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OUTSOURCING AND FINANCIAL PERFORMANCE: A NEGATIVE CURVILINEAR EFFECT

ABSTRACT

This study asks how a firm's degree of outsourcing across all activities influences financial performance. We argue there is an optimal degree of outsourcing, where firms outsource some activities yet integrate others, and that deviations lower performance in a negatively curvilinear fashion. We find empirical support, using 1995 and 1998 data on a sample of manufacturing businesses in the Netherlands, and show that the steepness of the curve increases under conditions of high uncertainty. We show the magnitude of the uncertainty effect on performance outcomes through a post hoc scenario analysis. Thus we provide a specific, theoretically and empirically grounded prediction of how outsourcing affects performance with implications for theory and practice.

Keywords: Outsourcing; performance; negative curvilinear effect

INTRODUCTION

Firms face intense competitive pressures due to factors like technological change and globalisation. In response to these concerns, companies, both large and small, are increasingly outsourcing their activities by shifting what they traditionally handled in-house to external suppliers. There has been so much outsourcing in areas like IT that scholars are now starting to ask whether some of that outsourcing will be reversed, in the form of backsourcing (Whitten and Leidner, 2006). Outsourcing commonly refers to the purchase of a good or service that was previously provided internally (Lacity and Hirschheim, 1995; Rothery and Robertson, 1995). In line with this broad notion, we define outsourcing in this paper as *the transfer of activities to an external source*.

According to Coase (1937), the existence of organisations can be attributed to market failure that induces transaction costs. Thus firms are constantly weighing the total costs, including transaction and production costs, of the market and hierarchy modes. In the transaction costs line of research, Williamson (1975, 1981) made important theoretical contributions, which have been empirically justified by various others (e.g., Hennart, 1988; Walker and Weber, 1984). In recent years resource-based arguments have been added to the explanation of outsourcing (Barney 1999; Leiblein, Reuer, and Dalsace, 2002; Marshall, McIvor, and Lamming, 2007) as have real options (Leiblein, 2003), agency (Holmström and Roberts, 1998) and industrial organisation arguments (Shy and Stenbacka, 2005). Thus a fairly good understanding has emerged as to what drives the decision to outsource, or integrate, a specific activity.

Yet in the empirical reality we observe that firms outsource some but not all of their activities. As extreme examples they for instance retain in-house outsourcing decisions and

supplier management and externalise auditing activities and the production of electricity. This leaves room for theoretical grounding of the outsourcing phenomenon at the firm level. Any value chain needed to produce products for a customer can be seen as a bundle of activities governed by a nexus of treaties and these activities are performed either internally or externally (Aoki, Gustafsson, and Williamson, 1990; Williamson, 1995). So for every individual activity a governance choice must be made (make or buy) and the sum of all governance choices determines a firm's overall level of outsourcing, which will differ for every individual firm. In this paper we ask: *how does the overall outsourcing level influence firm performance* (cf. D'Aveni and Ravenscraft, 1994)?

This above research question is answered in four steps. First, we provide a theoretical argument that an optimal degree of outsourcing exists for every individual firm, where the firm's overall outsourcing level leads to the best financial performance. Second, we specify the shape of the outsourcing-performance relationship at the firm level, suggesting this relationship is negatively curvilinear in nature. Subsequently, we argue that market uncertainty makes the negative consequences of deviating from the optimum more severe. Third, we provide an empirical test using a sample of over 1,100 businesses from census data in the Netherlands which supports the argument and the specified relationship. Fourth, we show that market uncertainty has a negative impact on the outsourcing-performance curve. This implies that taking the right outsourcing decisions becomes more important for firms as uncertainty increases. We illustrate this further through a post hoc analysis, where three scenarios, of low, medium, and high uncertainty are compared.

OUTSOURCING

Because there are substantial differences among the various activities that form part of a value chain, most analyses of make-or-buy decisions have concentrated on a limited set of activities, for instance, manufacturing (Leiblein et al., 2002), services (Murray and Kotabe, 1999), information technology (Poppo and Zenger, 1998) or retail activities (Kaipia and Tanskanen, 2003). Extant literature has provided much insight into what determines whether firms integrate (make) or outsource (buy) a particular activity.

Undoubtedly, transaction cost economics (TCE) (Williamson, 1975) has made key contributions to our understanding of make-or-buy decisions, although its limitations have also been highlighted (Barney, 1999; Marshall et al., 2007). Asset specificity has been shown to be a key determinant of make-or-buy decisions (Leiblein, 2003; Walker and Weber, 1984; Williamson, 1981). The lower the asset specificity of an activity, the easier it becomes to write complete contracts, and the more likely is outsourcing. Uncertainty has similarly been identified as a determinant of the make-or-buy decision (Williamson, 1981). The original argument maintains that in highly uncertain environments, contracting will be incomplete, transaction costs will rise and it is hard to reach an affordable agreement with a supplier. If uncertainty is lower, a higher degree of outsourcing is possible, especially if low uncertainty occurs in the joint presence of low asset specificity (Williamson, 1985).

Firm capabilities and resources are a firm-level indicator of what can and can not usefully be outsourced (Barney, 1999). The resource-based view (RBV) predicts that firms with a rich competence base that can be deployed for undertaking a given activity may internalise that activity. For those firms that are less well prepared internally, outsourcing is more viable. Thus having many useful capabilities for an activity reduces the likelihood

the activity will be outsourced (Barney, 1999; Leiblein et al., 2002). The most relevant comparison to determine the strength of firm capabilities is with potential suppliers, not with competing firms. Finally, TCE and RBV considerations appear to strengthen one another (Leiblein, 2003).

