but it is instead central for corporate production. In knowledge intensive production human capital is as important as physical and financial assets in creating innovation.

Although both theoretical and empirical research often focuses on individual links between corporate governance and innovation, these three dimensions must not be conceived as separated in their effect on technological development. For example, a financial structure characterized by the involvement of thousands of small equity investors may positively affect corporate innovation activity because it favors the commitment of capital to long-term investment projects (Bradley *et al.*, 1984). At the same time, however, it also pushes managers towards short-run strategies because it increases the probability of an ownership change due to takeover (Shleifer and Summers, 1988). Moreover, a dispersed ownership structure may reduce the ability of the employer to enter in long-term relationships with workers, because individual shareholders can easily use the "exit" option, therefore depressing the development of human capital (Mayer, 1997). The various dimensions of corporate governance are likely to be related also at the macro level. For instance, countries tend to show market forms of coordination in both the sphere of shareholder-manager relationships and in that of labour organization, or in neither of them, and this shapes, in turn, the patterns of corporate innovation observed at the national level (Hall and Soskice, 2001).

In this paper, we try to provide an organic and systematic review of the contributions on these aspects of corporate government and innovation, motivated by the fact that how institutions of corporate governance affect technological development is increasingly recognized as a crucial question for both legal and economic policymakers (see, e.g., O’Sullivan, 2000).

Having clarified what we do discuss in this paper, it is worth emphasizing what we do not do. Because many comprehensive surveys of the literature on the relationship between corporate governance and corporate performance have been written over the years,³ we do not review that literature here, while we focus on those studies that explicitly address the innovation process. We do, however, briefly review the most influential theories of the firm, inasmuch as they provide some useful insights for understanding the organizational characteristics relevant to corporate innovation.

We also explicitly restrict our discussion to the literature referring to business corporations’ production of innovation, and exclude from the survey the literature focusing on innovation performance of other forms of economic organization (such as cooperatives or public institutions).

Finally, the usual caveat for survey papers applies to this one as well. Although we try to cover a representative spectrum of the papers on corporate governance and innovation, it would be impossible to give due consideration to all the many works written on this theme.

The paper proceeds as follows. In Section 2, we briefly discuss how technological innovation has been taken into consideration by the theories of the firm. We then review the main contributions on the organizational determinants of innovation, developing our discussion along the three dimensions of corporate governance mentioned above: corporate ownership (Section 3), corporate finance (Section 4), and labour (Section 5). Section 6 examines national structures of governance and provides some macro-evidence. Section 7 concludes.

³ See, for example, the book of Gugler (2001).

2. Innovation in the theory of the firm

Technological innovation is the development of an original (higher quality) product or process, through the utilization of productive resources and the embodiment, combination or synthesis of knowledge in a new object or method. It follows that innovation is generated through a collective and cumulative process of learning, which requires the commitment of resources for a prolonged period of time. By definition, technological innovation involves three elements: (i) specificity of the investments, (ii) uncertainty about the result, and (iii) impossibility of anticipating future returns.

(i) Investment specificity relates to the cumulative and collective character of the innovation process. The development of a new technology needs the interaction of knowledge and experiences by those individuals that are collectively attempting to innovate, so as to generate specialized skills specific to a certain relation. The coordination and integration of these skills in response to technological problems then generates new knowledge and innovation.

(ii) Innovation production is highly uncertain. Underlying the innovation production there is a process of discovery that may or may not succeed in generating new technology. As a consequence, individuals cannot describe *ex-ante* every possible situation they will face and their future actions, while they must adapt to new information as it becomes available.

(iii) Even if the innovation process generates new knowledge, the new technology or product may not be an improvement of the existing knowledge sufficient at guaranteeing commercial success. Thus, final returns and their distribution among those who have taken part (and invested) in the innovation process cannot be anticipated when the process starts.

These three elements imply the impossibility of writing complete contracts that specify each party's obligations in every possible state of the world. Individuals that engage in collective innovation processes are simply not able to foresee all future contingencies and contracting for details of every conceivable eventuality may be too costly.

In a context of incomplete contracting, the need of specific investments causes the so-called hold-up problem, which relates to the possibility of a given party to threaten opportunistically to withdraw some of the resources from the relationship (after the specific investments of the other project participants are

made) unless his share of the final returns is increased. The consequence of the hold-up problem is a distortion in the initial investment decision; in particular, parties that are required to undertake specific investments may anticipate this opportunistic behavior and may refrain from investing *ex-ante*.

The firm, as an *ex-post* mechanism of governance, provides a partial solution to this problem. The theory of the firm conceived by Williamson (1985) and then further developed by the New Property Rights School (Grossman and Hart, 1986, Hart and Moore, 1990) describes the firm as a structure of vertical integration in which the ownership of the assets involved in the production process is concentrated in the hands of a single party, so that the incentives for opportunism are removed. Since only one party has both the right to make residual management decisions (i.e. the right to control how the assets are used under contingencies that are not specified in the contract) and the right to claim the residual profits of the production, the remaining parties lose the capabilities to make opportunistic threats.

Yet, the firm as a centralized structure of governance is only a second-best solution, to the extent that, under a one-party-owner regime, the non-owner firm participants lose the abilities to hold-up as well as the incentives to invest.⁴ Since innovation is a process of collective and specific investing (the firm itself may be defined as a “bundle of skills”, see Nelson and Winter, 1982), it follows that the underinvestment by some of those firm members that are crucial for the innovation process to succeed may endanger the entire undertaking. This is the reason why the crucial problem of firm innovation production is to devise institutional arrangements for governing the relationships among those who contribute firm-specific assets, in the presence of multiple investors, uncertainty, and self-interest, and why understanding firm innovation requires an analysis of how and under what organizational conditions corporations innovate.

The “shareholder primacy” view of the firm builds on the principal-agent paradigm, according to which shareholders (the principals) engage managers (the agents) to run the firm on the shareholders’ behalf (Jensen and Meckling, 1976).⁵ Advocates of this theory argue that what enhances corporate

⁴ Pagano and Rossi (2004), in a Grossman-Hart-Moore setting, argue that, in particular, the second-best allocation of intellectual assets entails an underinvestment of human capital when many agents should make investments specific to the same piece of intellectual property.

