Production Outsourcing, Organizational Governance and Firm's Technological Performance: Evidence from Italy

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Summary

Aim of this paper is to study whether and how the firm's decision to outsource production activities affects its technological performance. In particular, we look at how the alignment between the firm's governance strategy and the underlying attributes of the transactions affects the capacity of the firm to introduce new products and processes. Using microeconomic data on a repeated cross-section of Italian manufacturing firms for the period 1998-2003, we develop a two-stage approach: first, we estimate the determinants of the firm's organizational governance (production outsourcing); second, we incorporate a measure of governance misalignment into a technological performance relation. We find (i) that firms not aligned with the optimal organizational governance perform less well in terms of process innovation than more aligned competitors, but (ii) that misalignment has a positive effect on product innovation. However, this counterintuitive result is strongly characterized by non-linear effects that reverse the latter correlation for high values of governance misfit.

Keywords: Production Outsourcing, Organizational Governance, Misalignment, Technological Performance, Non-Linearity

JEL Classification: L23, L24, L25, O31

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1 Introduction

Since the second half of the 1990s, entry into the world market by new producers from low labor cost economies, such as China, India, and some other European eastern countries, has dramatically changed the way that goods and services are manufactured. The consequent increasing fragmentation of production - that is, the splitting-up of vertically integrated processes in relatively autonomous production stages located in different geographical areas - has affected firms' production technology, and models of governance and organization of production transactions. The recent literature on international fragmentation has separately investigated two main aspects of this phenomenon of fragmentation: its determinants and its performance implications. Determinants of the firm's decision to contract out production include labor cost savings, scale economies, technology, the lack of domestic skilled labor and the availability of qualified middle management in the host country (Abraham and Taylor, 1996; Grossman and Helpman, 2002; Girma and Görg, 2004; Tomiura, 2004; Diaz-Mora, 2005; Bartel, Lach, and Sicherman, 2005; Antras, Garicano, and Rossi-Hansberg, 2006). The research on the impact of outsourcing on firms' economic performance, typically investigated using different measures of productivity and profitability (Glass and Saggi, 2001; Gorzig and Stephan, 2002; Heshmati, 2003; Girma and Görg, 2004; Görg and Hanley, 2004; Amiti and Wei, 2006), has not reached strongly unambiguous results.

In our view, these two streams of the literature do not depict a complete picture of this trend. The first strand examines only a sub-set of the factors underlying the decision to externalize production; the latter risks identifying a 'spurious' relationship because it does not take adequate account of the fact that outsourcing also affects the organizational structure of production and, hence, the firm's techno-economic performance.

This paper aims to remedy this by looking at the link between outsourcing and firm's performance from a different perspective and based on three insights. First, since the choice to outsource production activities implies a re-organization of firm's transaction governance, this will have an impact on technological performance. The geographic re-location of inefficient, low-cost, or routine activities allows firms to focus on their 'core competencies' (Prahlad and Hamel, 1990), that is, on those activities where they have a comparative advantage. Second, based on a normative interpretation of

transaction costs theory (Williamson, 1975, 1991), we are able to assess empirically whether or not the 'observed' organizational arrangement of production can be considered efficient, in the sense of being in line with transaction cost economics (TCE) principles. We can thus determine the level of misalignment in the governance of the observed organizational structure with respect to the optimal solution, determined by transaction-level attributes such as uncertainty and asset specificity. Finally, extending a recent strand in the literature that empirically investigates the relationship between 'observed' organizational choices and firms' techno-economic outcomes, we analyze the performance implications of organizational misalignment. We would expect that technological performance would be negatively affected by a greater degree of misalignment, and the better alignment of the organization of production with TCE theory would increase technological performance.

Within this framework, we follow a two-stage econometric methodology by estimating, in the first stage, a 'governance selection' model to test the hypothesis that a firm's organizational structure depends on two sets of factors: (i) the characteristics of transactions, particularly uncertainty and asset specificity; and, (ii) as suggested by the international fragmentation of production (IFP) literature, variables such as technology, labor costs, and export propensity. We define the misalignment variable as the difference between observed organizational choices and those predicted by the theory. Once we have derived the degree of observed governance misfit, we next estimate the impact of this variable on firms' technological performance, measured as product and process innovations.

For the empirical analysis, we use a firm-level balanced repeated cross-section sample of 1.777 Italian manufacturing firms for the period 1998-2003. The data are drawn from the VIII and IX waves of the Survey on Manufacturing Firms collected by Capitalia (ex Mediocredito Centrale).

The paper is organized as follows. In Section 2 we review the literature developed around the determinants of and the relationship between organizational governance and firm performance. Section 3 describes the data and methodology. Section 4 presents and discusses the empirical results and Section 5 concludes.

