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INTERNAL PRODUCTION VERSUS EXTERNAL EXCHANGE - A PROPOSAL
FOR AN
EMPIRICAL TEST OF THE TRANSACTION COST MODEL.

Guido Krickx

APRIL 1982

Guido Krickx

*Internal Production versus External Exchange: A Proposal for an empirical
Test of the Transaction Cost Model*

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ABSTRACT

In this paper a theoretical model is proposed, that allows investigation of why certain organizations manufacture goods internally, while other organizations seek to get supply from other companies. The transaction cost model elaborated here, explains how the characteristics of the production or exchange requirements affect this choice. A number of hypotheses are derived out of this model and an approach to empirically test these hypotheses is proposed and elaborated.

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1. INTRODUCTION

In this paper I investigate what motivates organizations to produce certain goods and services internally, when they could rely on acquisitions from other producers which manufacture these goods. This issue has received attention in a number of disciplines, often under different names: in Industrial Organization this problem is described as vertical integration, while in marketing it is termed make-or-buy decisions. The scope of research on this topic has ranged from broad crosssectional investigations to detailed analyses of specific companies, on which antitrust decisions are based.

The issue of internal production versus external acquisition of the goods required by an organization, will be explained by the transaction cost model in this paper. The basic unit of analysis will be the transaction. I will link the notion of transactions with the organizational mechanisms that are used to accomplish them. This will lead to a discussion of how an organization should be set up between internal production and external acquisition of goods and services. I will describe what the characteristics of transactions are that in some instances require internal production, while in other require buying goods from outside suppliers.

The level of analysis used in this proposal is of a more microlevel than studies conducted previously. This will al-

low to test the transaction cost model which is developed further. In addition, some statements will be made on how organizations will do in terms of efficiency, which will require an aggregation over different transactions. With this aggregation, it will be possible to study the implications of internal production versus external acquisition of goods, at the level of a company or at the level of a division.

This paper will consist of five parts. I chose to start with a discussion of what transactions are and how they can be characterized. In the second part, I will develop the different ways in which transactions could be conducted. This is followed by a discussion of which characteristics of transactions motivate the choice between internal production or external acquisition. In a third part, I will discuss some alternative explanations of why internal production occurs and will show that these explanations do not add anything substantive. Next, I will formally state the problem and discuss the hypotheses that can be derived out of the theoretical framework. Last, I will discuss the research design and methodology to be used in the test of the model, while I will also address what results are expected and which factors may mitigate against the hypothesized relationships.

As a final comment, I wish to stress that the emphasis of this proposal lies on theory development and how empirically test that theory. I do not yet have results. My main effort lay in the elaboration and operationalization of the

theory and how an empirical test will be conducted. The reason for this choice is clear. A hasty empirical test can do nothing but show numbers, while a well developed theory accompanied by an appropriate empirical test will allow insight and depth for the interpretation of the findings.

2. TRANSACTIONS AND TRANSACTION CHARACTERISTICS

2.1 TRANSACTIONS

Coase in his seminal paper "The Nature of the Firm" (1937), suggested that markets and firms provide alternatives for completing transactions. According to Coase, firms exist because their operation entails less costs, than using market transactions: the main cost of using market transactions is the cost of discovering what the relevant prices are (Coase, 1937, p. 335- 336). Although these views gained some popularity in the thirties, not much theory development was done subsequently. The main reason in my mind is, that definitions of transactions and transaction costs were elusive and hard to operationalize. Recently however, theoretical work has been done on transactions as a concept that allows us to understand the differences between internal organization and market mechanisms with which to accomplish exchanges.

A transaction occurs when a good or service is transferred across a technologically separable interface (Williamson, 1981, p. 6), or when an economic exchange between two or more parties takes place (Ouchi, 1980b, p. 3). These definitions are essentially different from Commons' view of a transaction as a legal transfer of goods (Commons, 1952, p. 55). Indeed, in both Williamson's and Ouchi's definition, a transaction is possible between economic enti-

ties belonging to the same legal ownership structure. This is the clearest in Williamson's definition, where the emphasis lies on economic units that are technologically separable (for example divisions within a company), which obviously is different from legally separable units. Thus we can define transactions as transfers of goods and services between different authority centers. Transfers between centers of legal authority represent one type of transactions, while transfers between centers of administrative or managerial authority represent a second type. This last view is somewhat broader than Ouchi's definition in that it does not require a distinction between economic and non-economic exchanges. It also avoids the potential confusion in Williamson's definition of transactions being exclusively linked to the technological aspects of production.

2.2 THE CHARACTERISTICS OF TRANSACTIONS

In order to better understand what a transaction is, it is useful to comprehend how transactions may be different along several underlying dimensions. Transactions can be characterized by three dimensions: 1) the degree of ambiguity or uncertainty with respect to the attribution of performance between the parties to a transaction (called performance accounting ambiguity), 2) the degree of goal congruence between the parties, and 3) the frequency with which a transaction is executed (Ouchi and Barney, 1981, p.7). Williamson's

characteristics of a transaction, namely asset specificity, uncertainty and frequency, can be recasted in terms of the framework proposed by Ouchi and Barney (Williamson, 1979, p. 239). I will now treat each of these dimensions in more detail.

2.2.1 Performance Accounting Ambiguity

Performance accounting ambiguity arises when it is not possible to accurately monitor the performance of the parties to a transaction, or even when performance can be accurately measured, it is not easily possible to accurately value the contributions that each party made to the exchange. Associated with performance accounting ambiguity are four concepts that help clarify this transaction characteristic, namely investment specificity, transaction uniqueness, complexity and uncertainty.

Asset specificity refers to the phenomenon that in order to accommodate certain transactions, investments have to be made that are highly specialized and therefore have a low value in alternative uses (see also Williamson, 1979, p. 239ff.). Asset specificity is similar to the notion of appropriable quasi-rents in Klein, Crawford and Alchian (further KCA, 1978, p. 298ff.). KCA assume that as assets become more specific, more appropriable quasi-rents are created, whereby the quasi-rent value of an asset is defined as the excess value of that asset over its value in a second

best use. The more specialized an asset is the more restricted is its use for other purposes, hence, it has a high value in its current use compared to any alternative use or a higher quasi-rent. Asset specificity can occur because of the location of assets, because certain assets are highly specialized or because investments have been made in specific human capital (Williamson, 1981, p.8).

The second concept, uniqueness, has a different meaning than the frequency with which a transaction takes place, although these concepts are somewhat related. Transaction uniqueness is related to the uniqueness of the goods and services being exchanged. This uniqueness implies that at least one of the parties to the exchange cannot easily determine the value of the goods being exchanged, or monitor the performance of the other party (Ouchi and Barney, 1981, p.9-10). Only one party to an exchange will face uniqueness when the good or service has already been manufactured by the second party, but has never been acquired by the first party. Both parties to an exchange will face uniqueness, when the good or service does not exist at the time of their agreement (e.g., the space shuttle project).

The third concept, complexity, can also easily be understood. When goods or services are highly complex, both the costs of specifying the performance characteristics and design features, as well as the costs of monitoring the performance of the other party will be high (Ouchi and Bar-

ney,1981,p.10 and Klein,1980). Complexity is also related to property rights:when the rights to specific goods and services are fully determined,then contracts that are negotiated over these goods and services are fully enforceable. Given that contracting is not costless and given that,as complexity increases of the goods and services being exchanged,it is more difficult to write contracts that are fully specified, it follows that for more complex goods and services, property rights are less completely defined (see also Furubotn and Pejovich,1972). When property rights are less fully defined for goods and services with a high complexity,this means that more administrative machinery, whether internal to the firm or external to it (e.g.,arbitrators) will be sought to assist the contract.

