

# Corporate relations and strategic subcontracting

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**Abstract.** Technological progress, such as that associated with robotics and computer-aided manufacturing, is increasingly delivering machines that operate at lower variable costs, but often with a different optimum degree of utilization. If we restrict our analysis to companies that use two different types of machines to manufacture a product, a change in the optimal degree of utilization of machines of one type resulting from technological developments may make it necessary to adapt the entire manufacturing process in order to fully exploit the cost advantage. If the cost advantages cannot be fully achieved by reconciling internal company structures, this may be achieved by adjusting inter-company structures. Such an adjustment can take various forms, depending on whether the enterprise in question offers unneeded capacity to other enterprises or complements insufficient internal production resources with available capacity from another enterprise. The aim of the article is to analyse important trends in the context of subcontracting. In order to keep the subject of the study easily comprehensible, the important empirical methods are used, which can discover new insights in the scientific sources. The resulting generalization is intended to show when the question of possible outsourcing should be placed on the negotiating table.

## 1 Introduction

Looking at a company's decision, two parameters can be identified that lead to outsourcing, which are fundamental to the design of an outsourcing arrangement. These two parameters concern, on the one hand, the extent of the outsourcing and, on the other hand, the design of the inter-company relationship associated with it.

The first parameter, the extent of outsourcing, is the degree to which outsourcing should take place. It thus describes whether the external procurement of a work step is limited or whether a work step is completely removed from stock. In the first case, a work step is carried out in the company itself. In the second case, the company transfers its execution completely to another company.

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The second parameter to be defined by a company in the context of an outsourcing is the form of the relationship with the company that will provide the work step. If possible, exogenous restrictions are neglected, the number of different forms of contracts available to a company is unmanageable.

If it is assumed that a company that carries out outsourcing and determines the design parameters under consideration interacts with other companies, the question of the resulting economic implications arises. Especially the effect on other companies, which results from the outsourcing, is important for the answer to the question, because it can influence the optimal design of the above parameters.

The influence on other companies relevant for an optimal design can be divided into two directions of action or consideration. On the one hand the effect on competitors and on the other hand the effect on a supplier or customer. The resulting effects of outsourcing on competitors can further be divided into those resulting from the outsourcing itself, i.e. direct, and those resulting from the interaction with other companies. The latter are called indirect or strategic effects.

## **2 Outsourcing as an alternative in production design**

In the scientific literature, there is agreement on the definition of outsourcing to the extent that the term means the use of external resources. The word itself represents a concept of art composed of outsourced resource using. It thus aims to restructure the internal production of goods or services. Furthermore, there is little agreement in the literature and in the use of the term. [1, 2]

In the following, it is assumed that outsourcing a work step that was formerly carried out in-house in return eliminates all the conditions necessary for this work step. Outsourcing includes the decision itself as well as the process of implementation. In addition, it is assumed that the outsourced work steps will continue to be a necessary part of the creation or disposal process of the goods concerned. A central assumption in outsourcing is that a company has previously carried out the outsourced work step internally, i.e. there is not only a change in the source of supply.

Since a rationally acting company carried out the considered work steps internally before outsourcing or subcontracting, it must be assumed that this form was optimal under the given environmental conditions. Thus, the various effects acting on the company must have been in equilibrium if the outsourcing could have been carried out previously but did not take place. Thus, for outsourcing to be beneficial, a shock of some kind must have occurred.

It is assumed that the triggering moment is to be found in the internal or inter-company technological framework. For this purpose, two possible forms of a shock that changes the framework conditions are considered. On the one hand, a shock that affects the available production technology, and on the other hand, a shock that changes the underlying information and communication technology.

### **2.1 Shock in production theory**

Production technology refers to the transformation process by which a company or part of a company converts input factors into output. Assuming that the shock was caused by an innovation, a company will need or at least be able to replace its existing production technology for reasons of profit maximisation. However, since such a technological change is often associated with a change in the optimal degree of capacity utilisation, it may also be necessary to adjust capacities at those stages of production that are not directly affected by the shock.

For example, outsourcing can be advantageous for cost reasons if the capacities at the various production stages can be adapted to the new conditions at different speeds or not at all. Thus, outsourcing is a way of adapting the variable and fixed costs of production to the new conditions in order to reduce production costs. A different speed of adaptation to new technologies can also play a role.

At the same time, such a shock may also simply change existing fixed costs without affecting variable costs. However, even in this case there would be an impact on competition, as a change in fixed costs influences the market entry behaviour of companies. For example, a change in fixed costs may result in a change in the market power of the company under consideration or of one of its suppliers, which would also have an impact on the outsourcing behaviour of a company. This is also because it influences the possibility of opportunistic behaviour.

Similarly, a change in production technology can directly enable the use of more flexible and versatile inputs, thereby reducing factor specificity and thus reducing the risk of opportunistic behaviour. [3] This would also speak in favour of outsourcing in response to a corresponding shock in production technology.

