Chapter 1

Theoretical Background

This chapter presents the theoretical background for the thesis. This theory deals with the organization of transactions that occur between successive stages of activity. For example, components have to be brought from where they are produced to where they are assembled into a finished product, iron ore or coal has to be transported from the mine to the smelter to the steel producer, and knowledge has to be transported from where it is created (using money) to where it is used (to make money). The phrase ‘successive’, by the way, is not used to suggest that only vertical relations are implied, but simply that one activity happens before another; these may be different activities at the same level between different firms (in cooperative R&D, for example), yielding a horizontal relation.

In any case, goods and services have to be transferred from one stage to another. The main substantive theory used here is transaction cost economics, which says what the best structural form is for organizing such transfers. For example, both stages might be brought together within the bounds of a single firm—i.e. vertically integrated—or put in separate firms, using the market to organize transactions between them. A company might own its own R&D department, or outsource research work to a specialized institute. Depending on the characteristics of the transaction, some organizational forms are more appropriate than others. Transaction cost economics is about finding the most appropriate—i.e.
the economic—organizational form for a given transaction.

Transaction cost theory is described in Section 1.1. The approach used in this thesis requires certain substantive extensions, described in Section 1.2. These will be shown to supplement transaction cost economics in a very natural way. Methodological issues, on the other hand, are discussed in Chapter 2, where objections are raised to the approach taken in TCE, and where the alternative approach that was taken in this research is presented.

1.1 Transaction Cost Economics

Transaction cost economics says which structural form should be used for organizing a given transaction. “A transaction occurs when a good or service is transferred across a technologically separable interface. One stage of activity terminates and another begins” (Williamson 1981a, p. 552). Rather than focus on individual stages of activity—viewing the firm as a production function to be optimized—TCE focuses on transactions between stages of activity and views the firm as one of the organizational forms that may be used to organize such transactions.

Figure 1.1 shows an example. The figure shows a firm whose technological core consists of three stages of production, S1, S2, and S3. These are the firm’s core activities and—in the example—it ‘always’ performs those itself. Raw materials production is R, which, likewise, the firm has decided ‘never’ to perform itself, and distribution of finished products is D. This is not to say that the firm will indeed always perform each of the productive stages Sx itself, but it will in the context of the example, in which this is not at issue. More generally, all such decisions about which activities a firm performs will eventually have to be justified in terms of transaction cost economic reasoning.

Each stage of production Sx uses a component Cx, which has to be produced. The choice exists for the firm to produce the component itself (Cx-M for make) or to let a specialized outside supplier produce it (Cx-B for buy). The same applies to distribution D, which is D-M if the firm owns distribution and D-B if the firm uses market distribution. Each of
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Figure 1.1: Efficient boundary (adapted from: Williamson 1981a).

the four transactions $C_x-S_x$ ($x = 1, 2, 3$) and $S_3-D$ might be organized within, as well as across the firm’s boundary, which is the thick black line. In this particular case, the decision has been made to make $C_2$ and to also keep distribution in-house, and to buy components $C_1$ and $C_3$. Transactions $C_2-S_2$ and $S_3-D-M$, therefore, are organized within the firm’s boundary, while transactions $C_1-S_1$ and $C_3-S_3$ are organized across the firm’s boundary, i.e. on the market.

Transaction cost economics is a theory about this mapping of organizational forms onto transactions. TCE originated in Coase’s (1937) paper *The Nature of the Firm*, in which he set out “to discover why a firm emerges at all in a specialised exchange economy” (Coase 1937, p. 390); in other words, “in view of the fact that it is usually argued that coordination will be done by the price mechanism, why is such organisation necessary?” (1937, p. 388). Coase based his answer on the recognition that the transaction should be the unit of analysis and that firms and markets are *alternative* organizational forms that can both be used for organizing a transaction. According to Coase, then, firms exist because there are costs of using the price mechanism that market-organization
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relies on.\(^1\)