The outsourcing literature has started to integrate RBV, knowledge, and competence considerations in outsourcing decisions (Barney, 1999; Leiblein et al., 2002; Poppo and Zenger, 1998) in addition to transaction cost reasoning. From an industry structure and positioning perspective (Porter, 1985), outsourcing is an approach particularly suitable for cost minimisation strategies given its ability to reduce production and procurement costs. Indeed outsourcing is most useful in commodity markets and has an effect of strengthening price-based competition (Cachon and Harker, 2002) since external suppliers are more likely to provide standardised solutions, reducing the possibilities for successful differentiation from competitors. Leiblein (2003) has suggested that the make-or-buy decision can also be framed as a real option, where outsourcing and vertical integration are undertaken to create a platform for future investments and strategising. The larger the uncertainty surrounding decision-making, the more valuable such options will become.

At the industry level, bandwagoning may have an impact on supply structures. If all competitors in an industry outsource, they actually induce an improvement in the scale and efficiency of operations of suppliers. Furthermore, there are other industry factors such as the need for local responsiveness versus global integration (Bartlett and Ghoshal, 1989; Prahalad and Doz, 1987), the existence of supply clusters within reach of the firm, and the effectiveness of using information technology in linking various vertical stages of production and the nature of competitive positioning that are meaningful predictors in the

context of outsourcing. We believe industry, including product characteristics, to be the most important level for explaining outsourcing.

There also national-level explanations for the level of outsourcing. In countries with institutional voids, for example, in terms of weak property rights regimes, vertical integration again is often a preferred solution because it provides the only guarantee against opportunistic behaviour and contractual hazards (Teece, 1986). More generally, the lower the level of market imperfections in a country, the higher the level of outsourcing by firms in that country will be (Williamson, 1985). In conclusion, current literature has identified a range of predictor variables of outsourcing, which can broadly be seen to operate at the activity (transaction), firm, industry and institutional environment levels. Activities will vary in their scores on these variables. Based on the sum of these scores, it will make more or less economic sense for a firm to outsource a given activity.

Outsourcing and performance

The link from outsourcing to performance is less well developed empirically (Gilley and Rasheed, 2000; Masten, 1993). Recent normative literature (Domberger, 1998; Quinn, 1999) and managerial practice, where outsourcing has been one of the buzzwords (Porter, 1997), suggest that outsourcing is one of the key sources for increasing a firm's performance.

Various arguments have been provided for such a positive relationship. Because outsourcing makes a firm more nimble, it allows firms to increasingly focus on its core activities (Domberger, 1998; Quinn, 1999). Outsourcing also lowers production costs because specialised suppliers are used (Hendry, 1995; Kotabe, 1998) and it increases a

firm's strategic flexibility to deal with technological or volume fluctuations (Balakrishnan and Wernerfelt, 1986; Semlinger, 1993). Outsourcing helps to avoid the costs associated with bureaucracy typically associated with production inside the firm (D'Aveni and Ravenscraft, 1994; Jensen and Meckling, 1976). Finally outsourcing opens up the possibility of obtaining rents from relations with suppliers (Dyer and Singh, 1998; Linder, 2004).

But vertical integration also has its merits. Older literature in fact took integration as the default mode through which competitive advantage could be obtained (Capon, Farley, and Hoenig 1990; D'Aveni and Ravenscraft, 1994; Harrigan, 1986). And the world of practice was long infatuated by the benefits of vertical integration, including its ability to increase bargaining power. This older trend is perhaps best exemplified by the Fordist production model, which takes integration to the extreme.

Integration can produce scope economies especially at those intersections between activities where value is created (D'Aveni and Ravenscraft, 1994; Porter, 1997).[1] Outsourcing can lead to hollowing out and an accompanying loss of competitive distinction (Bettis, Bradley, and Hamel, 1992; Chesbrough and Teece, 1996), a danger especially eminent in industries where little value is added by integration and assembly (Brusoni, Prencipe, and Pavitt, 2001). Outsourcing increases transaction costs (Williamson, 1975) in subtle, not so visible ways (Masten, 1993), due to the difficulty of monitoring behaviour of

[1] It is an interesting paradox that supporters of outsourcing are often found within the camp of the inside-out view of firm strategy, which argues competitive advantage starts with core competences and firm resources inside the firm, while the opponents of outsourcing are those that use an outside-in approach, arguing competitive advantages arises from analysing the industry structure and positioning the firm in that industry. One would expect an approach based on internal strengths to have a bias for internalisation and one that primarily looks at the environment to display more of a belief in externalisation. This can perhaps be explained by the former approach focusing on specialisation, which encourages organisational fragmentation, and the latter on the creation of interfaces between activities, which encourages integration.

external suppliers and the related threat of opportunism. Related, outsourcing raises co-ordination costs because all these external supplier relations will have to be managed and it can make learning and innovation more difficult because of the difficulties of appropriating innovative rents from suppliers (Hendry, 1995; Nooteboom, 1999).

Perhaps not surprisingly then, empirical research displays a similar pattern where some studies found a positive relationship between outsourcing and performance, while others found either a negative relation or no connection at all. In a meta-analysis, Capon, Farley, and Hoenig (1990) found that vertical integration was positively linked to performance in some cases and negatively in others. D'Aveni and Ravenscraft (1994) found that vertical integration has a moderately positive impact on performance, yet Murray, Kotabe, and Wildt (1995) found a positive relationship between the extent of external sourcing and financial performance (i.e., ROS, ROI and ROE). Then there are some studies pointing to no relationship at all. Neither Gilley and Rasheed (2000) nor Leiblein et al (2002) were able to establish a significant direct relationship between outsourcing and performance and both studies argued for a moderated effect.