The fourth and final characteristic of performance accounting ambiguity, uncertainty,is related to the difficulty of forecasting the future or even of evaluating the present. In other words,the future is not unequivocally determinable in advance,or the cost of obtaining information is not zero (see Demsetz,1981,lecture 2, p.1 and Ouchi and Barney,1981,p.11).

When performance accounting ambiguity,as made explicit by these four concepts, is higher, transactions will become more difficult and will require mechanisms that are more elaborate,to execute the transaction (Ouchi and Barney,1981,p.11).

2.2.2 Goal Congruence

Goal congruence refers to the alignment of incentives between the parties to an exchange. When one party can only achieve its interests at the expense of the other, then the goals of these two parties are incongruent. The most extreme form of goal incongruence is a zero-sum game, where the loss of one party forms the gain of the other (Ouchi and Barney, 1981, p.13). Goal congruence is the concept with which to understand implicit contracts (see KCA, 1978, p.303-304). Given that for some exchanges, not all relevant dimensions of quality can be defined, an exchange may be organized so that the party which can affect the quality of the good or service earns a return over and above the normal return. This return forms a rent stream which is valuable and therefore reduces the risk of short term opportunistic behavior. Here then, in effect, incentives are created so that both parties to the exchange have an interest in maintaining it, i.e. their wealth maximizing incentives overlap with respect to the exchange in question.

2.2.3 Frequency

The frequency with which a transaction is executed is linked to the previously discussed notion of asset specificity. In some cases, transactions require an amount of specific assets not easily transferable to other uses besides accommodating this specific transaction. If this transaction

takes place infrequently, it may not be worth or it may be too risky to set up a mechanism specifically devoted to that infrequent transaction. For example, a company may not set up a permanent group of employees and managers to buy a company, unless buying companies is a common transaction for the company in question (e.g. a holding company or large conglomerate). The company that buys another company once in 20 years on the other hand, may choose to set up a temporary task force to accomodate this transaction.

3. THE GOVERNANCE STRUCTURE OF TRANSACTIONS

3.1 INTRODUCTION

Coase originally proposed that transactions could take place across markets or internally to an organization; these represent different modes of executing a transaction (Coase, 1937, p. 333). These different modes of executing a transaction can be called governance mechanisms, in line with Williamson (1979) and Ouchi and Barney (1981).

The distinction Coase made, between market and non-market exchanges is too broad for two reasons. First, a number of market transactions have associated with them mechanisms that help the execution of contracts. For example, a third party may be designated in case conflicts arise and in order to solve these conflicts through arbitration. Secondly, Coase limited his attention to market transactions (Alchian and Demsetz, 1972, p. 784) and did not really distinguish between the different forms an organization may take (Williamson, 1975). These organizational structures do make a difference and help explain the particular success or failure of organizations over time (Chandler, 1962). In addition, internal production may reduce risk (Teece, Armour and Saloner, 1980).

Vertical integration is linked to this distinction between internal production or execution of transactions across markets. Vertical integration involves the choice by an or-

ganization to manufacture internally or buy the required goods and services from outside¹ suppliers. This choice is related to the choice of organizational boundary, which can be defined as "that locus within which all transactions are governed through internal means and beyond which all transactions with the organization are governed through external means" (Ouchi and Barney, 1981, p.4; see also Williamson, 1981, p.28ff.). Clearly the analysis on which this choice is based, may change over time as changes take place in the environment of the organization (Williamson, 1981, p.70).

In turn I will discuss forms of market transactions, modified market transactions and intraorganizational transactions. A final section will discuss the relationship between the different governance structures and the characteristics of transactions.

3.2 MARKET TRANSACTIONS

3.2.1 Characteristics of Markets

Before a number of specific types of contracts, used for market transactions will be described, it is useful to elaborate on some general characteristics of markets.

Markets have efficiency properties that are related to the basic nature of what a market is: a place where goods and services are exchanged for a price. As a communication

¹in the sense of not belonging to the same legal structure

device, the price system typical of a market is efficient given that it allows to make rational decisions, without having to know what factors determine price and price changes (Hayek, 1945, p. 526-528 and Coase, 1937, p. 333). In addition, specialized producers which are contracted to supply a certain good or service, may be better able through scale economies, to provide that good or service at a lower price than a firm which has only limited needs for that good or service (Williamson, 1981, p. 32). Finally and related, a firm generally has only a limited amount of resources (capital and managerial attention) and must therefore resort to market contracting for at least some goods or services. Indeed, the cost of managing operations internally is not zero (see Jensen and Mechling, 1976).

Transactions across markets entail using contracts² and monitoring the execution of the terms of the contract over time: both of these activities involve costs (Klein, 1980, p. 356). Due to uncertainty, not all possible contingencies can be fully specified and contractual performance may also be costly to monitor. Therefore, real resources are generally expended. If we use the agency theory

² The term contract is used in its broad behavioral sense as that what binds parties to an agreement and not in its narrow sense as a legal document.

³ An agency relation was defined as a contract where (one or more) persons (the principals) engage another person (the agent) to perform some service on their behalf, which involves some delegation of decision making authority to the agent (Jensen and Mechling, 1976, p. 308).

3 that Jensen and Mechling (1976) developed for the relationship between stockholders and managers, and apply it to the supply of goods and services, we can identify as contract monitoring costs:

- 1) costs made by the customer to monitor the performance of the products of the supplier;
- 2) costs made by the supplier to assure that equity will be maintained in the relationship; and
- 3) costs due to the loss of not having supply perfectly matched to the needs of the customer (i.e., costs made to use the component made by the supplier, as opposed to components made internally, which would better match the specific requirements of the customer).

3.2.2 Market Transactions

Market transactions can take place with different types of contracts. Following Levy, I will make a distinction between short term contracts, long term explicit contracts and long term implicit contracts (Levy, 1981, p.20).

The classical contract from economics is a short term contract, where parties exchange a good or service for a price, without the identity of the parties to the exchange being of importance (except possibly for purposes of litigation). Some of the characteristics of this type of contract were described by Williamson as :1) the identity of the parties is irrelevant, 2) the nature of the agreement is carefully determined and 3) remedies, in case of contractual non-performance, are narrowly prescribed (Williamson, 1979, p.236).

The typical marketplace for this type of contract is a spot-market. The goods and services most akin to be exchanged in this fashion, are those of which the performance characteristics can be easily described. In addition, spot market exchanges will be facilitated when the variance of the goods and services being transacted can be reduced. In effect, if performance characteristics can easily be described and if the variance of the goods and services can be reduced, this serves to reduce performance accounting ambiguity. Basically, the class of goods and services for which this holds, are those that are very homogeneous or have been made more standardized. This process of reducing variance and making goods more homogeneous is exemplified by the emergence of futures markets (Telser, 1981). In addition, costs can be reduced if the number of goods on the spot market is limited and if trading is concentrated on one or a few markets, given that increased trading reduces the cost of transacting (see Demsetz' empirical investigation of the New York Stock Exchange, 1968).