⁵ See Alchian and Demsetz (1972) for a pioneer contribution on asymmetric information problems within firms, while Holmstrom (1982) and Holmstrom and Milgrom (1994) for an assessment of moral hazard in teams. See also Smith (1998) for a discussion of the shareholder primacy view in legal scholarship.

performance, broadly speaking, is the shareholder control power over management's behavior and strategies. It is also assumed that shareholders are the only residual claimants because they are the only economic actors that invest in the corporation without a guaranteed return, while the other firm participants are hired by the shareholders through arm's length market transactions. So, the relationship between the firm and the employee is given by a series of short-term complete contracts, long-term relationships remain an exception and specific investments by non-shareholder constituencies are absent. The main problem with this theory of the firm is that it precludes an analysis of how business corporations might transform knowledge and physical resources in innovation. Indeed, on the one hand, shareholders' investments are advocated as the only fundamental source of productive activities, on the other hand, the absence of any possibility of sharing in the surplus of superior performance therefore expunges the incentives for employees to devote their skills and efforts to the innovation process (Lazonick, 2003).

Contrastingly, the so-called "stakeholder approach" envisions the firm as a wide constituency of stakeholders. Blair (1995), in particular, defines stakeholders as those who contribute firm-specific assets. Proponents of this model argue that the physical assets in which shareholders invest are not the only assets necessary to innovation, while firm-specific human assets are as important as (and often more important than) physical capital in generating innovation. Therefore, any assessment of firm innovation must consider the incentives and disincentives faced by all stakeholders who potentially contribute to the innovation process. In this context, the problem of finding mechanisms that lead to higher levels of investment by all firm-specific investors becomes central to a theory of innovation.⁶

Rajan and Zingales (1998) show analytically that the optimal investment decisions cannot be achieved if only one party (among multiple specific investors) owns the assets necessary to the production. Optimal investment decisions can be achieved when the assets are owned by an otherwise passive third party that controls the use of the assets, so eliminating the risk of hold-up between the specific investors. Of course, the third-party owner must be a generic input in the team who does not contribute something critical to the production. In Rajan and Zingales' (1998) interpretation this is exactly the role of passive outside shareholders. However, that shareholders will not use control over the assets to extract an undue

⁶ See O'Sullivan (2000) for a critical discussion of the stakeholder approach to corporate innovation.

rent at the expense of the other investors has been argued to be an implausible interpretation (Blair, 1999).⁷

Two legal scholars (Blair and Stout, 1999, 2006) develop an alternative theory according to which the corporation itself, as a legal entity under the law separated from the investors, acts as the repository of all the property rights over the assets used in production. In their view, the corporate production is a team production where financial investors put up money and workers human capital. Thus, in order for the production to be successful, all the resources must be locked in to the corporation and none of the team members should be able to withdraw his contribution from the firm. Consequently, managers and directors are not agents of the shareholders-owners but they are “mediating hierarchs” who protect firm-specific investments and distribute the returns. Blair and Stout (2006) conclude that the lock-in function of corporation promotes value creating corporate productions.

In accordance with this view, Lazonick (2007) states that the claim that only shareholders have a residual claimant status ignores the ways through which the other stakeholders make firm-specific investments in the corporation without a guaranteed financial return, and he argues further that incomplete contracts pervade the innovation process. The so-called Organizational Control Theory proposed by Lazonick and others (Lazonick and O’Sullivan, 1996, Carpenter *et al.*, 2003, Lazonick, 2003, Lazonick and Prencipe, 2005, Lazonick, 2007) affirms that an enterprise must engage in three activities in order to innovate: first, strategizing, through which the firm gives decision-makers the power to allocate physical and human resources to specific investment strategies; second, organizing, through which the firm creates incentives for team members to apply their skills and efforts to collective learning processes; third, financing, through which the firm ensures the allocation of money to the innovation process until it generates financial returns. The achievement of these three activities results, then, in the three social conditions that can lead a cumulative learning process to innovation. They are strategic control, organizational integration and financial commitment. Lazonick (2003), in particular, compares his theory of the innovative enterprise to the traditional theory of the market economy and argues that only firm-level organizational control (rather than market control) over the resource allocation can put in

⁷ The problem of the allocation of property rights within the firm can be further extended considering that property rights can be assigned also *ex-ante* on the innovation output, in addition to those on the inputs. On this point, see Aghion and Tirole (1994).

place these three social conditions. Specifically, it is the firm rather than the market that creates incentives that affect how individuals allocate their labour, that controls the allocation of money to alternative uses, and that shapes the type of investments in productive capabilities.⁸

3. Corporate ownership

3.1. Ownership structure

The corporate ownership structure is the mode through which ownership rights (i.e., control rights and residual profit rights) are distributed within the corporation. Traditionally, the degree of concentration of equity ownership is considered as the main factor shaping the ownership structure of a corporation. Two different approaches deal with the relationship between ownership structure and innovation. The first approach affirms that a concentrated ownership entails a more effective monitoring over management strategies and, in turn, reduces the high agency costs associated with innovation, according to a principal-agent framework. A second approach emphasizes that various ownership structures relate to different methods of enforcement in incomplete contractual relations concerning specific investments by firm-internal and firm-external investors.

The agency costs approach predicts that diffuse equity ownership negatively affects corporate innovation activity, because it enables the managers to pursue their own objectives, such as increasing their personal wealth and prestige, to the detriment of profit-enhancing projects. Indeed, small dispersed shareholders do not have incentives to monitor management behavior, inasmuch as the costs of monitoring exceed the benefits.

This view is corroborated by the Hill and Snell's (1988) findings, concerning 94 *Fortune 500* firms drawn from research-intensive industries, that show a positive relationship between the level of corporate R&D spending and stock concentration. Similarly, Baysinger *et al.* (1991) examine the R&D investments in 176 *Fortune 500* companies and, moreover, distinguish between individual and institutional equity owners. They find a positive effect of concentration of equity ownership on corporate

⁸ See Lazonick and Prencipe (2005) for an analysis of the innovation process at Rolls-Royce using this approach.

R&D spending, and argue that such an effect can be attributed mainly to the role played by large institutional investors, given their ability to spread R&D risk more effectively than undiversified investors.