So evidence on this topic is inconclusive and the influence of the make-or-buy decision on a firm's effectiveness remains unclear. We suggest that rather than simply producing further empirical data, this issue is best tackled through a reconceptualisation of the relation between outsourcing and performance at the firm level.

Outsourceability

Earlier we noted that activities vary in the extent to which they are suitable candidates for outsourcing. We will apply the term *outsourceability,* to capture the degree to which it

makes sense for a firm to outsource a given activity to improve performance. In other words, an activity's outsourceability reflects the relative merits, in performance terms, of outsourcing versus integrating that activity given the characteristics of the activity (transaction), the firm, its industry and its institutional environment. If an activity scores high on outsourceability, that activity is best outsourced from a performance perspective. Reversely, if it scores low, it is best integrated into the firm. Intuitively, few would argue that the outsourceability of a CEO is high, which is why we do not see CEOs being outsourced. Likewise the construction of office space by an organisation (that is not itself a construction company) will score high on outsourceability and IBM indeed does not build its own offices. But there are other instances when the decision is less clear-cut. We would rate these as cases of medium outsourceability, including the decision whether or not to outsource semiconductor production (Leiblein et al, 2002) or transportation (Ashenbaum, Maltz, and Rabinovich, 2005). These are often the outsourcing decisions that academics have studied, precisely because medium outsourceability implies there is substantial variance in these decisions. To clarify, we use the term outsourceability below as an intermediate concept to bridge theory on outsourcing at the transaction level to our predictions of the outsourcing–performance relationship at the firm level. We do not directly measure outsourceability in the data. Also, we do not suggest that the level of outsourceability has any particular performance implications; these implications only arise when firms make choices about their outsourcing levels. In other words, there is no presumption here that high outsourceability is better or worse than low outsourceability.

RESEARCH QUESTIONS

As long as managers maintain some level of purposeful choice, outsourceability explains why some activities are outsourced and others are not, reflecting Hendry's (1995) call for striking a balance between outsourcing and integration. But it also helps us understand what performance results outsourcing choices produce. When a firm outsources an activity that should be best kept in-house, this will result in a suboptimal performance outcome (Masten, 1993).[2] Likewise the integration of an activity that ought to be outsourced will lower the performance of that activity. When, however, a firm matches its governance choice to the outsourceability of the underlying activity, it reaches the best possible performance outcome (Masten, 1993; Williamson, 1995). In the aggregate, a firm that is correct in all of its make-or-buy decisions therefore reaches optimal performance. Once the firm starts to make mistakes, its performance will suffer. There is, in other words, an optimal degree of outsourcing for all of a firm's activities and deviations from that optimum will lower performance.

But what will the shape of these performance decreases be? Proponents of outsourcing argue that heavy reliance on internal sourcing leads to poor performance, and it is at its worst when firms apply it by default (Domberger, 1998). Firms that internally procure almost all of their activities will be so far removed from the market that their efficiency tends to suffer. In other words, if almost no outsourcing is undertaken, there will be no benchmark available that would permit a firm to judge how efficient its own activities are relative to the market. A firm like that could face staggering production costs

[2] Please note that optimising performance according to the degree of outsourcing alone will clearly not provide a firm with its optimal global performance.

as some U.S. and British conglomerates discovered in the 1980s and 1990s before being dissolved. If outsourcing is undertaken, such a beacon exists.

Those who have warned against the dangers of excessive outsourcing likewise point to the consequences of very high outsourcing. The disadvantages of outsourcing are at their worst when firms outsource (almost) everything, so it is suggested. Firms that become hollow or virtual lack a solid basis for competing and can neither innovate enough nor learn much (Chesbrough and Teece, 1996; Kotabe, 1998). In both cases, if firms do not adjust outsourcing levels according to the outsourceability of their activities, their performance will suffer.

This suggests that the further away from the optimum sourcing level a firm is, the more its performance is likely to suffer from taking the wrong make-or-buy decision. Near the optimum there is a range of activities, those with a medium level of outsourceability, for which it makes little difference whether they are outsourced or not. But towards the extremes of complete integration and full outsourcing, activities are found for which the optimal choice is much more discrete (i.e., outsourceability of these activities is either low or high). In other words, the pace at which performance decreases when we move away from the optimum increases faster, the further away we are from the optimum. And if the outsourceability of activities is distributed in a roughly linear manner, this implies mathematically that the performance gaps from taking the wrong decision follow a negative curvilinear pattern.

To summarise, an activity has a certain level of outsourceability, which follows from predictors proposed by various theories. If we combine all of the activities in a value chain, optimum performance is obtained when all governance choices reflect the activities'

outsourceability. Deviations from that optimum are costly and increasingly so as the mismatch between governance choice and outsourceability grows. As a result we obtain that a firm's performance is a negative curvilinear function of its degree of outsourcing.

Hypothesis 1: *There is a negative curvilinear relationship between a firm's level of outsourcing and its performance.*

Why has earlier research not uncovered this negative curvilinear relationship? In our view, there are four explanations for this. Theoretically, authors have usually focused on either the benefits of vertical integration or those of outsourcing and usually done so for a limited range of activities. Rarely have they tried to integrate both arguments in their work. Two key exceptions are D'Aveni and Ravenscraft (1994) and Murray, Kotabe, and Wildt (1995) who look at both the positives and the drawbacks of outsourcing. However, neither study suggests a non-linear relationship.