Long term contracts pose interesting problems. Basically, parties to a market transaction will be locked into a situation that resembles a bilateral monopoly.⁴ The reason for this is, that when a party to a transaction makes investments to accommodate that exchange, than the second party has the possibility to behave opportunistically and thereby

⁴ Here the identity of the transaction partners will be important.

appropriate any income that the investment would have generated for the first party (see KCA,1978,p.297-299 and Williamson's notion of small numbers bargaining, 1975,p.26ff.). A situation that is very competitive before contracts have been agreed upon, reduces to a situation where one party to the transaction gains market power at the expense of the second transaction partner, because of the investments made by the latter. Thus, the market power is created after the investment is made (Klein,1980, p.357). One example would be where a company asks a supplier to locate his plant adjoining the company's facility. Once this investment is made by the supplier and due to the limited number of alternative uses for such a plant, the first company in effect, could drive a better bargain after the supplier made his investment. The reason this may occur is that it is costly to specify all rights of each party contractually and to enforce these contractual agreements (Klein,1980,p.356-357). This really is the same as stating that the property rights of the parties to an exchange cannot be fully specified.

Long term contracts can then still take two forms, either explicit or implicit contracts. Explicit long term contracts will entail specifying the different contingencies that may arise and how the performance of the transaction partners is to be changed under each of these contingencies (KCA,1978,p.303 -304). Clearly contracts can never be fully complete, because, given uncertainty, the number of possi-

ble contingencies is very large (Klein,1980,p.356). However, if performance accounting ambiguity is low, which really means that the most important performance characteristics can be specified, and hence, contractually agreed upon without too much uncertainty or that the value of the specific assets required by this transaction are low, than a long term explicit contract may efficiently be used.

The second type of long term contracts are long term implicit contracts. Here performance is induced and post-contractual opportunistic behavior is weakened by a price premium, with the understanding that if opportunistic behavior occurs, the business relationship will be ended, so that the party acting opportunistically loses future sales which were earning returns above the competitive level (KCA,1978,p.303-304). Here the sanction for the transactor who "cheats" is withholding future business, while for explicit long term contracts sanctions must be obtained via litigation or third party arbitration, which of themselves are costly. Implicit long term contractual relations can basically induce both partners not to behave opportunistically, because each partner has a stake in the continuation of the (profitable) relationship. A succession of short term contracts with one or a few suppliers could indicate that the contract is in fact long term and implicit: indeed, after the completion of each short term contract, the possibility exists to withhold future business. For this type of

contract to work, the goal congruence between the transaction partners must be high. In addition, performance accounting ambiguity must be low.

3.3 MODIFIED MARKET TRANSACTIONS

A number of authors have remarked that some real life contracts are more complex than the ones described in the previous paragraph. Williamson remarked that explicit long term contracts may not suit certain transactions well, given that not all future contingencies may be anticipated and given that due to ambiguity, disputes may arise concerning the interpretation of the agreement. One possible solution is to complement the contractual relation with additional mechanisms, such as a system that provides arbitration when disputes arise (Williamson, 1979, p. 237). Elsewhere, Williamson calls this trilateral governance, given that three parties are involved in the transaction (Williamson, 1979, p. 249). This solution serves as an alternative to settling for a more standard good or service, which would reduce accounting performance ambiguity and thus allow simple market transactions (Williamson, 1979, p. 254).

Porter defines quasi-integration as a contract that maintains a market exchange, but where a greater convergence of interest is obtained between parties to a transaction by means of minority equity, loans, exclusive dealings agreements, cooperative research and development, etc. (Porter,

1980,p.321). Exclusive dealings agreements seem to fit better with the implicit market transactions discussed before (see also KCA,1978,p.303-304),given that an exclusive dealings agreement creates a positive value for the party receiving it. Minority equity and loans to a transaction partner as well as cooperative research and development, can help demonstrate a commitment to a long lasting trading relation beneficial to both parties (KCA give an example where General Motors concluded a ten year contract with Fisher Body in 1919,acquired 60% of the stock of Fisher Body while the original owners remained in charge,and where GM ultimately acquired Fisher;KCA,1978,p.308).

Ouchi and Barney coined the terms bureaucratically assisted market and clan assisted market for governance mechanisms that are no longer purely market transactions and which help accomplish transactions,where performance accounting ambiguity is higher than for markets. These two assisted market forms can be linked with implicit and explicit contracts as described by KCA (1978). A bureaucratically assisted market obtains when the parties to a transaction bring into existence a formal mechanism to resolve conflicts and ambiguities during the execution of a contract (the example given is that of an architect as an intermediate function between the builder and the customer-Ouchi and Barney,1981,p.21-24). This in fact represents a situation where two parties contractually agree on third party arbi-

tration and this then is an explicit contract as far as the arbitration mechanism is concerned, given that not all relevant contingencies can be specified in advance. This notion is also similar to Williamson's trilateral governance (Williamson, 1979, p. 249).

A clan assisted market represents a two party transaction, where both parties through a variety of means have established a relationship that allows conflict resolution, adaptation to changing requirements and technological innovations over time for an ongoing project. An example is the US Air Force-private sector interface for the development of the F16-airplane (Ouchi and Barney, 1981, p. 24-26). Some of the mechanisms used to convince the parties of their mutual interest in the ongoing relationship are: employees delegated to the transaction partner, hiring of retired officials from one of the two parties, frequent and often informal communication, etc. This, using the phraseology of KCA, could be described as an implicit contract, where the incentives of at least one of the transaction partners cannot be influenced enough by a price premium or rent stream, so that alternative mechanisms are used to induce a climate conveying that the interaction is intended to be long term and beneficial for both. Some of the mechanisms described by Porter's concept of quasi-integration (Porter, 1980, p. 321) could be used in this vein.

3.4 INTRAORGANIZATIONAL TRANSACTIONS

3.4.1 Characteristics of Transactions

Internal organization of transactions will reduce the risks of appropriation of quasi-rents in specialized assets to which market and modified market transactions are akin (KCA,1978,p.299). In addition,vertically integrating certain transactions within the boundary of the organization,will resolve the conflict typical of market contracting between an efficient level of investments in (specific) assets and an efficient sequential decision making process (Williamson,1971,p.116). Vertical integration (or internal production) allows harmonization of interests between different stages in a production process (Williamson, 1971,p.117).

Additional efficiencies can be obtained via internal production,both with respect to the costs of monitoring performance over time and with respect to the costs of information exchange. With respect to the costs of monitoring performance,internal production implies common ownership,hence, there is less incentive to suboptimize. Secondly,instead of arbitration or litigation,differences can be resolved by fiat. Third,internal production allows easier and more complete access to relevant information concerning performance (Williamson,1981,p.33-34). With respect to information exchange,internal production allows more easily to coordinate responses to unforeseen events, allows benefits from infor-

mation impactedness (e.g., past experience leading to idiosyncratic language which is more efficient than the lengthy explanations required to transmit information to individuals which have not shared the same organizational history) and finally, internal organization may lead to efficiencies if the cost of gathering information is independent of the scale of operations (Williamson, 1971, p. 119-120 and 1979, p. 240).

When property rights are not fully specified and therefore increase the risk of opportunistic behavior when investments in specific assets are made to accommodate a transaction, then internal production, which allows easier control and sequential adaptations can provide a more efficient incentive structure (Williamson, 1971, p. 118 and 1979, p. 252-253). Phrased more generally, when performance accounting ambiguity is high, we expect internal organization to supplant the market mechanism. In addition, when asset specificity (or more generally, performance accounting ambiguity) increases, then the degree to which markets yield scale economies will decrease (Williamson, 1981, p. 36). To the extent that more specific assets will also be more specialized and hence yield more economies of scale, this seems plausible. In addition, greater performance accounting ambiguity will increase the cost of using market transactions particularly, the cost of contract writing and of monitoring contractual performance (Williamson, 1981, p. 36 and Klein, 1980, p. 356).