Some authors have argued that in the presence of substantial separation between equity ownership and business control contractual solutions to the problem of agency costs and information asymmetry in innovative productions may be beneficial. For example, Markman *et al.* (2001) discuss the beneficial effect of long-term pay, such as equity-based compensation, in reducing the managers' propensity to pursue non-innovative strategies. Nevertheless, others affirm that incentive contracts, aimed at aligning managers' and shareholders' interests, are unlikely to be successful. Francis and Smith (1995) sustain that innovative productions make the design of incentives contracts highly costly, since innovation production is risky and idiosyncratic. As a consequence, contracting solutions are unlikely to solve agency problems between dispersed shareholders and managers, and diffusely-held firms end up being less innovative than closely-held firms. Francis and Smith (1995) also examine empirically the relationship between ownership structure and innovation outcomes of approximately 900 US corporations. They find that relative to firms where an individual investor (or an investors group) owns a large block of equities diffusely-held firms have a lower patent activity and focus more on growth by acquisition versus internal development. Holmstrom (1989), finally, argues that the larger the firm's size, the higher the incentive costs of a principal-agent relationship. In particular, larger firms conducting innovative research face more difficulties than small ones, because they have to manage heterogeneous sets of tasks.⁹

The second approach suggests that corporate ownership structures differ in their organizational capacity and in their ability to enter in incomplete contractual relations with various stakeholders.

Battaglion and Tajoli (2001) affirm that the ownership structure shapes the *ex-post* bargaining over (and so the final allocation of) the quasi-rent generated by the firm. Thus, the ownership structure can directly affect corporate innovation by influencing the incentives of firm-external investors to participate in innovative activities. From this point of view, the coincidence between equity ownership and business control (that the agency costs approach deems to be beneficial) implies an asymmetric bargaining power

⁹ See Bitar (2003) for an introductory discussion on agency theory and corporate innovation.

between block-holders and small outside investors, and, in turn, reduces the capabilities of block-holders to make credible commitments to small outside investors. This should cause difficulties for the firm in raising funds and a consequent decrease of innovative investment projects, which are, generally, highly costly. Battaglion and Tajoli (2001) then estimate a probit model using data from a sample of 1233 Italian firms and find that more capitalized corporations are more innovative, in terms of patenting activity.

Mayer (1997), taking a different view, suggests that concentrated shareholdings may encourage trust and commitments. Indeed, in a system of dispersed shareholdings, individual shareholders can use their “exit” option anonymously, while a concentrated shareholder cannot do so, because of the reputational consequences. Large shareholdings, thus, should favor long-term relationships between equity owners and other stakeholders (such as employees, suppliers and outside financiers), and support firm-specific investments. The reputation concern of large shareholders is highlighted also by Miozzo and Dewick (2002), which examine innovation activity in the construction sector of five European countries and observe that firm-specific investments are more readily financed in the presence of concentrated equity ownership and cross-holdings.

The approach proposed by Lacetera (2001) tries to integrate the principal-agent and the incomplete contracts perspectives. He argues that the core of the relationship between corporate governance and innovation is neither the agency costs nor the hold-up problem, rather it is the definition of institutional devices promoting knowledge flows and the integration of different capabilities. Specifically, the corporate ownership structure influences innovation because it affects who makes investment decisions, what type of investment investors make and how returns are distributed within the firm. As a consequence, equity ownership concentration reduces agency conflicts, yet it implies the involvement of block-holders in long-term firm activities, thus improving the block-holders’ knowledge about such activities. Phrased differently, ownership concentration may be seen as a form of both financial commitment and organizational integration. Lacetera (2001) goes on to perform an empirical analysis using panel data from a sample of 27 pharmaceutical companies. He finds that equity ownership concentration positively affects R&D intensity (measured as R&D/sales ratio).

Finally, Cho (1998) cautions researchers that corporate ownership and innovation activity may be linked in a two-way relationship. Cho (1998) performs a simultaneous regression using data on 230 *Fortune 500* manufacturing firms and shows that, while ownership structure affects R&D spending, the R&D spending affects corporate value and, in turn, ownership structure. This may question the empirical results obtained assuming that the ownership structure is exogenously determined.

3.2. Owners' identity

Based in agency theory, traditional corporate governance studies assume that various ownership constituencies have homogeneous preferences concerning business strategies and innovation. However, the empirical research casts doubt on this assumption. Corporate owners may be families, government, or institutional investors. While the relationship between families or government ownership and corporate innovation production has not benefited from substantive theoretical or empirical insights, the effect of institutional ownership on firms' innovation has received much more attention. A large body of empirical works focuses on this issue in a principal-agent setting and provides mixed evidence.

Hill *et al.* (1988) argue that institutional investors are risk adverse, so that when they are major stockholders they also wield pressure on management to obtain good short-term performance to the detriment of long-term projects and innovation. This conjecture is empirically tested by Graves (1988). He performs a panel analysis on 22 computer-manufacturing companies and finds that institutional ownership has a negative effect on R&D intensity. Graves (1988) explains this result arguing that institutional investors have short-term interests and, furthermore, a limited knowledge of the firms or industries in which they operate. In a subsequent paper, Graves examines 133 US companies and does not find empirical support for the hypothesis of a negative relationship between institutional ownership and R&D investments (Graves, 1990).

Sherman *et al.* (1998) categorize the firms' institutional investors into four types (pension funds, mutual funds, banks, and insurance companies) and perform OLS regressions using data from a sample of 271 US *Fortune 500* firms. Doing so, Sherman *et al.* (1998) find that, while insurance ownership and bank ownership do not influence corporate R&D expenditure, pension funds ownership has a positive effect on innovation and mutual funds ownership has a negative effect on innovation.

Differences among owners' constituencies' preferences for corporate innovation strategies are found also by Hoskisson *et al.* (2002). These authors distinguish public pension funds' ownership from professional investment funds' ownership. They perform a two-stage regression analysis on 234 US firms and unveil that pension funds show a preference for internal innovation (R&D intensity and new product intensity) and that investment funds are associated with higher external innovation (external acquisition of new products and acquisitions to develop new processes). Managers of the former, indeed, do not feel pressure for immediate returns, rather they have long-term horizons. Conversely, investment funds are likely to prefer immediate returns.