In addition many studies on outsourcing, D'Aveni and Ravenscraft (1994) again being a notable exception, have analyzed one activity or a limited set of activities. Since the outsourceability of activities varies wildly, the outcome in terms of how outsourcing affects performance is simply a function of the activity studied and the context in which it is studied. For instance, if one were to study outsourcing of CEOs, to the extent this exists, it would surely tend to decrease performance. So a focus on a wider range of activities will influence what outsourcing-performance relation is observed. Corporations or their divisions announce they will increase outsourcing levels, to increase focus, cut costs or for some other reason, without a priori specifying the activities that will be outsourced.

Outsourcing decision-making therefore at least partly takes place at a more aggregate level of analysis.

A methodological limitation in previous sourcing literature is that most studies focus on a single moment in time. The effects of outsourcing, however, may not be immediate. A second methodological problem relates to the nature of the dependent variable measuring performance. Much earlier research on this topic relied on perceptual data collected through surveys. Although surveys allow for more degrees of freedom in gathering data, responses may be subject to common method bias and low response rates. Secondary data can therefore provide a fruitful complement.

The moderating effect of uncertainty

Strategic management research considers market uncertainty to be an important factor affecting major strategic decisions, such as the decision to vertically integrate (Porter, 1980; Williamson, 1975). The role of uncertainty in outsourcing, especially in transaction cost economics is contested terrain (Williamson, 1995), with some arguing for a positive effect, others for a negative effect or only a moderated effect. For instance, using perception data Gilley and Rasheed (2000) found that firms in less dynamic environments could increase performance through outsourcing. And Leiblein et al (2002) find that uncertainty arising from changes in market demand is positively related to buy (outsourcing) levels. We noted above that the real options approach also suggests uncertainty may affect the performance outcomes associated with outsourcing.

We are therefore interested in the effect that market uncertainty has on the outsourcing – performance relationship, and specifically in the extent to which it alters the

curve hypothesised above. Empirical results from studies investigating the effects of market uncertainty on the level of integration contradict one another (Sutcliffe and Zaheer, 1998). Studies utilising TCE provide empirical support that vertical integration / lower outsourcing is an efficient response to market uncertainty (e.g., Anderson, 1985). Contrarily, studies grounded in RBV suggest that firms facing uncertainty require greater flexibility; consequently, uncertainty results in a lowered rather than an increased degree of vertical integration, thus more outsourcing. Eisenhardt and Schoonhoven (1996) found, contrary to TCE, that in highly uncertain situations, firms seek, and do not avoid, alliances. The TCE and RBV perspectives therefore suggest that uncertainty creates different optimal strategy specifications.

Galbraith (1973, p. 5) defined market uncertainty as "the difference between the amount of information required to perform the task and the amount of information already possessed by the organization." Thus, market uncertainty refers to the cost and unpredictability of achieving an optimal expected decision (Galbraith, 1973). Although the reasoning of the TCE and RBV studies mentioned above is implicit, these studies suggest that firms seek specific strategy specifications because a high level of market uncertainty tends to result in suboptimal strategy specifications. In other words, in the face of much market uncertainty, firm performance is more sensitive to deviations from the optimal level. Consequently, we expect that market uncertainty will moderate the effect of outsourcing on firms' performance such that the higher the market uncertainty, the steeper the negative performance effect of firms deviating from their optimal outsourcing position. In simple terms, making mistakes through too much or too little outsourcing is costlier if firms face more market uncertainty. Therefore, we hypothesise:

Hypothesis 2: *Market uncertainty negatively moderates the negative curvilinear relationship between a firm's level of outsourcing and its performance.*

RESEARCH METHODS

We employ census data covering manufacturing companies operating in the Netherlands. Statistics Netherlands collects official data from all Dutch firms and foreign subsidiaries with more than 20 employees on an annual basis. The collected data are quantitative in nature. Our sample was limited to firms whose major lines of business belong to the assembly industry such as vehicles, electronics and machinery. A common characteristic of these industries is that a manufactured final product is made up of easily identifiable and separable components. The assembly industry is an interesting for a study of outsourcing because it engaged in the outsourcing trend long before other industries like services. Lessons on outsourcing in the assembly industry may therefore be relevant to other industries today or in the future.

Like in many other countries, outsourcing was a key management trend in the Netherlands during the 1990s (de Wit, Mol, and van Drunen, 1998). In the 1980s manufacturing firms had already outsourced some non-core activities. The current sample confirms the trend toward increased outsourcing. During the particular time period under study, from 1995, manufacturing firms in the assembly industry increasingly ventured into outsourcing important and high-value parts of their production process as well (De Wit et al., 1998), which makes it an especially useful time period and industry to look at.

A total of 1,147 manufacturing firms were identified in our sample. These firms are spread over 25 separate 3-digit level industries that are coded according to the NACE system, which is the European equivalent of the SIC in the United States. The assembly industry as we define it consists of the NACE codes 29 through 35. A list of all industries and numbers of firms therein is provided in Table 1. This list confirms that there is a wide spread of industries in which these firms operate. A large number of firms in the sample are foreign-owned. Interviews we have held with firms in the sample (reported in Mol, 2007) suggest that the outsourcing trend in the Netherlands, and the factors driving that trend, are highly similar to other countries. Using these basic data a number of firm-level measures were developed. For the present study we use 1995 and 1998 data, since 1998 was the most recent year available to us.