3.4.2 Intraorganizational Transactions

Ouchi and Barney distinguish between bureaucracy, clan and quasi-market. This typology, based on the work of Ouchi (1980a), is different in that it is not based on structural elements of organizations (such as organizational form), but on different informational requirements, such as prices, rules, and norms, values and traditions (Ouchi and Barney, 1981, p.17).

When an organization bases governance of its internal transactions on prices, then this organization is defined as a quasi-market. Here governance of transactions resembles most closely market transactions which are also based on prices (Hayek, 1945). The multidivisional form where different divisions have profit responsibility and where interdivision transfers are based on an (internal) price system is a clear example of a quasi-market.

A bureaucracy is defined as an organization where internal transactions are governed by rules and procedures (Ouchi and Barney, 1981, p.18). In order for a bureaucracy to work, authority must be seen as legitimate (Ouchi, 1980a), which is especially significant given that rules and procedures may be open to different interpretations. In that case the authority structure of the organization will be required to decide on interpretations and changes of the rules and procedures, which must be accepted by the organization members, hence the legitimacy. Functional organizations are a typical example of a bureaucracy.

A clan is based on a common set of beliefs, values and norms, which guide internal transactions (Ouchi and Barney, 1981, p.19). Clans generally are characterized by a willingness on the part of organization members to trade off short term inequities for long term equity. In other words, it may be necessary to accept short term transactions which are not favorable for part of the organization, while for the organization as a whole these transactions are clearly beneficial. The level of trust is such that those short term unfavorable conditions are judged to be more than likely offset in the long run.

In terms of the earlier classification of market transactions, transactions in a clan resemble more an internal implicit contract, where parties base their short term decisions on the expected long term beneficial effects. Transactions in a bureaucracy resemble an explicit contract or even more accurately a bureaucratically assisted market, where the rules and procedures represent the contingencies specified in advance and where the legitimated authority structure represents the conflict resolution and arbitration system. Transactions in a quasi-market are harder to place along these dimensions, but incorporate at the same time elements of bureaucratically assisted markets (the arbitration system resides for quasi-markets in the top layers of management) and elements of market contracts (namely the system of internal prices for quasi-markets).

3.5 MATCHING OF GOVERNANCE STRUCTURE AND TRANSACTION CHARACTERISTICS

The different types of governance structures can be linked to levels of both performance accounting ambiguity and goal congruence. In the previous section I have elaborated on the conditions under which certain transactions will take place. Pure market exchanges are most likely when performance accounting ambiguity is low and it was also possible to relate spot market transactions, explicit long term contracts and implicit long term contracts to respectively low, medium and high levels of goal congruence.

The modified market exchanges take place under conditions where performance accounting ambiguity is higher than for pure market exchanges, which is exactly why additional mechanisms are needed to assist the transaction. Bureaucratically assisted markets emerge under conditions where the performance characteristics of the goods and services being exchanged, can fairly well be described. However, in light of the fact that not all contingencies can be contractually specified and that unforeseen events may greatly affect each party, an arbitration mechanism is called into existence. If conflict were to arise over the terms of the contract, the arbitration mechanism would be relied upon, hence goal congruence can be low. Clan assisted markets involve goods and services that are more difficult to describe contractually and so many unforeseen events are expected, that an arbitra-

tion mechanism would be too heavily relied on. Therefore, implicit mechanisms are relied upon, which will work given the higher goal congruence they induce, compared to bureaucratically assisted markets.

The intraorganizational forms of exchanges can be matched with the transaction characteristics as well. Bureaucracies rely to a great extent on an arbitration type of governance to supplement the rules and procedures. Legitimate authority makes for easier changes in rules and procedures than third party (external) arbitration. Therefore, while performance accounting ambiguity will be high, goal congruence only needs to be of medium level, namely so much, that changes in operating procedures or rules will be accepted. Clans will operate under conditions where goal congruence is higher than for bureaucracies: when rules and procedures would have to be revised too much, then a more informal interaction pattern may be more workable. When decisions regarding internal transactions are more easily accepted, this frees the top levels of the management structure of the quasi-judicial tasks and it increases the speed of reaction to unforeseen events. Finally, quasi-markets rely on an internal system of quasi-prices, which implies that the crucial elements of internal transactions can more easily be specified, valued and priced. This means that performance accounting ambiguity will only be medium, but here goal congruence will be higher than for clan assisted markets, given that an inter-

nal decision making structure exists, which assures agreement on internal quasi-prices.

Table 1 summarizes the discussion in this section. This table is based on Ouchi and Barney (1981, p. 28) and supplemented with the distinction made here between the different forms of market exchanges. Clearly, both performance accounting ambiguity and goal congruence represent a continuum. The discrete representation is for purposes of clarity.

The first cell of "No Transactions" represents a situation where performance accounting ambiguity is high and goal congruence is low. In general two options are open to the organization for this transaction: one is to adopt a mechanism that reduces performance accounting ambiguity; the other option is to try to increase goal congruence (Ouchi and Barney, 1981, p. 32-33). In general the governance form that will be chosen for this type of transaction cannot be predicted.

We can now turn to a number of alternative explanations of why organizations choose to transact internally, rather than across a market.

TABLE 1

PERFORMANCE ACCOUNTING AMBIGUITY

		High	Medium	High
G O A L C O N G R U E N C E	Low	/// /// / No Trans- / actions //////// 1	Bureaucratically Assisted Market 6	Short Term Contracts 7
	Medium	/ Bureau- // / cracy // ///// 2 /////	Clan Assisted Market 5	Explicit Contracts 8
	High	///////// ///////// / Clan // /// 3 // ///////// ///////// ///////// /////////	///////// ///////// Quasi-Market // ///////// 4 // ///////// ///////// ///////// /////////	Implicit Contracts 9

Shaded: Internal Governance
Unshaded: External Governance

4. ALTERNATIVE EXPLANATIONS OF INTERNAL VERSUS EXTERNAL TRANSACTIONS

Next to the literature treated so far, a number of alternative explanations exist for why, under certain conditions, intrafirm production is chosen above market transactions. In turn, I will discuss arguments that rely on market power, price discrimination, economies of scale, technological interdependencies, and resource dependence to explain why internal organization obtains.

4.1 MARKET POWER

The basic argument is, that firms engage in more internal production (or vertically integrate), because this gives those firms more market power. The pursuit of market power cannot be fully understood without reference to the structure of the industries across which a transaction takes place. In principle and derived from basic microeconomic theory, if one of the two sectors to which each partner to a transaction belongs, is competitive while the other sector is oligopolistic, then forward or backward vertical integration by the oligopolistic firms into the competitive sector in order to gain market power, will not give rise to any additional profits. In other words, all gains coming to an oligopolistic firm, cannot be increased by integration into a competitive industry. A qualification is, that I assume that the oligopolistic firm has no competitive advantage in the production of the good or service manufactured by the competitive industry (see also Lustgarten, 1975, p. 129; Etgar, 1978, p. 249-250 and Porter, 1980, p. 322, footnote).

If market transactions take place between firms that belong to different oligopolistic industries, then the analysis is similar to that of successive monopoly, which is reinforced by the fact that after the contract is agreed upon a small numbers bargaining condition obtains (Klein, 1980, p. 357). Given the market power of each transaction partner, each has an incentive to appropriate the pro-

fits of the other. One solution would be an implicit contract where both parties make a profit in the long run. This however, does not eliminate the potential for opportunistic behavior. In that case a strong incentive for vertical integration exists.