2 Related literature

In this section we briefly review two streams of related literature: (i) studies focusing on the empirical determinants of outsourcing and (ii) studies aimed at empirically assessing the performance implications of governance organisational arrangements, and, particularly, outsourcing.

2.1 The determinants of outsourcing decisions

With respect to what determines the decision to outsource, standard theory and evidence generally suggests three factors as influencing for the decision to re-locate production outside the firm's boundaries (Abraham and Taylor, 1996; Girma and Görg, 2004; Diaz-Mora, 2005). The most important of these is the possibility of saving labor costs, that is, of cutting wages and benefits payable to non-core employees by contracting out peripheral stages of production to low-wage countries. This supposes that high-wage firms would typically be expected to outsource production more intensively than low-wage firms [1].

The next factor is demand volatility: the more a firm's output is subject to seasonal fluctuations, the more it will try to outsource peak period tasks in order to maintain as steady a flow of employment as possible over time. However, one would expect there to be a negative relationship between demand volatility and the propensity to contract out if the firm were able to internally re-organize tasks at relatively lower costs than the outsourcing case. The third factor is the search for specialized skills or equipment that the firm lacks in house. What is relevant here is the achievement of scale economies in the supply of the process or service that the firms seeks to outsource. There may be scale economies in the production of specific inputs such that firm size becomes a determinant of its outsourcing strategy: since small and medium sized firms usually find it more difficult to achieve a minimum efficient scale of production, they will be more keen to outsource

[1] When firms, instead, outsource within the domestic economy, the rate of unionization becomes relevant, even though its impact may be ambiguous: on the one side, unionized firms have relatively less bargaining power with respect to workers and pay higher wages than they might choose to pay. Therefore, a stronger union presence in an industry may induce a firm in that industry to re-locate production in order to save on labor costs. On the other side, however, if the objective of the union is to protect domestic employment, a stronger unionization may be an obstacle to a firm's desire to outsource.

production. However, as small firms have less flexibility than large firms to react to variability in consumer demand, and they face higher search costs, a positive relationship may emerge between firm size and outsourcing. In addition to labor cost savings, output cyclicality and scale economies, there are other factors that can contribute to the deciding to farm out some of its production activities. Swenson (2000), for instance, focuses on changes in international costs: strong dollar depreciation can lead to higher costs of imports, thus reducing the international outsourcing intensity of firms. In addition, Görg and Hanley (2004) point out that export propensity may have a positive effect on outsourcing: the more a firm exports, greater are the possibilities to find low wage foreign suppliers. Finally, technology can play a role (Tomiura, 2004; Bartel, Lach, and Sicherman, 2005): in particular, there is a positive relation between outsourcing and intensive use of computers in the workplace, high R&D intensity, and the presence of a highly skilled workforce within domestic firms. And, firms closer to the technological frontier are supposedly more willing to decentralize their activities in order to take advantage of information and techniques that are not directly widely available. For this reason, younger firms, having a limited history to learn about their own specific needs, are also more willing to choose a decentralized organizational form than older firms (Acemoglu, Aghion, Lelarge, VanReenen, and Zilibotti, 2006).

If the firm is seen as an 'administrative instrument' that seeks for efficiency gains (Leiblein, 2003), and the decision to outsource production as a choice made within a particular, vertically disintegrated, governance structure, TCE provides the standard framework for identifying other factors behind firm's vertical boundaries (Williamson, 1975; Joskow, 1988; Mazzanti, Montresor, and Pini, 2006). In this context, higher asset specificity, economies of scale and market uncertainty are three important aspects that influence the governance choice between production internalization - option to 'make' - and production externalization - option to 'buy' (Williamson, 1975, 1991; Joskow, 1988; Masten, 1993; Lyons, 1995; Leiblein, 2003). In particular, the more that assets are specific to a particular transaction, the more the firm will tend to produce in-house in order to minimize the opportunistic behaviors of partners and suppliers. Asset specificity also affects the capacity of the market to aggregate demands, and, thus, achieve economies of scale. It follows then that, in absence of specific assets, there is no constraint on

demand aggregation, which provides external production with a considerable edge in terms of lowering production costs. Finally, given a high degree of assets specificity, the more the environmental uncertainty, the lower will be the propensity to outsource and the higher will be the probability that firms will vertically integrate production (Williamson, 1975; Abraham and Taylor, 1996).