Insert Table 1 around here

Measures

***Performance*.** Measuring the financial performance implications of outsourcing is challenging. A standard measure of financial performance like ROS is not appropriate because it carries a consistent bias towards a negative relationship with outsourcing. An earlier study on vertical integration (D'Aveni and Ravenscraft, 1994: 1200) noted that with outsourcing a firm reduces its costs but also its (nominal) profits. To measure the profitability impact of outsourcing, then, we looked for a more balanced measure that takes into account changes in profit levels as a consequence of outsourcing. We employ the *return on value added* (ROVA). This measure is calculated as total profitability divided by

the firm's value added. The value added is calculated as sales minus external sourcing. The ROVA measure is more balanced because if a firm outsources this will not only lower the denominator, but the numerator too. Our empirical data confirm this, since we do not observe a consistent linear relationship with outsourcing across different years. Since our theoretical argument suggests that changes over time in a firm's outsourcing policy affect its performance over time, we refined our measure further by subtracting 1995 ROVA from 1998 ROVA[3].

***Outsourcing*.** Similar to the criterion variable, the predictor variable must capture changes over time[4]. The extent of external sourcing of a business unit was calculated as the ratio of industrial purchasing to total sales. This measure indicates to what extent a firm relies on external suppliers to produce its own products (a measure similar to Balakrishnan and Wernerfelt, 1986). Our outsourcing definition suggests a comparison of current levels of external sourcing with historical levels. So we calculated the variable, *outsourcing*, by subtracting the 1995 ratio of external sourcing from the 1998 ratio. In order to look at the curvilinear effect of outsourcing on performance, we included the square of this measure in our models.

***Market Uncertainty*.** Market uncertainty results in variation in profitability over time. Therefore, the *uncertainty* a firm faces was calculated as the logarithm of the variance in

[3] We ran a series of robustness tests to check whether shorter or longer periods of time generated the same findings. We found that our hypotheses are confirmed with other periods as well, but that the explanatory value of those models was smaller than is the case for the models we present below with a three-year lag. In other words, the three-year time lag we investigate here turned out to be the most suitable lag empirically but shorter or longer lags would not substantially change our findings.

[4] Note that an alternative definition of outsourcing could be the state of a firm's activities, rather than the changes in that state as we measure outsourcing here. Our measure is in line with the definition we provided earlier but we recognise the alternative definition has some merit as well. Our data in fact seem to more or less confirm that the main argument of hypothesis 1 holds for this alternative definition as well, which strengthens the case for a negatively curvilinear outsourcing-performance relationship.

the firm's respective return-on-sales figures over six years (1993 to 1998). In other words, we measured to what extent an individual firm's profitability fluctuates. This measure is very similar to that used by Leiblein et al (2002). Decision makers will respond to such uncertainty in their decisions.

Control Variables. To control for possible industry level effects, *industry dummies* were added. Since the sample consists of firms from 25 different industries, 24 dummies were added to our models. Firm size is another obvious variable to control for in a study of firm performance. To control for *firm size,* the logarithm of the number of employees of the firm in the base year 1995 was used. In order to look at the effects of firm expansion on profitability we also added a *sales growth rate* measure, calculated as 1998 sales over 1995 sales. Another possible explanation for high future profitability may be in the extent to which a firm exports its products. Therefore we calculated the *export ratio* as exports over sales in the base year 1995. Finally, we added a measure that describes the *productivity* of the firm, the logarithm of the per-employee sales, which is calculated as total sales over the number of employees in the base year 1995.

To analyse the effects of changes in the level of outsourcing on changes in the level of ROVA we utilise ordinary least squares (OLS) regression analysis. It is possible that a selection bias exists because the same variables that determine outsourcing also determine performance. To tackle this problem, we use subsample OLS, a technique preferable to its alternative, the Heckman correction, under many conditions (Puhani, 2000). This implies we run separate regressions for the largest three 3-digit industries (models 2, 3, and 4) to check whether our main findings hold for these subsamples.

FINDINGS

In table 2 the means and standard deviations of the independent, dependent, and control variables are reproduced along with the correlations between these variables. This table reveals an increase in the extent to which these firms relied on outside suppliers between 1995 and 1998, of 1.07% of sales from 48.75% to 49.82%. This confirms the outsourcing trend we discussed earlier. The table also shows a small drop in profitability, as our ROVA change measure is negative.

Insert Table 2 around here

Table 3 summarises our findings. In Model 1, we included the control variables and market uncertainty in addition to the predictor variables (*outsourcing* and its squared term) to test Hypothesis 1. In Model 5, designed to test the moderator effect of *market uncertainty*, we added to the base model the following two terms: *outsourcing x uncertainty* and *outsourcing**2 x uncertainty*. Once the two models were estimated, Models 1 and 5 were compared. Under the moderator hypothesis (described by Model 5), *uncertainty* was expected to moderate the effect of *outsourcing* on *performance*, the estimated slope coefficients for the interaction terms should be significantly different from zero, and the explanatory power of Model 5 should be greater than that of Model 1. If the moderating effect were not present, Model 5 should not account for more variance in the dependent variable than Model 1, the coefficients for the interaction terms should not significantly differ from zero. Furthermore, when the interaction terms between *outsourcing* and *uncertainty* are significant, the effect of uncertainty should only be

estimated independently of the effect of the interaction terms (Sharma, Durand, and Gur-Arie, 1981).

Insert Table 3 around here

The main hypothesis of a negative curvilinear relationship between outsourcing and firm performance is confirmed by Model 1, with a somewhat significant positive slope coefficient for the linear outsourcing term ($p = .06$) and a negative slope coefficient for the square term of outsourcing ($p < .001$). The explanatory power of Model 1 is 16.0% ($p < .001$). Models 2, 3, and 4 confirm hypothesis 1.[5] Thus the subsample OLS is supportive of the main hypothesis, which alleviates potential concerns over selection bias.