This brings us to the conclusion that the structure of the industries to which exchange partners belong does play a role ⁵ (Lustgarten, 1975, p.125-126 and p.129-131). This conclusion does not require an adaptation of the framework proposed earlier (see table 1). Indeed, market structure and more specifically market power does influence uncertainty, one of the four concepts which determine performance accounting ambiguity. Hence, if transactions occur between partners which stand to each other as bilateral oligopolists, then performance accounting ambiguity will be medium or high, so that we expect modified market exchanges or internal production.

4.2 PRICE DISCRIMINATION

Price discrimination as an argument for internal production also rests on an argument of market power, but is more subtle. In order to be able to price discriminate a firm needs some degree of market power. The rationale for internal production is, that a firm through forward vertical integration, will gain a better understanding of the final market

⁵ For a discussion of the elements that comprise market structure, see for example Caves (1980).

and thereby achieve more product differentiation, which is associated with higher revenues. This is one of the conditions under which integration into a competitive market may take place (Etgar, 1978, p. 250; Porter, 1980, p. 306-308 and Williamson, 1971, p. 118-119).

This argument can also be recasted in terms of the transaction cost framework. The only reason to vertically integrate in this case, is to gain access to information which the partner to the exchange has or can easily obtain. Vertical integration is one way to accomplish access to that information, which would facilitate price discrimination. Increasing goal congruence by means of an implicit contract (with financial or other incentives) is another alternative: here the transaction partner is "bribed" into transmitting the relevant information.

4.3 ECONOMIES OF SCALE

Production of certain goods or services entails efficiencies which can be obtained only for levels of production above a certain minimum level. One of the reasons why this may be so, is that for high enough levels of production, superior technology may be available. Efficiencies in production above a certain minimum level, forms the basis for one of the advantages of market production discussed earlier. When a specific firm has only a limited need for a good or service, this, when combined with the needs of other

similar producers, could allow enough production volume to allow a firm to specialize and supply to those manufacturers with limited needs.

The argument based on economies of scale, holds that when an organization requires so much of a specific good as to be able to gain roughly the same efficiencies which specialized producers of that good obtain, than the firm should integrate and manufacture its requirements internally (see Lustgarten, 1975, p. 126). On the contrary according to the transaction cost model, even when an organization requires an amount of goods or services so as to be able to sustain an operation of minimally efficient size, internal production is not a necessary outcome. Whether internal production will be chosen will depend on the level of performance accounting ambiguity: if it is low, firms probably should not integrate, given that they can obtain all benefits from internal production through market contracting. The reason why this is so, is that the size of their requirements confers them market power with respect to that good, so that in effect they can drive a good bargain.

A more interesting problem is posed in the converse case, when the characteristics of the transaction indicate that an internal governance would be optimal, but where some companies do not have requirements sufficient to sustain a minimally efficient operation. One solution would be to manufacture internally and incur higher costs given that not the

best available technology is used. I expect this to occur only when performance accounting ambiguity is very high. It is also possible when future growth is expected for the requirements of a specific good, that organizations will go ahead and start operations of a minimally efficient plant in advance. However, sale of an internally produced good when production volume exceeds the internal requirements, is not very likely: this would mean that the basic goods required for production are sold (most likely) to organizations in direct competition with the products of the own organization (Carlton, 1979, p.194). If internal production is not possible, then the alternative remaining is to contract across markets and to adopt that market or modified market mechanism that most closely approaches the preferred internal governance mechanism.

4.4 TECHNOLOGICAL INTERDEPENDENCIES

The technological interdependency argument holds that successive and interdependent (in both time and place) processes require vertical integration for efficient manufacturing (Williamson, 1979, p.112). According to Williamson, this argument really reduces to one where contractual terms cannot be fully specified or are too costly to be defined (Williamson, 1979, p.116). The contract writing and contract monitoring costs between the stage of melting ore into iron and warm rolling of steel, indeed seem formidable.

The underlying dimension that requires an internal governance mechanism for the transaction is the high level of performance accounting ambiguity in this case.

4.5 RESOURCE DEPENDENCE

The resource dependence paradigm is also based on a power view of organizations, where organizations attempt "to acquire control over resources which minimize their dependence on other organizations and to acquire control over resources which maximize the dependence of other organizations on themselves" (for an overview, see Barney and Ulrich, 1981 p.2). In effect this view is related to the position in the field of Industrial Organization that uncertainty of factor supplies creates incentives for vertical integration. The criticism on this last position is that it is not clear why factor supply is uncertain or why uncertain factor supply creates an incentive for vertical integration (Carlton, 1979, p.190). Applying this criticism to the resource dependence paradigm, it is not clear how internal production will buffer against unforeseen contingencies and where this process stops: in a chain of vertical production processes integrating into the next stage implies being dependent for supplies on yet another stage. In addition, the fact that supply is not reliable, reduces to the problem that you cannot fully specify and enforce everything with contracts (Williamson, 1971, p.117).

The transaction cost model as proposed in this paper, explains why supply unreliability leads to internal production: internal production reduces the effects of uncertainty. In addition, it explains which characteristics to look at for supplies, in order to determine whether production should be internal or not.

4.6 CONCLUDING COMMENT

Although I have only briefly treated each of the alternative explanations for internal versus market transactions, I believe I have given the basic argument underlying each of these positions. I hope to have shown that each of these explanations do not add anything substantial to the transaction cost model as presented here. The transaction cost model lends itself to a more precise interpretation why a shift between internal and external governance mechanisms may come forth and it provides an explanation why certain transactions, based on their underlying characteristics, should be governed internally.

5. PROBLEM STATEMENT AND HYPOTHESES

5.1 PROBLEM STATEMENT

Given the discussion of the transaction cost model, it is possible to more concisely define the problem I intend to investigate. Basically, I want to understand under which conditions organizations decide to manufacture goods or services internally, as opposed to conducting these transactions across a market. More specifically, I am interested in how the governance mechanism used to assist a transaction, affects the efficiency of the exchanges the organization is engaged in.

The transaction cost model elaborated in the first two parts of this paper provides a normative framework for according to which governance mechanism transactions should take place, given their characteristics. The framework implies that, when the transaction characteristics are matched with the appropriate governance structure, organizations will have more efficient operations. Basically, underlying this last comment, is the assumption that the way in which transactions take place, is not random, but follows a pattern that has a specific economic rationale (namely of efficient production or more broadly, of an organizational boundary that is efficiently drawn).

Formally, the problem can be stated as follows:

Will organizations in general match the characteristics of the transactions they engage in, with the appropriate governance mechanism, and how does this match (or mismatch) affect the efficiency of their operations.

Following the verbal description of the model and the representation in table 1, I plan to investigate whether transactions that are characterized by low performance accounting ambiguity are conducted across markets, and whether the governance mechanism is different for transactions characterized by high levels of performance accounting ambiguity. In addition, I want to investigate how the required level of goal congruence affects the form of the governance structure. If the model implications hold, the distribution of how transactions are governed for different levels of performance accounting ambiguity and goal congruence, will not be random, but will follow a specific pattern as proposed in table 1. In addition, the model holds that the non-randomness of the distribution of how transactions are accomplished, will affect both the short term results and long term viability of organizations.

We can now turn to the hypotheses to be tested.

5.2 HYPOTHESES

Three basic hypotheses will be formulated. The first posits the hypothesized match between transaction characteristics and governance mechanisms. The second one describes the efficiency characteristics of the match proposed in the first hypothesis. Finally, the third hypothesis deals with the evolution of transaction characteristics over time.