2.2 The role of organizational governance

The decision to outsource or vertically integrate the firm's production activities is one of the most complex choices facing management. Both strategies entail costs and benefits. However, while a great deal of attention has been paid to the factors influencing the 'make or buy' decision, relatively little empirical work has been done to assess the performance implications of these governance choices. In this context, TCE postulates that aligning transactions with governance structures leads to more efficient outcomes. However, while there is empirical evidence to show that firms choose governance that is consistent with TCE predictions, the performance implications of governance choices have been less well explored (Masten, 1993).
This literature has tented to stress the potential advantages associated with outsourcing and vertical integration and, in particular, that the former leads to a shift in the cost burdens from the home firm to its suppliers, and enables the firm to specialize in its core activities. On the other hand, vertical integration may enhance performance because of the coordination benefits associated with internalization and because the re-location of manufacturing activities outside the firm's boundaries may reduce its capabilities by weakening cross-functional coordination, that is, the capability to transfer information and coordination across activities within the same production system (Mahoney, 1992; Teece, 1996; Leiblein, Reuer, and Dalsace, 2002).
According to Masten (1993), the main problem is that the classical tests of the 'make-or-buy' decision do not add to our knowledge about the importance of governance choices. In other words, the usual econometric tests of the TCE propositions are indirect, they rarely investigate the cost of moving from one type of contractual arrangement to another, that is, the cost of not being aligned with a governance structure that optimizes production by minimizing transaction costs. This problem may be overcome by controlling

for the selection process used, even at the cost of more detailed data on observed characteristics, costs and performance of alternative governance choices. Some models have been proposed that aim to investigate not only the degree to which organizational forms are aligned with transaction features (Yvrande-Billon and Saussier, 2003), but also how this organization misalignment affects firm's performance. These types of analyses generally involve a two-stage approach in which, a probit/logit model identifies the main determinants of choice of governance, and constructs a variable to represent the degree of governance misfit. In addition, a performance regression is carried out to test whether, and how, the 'distance' from the optimal governance structure affects firms' techno-economic outcomes (Silverman, Nickerson, and Freeman, 1997; Leiblein, Reuer, and Dalsace, 2002; Yvrande-Billon and Saussier, 2003).

In terms of performance, results are mixed. Silverman, Nickerson, and Freeman (1997) analyzing the US motor carriers industry between 1977 and 1989, found that the misalignment of employment relation had no significant impact on firm's mortality, but also that firms that align their capital structure based on TCE principles are less likely to fail. Nickerson and Silverman (2004) show that, for the US hire truck industry, misaligned firms suffer from lower profitability, that is, lower annual returns on assets, and higher mortality rates relative to better-aligned rivals.

Poppo and Zenger (1998) focused on qualitative performance based on data on a set of top computer executives in the US. Their results support TCE in showing that misaligned governance leads to lower quality service, lower responsiveness to problems and inquiries, and lower customer satisfaction.

The implications of outsourcing versus vertical integration in terms of technological performance have received less attention. Leiblein, Reuer, and Dalsace (2002) tested this relation in the production of semiconductor devices in the US, using variables for governance misfit to capture the probability that too much governance is employed for transactions that are internally governed and the probability that too little governance is employed for transactions that are outsourced. Cross-sectional estimates lead them to conclude that technological performance, as measured by transistor density, is particularly depressed by governance *underfit*, that is when firms fail to implement adequate measures to offset hazards in the contracting environment. Conversely, they could find no evidence of a negative effect from the

excessive bureaucracy associated with governance *overfit*. In a study of R&D alliances in the US telecommunication industry, Sampson (2004) shows that good alignment increases the benefits of collaboration by an average of 138%, the actual magnitude of being dependent on the type of misalignment, that is, the choice of pooling contracts for transactions that are characterized by high hazard and opportunism or of equity joint ventures when transactions are governed by excessive bureaucracy.

3 Data and methodology

3.1 The data-set

In this paper we use a balanced repeated cross-section of Italian manufacturing firms for the period 1998-2003. These data are drawn from the VIII and IX waves of the Survey on Manufacturing Firms (*Indagine sulle Imprese Manifatturiere*) carried out by Capitalia, which conducted interviews in 2001 and 2004 respectively of all firms with 500 employees and over, and with a representative sample of firms with more than 11 and less than 500 employees, stratified by geographic area, industry, and size. These two waves of information gathering involved 4,680 and 4,289 firms respectively; the number of firms in the merged sample, after deleting outliers and observations not presenting any balance sheet information, is of 1,777 firms. Table 1 shows the structure of this sample of firms in terms of Pavitt sectors for the merged sample and for the reference 1998-2000 wave[2].

Table 2 refers to the 260 firms that outsourced some stages of their production process during the period 2001-2003. They represent 14.6% of the 1.777 firms in our sample. It is interesting to note that firms outsourcing production activities account for about the 75% of total outsourcing firms[3]. The most intensive industries are 'Leather and footwear' (23.5%), 'Computer and electronics' (21.1%) and 'Industrial machinery' (19.5%). This latter set of firms is of particular importance because the decision to outsource is specifically directed to the production stages rather than to complementary

[2]In the analysis, we use Pavitt taxonomy rather than the standard classification of economic activities (ATECO) in order to avoid the possibility of perfect identification of the sample during the first-stage logit estimation.