Contrary to the view of myopic institutional investors, Hansen and Hill (1991) unveil that larger institutional ownership is associated with higher levels of R&D expenditure. The authors examine 129 US firms over a 10-year period and find that institutional holdings have a positive effect on R&D intensity. They suggest two possible explanations for this finding: first, institutions are professional decision-makers that benefit from economies of scale in information gathering and analysis; second, institutions may be locked in to their stockholdings, so that they cannot exit from a firm's stock without depressing the stock price and suffering a substantial capital loss.

The locked-in position of institutional investors is corroborated by Kochhar and David (1996). They test three competing hypotheses: the myopic investor hypothesis (i.e. institutions have short-term horizons), the superior investor hypothesis (i.e. institutions possess better knowledge about the market than individual investors) and the active investor hypothesis (i.e. institutions cannot easily divest in the short-run and, consequently, they encourage investment strategies beneficial in the long-run). Kochhar and David perform an empirical analysis using information on ownership structure and R&D intensity from a sample of 135 US firms and propose findings that reject the first two hypotheses, while they suggest the validity of the third hypothesis. More recently, David *et al.* (2001) examining a panel of 73 US firms, found a positive effect of institutional investors' activism on corporate innovation.

Aghion *et al.* (2009), finding similar results, argue that institutional owners have better incentives and abilities to monitor than other owners. This increased monitoring, in turn, should "insulate" managers against the reputational consequences of an innovation project's failure due to purely stochastic reasons, and should therefore improve incentives to innovate. Aghion *et al.* also report empirical evidence

corroborating their career concerns model, using data on 803 US firms observed in the 1991-1999 period. Specifically, they show that there is a robust positive association between innovation and institutional ownership after controlling for the potential endogeneity of institutional ownership.¹⁰

4. Corporate finance

4.1. Stock market

To ensure the allocation of financial resources to irreversible investments with uncertain returns is one of the essential conditions to innovate.

The traditional corporate finance built on the Modigliani-Miller theorem (Modigliani and Miller, 1958) maintains that, under certain conditions such as perfect and efficient capital markets, financing decisions (i.e. various debt-equity ratios) are irrelevant to the firm's strategy. With respect to R&D investment, however, this proposition may not hold. As Williamson (1988) points out, debt and equity are not only alternative financial instruments, but rather they are alternative governance structures. On the one hand, issuing new equity causes a reduction of the individual shareholder's incentives to monitor. On the other, issuing debt induces shareholders to take large *ex-post* risks, since equity holders participate in the returns from successful projects while creditors incur the costs in the event of failure, which implies a creditor's preference for low-risk projects. Williamson (1988) argues that these are the reasons why debt should finance redeployable assets, while non-redeployable assets (i.e. specific investments) are better financed by equity.

Adverse incentive effects of debt financing for innovation are described in detail by Gugler (2001), who finds five reasons why debt is poorly suited to technological investment. First, when R&D assets are financed by debt, their specificity and low resale price may cause insolvency if a project fails. Second, asymmetry of information about R&D projects may discourage creditors from financing innovation activities. Third, early liquidation is likely to occur if cash flows from innovation are set throughout many periods and are insufficient to cover interest payments. Fourth, a large fixed-cost component of

¹⁰ For further evidence on a positive relation between institutional ownership and innovation, see Baysinger *et al.* (1991), Szewczyk *et al.* (1996) and Eng and Shackell (2001).

R&D expenditure makes diversification difficult. Fifth, creditors may be unwilling to finance risky activities, if they do not participate in the high-return states of such activities, but are exposed to the costs of failure.

These arguments are corroborated by Bradley *et al.* (1984), who show that the debt to asset ratio is negatively related to R&D expenses. Analogously, Long and Malitz (1985) find that the five industries with the lowest debt ratios, e.g. pharmaceuticals and cosmetics, grow fast and are R&D intensive. A negative correlation between a firm's leverage and R&D intensity is found also by Balakrishnan and Fox (1993). They examine a sample of 295 US firms across 30 industries over the period 1978-1987. Carpenter and Petersen (2002), more recently, study an unbalanced panel of about 2400 publicly traded US firms in the period 1981-1998 and show that equity financing has a positive effect on firm investments for high-tech companies.

Large and liquid stock markets, by providing firms with ready equity finance, may therefore play an important role in supporting corporate innovation activity. Gugler (2001) performs an ordinary least-square regression of the R&D/GDP ratio on the stock market capitalization to GDP ratio, using data on 14 OECD countries in 1994, and finds that the stock market capitalization has a positive and statistically significant effect on the R&D/GDP ratio.

Lazonick (2007) argues that the stock market can influence corporate innovation in a variety of ways. First, the stock market induces financial commitment to new firm formation by enabling private equity holders to monetize their stakes (*creation*). Second, the stock market influences who exercises strategic control by enabling the separation of share ownership from managerial control, so as to give decision-makers the power to allocate resources to uncertain innovation processes (*control*). Third, the stock market provides funds for mergers and acquisitions (*combination*). Fourth, the stock market provides means through which managers and employees can be induced to apply their skills to innovative processes, thus facilitating their organizational integration (*compensation*). Fifth, in speculative periods, the stock market serves as a source of financial commitment, providing the corporation with funds without the guarantee of a return (*cash*).

In two related papers, it has been argued also that the relationship between the stock market and innovation may be a two-way relationship (O'Sullivan, 2000, Carpenter *et al.*, 2003). O'Sullivan (2000)

suggests that shareholders of successful enterprises may not wait that the innovation generates commercial revenues and may “go public” to take advantage of the stock market evaluation of the innovation. In doing so, they leave resource allocation under the control of the organization, given the separation of asset ownership and managerial control made possible by the stock market. Carpenter *et al.* (2003), in a study focused on the optical networking industry from 1996 to 2003, show that innovative corporations may supply cash to the stock market along with the stock market supplying cash to corporations. Indeed, given the large use of stock-based compensation in the New Economy, the stock market increasingly functions as a source of cash for managers who exercise their stock options, even if not for the companies by which managers are employed.