HYPOTHESIS 1: In general, transactions will be executed by that governance mechanism, that matches the level of performance accounting ambiguity and goal congruence associated with the transaction.

This first hypothesis really states that the proposed match between transaction characteristics and governance type, as depicted in table 1, can be empirically observed. A number of hypotheses explicate the influence of the level of performance accounting ambiguity, of goal congruence and of the scale economies associated with the production of the good or service.

HYPOTHESIS 1.1: In general, the higher will be performance accounting ambiguity, the more likely that transactions will be organized internally.

HYPOTHESIS 1.2: In general, the higher is the level of required goal congruence, the more we expect implicit rather than explicit governance mechanisms.

HYPOTHESIS 1.3: When the characteristics of a transaction imply an internal governance mechanism,

ism, but the organization requires of the good or service an amount that would not allow internal production to exhaust all scale economies, then the organization will adopt the external governance mechanism that most closely resembles the type of internal governance mechanism indicated by the transaction characteristics.

Hypothesis 1.1 is derived directly from the theoretical treatment underlying table 1. Hypothesis 1.2 is related to the observation that as more goal congruence is required between the parties to a transaction, we will find less reliance on a detailed explicit enumeration of the behavior of the parties under different contingencies. Instead, we expect to observe a mechanism that imbues both parties to a transaction with the notion that the relationship is intended to be long term and beneficial to both. The expected behavior may be induced by a long term premium stream for parties to a market transaction, by a system of norms and values for parties to an internally organized transaction, or by some combination of these mechanisms for transactions governed as clan assisted markets.

Hypothesis 1.3 refers to the fact that not all firms have access to least cost production, even if internal production is indicated by then transaction characteristics. The reason is that some firms may be too small or, in other words, their requirements for a specific good or service are too small to gain any efficiencies in production that other ma-

nufacturers are able to obtain. The rationale for hypothesis 1.3 is, that firms will be forced to transact across markets, but will use the governance mechanism that most resembles the one indicated by the transaction characteristics.

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HYPOTHESIS 2: In general, organizations which match their transactions with the governance structure indicated by the characteristics of the transactions they are involved in, will be more efficient.

Hypothesis 2 is related to the efficiency implications of the transaction cost model. This hypothesis is related to the finding by Teece, Armour and Saloner (1980), that vertical integration reduces the risk of uncertainty over and above the risk reduction due to diversification. In hypothesis 2 this finding is qualified in the sense that I expect vertical integration to reduce performance accounting ambiguity (of which uncertainty is a component), when vertical integration takes place for transactions that involve a high level of performance accounting ambiguity. Hypothesis 2 would allow to test the assumption made by Klein, Crawford

and Alchian, that, as assets become more specific and more appropriable quasi-rents are created, the costs of contracting will generally increase more than the costs of vertical integration (KCA, 1978, p. 298). The implication (and in fact operational definition) of hypothesis 2, is that, when organizations conduct transactions according to the governance mode indicated by the characteristics of these transactions, then the production costs of these organizations will be lower, than those of their competitors which do not match transactions with appropriate governance modes.

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HYPOTHESIS 3: When the transaction characteristics of a specific good or service change over time, then, in general, firms will change the governance mechanism previously used to accomplish that transaction, so that the governance mechanism employed matches the modified transaction characteristics.

Hypothesis 3 describes the matching of transaction characteristics and governance structures as a dynamic process. If the transaction cost model holds, then we expect that as

changes take place in the characteristics that typify how transactions should be conducted, than this will be reflected by a change of the institutional responses by organizations involved in those transactions. In addition, the model depicted in table 1 would also indicate the direction of the change. For example, if due to an innovation, a specific good becomes more standardized, then that means that the good in question can more easily be specified contractually. If firms manufacture this good internally, I expect the organization over time to devise a governance structure that reflects the reduced performance accounting ambiguity: small decreases in ambiguity may lead to a quasi-market governance mechanism being used, while large reductions in performance accounting ambiguity may lead to market transactions. Clearly, organizations do not respond to changes immediately (due to organizational inertia), but over time, I expect an evolution towards the new governance mechanism that best matches the transaction characteristics.

6. METHODOLOGY AND RESEARCH DESIGN

In this chapter I will describe the basic methodology underlying the empirical work and the research design. I will also elaborate on how I hope to test the hypotheses, operationalize the constructs and find the required data.

6.1 METHODOLOGY

The basic philosophy underlying the methodology of the empirical test is that of survivorship. Stigler used the survivorship technique to study economies of scale and the prime behavioral assumption was in that case, that competition will sift out the more efficient enterprises over time (Stigler, 1958). This approach is similar to the propositions of the ecological model, which states that certain organizations will be selected for over time: those are in fact the "surviving" organizations (for a discussion of this model, see Barney and Ulrich, 1981, p. 12ff.). The application of this selection and retention mechanism to this study is, that those governance mechanisms will be selected over time, that match best with the characteristics of the transaction. In other words, organizations will govern their transactions in such a way that over time the most efficient mapping of transactions and governance forms emerges.

Basically, the implication is that the match between transaction characteristics and governance mechanisms is not random. Clearly, a perfect match is not expected. Rational-

ity is limited or bounded (March and Simon,1958,Ch.6 and Williamson,1975,p.21ff.). What is meant here is, that given bounded rationality, the transaction characteristics will be matched by the most efficient governance mechanisms. In other words, why certain transactions are assisted by specific governance mechanisms is not to be attributed purely to chance factors, although these will play a role to a certain extent. A further implication is that learning occurs over time or that over time the appropriate governance mechanisms will tend to assist transactions with specific characteristics.

Two basic methodologies can be followed to test the framework of table 1. The first approach entails the elaboration and operationalization of the dimensions that characterize a transaction, namely performance accounting ambiguity, goal congruence and frequency (Ouchi and Barney,1981,p.33). Further,suitable proxies must be found to represent these characteristics. The advantage of this approach is that a general framework for characterizing transactions would be developed,potentially applicable to many industrial settings. The disadvantage of this approach is the difficulty of operationalizing elusive concepts as investment specificity,goal congruence,frequency and uncertainty. Ouchi and Barney critique the calculation some economists have used in order to determine transaction costs,given that where these costs are likely to be high-

er, they are most difficult to measure (Ouchi and Barney, 1981, p.33). I believe that a similar situation occurs when one tries to operationalize transaction characteristics: here also, the higher is performance accounting ambiguity, the more difficult it will be to measure this concept.

The second approach involves selecting a number of transactions and categorizing them in terms of their characteristics. This is different from the previous approach in that here no attempt is made to precisely measure the underlying dimensions of the transaction characteristics. Instead, transactions will be characterized as having low, medium or high levels of both performance accounting ambiguity and goal congruence. These transactions would imply certain preferred governance mechanisms in accordance with the hypothesized governance mechanisms of figure 1: I will call these the theoretical governance mechanisms. The test of the transaction cost model than involves verifying according to which governance mechanisms these specific transactions take place. If the proposed framework is correct, we expect those governance mechanisms to be selected, which are the theoretically optimal governance mechanisms or which are very nearly those theoretical governance mechanisms. Alternatively, if the proposed framework is not correct, I expect that the frequency with which the theoretical governance mechanism appears, will not be significantly different from the frequency with which the other possible governance mechanisms appear.