[3]The remaining 25% is constituted by firms that outsourced complementary services such as accounting, cleaning, advertising, etc. See Appendix A for details on the specific question posed to sample firms.

services.

Table 1: Sample structure by Pavitt sectors and employment class size

Pavitt Sectors (1998-2003)	11-20	21-249	250+	Total
Supplier Dominated	366	513	50	929
Scale Intensive	125	141	25	291
Specialized Suppliers	134	292	39	465
Science Based	30	55	7	92
Total	**655**	**1.001**	**121**	**1.777**
Pavitt Sectors (1998-2000)				
Supplier Dominated	985	1.335	124	2.444
Scale Intensive	392	383	74	849
Specialized Suppliers	422	626	91	1.139
Science Based	70	150	28	248
Total	**1.869**	**2.494**	**317**	**4.680**

3.2 The econometric methodology

To assess the performance implications of alternative organizational structure choices - that is, production outsourcing versus integration - we use a recently developed two-stage econometric methodology, which extends the conventional TCE empirical research. Empirical works in this field aims at testing the validity of TCE hypotheses, and also investigating whether deviation from TCE principles produces poorer techno-economic performance. In the two stage methodology that we used to test the 'misalignment hypothesis' we conducted a probit/logit regression related to organizational choice; then, based on the results of this regression we estimated a performance equation by constructing a variable measuring the misalignment (Leiblein, Reuer, and Dalsace, 2002; Yvrande-Billon and Saussier, 2003; Nickerson and Silverman, 2004), using the governance misfit as a regressor.
In this paper we improve this analysis by including some other variables that might affect the firm's decision to outsource production, such as labor costs, technology, and export propensity, in addition to the traditional TCE variables: that is, asset specificity and uncertainty. The variable for governance misfit is calculated, in the first stage, as the absolute value of the

Table 2: Production outsourcing firms by industry (1998-2003)

Industry	*Firms*	*Production Outsourcing Firms*	
	N.	N.	%
Food, beverages and tobacco	155	5	3.2
Textile and clothing	211	30	14.2
Leather and footwear	81	19	23.5
Lumber and wood products	68	9	13.2
Paper, printing and publishing	94	13	13.8
Petroleum, refining and related industries	5	0	0.0
Chemicals and allied products	79	9	11.4
Rubber and plastic Products	95	10	10.5
Stone, clay, and concrete products	111	5	4.5
Metal products	300	52	17.3
Industrial machinery	272	53	19.5
Computer and electronics	147	31	21.1
Transportation equipment	44	6	13.6
Other manufacturing industries	115	18	15.7
Total	**1.777**	**260**	**100.0**

residual for each observation:

$$Misfit_i = |OG_i{}^{observed} - OG_i{}^{predicted}| \tag{1}$$

where OG is Organizational Governance. In our case, the organizational choice is discrete so that $OG^{observed}$ takes the value 0 or 1 and $OG^{predicted}$ is the probability of choosing one of the two governance models, according to both TCE and standard IFP analyses. The variables $Misfit$, thus, takes values between 0 and 1: the closer its value is to 0, the more aligned is the transaction, while the nearer its value is to 1 the more misaligned is the transaction. Since we only know about firms that answered 'yes' to the question in the Survey (see Appendix A), our $Misfit$ variable captures the choice of outsourcing production when transactions' conditions - high asset specificity and uncertainty - would indicate that production should be kept within the firm's boundaries. Due to data limitation, we are not able to directly measure the choice to integrate production under conditions when it would be convenient to outsource - because of low asset specificity and uncertainty. We are concerned with governance *underfit* (Leiblein, Reuer, and Dalsace, 2002), since we are interested in studying under what conditions the choice to externalize production is more profitable for the firm.
The second stage of the analysis consists of estimating a performance equa-

tion:

$$Y_{i,t} = \alpha_1 + \alpha_2 Misfit_{i,t} + X'_{i,t}\beta + \nu_{i,t} \quad (2)$$

where $Y_{i,t}$ denotes the variable for technological performance, $X_{i,t}$ is a vector of controls, and $\nu_{i,t}$ is an error term with the usual statistical properties.

The independent variables used in the first-stage estimation can be grouped into three typologies: (i) controls; (ii) variables measuring transaction attributes such as uncertainty and asset specificity; and (iii) variables capturing other factors underlying the decisions to outsource production, borrowed from the literature on IFP.