4.2. Takeovers

In the presence of active stock markets, takeovers are an important influence on firms’ investment strategies. In a typical takeover, a bidder makes a tender offer to the dispersed shareholders of the target firm and, if they accept the offer, acquires the control of the firm, and can replace the management. Thus, managers will be more reluctant to take self-serving actions that lower firm value, which increases the probability of a takeover. Takeovers, consequently, are generally viewed as a means for correcting managerial failure and providing a disciplining device (see, for example, Scharfstein, 1988). Nevertheless, takeovers may negatively affect long-term strategies based on specific investments, such as innovation activities. This can happen through both *ex-ante* and *ex-post* dynamics.

The takeover’s *ex-ante* effects on innovation are of two types, both of which are generally deemed to negatively affect innovation. First, as Shleifer and Summers (1988) argue, even if takeover is not a certainty but only a possibility, stakeholders may not agree to implicit contracts through which they invest in relation-specific capital because they fear a future breach. Phrased differently, stakeholders may anticipate that a takeover increases the probability of *ex-post* expropriation and in turn provide suboptimal levels of firm-specific investments *ex-ante*. Second, under a “myopia” hypothesis, managers concerned that low short-term profits will result in unwanted takeover attempts, will focus on projects

with short-term payoffs and on visible activities, even at the expense of long-term corporate performance (Stein, 1988, Maher and Andersson, 2002).

In accordance with this view, Johnston and Rao (1997) study the effects of antitakeover amendments and argue that these measures enable a firm's management to focus on long-term business strategies without the threats of losing control of the firm or of job displacement. In particular, Johnston and Rao (1997) examine 649 antitakeover amendments adopted in US firms between 1979 and 1985, and show that the R&D expenditures to sales ratio remains unchanged in each of the five years after adopting an antitakeover amendment compared to its value prior the adoption.

Pugh *et al.* (1999) use a sample of 183 US firms that adopted an antitakeover amendment in 1990 and report, for these firms, a strong increase in R&D expenditures (relative to both assets and sales) in the following four years.

The evidence on *ex-post* effects, instead, is mixed. On the one hand, some studies raise concerns that takeovers are followed by a reduction in innovation production. Indeed, after a takeover, managerial energy may be absorbed by the restructuring process to the detriment of innovation projects; moreover, successful bidders often have little interest in long-term investment strategies of target companies, while they may exercise rent-seeking behavior. Smith (1990) investigate changes in firm performance after 58 buyouts of US corporations during the period 1977-1986, and find a sharp decline of *ex-post* R&D expenditures. Similarly, Long and Ravenscraft (1993), using a sample of 72 US companies that experienced buyouts, show a drop of 40% in R&D intensity during the 3 years after the buyout. Analogous results are reported by Hoskisson *et al.* (1994). Hitt *et al.* (1991) find a negative effect of acquisitions on both R&D and patent intensity of the resulting company.

On the other hand, a number of recent papers support the hypothesis that takeovers are not detrimental to long-term investments in R&D and innovation, because equity funds provide superior management and enable acquired firms to seize innovative opportunities. Zahra (1995) uses data from 47 US companies and finds that, after a buyout, companies enhance their R&D units' size and capabilities. Wright *et al.* (2001) propose an efficiency approach and argue that buyouts can create entrepreneurial opportunities leading to an increased R&D activity and patenting. Bruining and Wright (2002) examine a sample of Dutch firms and show that buyouts are followed by an increase in new product development.

Lerner *et al.* (2008) study the changes in patenting behavior of 495 US firms and find that after buyouts, while the level of patenting seems not to change, firms pursue more influential innovations, as measured by patent citations. Finally, Ughetto (2010) considers 681 Western European manufacturing firms that underwent a buyout between 1998 and 2004, and tests whether the characteristics of the deal and of the successful bidder can affect acquired companies' innovation, which is measured by patenting activity. He finds that the post-buyout innovation output of an acquired company is better if the bidder is not an independent investor, is specialized in the buyout stage, is a European investor, and devotes a large amount of capital to the deal.

Finally, Sapra *et al.* (2009) predict a U-shaped relationship between the degree of innovation and takeover pressure. They argue that, when takeover pressure is very low, both the takeover premium and the loss of control benefits that managers expect are insignificant. Therefore, managers choose greater innovation, because it is associated with higher risks but also with a higher expected payoff. Conversely, when takeover pressure is very low, the expected takeover premium and the expected loss in control benefits are both high, but the former dominates the latter. Thus, managers choose greater innovation. When takeover pressure is moderate, instead, the expected loss in control benefits dominates the expected takeover premium, which encourages managers to choose lower innovation in order to reduce the likelihood of losing control benefits.

5. Labour

At present, firm-specific skills are acknowledged as the fundamental input to innovation production. Nevertheless, both theories of corporate governance and of corporate innovation have done little until recently to address the problems raised by investments in firm-specific human capital.

Investments in specialized knowledge and skills introduce a complication into simple models of contracting, inasmuch as such investments are specific to the individual firm where they have been undertaken. Indeed, firm-specific training has no effect on the productivity of the worker, after he has moved to another firm, so that the wage that an employee could get elsewhere is not affected by the amount of specific training previously received (Becker, 1975). In an incomplete contracting setting, the

main consequence of this is that the employer may adjust the wage downwards *ex-post*, behaving opportunistically, given that the employee has already applied his effort to the learning process. If the employee anticipates this opportunistic behavior, he will refrain *ex-ante* from developing firm-specific human capital. In the innovation process, this problem is exacerbated by the fact that the final returns of the innovation are unknown *ex-ante*; consequently, employees may be unwilling to apply their effort to the process if they do not have a guaranteed return from their investments but have to bear the opportunity costs associated with making those investments. It follows that only when employers commit themselves to not extracting rent from workers, do workers have incentives to apply their efforts to collective learning processes.

In this context, the organizational problem relevant to innovation relates to the need for institutional devices that protect non-contractible worker investments in firm-specific skills.

5.1. Trade unions

Clearly, trade unions are the primary way through which employees can increase their bargaining power over distribution of the enterprise surplus obtained from successful innovation.