The main disadvantage of this second approach to testing the transaction cost model is its judgmental character. Indeed, a number of transactions must be identified and classified according to level of performance accounting ambiguity and goal congruence into the nine cells of figure 1. In order to accomplish this a number of fargoining judgmental decisions must be made. In addition, this approach requires recognizing when certain governance mechanisms are used. Given Ouchi and Barney's classification of clan, bureaucracy, quasi-market, clan assisted market and bureaucratically assisted market (Ouchi and Barney, 1981) and given the classification of the different market mechanisms in this paper, I believe that identification of the different governance mechanisms is easier than operationalization of the different transaction characteristics. This then, is the main advantage of this second approach, although at this point I have not yet a more operational classification scheme for governance mechanisms than what was presented in this paper.

I propose that this second approach be used in testing the transaction cost framework. I will assume further that a more operational classification scheme for governance mechanisms can be developed.

6.2 RESEARCH DESIGN

Given the methodology described above, a test could be constructed either crosssectionally or restricted to one industry. I believe that a test using one industry and its evolution over time, would allow to test the model fully. Restricting the test to one industry has the advantage of allowing a more in depth study of the technological basis of that industry. In addition, given the choice, which requires judgments concerning the transaction characteristics of the transfers of certain goods and services, an in depth understanding greatly facilitates the classification process. The evolution over time would allow to test for the dynamic aspects of the transaction cost model. I believe this approach is more useful, than a broad crosssectional analysis which does not allow to a sufficient degree, detailed knowledge of the underlying technology and idiosyncracies of the industries involved.

The next step consists then of the choice of an industry. I have chosen to study the computer industry and this for several reasons. The first reason is that I have access to information already collected on the electronics industry and individual companies, including financial data and information on areas of production.⁶

The second rea-

⁶ This research effort is part of an ongoing research project that purports to investigate the differences between the United States and Japanese electronics industry. The sample currently contains information on about 650 public companies in the United States and about 140 companies in Japan. Professor Ouchi is the principal investigator.

son is that the computer industry has been subjected to a few, but very important innovations, for example the introduction of the IBM-360 model, which spurred the introduction of a host of similar models by other companies. In addition, one of the main types of goods used in computers are electronic components, such as semiconductors and integrated circuits, a sector which has been characterized by a number of drastic changes. Further a number of segments can be discerned in the segment which I have loosely called computers: next to mainframe general purpose computers, there are process control computers, small scale computers, microprocessors and computers for use specifically in the communication market. In order to increase the variance in the sample being studied, which obviously is limited given that only one industry is studied, I decided to investigate the computer industry in both the United States and Japan. In Japan the computer industry has been characterized by marked efforts to reduce the technological gap with the United States. This means that at least the historical development of the computer industry was different from that in the United States.

Next a number of transactions must be identified and characterized in terms of the nine cells of figure 1. Initially use can be made of the Input-Output tables for the United States (U.S. Department of Commerce, 1979). This will show which other industries (roughly by four digit SIC cate-

gory) supply goods and services to the computer industry. We are mainly interested in those industries that provide a large amount of the total requirements of the computer industry: these supplying industries are likely to be the ones that are closely related to the basic technology of producing computers. For example, in 1972 9% of the value of all shipments to the computer industry in the US consisted of semiconductors (US Department of Commerce). The information contained in the Input-Output tables is collected at the level of plants and not companies, therefore the bias that intraorganizational shipments are not discernible is not present. Input-Output tables also exist for Japan, but in any case, I expect these supply relationships with the computer industry to be very similar to those found in the US, precisely because they are marked by technological similarities.

Based on this preliminary investigation I will identify a number of transactions that represent a good or service used in computers. I will select those goods or services that represent a large amount of the total value of inputs. Next, after gaining a more in depth understanding of the technology of manufacturing computers, I will classify those transactions in terms of the nine entries of table 1. After consultation with industry experts, I intend to select nine transactions, one for each cell of table 1, and representative for the industry.

The next step will consist of sampling all public computer manufacturers in the US and Japan and verifying for each of the nine typical transactions under which governance mechanism it is conducted. A more operational definition for each of the different governance mechanisms must be provided. This information ideally could be collected with questionnaires. However, which is more likely, if the questions are too complex to be dealt with in a questionnaire, I will conduct interviews with each company. Information on the historical pattern of the governance mechanism employed for each transaction will also be collected.

I will next discuss how this information allows to test the hypotheses.

6.3 TESTING OF THE HYPOTHESES

The result of the information on each transaction can be arranged in terms of the nine cell scheme of table 1: for each transaction we will observe a distribution of frequencies over the different cells. If the first hypothesis holds, we expect the frequency for the theoretically expected governance mechanism to be significantly different from the observed frequency for the other governance mechanisms, and this for each observed transaction. A similar test can be constructed for the two subhypotheses (1.1 and 1.2).

The expected result and test for hypothesis 1 may be mitigated against for two reasons. The first reason is that

the approach used here is obviously crude: 1) we have forced performance accounting ambiguity and goal congruence, which are basically continuous characteristics, into a discrete categorization; 2) given bounded rationality, even if the proposed model holds, we can only expect a trend towards the hypothesized governance mechanism.

The second reason why the findings may not support the first hypothesis is that with respect to internal governance mechanisms, the hypothesized theoretical cell of internal production may not be observed given that not all firms will have a size sufficient to support internal production, and realize economies of production with that size. This is exactly the reason why hypothesis 1.3 was formulated. The appropriate test then, would be to split the sample for those transactions which require internal production, between those firms that have requirements for the good or service in question that exceed the level of what is required to sustain a plant of minimum efficient size, and those that do not. For the former group of firms, we expect to observe most frequently the theoretical, internal governance mechanism. For the latter group, we expect external governance mechanisms that most closely resemble the theoretical governance mechanism to be observed most frequently.

This second modification cannot be conducted without an operationalization of the concept of minimum efficient scale. A number of alternatives have been proposed (see Scher-

er). I believe that the most useful technique would be the survivorship technique (see Stigler, 1958 and McGee). The idea is to determine the size distribution of plants over time: the size classes that decrease in frequency are less efficient. In other words, if the size is less efficient, we expect over time that as those plants are phased out, that no new plants of the same size class will replace the old ones: hence, the frequency of that size class of plants will decrease. Although Stigler (1958) is reticent about this, I would argue that the size categories that show the most growth over time are more efficient plant sizes. Hopefully, theoretical support can be found for a more operational measure (for example, the fiftieth percentile based on cumulative number of plants, or based on cumulative capacity of plants in the industry supplying a specific good).

Information on plant sizes can be found in the Census data (US Department of Commerce) for different years. Clearly, this operationalization of minimum efficient plant size does not exhaust all efficiencies or put differently, there may be efficiencies at the level of the corporation over and above those of efficient plant size. In addition, the Bureau of the Census aggregates information on all industries that it categorizes as one. This implies that we should seek industries (by four digit SIC classification) that map exactly onto the transaction under study. For example, it is preferable to look at "semiconductors" than at

"various electronic components". This clearly limits the number of transactions on which we can find information on minimally efficient plant size.

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In order to test the second hypothesis, namely that organizations that match their transactions with the governance mechanism that is indicated by the theory will be more efficient, we will follow a different strategy. The first hypothesis will lead for each transaction to a distribution of governance mechanisms, one for each company. In order to test the second hypothesis, we will calculate the number of times that a company chose the theoretical governance mechanisms for all transactions sampled: we will call this the number of matches. An organization could, for each transaction sampled, use the theoretical governance mechanism and would then have the maximal number of matches. The converse case is where each transaction is executed with a governance mechanism different from the theoretical governance mechanism: that organization would then score zero matches. Our sample of companies can then be arranged, so that those

companies that have the same number of matches are members of the same group. For the group of companies that have a high number of matches, we expect better performance or efficiency, than for the group of companies that have a low number of matches with theoretical governance mechanisms.