As controls we consider five types of variables: (i) four geographic dummies (*North West*, *North East*, *Centre* and *South*); (ii) three size dummies (*D11-20*; *D21-249* and *D250+*); iii) four Pavitt sector dummies (*Scale Intensive*; *Specialised Suppliers*; *Science Based* and *Supplier Dominated*); (iv) a dummy (*Group*) measuring whether or not a firm belongs to a business group; and (v) a variable (*Lage*) measuring the age of the firm. Appendix B provides a more detailed definition of these variables.

As far as transaction attributes are concerned, we considered the following proxies. We measure demand uncertainty as the variance in the annual percentage rate of change in total sales (*Uncertainty*), and asset specificity as the ratio between the book value of total debt and the total assets (*Asset specificity*). We also consider an interaction term between uncertainty and asset specificity. At this point, it is useful to provide some insights into our rationale for this measure of asset specificity. According to Williamson (1988), debt and equity can be considered as different forms of governance structure. In fact:

"[D]ebt like market is less interventionist and the bond-holders can seize control over the firms' assets if and only if the firm has defaulted or violated the covenants of the debt contract in some way. Equity is similar to hierarchical control. The rights of the equity-holders are much more general than those of the bond-holders. They can exercise these rights through the board of directors, by monitoring the conduct of management and intervene in strategic decisions whenever it is deemed necessary" (Balakrishnan and Fox, 1993, pp. 6-7).

Within this TCE perspective, the type of governance chosen - equity and debt - will depend fundamentally on the characteristics of the firms' assets, in particular, their redeployability with respect to more general purpose assets. This property of some firms' assets such as R&D, skills, brand name,

reputational investments and so on tends to affect the firm's capital structure trough bankruptcy costs. In the event of a firm's bankruptcy and liquidation, its more specialized and specific intangible assets face greater losses in value, thus increasing the costs of financing these assets with debt. Thus, in this perspective, the debt asset ratio - our measure of asset specificity - should be negatively related to intangibles, and firm-specific assets.

To capture the other factors behind the production outsourcing decision, we consider the following variables: (i) labor costs per employee (*Labor costs*); (ii) an export dummy (*Exp*) which takes value 1 if the firm exports and 0 otherwise; and (iii) a technology dummy (*R&D*) which gives information about the firm's propensity to invest in research and development[4]. All these variables are calculated for the 1998-2000 wave so to a priori exclude any possible problem of endogeneity in the relationship between the dependent variable and the covariates. In the second stage of the analysis, the misalignment variable (*Misfit*) - defined as the absolute value of the difference between observed organizational choices and those predicted by the theory - is included into our technological performance equation.

Technological performance is measured using three different dummies: *Inn* for indicating if the firm has introduced any form of technological innovation between 2001 and 2003 and *Inn_prod* and *Inn_proc* which indicate, respectively, the introduction of a new product or a new process in the period considered.

It is worth noting that since both the misalignment variable and technological performance indicators refer to the same time period (2001-2003), we cannot consider the second stage regressions as proof of an actual causal relationship; however, their sign and magnitude allow us to identify which type of correlation occurs between the variables considered. The sign and significance of the coefficient of the Misfit variable is important: a negative sign would indicate that firms that choose outsource (production) while having good theoretical reasons for integrating it, suffer a reduction, or a cost, in terms of their propensity to innovate.

[4]On this purpose, firm's age (*Lage*) can also be considered a proxy of 'experience' on a technology (Bartel and Lichtenberg, 1987; Acemoglu, Aghion, Lelarge, VanReenen, and Zilibotti, 2006).

4 Empirical results

The results of the econometric analysis are reported in Tables 3, 4 and 5. Table 3 presents the results of the first stage level (Logit) estimation: as expected, the signs of the most relevant variables seem to confirm the basic predictions of TCE, and particularly in relation to the interaction between asset specificity and uncertainty which is negative and statistically significant. This finding can be interpreted as indicating that in the presence of high asset specificity, firms tend to outsource production when the environment is uncertain.

As far as the traditional determinants of production outsourcing - per-capita labor costs, export, and R&D - are concerned, the variable for technology is both positive, and statistically significant. This suggests the role of technology in influencing production outsourcing. In fact, a higher propensity to invest in R&D leads the firm to externalize redundant, or low-value added activities. In other words, it allows firms to focus on their 'technological core'. At the same time, it is interesting that labor cost reasons, as well as the seek for economies of scale, do not seem relevant in these processes.

Tables 4 and 5 show the results from the second-step in our analysis. Interestingly, the coefficient on the dummy for total technological innovation (Inn) is statistically significant and positive. This means that, in general terms, higher governance misalignment is associated with higher propensity to innovate. We test for the potential presence of non-linear effects in the relationship between technological innovations and governance misalignment by introducing a misfit squared term into the equation[5].