On the one hand, some studies argue that the “voice function” of unions allows workers to benefit from human capital investments. Daniel (1987) finds that UK unionized firms are more likely to invest and to adopt new technologies. Consistent with this result, Machin and Wadhvani (1991) undertake a probit estimation on 630 UK establishments observed in the 1981-1984 period and show that unionized firms are not deterred from investing in new technology, while, in terms of raw correlations, unionism is positively associated with the level of corporate investments. Corroborating evidence is also provided by Michie and Sheehan (2003), who perform a probit estimation on UK firms data showing that unionized establishments are correlated with product innovation. Furthermore, using Australian data, Drago and Wooden (1994) unveil that active unions positively affect the probability of the introduction of a new technology at the firm-level.

On the other hand, the idea of a negative relationship between unions and innovation finds some support in the empirical evidence. It may be argued that the development of firm-specific skills is costly for the employee (in terms of effort) as well as for the employer (in terms of resources allocated to the

training programs) and that where firms and unions are unable to stipulate incentive-compatible contracts, the employers decrease their investments in human capital and in new technologies in order to avoid union capture. As a result, unionism may have a negative effect on tangible and intangible capital investments. Hirsch and Link (1987) test this hypothesis on 315 US manufacturing corporations and find that firms reporting 50% or more unionization are less likely to show product innovation. Similarly, Acs and Audretsch (1988), analyzing patent activity in US, find that, to the extent to which unions are successful in rent-seeking activities, they discourage innovative investments and negatively affect the total number of firm's innovations. More recently, the same negative correlation has been found in UK data by Menezes-Filho *et al.* (1998).

So, whether unions can actually provide a way of solving *ex-post* distributional conflicts arising in the presence of firm-specific investments remains unclear, and the link between unionism and innovation still appears difficult to disentangle.

5.2. Worker participation

Another solution to organizational failures in the development of firm-specific human capital is an internal governance structure promoting employee participation in the firm's decision-making even in the absence of unions. Worker participation (by which a direct voice in management is given to the employee along with some control over the allocation of final returns) is a device that may support internal commitments between employees and employer. For example, McCain (1980) develops a theory of board-level worker participation, arguing that it permits improved efficiency by creating a context of joint management and power-sharing, and prevents sub-optimal behavior resulting from incomplete labour contracts. Similarly, Smith (1991) argues that a worker participation mechanism corrects organizational failures, by providing employee "checks" on management actions, and encourages technical efficiency and the development of skills and new knowledge through the protection of investments in firm-specific human capital.

As far as we know, empirical research directly examining the relationship between board-level employee participation and firm innovation activity is absent, while a few empirical papers focus on the worker participation in day-to-day decision making.

Michie and Sheehan (1999a) employ a qualitative response model on a sample of about 400 UK firms and find that employee participation correlates positively with the likelihood of firms innovating. In particular, the two authors unveil how regular meetings among work-groups or between union representatives and managers help cooperation and problem solving and in turn positively affect a firm's innovation production, where innovation is measured by both the R&D expenditure and the introduction of new micro-electronics technology in production. In related work, Michie and Sheehan (1999b) explore data from the UK's 1990 Workplace Industrial Relations Survey and show that work organizational practices aimed at generating a high commitment organization are positively correlated with R&D investments. Similar results are obtained by Michie and Sheehan (2003), who perform a probit estimation using data on UK firms and find a negative effect of short-term contracts on process innovation, because they discourage commitments and trust between employer and employee. In this latter paper, firm innovation activity is showed, moreover, to be fostered by work practices based, among other things, on regular information sharing between employees and management, and on consultations involving negotiations.

Laursen and Foss (2003) systematically test for the relationships between various types of Human Resource Management (HRM) practices and corporate innovation activity, analyzing the effect of such practices on tacit knowledge and specific human capital development. Thus, with respect to previous studies, the link between worker participation and innovation is thought to be the mode through which workers acquire skills rather than their incentives to do so. Laursen and Foss indicate two aspects of new HRM practices that positively affect innovation: first, an increased use of teams, which enhances the interaction between individual workers' skills; second, job rotation, which promotes knowledge diffusion and information dissemination. The authors perform an empirical analysis using data on 1884 Danish business firms, and, consistent with their hypothesis, find that HRM systems governed by interdisciplinary workgroups, planned job rotation and delegation of responsibility are the most likely to drive a firm's ability to innovate.¹¹

¹¹ For a survey on the relation between various types of HRM practices and corporate performance outcomes (but not innovation) see Michie and Oughton (2003).

5.3. *Employee resistance to innovation*

A limited number of papers report some evidence of employee resistance to innovation. This phenomenon is generally explained by the fact that, given the sunk cost nature of human capital investment necessary for innovation, the lack of institutional devices protecting worker investments causes organizational failures. This is, for example, the case for firms in which unions are absent and employees do not share any decision-making power with employers. In particular, firm-internal resistance to innovation is likely to occur when it is uncertain whether the employees will be able to reap the benefits of their investment in human capital.

Zwick (2002) provides an empirical investigation performed on data from the Mannheim Innovation Panel that collects information representative of the profit-oriented part of the German economy. He finds that employees do not oppose innovation *per se*, but they resist innovation when the employer is not convincingly committed to avoid job losses or when the innovation implies an increase in the labor burden. Contrastingly, employee resistance to innovation is showed to be lower when workforce-management relations are better developed. Evidence on this issue is offered also by Hauschildt (1999), who uses data on 151 German firms.

Bemmel and Reshef (1991) analyze managers' perceptions of employee reactions to the introduction of new technologies, assessing 206 Canadian manufacturing enterprises. Their results suggest that worker resistance to innovation is lowered by an effective participation in the decision-making process, while the presence of unions (if it entails new ground for labor-management disputes) increases managers' perceptions of employee resistance.¹²

6. National structures of governance and macro-evidence

6.1. *Varieties of capitalism*

Organizational characteristics of corporations are likely to vary interdependently with the broader institutional context in which they operate. The modes of coordination of specific investors and the ways

¹² For a bargaining model of the interaction between employers and organized workers on the timing of innovation see Ulph and Ulph (1998).

through which economic activities are integrated, then, generate dominant patterns in market economies and shape national trajectories of innovation. The last two decades have seen the fast development of a body of literature arguing that national settings largely differ with respect to this, so creating “varieties of capitalism” (Lazonick and O’Sullivan, 1996, Soskice, 1997, Tylecote and Conesa, 1999, Whitley, 1999, Hall and Soskice, 2001, Casper and Matraves, 2003).