Three important qualifications have to be made at this point. First, and similar to a comment made earlier, a number of companies may not have a scale of operations in computers sufficient to allow efficient internal production for some or other good. The minimum efficient plant size for a good that will be the object of a transaction clearly plays a role. One way of dealing with this problem, is not using data on companies that are too small. This will probably reduce the size and variance of the sample too much. A second approach would be to consider as a match the use of that external governance mechanism that most resembles the theoretical internal governance mechanism for small firms. This second approach would clearly weaken the expected differences in efficiencies. The third and final approach to deal with this problem, would be to consider two groups: organizations large enough to engage in internal production for certain transactions under consideration and organizations that are too small to take this route. The second hypothesis could then be tested for each of these two groups. Given that the number of matches can never be so high for the group of smaller organizations (they cannot engage in

certain internal transactions), I expect this group to have a lower efficiency.

A second qualification is that when mismatches occur for transactions that have a high level of performance accounting ambiguity, this is likely to have greater efficiency implications, than when mismatches involve transactions characterized by a low level of performance accounting ambiguity. This relates to the phenomenon that some organizations may not be able to produce the good internally. A combination of the first and second qualification indicates that the most appropriate way to test the second hypothesis would be to divide all organizations between those that have a sufficiently high requirement to allow internal production and those that do not. The second hypothesis would then be tested for each of those groups. This is clearly more appropriate than eliminating information on companies that are too small for internal production, given that this would eliminate a lot of the variance in the sample, and given that the framework can be applied taking into account this problem. The proposed division is also better than forcing small companies into groups comprised of large companies as far as the requirements for a specific good is concerned: these groups are different and have varying strategies open to them and aggregating them would obscure those differences.

An alternative test to take account of this second qualification, would be to calculate mismatches for all companies for each of the following cases: 1) when performance accounting ambiguity is high, 2) when it is medium, and 3) when ambiguity is low. This last test would allow to verify whether mismatches for transactions that require internal production have a greater explanatory power in accounting for differences in efficiency, than mismatches for transactions that entail low performance accounting ambiguity, which is what the transaction cost model would predict.

A third and last qualification is that implicitly it has been assumed that the nine transactions sampled for this test are representative for all transactions that the organizations are engaged in. If this were not the case, I would expect mismatches between the characteristics of the transactions in the sample and the governance mechanism not to be related to efficiency differences.

Testing the second hypothesis crucially depends on an appropriate operationalization of the concept of efficiency. If the assumption holds that the transactions studied are representative of all transactions that organizations are involved in, then the measure to be used could be constructed similar to a ratio of value added to sales. I realize that in the past a ratio of this nature has been used to measure vertical integration (see Daems, 1981), however, this measure tried to quantify vertical integration at the level

of industries in crosssectional studies and was based on the Input-Output tables (US Department of Commerce,1979). In this case, the measure would be used at the level of a company or a division and the interest of this measure lies not in its absolute value but in its relative value compared to other organizations. In that sense then, it has clear efficiency characteristics. If a company matches its transaction with the appropriate governance mechanisms, I expect that the total costs of production,including such hard to measure directly costs as contract costs,information costs and transaction costs, will be lower than the costs of production of similar firms which have mismatches for their transactions. If we deduct from the total revenues of a company or division, the total costs of raw materials,the costs of production and machinery and the wage costs,we expect to get some measure of value added. This measure must be related to a size characteristic of the company or division in order to obtain a ratio comparable over different organizations. Different size characteristics such as sales, total assets, etc. were found to be highly correlated for the companies under study (see findings by Ulrich,1982). As a deflator for value added,I will choose total sales or revenues. We can then calculate this ratio for each company or division in our sample, and given that both wage costs and costs of fixed capital have been taken into account,besides the adjustment for size, we expect no more

differences for this ratio except those that are due to efficiency. In order to avoid any confusion, I shall call this ratio the efficiency ratio.

Some companies are likely to be involved in different industries, besides computers or the materials required for production of computers. In that case the intent is to obtain the efficiency measure at the level of divisions. If internal production takes place in some other division of those materials that are used in the manufacture of computers, than that division will be included for the computation of the efficiency ratio to the extent that it supplies the computer division. An example may clarify this matter. If a semiconductor division supplies 60% of its semiconductors to the computer division, then we will calculate the cost of production in the semiconductor division and attribute 60% of this cost to the computer division. Clearly, the cost at which semiconductors are acquired internally by the computer division must be cancelled out. The resulting efficiency ratio would be:

$$S - ((CC - CS2) + a CS1)$$

S

where: S = revenues from sale of computers

cc = total cost of production of computers

(incl. raw material, fixed capital and wage cost)

CS1= total cost of production of semiconductors

CS2= cost of semiconductors acquired internally by the computer division at transfer price

a = percentage of internally produced semiconductors delivered to the computer division.

The results I hope to find are that companies that match the transactions they engage in with the theoretical governance mechanisms, will have a higher efficiency ratio.

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Finally, the third hypothesis, which states that when transaction characteristics change over time, firms will adopt governance mechanisms that more closely match the changed characteristics, must also be tested. To conduct this test, it is necessary to determine a number of characteristics for

which for example, performance accounting ambiguity has changed. This change could be due to a technological innovation (e.g., a new product), which reduces the ambiguity of previously transacted goods. We would then measure if for this transaction, organizations have adapted governance mechanisms which reflect the changed characteristics. Basically, the same approach as used to test the first hypothesis could be used.

After this rather lengthy explanations of how to test empirically the hypotheses proposed, we can now turn to a brief conclusion.

7. CONCLUSION

In this paper I have tried to explain the transaction cost model and its implications for the choice between internal production versus external exchange. Although a theoretical model certainly has its importance, even in guiding concrete actions, it is only through an empirical test that one can investigate how theory matches up to reality. This I see as my task for the near future.

At the basis of this work lies the transaction as the unit of analysis. In the theoretical sections, I have demonstrated how transactions are linked to the notion of organizational boundary. Transactions involve exchanges between different parties across organizational boundaries, be they internal or external. Basically, choices made about how to conduct transactions, involve choices about what to produce internally and which goods to obtain from outside suppliers, and involve also choices about how to organize the transaction. In other words, these choices pertain to the choice of organizational boundaries and organization or governance mode.

The empirical tests described in this proposal aim at a direct test of the transaction cost model. Until now no full-fledged test of this model has been accomplished. I believe that the empirical test proposed here, although judgmental to some degree, would allow a full test of the model, including its efficiency implications.

If it can be shown that the choice of the governance mechanism or, related to this, the choice of the organizational boundary is related to some clear efficiency implications, then this theory has some important potential uses, both with respect to theory development and with respect to applications. As a theoretical application, I believe that a better theory of vertical integration could be proposed, based on the implications of the transaction cost model. Indeed, vertical integration deals exactly with why firms organize transactions internally, rather than across markets. In other words, the issue in vertical integration is precisely the choice of the organizational boundary. In addition, the findings to which this research will lead to and specifically the findings with respect to the efficiency implications may illuminate what determines interindustry and interfirm differences.

With respect to practical applications, it would be possible to show how a shift in the organizational boundary for a specific firm, would allow this firm to improve its performance. In addition, the methodology developed in this paper, would allow a better understanding of why certain organizations manufacture certain goods internally, and therefore would allow a better ground on which base antitrust decisions, specifically those decisions that pertain to issues of vertical integration and concentration.

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