In Model 5, both interaction terms are found to be negative and significant ($p < .001$ for both). Uncertainty itself as a main effect in Model 5 is not significant although negative and significant in Model 1. This suggests that uncertainty should not be considered a main effect variable but rather a pure moderator variable. Thus this finding supports hypothesis 2. The estimated coefficients for the other variables in Model 5 remained consistent with those in Model 1, confirming the stability of the research findings. Model 5 accounts for 18.4% of the variance in performance, a significant increase of 2.4% from Model 1 ($p<0.01$).

Among the five control variables other than industry dummies productivity had a somewhat negative effect, and sales growth rate had a positive effect on the change in ROVA. While the positive effect of sales growth rate on the change in ROVA is rather

[5] For industries with fewer firms the direction of the effect is also confirmed but statistical significance could not be established because of the size of these subsamples.

intuitive and as anticipated, the negative effect of productivity on the change in ROVA begs for some explanation. Per-employee sales is suggestive of the firm's in-house productive capacity. There appear to be diminishing returns to per-employee sales. At a higher per-employee sales level, further improvement may not generate an improvement in the change in ROVA because there is a catching-up effect.

Post hoc analysis

The effect of uncertainty, which model 5 revealed, can be illustrated further in order to show how uncertainty impacts on optimal outsourcing levels. This is a useful exercise because the magnitude of making the right or wrong outsourcing choices under different levels of uncertainty will be of particular relevance to managers. We therefore build up three different scenarios. To examine how the change in outsourcing affects performance (i.e., the change in ROVA) under various levels of market uncertainty, a partial derivative of the curvilinear regression equation is taken with respect to outsourcing and equated to zero to determine the value for outsourcing at which the negative curvilinear function peaks:

$$\frac{\partial\,(\text{performance})}{\partial\,(\text{outsourcing})} = 0.56 - 0.20*(\text{outsourcing}) - .14*(\text{uncertainty}) - .016*(\text{outsourcing})*(\text{uncertainty}) = 0,$$

The mean of market uncertainty (i.e., the logarithm of the variance in the firm's respective ROS figures for 6 years) is 3.10, and its standard deviation is 1.27. Since the effect of outsourcing on performance is contingent on market uncertainty, we use three levels of market uncertainty (i.e., mean and $\pm$ one standard deviation away from the mean) for

illustrative purposes. Therefore, the three levels of uncertainty are: low uncertainty (1.83), average uncertainty (3.10), and high uncertainty (4.37). Substituting these respective values for uncertainty in the above partial derivative model, we can evaluate the effect of outsourcing on performance under three uncertainty scenarios.

Scenario 1: Low market uncertainty

$$\frac{\partial (\text{performance})}{\partial (\text{outsourcing})} = 0.56 - 0.20*(\text{outsourcing}) - .14*(1.83) - .016*(\text{outsourcing})*(1.83)$$

$$= .30 - .23*(\text{outsourcing}) = 0,$$

This partial derivative will stay positive if outsourcing < 1.31; it will become negative if outsourcing > 1.31. In other words, other factors being constant, the effect of outsourcing on ROVA would on average be positive as long as the increase in outsourcing did not reach 1.31% (recall that the base was 48.75% on average). In a more managerial sense, individual firms could on average improve performance by outsourcing activities by as much as 1.31% from their current base. It is important to keep in mind that 1.31% is an average percentage and will differ strongly across industries and firms.

Scenario 2: Average market uncertainty

$$\frac{\partial (\text{performance})}{\partial (\text{outsourcing})} = 0.56 - 0.20*(\text{outsourcing}) - .14*(3.10) - .016*(\text{outsourcing})*(3.10)$$

$$= .12 - .25*(\text{outsourcing}) = 0,$$

This partial derivative will stay positive if outsourcing < .48; it will become negative if outsourcing > .48. If the uncertainty level were average, the effect of outsourcing on ROVA would be positive as long as the increase in outsourcing, or the increase in the ratio

of industrial purchasing to total sales from 1995 to 1998, did not reach .48%. In other words, compared to a low uncertainty scenario, firms would have much less leeway in terms of increasing their outsourcing levels under an average uncertainty scenario.

Scenario 3: High market uncertainty

$$\frac{\partial (\text{performance})}{\partial (\text{outsourcing})} = 0.56 - 0.20*(\text{outsourcing}) - .14*(4.37) - .016*(\text{outsourcing})*(4.37)$$

$$= -.06 - .27*(\text{outsourcing}) = 0,$$

This partial derivative will stay positive if outsourcing < -.23; it will become negative if outsourcing > -.23. If the uncertainty level were high, the effect of outsourcing on ROVA would be positive as long as outsourcing had been reduced at least .23% from 1995 to 1998. In other words, under a high level of market uncertainty, firms would even have to reduce outsourcing activities from their current level. All three scenarios combined, it is clear that the higher the market uncertainty, the less flexibility in the level of outsourcing activities firms tend to have, providing further support and insight into the second hypothesis.

DISCUSSION AND LIMITATIONS

Scholars working on the relationship between outsourcing and firm performance have been divided into three camps, arguing for a positive or negative effect or no direct effect at all. We believe all of these arguments carry some validity in them, but need to be put in perspective. We used various theories to show that activities vary in their outsourceability. Value chains can be conceived of as a bundle of activities, where a governance choice

needs to be made for each activity. Building upon those notions we described how making the wrong governance choices is costly and more so as the difference between the optimal decision dictated by an activity's outsourceability and the actual governance choice increases.