The result of this analysis - which are presented in Table 4 - provide evidences that the relationship between these two variables is quite complicated, taking a non-linear bell-shaped form. This means that higher governance misalignment is associated with higher propensity to innovate in general terms only in the case of low values of misfit. After a certain value threshold of this variable, an increase in the governance misalignment tends to reduce the propensity to innovate: that is, as the value of misalignment increases, firms face higher costs in terms of technological innovations.

To obtain a more detailed and informative picture of these phenomena we

[5]Equation (2) was estimated first including the vector of characteristics X_i and then by simply including the $Misfit$ terms: the results were not significantly different. In Table 5 we report the results for $Misfit$ and $Misfit^2$ only.

conducted an analysis distinguishing between process (*Inn_proc*) and product innovations (*Inn_prod*). As can be seen from Table 5, the coefficient for process innovation is negative and statistically significant. In other words, the impact of governance misalignment on technological performance of firms in terms of process innovations seems to be in line with literature predictions. The negative signs in Table 5 confirm that firms less able to conform to the optimum organizational strategy suffer a lower propensity to adopt new production processes.

In the case of the product innovation variable, we find a non-linear relationship between governance misfit and the introduction of new products or improvements to existing ones (see also Figure 1).

There are two possible explanations for this somewhat puzzling framework. On the one hand, firms seem to accompany their choices to outsource production with the introduction of process innovations which changes the organization of their production transactions. In fact, firms less able to adapt to the optimal organizational strategy are also those firms that show a lag in the adoption and introduction of process innovations. On the other hand, the initial positive and significant correlation between product innovations and governance misalignment can be interpreted as the result of the firms embarking on a strategic process of repositioning through the introduction of new products and improvements to existing ones. In other words, this positive relationship may be a symptom of the firm's adaptation behaviour: higher misalignment is associated with higher 'propensity to change'. The search for new markets or for new customers generates a process of adjustment within the firm's organization boundaries which could be the reason for this finding. However, after a certain value, poor organizational alignment tends to have a negative impact on product innovation also.

A third explanation might rest on the path dependent nature of technology. It is possible that, when governance misfit is low, the positive correlation with product innovation could come from the positive sign of our R&D variable. Since product innovation is supposed to be the outcome of earlier R&D effort, we can think of such a technology effect as prevailing over a negative impact from (low) misalignment. However, when the degree of alignment with the optimal governance organization exceeds a certain threshold, the cumulative effect of technology is 'overtaken' by the organizational effect of misfit.

Table 3: First stage: determinants of production outsourcing (2001-2003)

ESTIMATION METHOD	LOGIT[a]		LOGIT		LOGIT		LOGIT	
	Coeff.	*t values*	*Coeff.*	*t values*	*Coeff.*	*t values*	*Coeff.*	*t values*
North West	0.656**[b]	2.53	0.631**	2.43	0.620**	2.38	0.645**	2.35
North East	0.663**	2.54	0.637**	2.44	0.626**	2.40	0.626**	2.31
Centre	0.529*	1.91	0.498*	1.79	0.493*	1.77	0.488*	1.71
South	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Scale Intensive	-0.305	-1.42	-0.284	-1.32	-0.308	-1.42	-0.269	-1.23
Specialized Supplier	0.242	1.52	0.236	1.47	0.244	1.52	0.172	1.04
Science Based	0.559**	2.07	0.586**	2.17	0.588**	2.18	0.510*	0.181
Supplier Dominated	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Lage	-0.058	-0.43	-0.070	-0.52	-0.080	-0.59	-0.071	-0.53
D11-20	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
D21-249	0.349**	2.32	0.289*	1.89	0.292*	1.91	0.255	1.62
D250+	0.066	0.20	-0.0005	-0.00	0.018	0.05	-0.081	-0.23
Group	-0.023	-0.13	-0.059	-0.31	-0.078	-0.42	-0.085	-0.44
Uncertainty$_{t-1}$	...	...	0.003	0.23	0.704**	2.98	0.701**	3.01
Asset Specificity$_{t-1}$	...	...	0.433*	1.93	0.553**	2.43	0.497**	2.16
Uncertainty*Asset Specificity$_{t-1}$	...	...	...	...	-1.92**	-2.95	-1.94**	-2.98
Labor Cost$_{t-1}$	...	...	...	...	...	...	-0.310	-1.43
Exp$_{t-1}$	...	...	...	...	...	...	0.160	0.94
R&D$_{t-1}$	...	...	...	...	...	...	0.348**	2.28
N. Obs.	1.777		1.777		1.777		1.777	
MacFadden R^2	0.018		0.021		0.027		0.033	
ML R^2	0.015		0.017		0.022		0.027	
Efron R^2	0.014		0.017		0.024		0.029	
AIC	0.830		0.830		0.826		0.824	

[a]The regression also includes a constant term. All coefficients are robust to heteroskedasticity.
[b]*Significant at 10%, **significant at 5%.