## **2.2 Shock in information technology**

An alternative triggering factor is a shock in the context of information and communication technology and thus to the internal or inter-company coordination costs associated with the execution of the task. It can be reflected in the costs that arise in the search for a suitable supplier or the conclusion of a contract with the supplier, i.e. the costs that arise for an inter-company division of labour and thus have a positive effect on outsourcing.

At the same time, however, such a shock can have a decisive influence on outsourcing, even with an already known supplier. For example, greater specialisation in the course of an inter-company division of labour also leads to the isolation of information. This is not a problem as long as the different work steps are completely independent of each other. If, however, there are positive interactions, so-called synergy effects, between them, these synergy effects can decrease or be completely lost through outsourcing. A more cost-effective transfer of information can reduce these negative effects by extending or improving communication possibilities and compensate for a loss of synergy effects in the case of an inter-company division of labour. Reducing the costs of information procurement can also influence coordination costs and thus allow for an extension of control possibilities. This can go so far as to increase the amount of control tools available. Thus, after such a shock, it may be possible to implement control instruments that previously could not be used for cost reasons. [4, 5]

Overall, better availability of specific information is the result of such a shock. Correct use of this additional information together with better asset utilisation can then lead to higher profits. [6] Conversely, however, the need for greater specialisation may arise for capacity reasons, without this having a positive effect on profits. [7, 8]

## **3 Subcontracting as a form of corporate relationship**

If you look at more than one company and assume that they interact, there must be a direct or indirect relationship between them. The production of many goods or services requires a certain sequence of work steps. Such a successive sequence of work steps is also called a vertical chain. The vertical chain is also associated in the literature with the concept of value added. The focus here is on the inherent change in value that results from the execution of successive work steps for the goods or services to be produced. If one groups

the resulting stages with regard to the change in value, a sequence of value creation stages is created, the so-called value chain.

By contrast, a horizontal relationship is a relationship between two companies or parts of companies that only perform work steps at the same stage of the creation process. In the context of horizontal relationships, this often refers to interactions between enterprises that produce an almost or completely identical good and usually compete for the sale of this good. If these goods are homogeneous from the point of view of the consumer, they are also called substitutes.

In contrast, a vertical relationship describes all relationships that exist along the direction of creation of a product or service between companies at different levels of the vertical chain. The products or services considered in the context of such a relationship are thus less homogeneous, but rather heterogeneous. Along the sequence of steps, a direction can be defined additionally for a more precise description.

A backward relationship or upstream direction is one that runs counter to the direction of production of the good or service, i.e. represents the receipt of an input for the enterprise under consideration. Conversely, all companies that process the output of a company under consideration, i.e. use it as an input, are in a downstream relationship with it from the company's point of view. It should therefore be noted that these terms are always relative. [9]

### **3.1 The essence of subcontracting**

Subcontracting describes the outsourcing of a work step, where this work step is carried out within the company to a limited extent even after the outsourcing. In order to maintain the same production level, it is therefore necessary to procure additional units from external companies. [10] Subcontracting therefore requires a division of the required quantity between internal and external supply sources, so that capacity aspects play an important role.

This form of outsourcing thus represents a decision from the space of inter-company segmentation of a work step that is to be assumed as continuous. In subcontracting, this space is limited on the one hand by the fact that the company completely outsources a work step, and on the other hand by the fact that it executes it exclusively internally. If there is no marginal solution, subcontracting can also be seen as a special case of dual or second sourcing, in which one of the sources is internal. At the same time, however, subcontracting also includes the consideration of additional factors such as a change in the control and sanction mechanisms for controlling and coordinating these various sources of supply. Overall, both outsourcing and subcontracting can be interpreted as the substitution of the internal execution of a work step by external procurement. The scope of the execution of a work step is reduced or completely discontinued in the company under consideration and additionally required quantities are procured from other companies. While subcontracting focuses on the scope of outsourcing, outsourcing focuses on the structure of procurement.

### **3.2 Strategic Subcontracting**

If one looks at a sector in which the production of a good or a service is carried out by a sequence of work steps that can be divided up between companies, the determination of the balance between the operating companies is usually based either on the transaction costs incurred or the underlying market structure. The basic work, which deals with the consideration of transaction costs as a starting point for the division of the production process, is by Williamson and Grossman & Hart. [11]

Based on this, many authors devoted themselves to an investigation of the role of transaction costs, asset specificity and the impact of incomplete contracts. All of this work is aimed at presenting statements for a decision on the optimal intra- and inter-company allocation of the creation process.