What follows from this is that across all of firm's activities, its degree of outsourcing is negatively curvilinearly related to its performance. In a linear test of outsourcing and performance we may therefore find a positive relationship between outsourcing and performance, when firms have not yet reached their optimal point, a negative relationship, when firms have gone beyond their optimal point or no relationship when a firm is very close to its optimal point.

At the same time a word of caution is required around the notion of optimisation of results. We do not wish to suggest that optimising outsourcing levels is something companies actually do, or even that it is desirable. Companies may well be happy with satisfactory, rather than optimal results. And in the face of uncertainty and continuous change, a static optimisation strategy might lead to worse outcomes, rather than better ones. As scholars, with the benefit of hindsight, we can identify optimal strategies but we do not want to suggest companies do or indeed should try to engage in continuous optimisation.

Several empirical limitations of this study should be mentioned. This study has not explicitly included asset specificity or other predictor variables of outsourcing like the frequency of transactions or the transferability (stickiness) of resources in its measurement models. Measuring these variables has proven to be difficult even at the level of individual transactions and finding a proper measure at the business unit level, where various activities are combined, would seem to be even harder. In any case, no such measure was available to

us. Therefore we only tested the moderating effect of uncertainty, and not of other variables.

And the ROVA performance measure used here is only one possible indicator of performance. Single indicators always carry some measurement bias. ROVA cannot account for the impact of leverage on firm profitability. It can also be susceptible to price changes caused by marketplace pressures. And we have assumed here that changes in return and changes in value added occur in conjunction. Outsourcing should also be studied using ROI or similar measures. Finally, this study operates within a certain geographic and temporal context, manufacturing businesses in the Netherlands in the 1990s, and the data applied here are now somewhat historical. This is a negative aspect of using secondary data. Replication of the findings in other contexts and through other methods is therefore very desirable.

IMPLICATIONS

Whether the relationship between outsourcing and the performance of a firm or a sample of firms in a cross-sectional dataset is negative, positive or non-existent is determined by the context of measurement. In a country, industry and time where the outsourcing trend has not gone far enough, we may find a positive relationship between the degree of outsourcing and firm performance. If however, there is excessive outsourcing at a certain point in time, the relationship could become negative. If a firm has found a balance between integration and outsourcing, there may not be any relationship. Scholars should be cognisant of their context of measurement and use it in explaining cross-sectional findings. Future theorising on outsourcing and performance should incorporate the advantages and drawbacks to

outsourcing as well as the contingencies that determine the most effective level of outsourcing. Thus it would be wrong to propose a linear effect of outsourcing on performance at the firm level, be it positive or negative, as this excludes either the advantages or the drawbacks from the discussion. And it would be equally wrong to ignore that circumstances co-determine what the optimal degree of outsourcing is for a given firm.

A further point future research could address is whether some firms are able to raise their performance outcomes by being better outsourcers. For instance, do the type of value-creating partnerships between buyers and suppliers seen in 'transformational outsourcing' (Linder, 2004) have an impact on the outsourcing-performance curve? It is conceivable that being a better outsourcer raises a firm's performance curve. Surveying this would allow researchers to cross the important bridge between outsourcing and supplier relations as these are two strongly related phenomena (Takeishi, 2001).

Another research direction is to look at shifts in optimal outsourcing levels over time. For instance it is stated that the introduction of IT increases the transparency of markets, which lowers the costs of transacting in these markets and consequently increases the benefits of outsourcing (Malone, Yates, and Benjamin, 1987). And it has also been remarked that institutional change, in the form of trade liberalisation and better enforcement of intellectual property rights for instance, helps to increase optimal outsourcing levels (Mol, 2007).

The results raise the question why firms would engage in less than optimal behaviour. While it exceeds the scope of this article to investigate the causes of such misalignment, we would like to suggest some possibilities. First, outsourcing is one of a great number of causes of performance and as such the best overall performance will not

necessarily come from just optimising the firm's outsourcing strategy. It could well be that obtaining the best overall performance requires a less than optimal outsourcing strategy. Second, it is well known that much managerial decision-making is of a satisficing rather than an optimising nature and takes place through the application of heuristics (Simon, 1957). Hence outsourcing policies can be expected to deviate somewhat from the optimum. Third, the nature of this type of decision-making is so complex that much causal ambiguity is likely to exist over its impact on performance. And some of this impact will not be felt immediately but rather in the long run. Finally, outsourcing decision-making could be influenced by bandwagoning effects (Abrahamson and Rosenkopf, 1993). Firms certainly appear to be inspired by competitors when making outsourcing decisions and perhaps also by other outside institutions. In all this implies that outsourcing often takes on an experimental character where optimal strategies are approached at best. This is a further avenue for academic research.

Practical implications

The notion of outsourceability that we have put forward can help practitioners in their assessment of the suitability of an activity for outsourcing. Based on our discussion of outsourceability, it can broadly be seen as a consequence of past experiences, present transaction traits and future strategic intent. Practitioners could use these categories to make sense of their portfolio of activities and to rank these activities in terms of their outsourceability.

Most business managers have a strong general sense for what constitutes a sound outsourcing policy. They know that outsourcing everything leads to disasters just as much

as they know that not all activities should be integrated within firm boundaries. However, we would like to suggest the analysis can improve managerial decision-making in two important respects. First, managers are often not conscious of the fact there is an optimal degree of outsourcing for their entire portfolio. Instead they tend to see the good or evil of outsourcing or integrating particular items. Our research suggests a simultaneous focus on the portfolio as a whole will help to make better outsourcing decisions.