Whitley (1999) explains that different kinds of economic organization and control systems in market economies can be described as different types of business systems. Business systems are conceived as distinctive patterns of economic organization that vary across national economies in the mode of coordination of, and interconnection between, shareholders, managers and other employees. Whitley (1999) proposes three key dimensions for comparing business systems: ownership coordination, non-ownership coordination, and employment relations.

Ownership coordination concerns the relationships between shareholders and controllers of corporate resource allocation and activities. There are three relevant sub-dimensions: type of shareholder control of firms (that can be direct control, alliance or delegated control, and market or arm’s length portfolio control), the extent of ownership integration of production chains (i.e. degree of vertical integration), and the extent of ownership integration of activities across sectors (i.e. degree of horizontal integration).

Non-ownership coordination refers to the integration of activities in inter-firm relationships. This can be described along three lines that are, respectively, the degree of alliance coordination of production chains, the degree of collaboration between competitors, and the degree of alliance coordination of sectors.

Finally, employment relations can be described by the degree of employer-employee interdependence (the two extreme cases are the Japanese organization-based employment system and the Anglo-Saxon pattern of flexible external labour market). Different degrees of managerial delegation to, and trust of, employees are then associated to the different types of employment relations (the pure cases are scientific management, on one side, and responsible autonomy, on the other).¹³

¹³ For a detailed discussion on national institutional diversity and technological development see, among others, Chandler *et al.* (1997) and Berger and Dore (1996).

Soskice (1997) and Hall and Soskice (2001) directly link national structures of governance to national patterns of corporate innovation. They argue that national systems of institutional coordination devices provide different solutions to incomplete contracting problems across micro-level actors, so that different institutional models sustain different types of innovation. In particular, Hall and Soskice (2001) distinguish between market and non-market forms of business coordination. Market forms of coordination (such as those of the USA, United Kingdom, and other Anglo-Saxon economies) are characterized by liquid capital markets and flexible labour markets, which encourages the use of the “exit” option by the contract’s parties in economic relations. This inhibits alliances and, in general, commitments, because contractual parties can change quickly. At the opposite, non-market forms of coordination (typical of Germany, some continental European economies and, with several peculiarities, Japan) have institutional structures that facilitate the solution of incomplete contracting dilemmas. Here, strong trade unions, cross-shareholdings and reputational issues lead to long-term and credible relationships between most actors within the economy in the context of both intra-firm and inter-firm relationships. Therefore, on the one hand, market forms of coordination should be better at supporting radical innovation, which requires a low asset specificity (for example, this is the case of pharmaceuticals and biotechnology); on the other hand, non-market forms of coordination facilitate the development of highly specific assets, which substantially characterize incremental innovation (typical of mechanical engineering).

Using data from the European Patent Office, Hall and Soskice (2001) show that, according to their argument, in the 1984-1994 period German firms have increased their innovative specialization in mechanical engineering, product handling, transport, consumer durables and machine tools sectors, while US firms have innovated mainly in medical engineering, biotechnology, semiconductors and telecommunications sectors.

Casper and Matraves (2003) provide corroborating evidence, reporting aggregate data on R&D expenditure for the pharmaceutical industry, showing that UK firms have outperformed German firms in the late 1990s. Similar conclusions are reached also by Tylecote and Conesa (1999), who show that in the period 1989-1992 innovation activity in Germany was higher in chemicals and motor vehicles, while

the US was more innovative in pharmaceuticals. Within this framework, a country analysis of the French case is provided by Goyer (2001).

From a similar perspective, Lazonick and O'Sullivan (1996) explain national patterns of corporate innovation analyzing the organizational problems relating to financial commitments. The two authors emphasize that the increased concentration of control over shares by fund managers and institutional investors in the USA and UK forces managers to focus on short-term performance, since managers can switch portfolios of assets between short and long-term assets at quite short notice. Thus, although delegation of decision-making powers by equity owners to managers is high in the Anglo-Saxon system, the same system imposes strong short-term financial criteria on corporate strategies. Lazonick and O'Sullivan (1996) argue that this is shown by the fact that, in the USA, corporations seek to minimize the skill base on which the innovative process relies, by means of skill-displacing strategies. Conversely, Germany is characterized by strong financial commitments and organizational integration, which makes Germany more competitive in the chemical, electrical and mechanical sectors, where human capital and integrated skills are fundamental.

6.7. Institutional complementarities

Institutional complementarities between macro-spheres of the political economy are particularly relevant in shaping innovation patterns of corporations. According to Milgrom and Roberts (1992), complementarities are present when doing more of one activity increases (or at least does not decrease) the marginal profitability of each other activity in the group. Such a definition can be applied to institutions as well (see, e.g., Aoki, 2001).

Hall and Gingerich (2004) provide an empirical analysis of the economic effects of institutional complementarities in the macroeconomy. They consider, in particular, the relationship between the labour market (as described by the level of wage-claims coordination, the degree of wage coordination between unions and employers, and labour turnover) and some institutions of corporate governance (such as shareholder control power, dispersion of control, and size of the stock market). First, they find a strong and statistically significant relationship between coordination in labour relations and corporate governance. Countries show high levels of coordination in both their labour relations and corporate

governance spheres, or in neither of them. Second, the authors argue that, on the one hand, in highly coordinated economies firms easily enter into collaborative arrangements with other firms for the purpose of research and product development, thus substantial amounts of technology transfer take place through inter-firm collaboration; on the other hand, where fluid capital markets facilitate the movement of funds across endeavors, firms find it more efficient to access technology by licensing or by acquiring other firms, and they are more likely to invest in assets that can be switched to other uses as new opportunities emerge. Providing more complete evidence, Hall and Gingerich (2004) conclude that aggregate economic performance should be better in nations where institutional arrangements correspond more closely to pure types of liberal or coordinated economic organizations.

7. Conclusions

Although Coase opened the economics *of* firms in 1937, for many decades the economics of innovation has remained an economics *with* firms, according to the Schumpeterian tradition. Contrastingly, the organizational foundations of corporate innovation have received much more attention within the corporate governance research, to the extent that such literature examines the economic consequences of different modes of coordination between firm participants.