However, in many cases the focus was on a bilateral relationship between an individual outsourcing company and its potential supplier. Thus, the results obtained are not fully transferable to the analysis of industry trends, since the attractiveness of an available decision alternative for a company may also depend on how competitors react to such behaviour. [12, 13]

On the other hand, strategic aspects are taken into account in work that aims to examine the resulting market structure. A central work in this context is the paper by Spengler. There he shows that integration forms a balance when two successive monopolies would be the alternative. Building on this, Greenhut & Otha show that even in the case of a duopoly in a multi-level Cournot competition, vertical integration leads to equilibrium. This equilibrium results from the fact that the dissolution of double marginalisation through vertical integration reduces the costs for the integrating firm.

Based on the work of Greenhut & Otha [14], Abiru, Nahata, Raychaudhuri & Waterson [15, 16] investigated the case of a Cournot competition on two levels with a different number of companies. The elimination of double marginalization provides a cost advantage and thus an incentive for a company to integrate. However, the cost advantage also depends on the difference in the number of companies at both levels. Abiru, Nahata, Raychaudhuri & Waterson [17] conclude that the elimination of double marginalisation does not necessarily provide an incentive for integration, but rather concludes that if there is an unequal number of companies at both levels, there is generally no clearly dominant strategy.

The change of an industry equilibrium was also investigated by Salinger [18], who, however, in contrast to Abiru, Nahata, Raychaudhuri & Waterson, considers the reasons for a static equilibrium. In his investigation he uses a two-tier oligopoly, whereby the independent downstream companies take the price of the primary product as a given. Thus, the non-integrated upstream firms face a derived demand curve resulting from the equilibrium in the final product market. The price in an assumed quantity competition at this level is then derived from the resulting Cournot equilibrium. Through a merger and the resulting elimination of double marginalisation, a company can increase its final output.

This in turn leads to a backward shift in the residual demand curve, to the non-integrated firms, thus reducing their demand for the intermediate good. The stability of the result is crucially dependent on the assumption that changes in quantity remain endogenous. In his analysis Salinger, for example, assumes that the vertically integrated companies do not participate in the intermediate goods market, which means that the market equilibrium remains stable even with vertical integration.

It can now be shown that a vertical merger may lead to either an increase or a decrease in the price of the intermediate and final good or service. Salinger takes up this approach and shows in an adapted model that, in order for the price of the final product to rise, the upstream stage must be more concentrated than the downstream stage as a result of a vertical merger.

In contrast to the previous works, which deal with quantity competition, Bonanno & Vickers [19, 20] consider price competition. Like Lin [21], they assume that either demand is sufficiently inelastic, or franchising is possible. They can thus show that vertical separation results in a reduction of oligopolistic competition and thus an increase in profits, since the introduction of a wholesale market enables companies to credibly commit themselves to a higher price. Ordober, Saloner & Salep [22] generalizes this result to a vertical separation in the complete absence of vertical integration.

Cyrenne [23] and Economides [24, 25] also consider the effect described by Bonanno & Vickers in their study of strategic forces in vertical relationships. In a model with differentiated products they show that the decision on a vertical merger for an upstream company in price competition depends on the degree of product heterogeneity on the final product market. They consider the trade-off for an upstream company between double marginalisation and competitive weakening through vertical separation. The problem of double marginalisation results in a price increase at the wholesale level, which causes the volume to fall below the desired level. At the same time, however, price competition produces the positive strategic effect at the final stage described by Bonanno & Vickers.

They therefore conclude that, in the case of close substitutes, outsourcing makes sense for strategic reasons. In most of the work described above on the inter-company division of labor, however, it is striking that the phenomenon of subcontracting is not taken into account. The absence of subcontracting in these models results on the one hand from the fact that when using price as a strategic variable, only the costs of production are usually relevant.

## 4 Discussion

This means, however, that only the source of supply that allows cheaper delivery is used. If, on the other hand, the basic structure of the models allows subcontracting to be taken into account, they are often omitted anyway, as they often do not provide any gain in knowledge within the approaches used, but make the analysis more difficult due to the additional decision alternatives in the selection of the corporate structure, thus reducing clarity.

Notwithstanding the modeling problems discussed above, there are a few papers in the literature that deal with the investigation of a simultaneous internal and external reference of a working step or its result. One area where this occurs is production. The advantage of subcontracting as a means of production and capacity planning is particularly emphasized. It is argued that subcontracting allows short-term capacity adjustments under temporary fluctuations in demand.

In order to analyze the resulting behavior, Kamien, Li and Samet and Kamien & Li consider a multi-periodic, game theoretic aggregated planning model with given capacity constraints. The capacity constraints result implicitly from the underlying convex cost structure. In this way, you can show that the ability to subcontract provides an opportunity for production smoothing.

All the works mentioned once had in common that the justification for subcontracting was based on a capacity decision made under uncertainty. However, this means that the analysis of a strategic effect is distorted by the risk transfer associated with uncertainty. What would be important, on the other hand, would be a fundamental investigation that does not assume uncertainty with regard to relevant model parameters.

Furthermore, the majority of this work focuses on the vertical relationship associated with subcontracting. A consideration of horizontal effects is missing so far.

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