Second, managers are in need of guidelines as to where the optimal point lies for their particular business at a particular time. We discussed various theories that predict outsourceability. Combining these two points it appears that what would really be useful from a managerial perspective is a model that helps managers determine what the optimal degree of outsourcing is for their particular firm. The development of such a model provides an interesting challenge for the academic community.

CONCLUSIONS

In this paper we have focused on how outsourcing levels across all activities influence a firm's overall financial performance. We argued that activities vary in their degree of outsourceability, such that it makes sense for activities with high outsourceability to be outsourced while activities with low outsourceability are vertically integrated. Using the concept of outsourceability we proposed and empirically confirmed that outsourcing has a negative curvilinear effect on firm performance, such that there is an optimal degree of outsourcing and deviations become ever costlier when moving away from that optimum. And as levels of market uncertainty rise, the curve becomes steeper, and mistakes become costlier. Through a post hoc analysis, the magnitude of these costs was demonstrated. The

performance implications of outsourcing therefore well deserve their place on managerial and research agendas.

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Table 1
Industry distribution of firms (total N = 1,147). From revision 1 of statistical classification of economic activities in the EU (categories DK, DL and DM)

NACE code	Description	N
291	Machinery for production and use of mechanical power, except aircraft, vehicle and cycle engines	96
292	Manufacture of other general purpose machinery	272
293	Manufacture of agricultural and forestry machinery	61
294	Manufacture of machine-tools	22
295	Manufacture of other general purpose machinery	200
297	Manufacture of domestic appliances n.e.c.	20
300	Manufacture of office machinery and computers	12
311	Manufacture of electric motors, generators and transformers	25
312	Manufacture of electricity distribution and control apparatus	24
313	Manufacture of insulated wire and cable	10
315	Manufacture of lighting equipment and electric lamps	19
316	Manufacture of electrical equipment n.e.c.	16
321	Manufacture of electronic valves and tubes and other electronic components	17
322	Manufacture of television and radio transmitters and apparatus for line telephony and telegraphy	6
331	Manufacture of medical and surgical equipment and orthopedic appliances	52
332	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment	48
333	Manufacture of industrial process control equipment	12
334	Manufacture of optical instruments and photographic equipment	12
341	Manufacture of motor vehicles	12
342	Manufacture of bodies (coachwork) for motor vehicles, manufacture of trailers and semi-trailers	79
343	Manufacture of parts and accessories for motor vehicles and their engines	21
351	Building and repairing of ships and boats	81
353	Manufacture of aircraft and spacecraft	6
354	Manufacture of motorcycles and bicycles	19
355	Manufacture of other transport equipment n.e.c.	5

Table 2

Means, standard deviations and correlations among key variables

*** significant at .001; ** significant at .01; * significant at .05; † significant at .10.

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 ROVA change	-.49	24.32	1									
2 Firm Size	4.09	.83	-.03	1								
3 Sales Growth Rate	25.92	42.27	.31(***)	.02	1							
4 Export Ratio	35.93	34.46	-.02	.37(***)	.05(†)	1						
5 Productivity	5.36	.44	-.10(**)	.21(***)	-.10(**)	.27(***)	1					
6 Uncertainty	47.19	76.01	-.10(**)	-.11(***)	.01	.08(***)	-.14(***)	1				
7 Outsourcing	1.07	11.43	.07(*)	.00	.11(***)	-.05(†)	-.06(*)	-.05	1			
8 Outsourcing**2	131.72	270.91	-.14(***)	.03	.01	.04	.07(*)	.19(***)	.10(**)	1		

Table 3
Regression Models (slope coefficients and standard errors) for the Effect of the Change in Outsourcing on the Change in Return on Value Added (between 1995 and 1998).
*** significant at .001; ** significant at .01; * significant at .05; † significant at .10.

	Model 1 All industries		Model 2 Industry 291		Model 3 Industry 292		Model 4 Industry 295		Model 5 All industries	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
(Constant)	26.27	10.15(**)	31.18	30.73	-5.06	18.68	56.58	22.82(*)	22.06	10.04(*)
Firm Size	-.50	.92	-5.12	2.92(†)	.54	1.75	2.69	2.17	-.75	.91
Sales Growth Rate	.18	.02(***)	.05	.05	.18	.03(***)	.18	.04(***)	.17	.02(***)
Export Ratio	-.00	.02	.09	.08	.03	.04	-.05	.05	-.01	.02
Productivity	-4.22	1.72(*)	-2.12	5.43	-.10	3.30	-12.83	4.10(**)	-4.12	1.67(*)
Uncertainty	-1.64	.57(**)	.06	.03(†)	.01	.02	-.05	.02(*)	-.32	.61
Outsourcing	.11	.06(*)	.49	.19(*)	-.01	.12	-.39	.13(**)	.56	.17(***)
Outsourcing**2	-.01	.00(***)	-.03	.01(***)	-.03	.01(***)	-.02	.01(**)	-.01	.00(***)
Outsourcing x Uncertainty									-.14	.04(***)
Outsourcing**2 x Uncertainty									-.01	.00(***)
N	1,147		96		272		200		1,147	
R^2	.16		.29		.22		.22		.18	
Adj. R^2	.14		.23		.20		.20		.16	
F-value	7.05(***)		5.12(***)		10.88(***)		7.87(***)		7.86(***)	

Note: Industry dummy variables are not shown for the sake of brevity but are available upon request.