In this paper, we have discussed the main contributions exploring the relationship between the various dimensions of corporate governance and firms' innovation performance, providing, to the best of our knowledge, the first literature review on this theme.

As we explained at the beginning of the paper, to organize such a body of literature is rather difficult, since they form an heterogeneous and somewhat disorganized puzzle, that crosses interrelated (but apparently far from each other) aspects of corporate organization. In particular, we have started outlining why a theory of the firm must be put at the base of an economic analysis of corporate innovation. We then described the main channels through which a system of corporate governance shapes innovation activity, having classified them in the three dimensions of corporate ownership, corporate finance and labour. Finally, we considered a larger perspective and examined the recent literature on national structures of governance.

However, despite the relevance of the issue, a general theory of the innovative enterprise does not exist yet, as many have noted (e.g., O’Sullivan, 2000, Carpenter *et al.*, 2003, and Lazonick, 2003). Moreover, there is still much that remains unclear. For example, the growing “law and finance” literature maintains that shareholder empowerment and stronger institutions of minority shareholder protection should have a positive effect on long-run performance of corporations, by boosting the stock markets (see La Porta *et al.*, 1998, and Pagano and Volpin, 2005). But the same literature does not address the risk of opportunistic actions played by small and diversified shareholders, which may pervasively depress corporate specific investing and innovation activities.¹⁴ Furthermore, research on the link between corporate governance, business strategies and innovation performance should take into account the effect of the recent strengthening of the international system of intellectual property rights (by the 1994 TRIPs agreements), that is likely to affect the specificity of corporate investment and organization and the effects of which are still far from being fully assessed.

Therefore, we believe that much further research is needed to obtain a comprehensive picture of the organizational determinants of corporate innovation. With this paper, we have tried to take a step in this direction.

¹⁴ Some preliminary results on this issue are provided by Belloc (2010).

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TABLE 1. Summary Table.

ORGANIZATIONAL PROBLEM	EFFECTS ON INNOVATION	MAIN RELATED WORKS
Corporate ownership		
Ownership structure <i>(concentrated versus dispersed ownership)</i>	Concentrated ownership positively affects innovation because it reduces agency costs and disciplines managers' behavior	Hill and Snell (1988), Holmstrom (1989), Baysinger <i>et al.</i> (1991), Francis and Smith (1995)
	Concentrated ownership positively affects innovation because it favors financial commitments and organizational integration	Lacetera (2001)
	Concentrated ownership positively affects innovation because it make reputation constraints stronger and favors long-term relations	Mayer (1997), Miozzo and Dewick (2002)
	Concentrated ownership negatively affects innovation because it exacerbates asymmetric bargaining power problems	Battaglion and Tajoli (2001)
Owners' identity <i>(institutional investors versus others)</i>	Institutional investors positively affect innovation because they cannot exit from ownership in the short-run without depressing the price of their other stocks	Hansen and Hill (1991), Kochhar and David (1996)
	Institutional investors positively affect innovation because they increase monitoring	Aghion <i>et al.</i> (2009)
	Institutional investors negatively affects innovation because they have short-term interests	Hill <i>et al.</i> (1988), Graves (1988)
	Pension funds positively affect innovation because they have long-term interests	Sherman <i>et al.</i> (1998), Hoskisson <i>et al.</i> (2002)
	Mutual funds negatively affect innovation because they have short-term interests	Sherman <i>et al.</i> (1998)
Corporate finance		
Financial structure <i>(equity versus debt)</i>	Equity finance positively affects innovation because it helps risk management and financial commitments, and reduces asymmetric information problems	Bradley <i>et al.</i> (1984), Long and Malitz (1985), Williamson (1988), Gugler (2001), Carpenter and Petersen (2002), Lazonick (2007)
Takeovers <i>(easy versus difficult replacement of management)</i>	Takeovers negatively affect innovation <i>ex-ante</i> because they discourage specific and/or long-term investments	Shleifer and Summers (1988), Stein (1988), Johnston and Rao (1997), Pugh <i>et al.</i> (1999)
	Takeovers negatively affect innovation <i>ex-post</i> because the restructuring process absorbs managerial energy	Smith (1990), Hitt <i>et al.</i> (1991), Long and Ravenscraft (1993)
	Takeovers positively affect innovation <i>ex-post</i> because they provide superior management	Zahra (1995), Wright <i>et al.</i> (2001), Lerner <i>et al.</i> (2008), Ughetto (2010)
	Takeover pressure affects innovation non-monotonically, depending on the relative effect of the expected takeover premium and the loss of control benefits	Sapra <i>et al.</i> (2009)

TABLE 1. (Continued)

ORGANIZATIONAL PROBLEM	EFFECTS ON INNOVATION	MAIN RELATED WORKS
Labour		
Collective bargaining <i>(strong versus weak workers' bargaining power)</i>	Strong workers' bargaining power positively affects innovation because it allows workers to benefit from human capital investments	Daniel (1987), Machin and Wadhvani (1991), Drago and Wooden (1994), Michie and Sheehan (2003)
	Strong workers' bargaining power negatively affects innovation because workers rent-seek	Hirsch and Link (1987), Acs and Audretsch (1988), Menezes-Filho <i>et al.</i> (1998)
Worker participation <i>(large versus low worker participation)</i>	Large worker participation positively affects innovation because it corrects organizational failures and encourages skills development	McCain (1980), Smith (1991), Michie and Sheehan (1999a, 1999b, 2003), Laursen and Foss (2003)
	Low worker participation may cause employee resistance to innovation because it causes employees to expect not to reap the benefits of their investment in human capital	Bemmel and Reshef (1991), Zwick (2002)
National settings and business systems		
Modes of coordination <i>(spot transactions versus long-term relationships)</i>	Non-market forms of coordination positively affect incremental innovation because they sustain long-term commitments and specific skills development	} Lazonick and O'Sullivan (1996), Soskice (1997), Tylecote and Conesa (1999), Whitley (1999), Hall and Soskice (2001), Casper and Matraves (2003)
	Market forms of coordination positively affect radical innovation because they encourage the use of the exit option and redeployable assets	