Table 4: Second stage: technological performance and governance misalignment

ESTIMATION METHOD	*LOGIT*[a]		*LOGIT*	
Dependent variable	Inn		Inn	
	Coeff.	*t values*	*Coeff.*	*t values*
Misfit	1.103**[b]	4.91	14.79**	10.43
Misfit^2	...	...	-14.32**	-9.84
N. Obs.	1.777		1.777	
MacFadden R^2	0.012		0.055	
ML R^2	0.017		0.072	
Efron R^2	0.017		0.071	
AIC	1.346		1.289	

[a]The regression also includes a constant term. All coefficients are robust to heteroskedasticity.

[b]*Significant at 10%, ** significant at 5%

Table 5: Second stage: technological performance and governance misalignment

ESTIMATION METHOD	*LOGIT*[a]		*LOGIT*		*LOGIT*	
Dependent variable	lnn_proc		lnn_prod		lnn_prod	
	Coeff.	*tvalues*	*Coeff.*	*t values*	*Coeff.*	*t values*
Misfit	-0.571*[b]	-1.88	1.287**	6.43	18.585**	12.25
Misfit^2	...	...	...	...	-17.97**	-11.62
N. Obs.	1.777		1.777		1.777	
MacFadden R^2	0.003		0.019		0.084	
ML R^2	0.002		0.025		0.108	
Efron R^2	0.002		0.025		0.114	
AIC	0.867		1.333		1.245	

[a]The regression also includes a constant term. All coefficients are robust to heteroskedasticity.

[b]* significant at 10%, ** significant at 5%

5 Conclusions

The main idea underlying this paper is that, when firms engage in production outsourcing activities they move towards a business strategy based on development of their 'core competencies' (Prahlad and Hamel, 1990), that is, the set of skills and knowledge that enables them to maintain competitive advantage in the global market. If outsourcing saves on costs related to the production of low value-added, or low-skill, production stages, then the firm can specialize in high-value added activities, such as design, product development, research, and rely on its 'technological core' (Rumelt, 1982). Within this framework, we expect a positive relationship between the choice to outsource production and measures of technological performance.

Based on this, we empirically investigated the relationship between production outsourcing decisions and firms' technological performance.

Using firm-level balanced repeated cross-sections for the Italian manufacturing industry for the period 1998-2003 and adopting a two-stage econometric methodology, we obtained the following results. In the first stage of our analysis we found a positive coefficient for R&D that is reflected in the positive sign for the technological performance obtained in the second stage. Therefore, technology affects the outsourcing decision of firms and, once the outsourcing decision has been taken, the firm continues to engage in innovation activities. Second, we suggest that the relationship between production outsourcing and performance is not direct, but should be filtered through the analysis of the firm's organizational governance choice. Third, governance misalignment negatively affects the firm's technological performance in terms of product innovations for high values of governance misfit. In fact, firms that are poorly aligned with the optimum organizational governance, as predicted by the theory, suffer a poorer performance with respect to their more aligned competitors. In other words, firms that outsource while having good reasons to internalize their production (because of the high level of hazard and uncertainty of the contracting environment), are associated with lower technological performance than firms that outsource more appropriately.

However, in the case of product innovations, this occurs only after a certain threshold of misalignment. This apparently counterintuitive result can perhaps be explained as follows: if outsourcing is seen as a kind of organizational change, then we would expect that, the poorer the alignment with

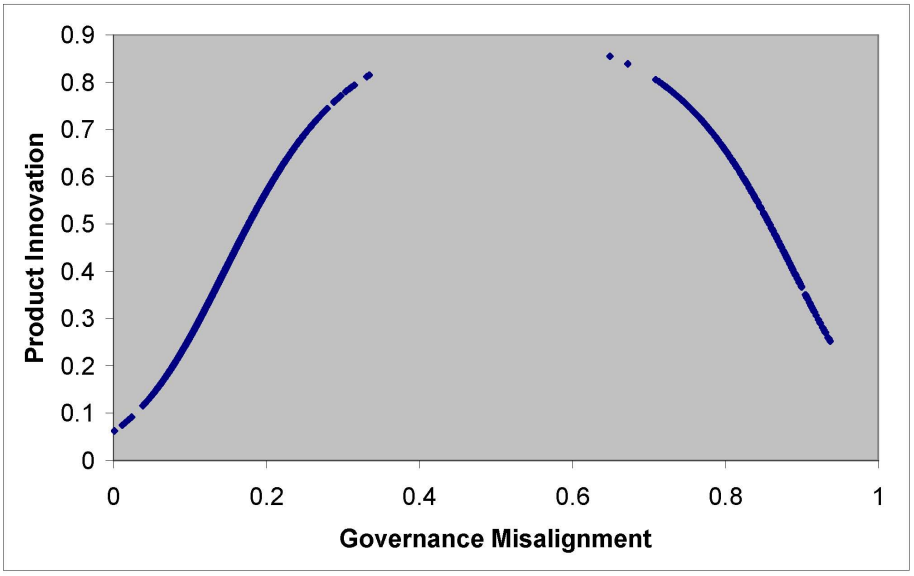

Figure 1: Non-linearity between product innovations and governance misalignment

the optimal organizational governance, the higher would be the negative correlation with the firm's capacity to re-tool its production processes. The data seem to confirm a significant correlation between these two indicators of organizational change, that is, outsourcing and process innovation.
If we look at product innovation, the scenario is slightly different, due to the fact that this variable does not provide directly information on the firm's organization of production. Our empirical analysis shows that, in order for there to be a negative effect on product innovation, we need 'relatively high' values of governance misfit: this *'threshold effect'* tells us that low values of misalignment are not in themselves sufficient to depress the technological activity of the firm. This suggests that the positive effect on product innovation is related to the previous technological activity developed by the firm (as given by R&D) which, in the first stage, was shown to positively affect the firm's decision to outsource production.
In summary, in the presence of low levels of governance misfit, the 'path dependent' nature of technological activity can be thought of not only as a driver of the (first-stage) outsourcing decision, but also as a driver of the (second-stage) positive correlation between misalignment and product innovation. In this case, up to a certain threshold, the governance misalignment is not strong enough to negatively affect the capacity of the firm to introduce new products. When this threshold is passed, the effect of misfit seems to exceed the effect of R&D, producing a negative correlation with respect to technological performance.

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Appendix A: Definition of outsourcing from the Questionnaire

1 *In the three years 2001-2003, has the firm outsourced activities that were previously integrated?*

1.1 Yes

1.2 No

2 *If yes, indicate which activity:*

2.1 Stages of the production process

2.2 Administrative-managerial activities

2.3 Accountability

2.4 Informatics

2.5 Research and development, engineering, projecting

2.6 Testing and technical analyses

2.7 Advertising

2.8 Research of personnel

2.9 Storage and packing

2.10 Surveillance and cleaning

2.11 Call center

2.12 Other activities (specify)

Source: Capitalia (2004), IX Indagine sulle Imprese Manifatturiere (2001-03), Rome.

Appendix B:Description of independent variables

Variable	Description
	First Stage Dependent Variable
Production Outsourcing	1 if the firm has outsourced at least one stage of its production process to external agents; 0 otherwise
	First Stage Independent variables
Age	
Lage	Natural logarithm (2003-year of firm's set-up)
Geographical Area	
North West	Liguria, Lombardia, Piemonte, Valle d'Aosta
North East	Emilia-Romagna, Friuli Venezia-Giulia, Trentino Alto-Adige, Veneto
Centre	Abruzzo, Lazio, Marche, Molise, Toscana, Umbria
South	Basilicata, Calabria, Campania, Puglia, Sardegna, Sicilia
Employment Size	
Small (D11-20)	11-20 employees
Medium (D21-249)	21-249 employees
Large (D250+)	more than 250 employees
Sector of economic activity - Pavitt classification	
Supplier dominated	Textiles, footwear, food and beverage, paper and printing, wood
Scale Intensive	Basic metals, motor vehicles and trailers
Specialized Suppliers	Machinery and equipment, office accounting and computer machinery, medical optical and precision instruments
Science Based	Chemicals, pharmaceuticals, electronics
Groups of firms	
Group	1 if the firms belonged to a business group at 31.12.2003; 0 otherwise
Unit Labor Cost	
Labor Cost	Log of labor cost per employee (1998-2000)
Technology	
R&D	1 if the firms has invested in R&D in the period 1998-2000; 0 otherwise
Uncertainty	
Volume uncertainty	Variance of the annual percentage rate of variation in total sales (1998-2000)
Asset Specificity	
Assets	Net mean physical assets + net mean financial assets + net mean immaterial assets + net mean shareholdings + mean current assets 1998-2000
Debts	Mean short term financial debts + mean short term debt to suppliers + mean long term debt to banks + mean long term other debts + mean bonds 1998-2000
Spec_unc	Asset Specificity * Volume Uncertainty
	Second Stage Dependent Variable
Technological performance	
Inn	1 if the firm has introduced, or improved, at least one product or one process in 2001-03; 0 otherwise
Inn_prod	1 if the firm has introduced, or improved, at least one product in 2001-03; 0 otherwise
Inn_proc	1 if the firm has introduced, or improved, at least one process in 2001-03; 0 otherwise
	Second Stage Independent Variables
Misfit	Governance misalignment: absolute value of the residuals from the first stage governance selection estimation
Misfit^2	Misfit squared

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