Transacting on the market requires, for instance, that prices are established and that contracts are designed. Some or all of these costs can be reduced or even eliminated when firm- is substituted for market-organization. Instead of having to conclude a separate contract for each transaction to tell the parties involved what to do under which circumstances, both parties agree to obey the directions of an entrepreneur or hierarchically superior manager, who decides on those directions in the interests of the firm as a whole. Were the parties separate and autonomous, each would want to decide on the various terms of the contract in his own interests. The resulting costs of negotiating (‘haggling’) and designing contracts in this manner are transaction costs and some of them can be avoided by using firm-organization. This is how different organizational forms influence transaction costs, so the question “why co-ordination is the work of the price mechanism in one case and of the entrepreneur in another” (Coase 1937, p. 389) can be explained by relating characteristics of transactions to the costs of those transactions when organized using each possible organizational form. For different transactions, different organizational forms will best be able to economize on those costs, which is why organization will be the work of the price mechanism in one case and of the entrepreneur in the other.

Coase’s work was carried further—among others\(^2\) and mainly—by Williamson (1975, 1985), who gives a thorough analysis of the characteristics of transactions and of the way they influence the abilities of different organizational forms to economize on the costs of transactions. Furthermore, Williamson included the effects of the characteristics of human decision makers within organizations on ex post transaction costs, next to the ex ante transaction costs that Coase (1937) focused on. Ex ante

\(^1\)Coase received the 1991 Nobel Prize in Economics “for his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy” (quoted from the website of the Nobel foundation at http://www.nobel.se/).

\(^2\)Olson (1965, p. 12), for example, also writes about “economic organizations that are mainly means through which individuals attempt to obtain the same things they obtain through their activities on the market”.

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Transaction costs are the costs that have to be incurred before a transaction can occur; partners have to search and find each other, and they have to negotiate a contract. Ex post transaction costs are the costs that have to be incurred once the transaction is underway and the agents have committed themselves to it; they have to monitor the partner to ensure that he keeps up his end of the bargain and respond to unforeseen circumstances that may arise. What follows is a description of transaction cost analysis that is based mainly on the writings of Williamson. Section 1.1.1 discusses behavioral assumptions, Section 1.1.2 characteristics of transactions, and Section 1.1.3 outlines transaction cost economics' main argument.

1.1.1 Behavioral Assumptions

Decision makers’ characteristics are summed up in the two ‘behavioral assumptions’ that—in Williamson’s rendering—underlie transaction cost economics, namely that agents are boundedly rational as well as potentially opportunistic.\(^3\) Bounded rationality refers to the fact that people (agents) are intendedly rational, but only limitedly so. So although economic agents may want to choose optimally, they are typically unable to gather as well as process all the information required to make such decisions. Information about future circumstances will always be incomplete and the agent’s cognitive architecture is limited in various ways. Moreover, certain classes of decision making problems themselves can be proven to be insoluble—even with unlimited processing capacity.

\(^3\)The term ‘agent’ is used to refer to economic entities—people as well as firms. A firm’s ‘behavior’, like decision making, is considered to be a function of the behavior of the human agents within the firm; those individuals’ personal characteristics, like trustworthiness and general attitude towards the world, affect the resulting firm behavior. Ring and van de Ven (1994) make the distinction between characteristics of decision makers ‘qua persona’ and ‘qua organizational role’. Although we abstract away from the actual individuals within the firm and also from the politics of intra-organizational decision making, we do let certain personal traits re-emerge at the firm-level, as the outcome of some kind of—not explicitly modeled—aggregation across all of the firm’s constituents. See (Masuch and LaPortin 1989) for a model in which this micro-macro link is modeled explicitly.
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of the game of chess for an example. These are some of the considerations that underly the assumption of bounded rationality; a complete treatment of the issue is beyond the scope of this thesis.

Opportunism is self-interest seeking with guile. This goes beyond simple self-interest seeking to include “calculated efforts to mislead, distort, disguise, obfuscate, or otherwise confuse” (Williamson 1985, p. 47). It is not assumed that every agent is opportunistic all the time, or that all agents are opportunistic in the same degree; just that some are more prone to opportunism than others, and that this is impossible, with certainty, to judge ex ante. Opportunism will be discussed in more detail and in relation to trust in Section 1.2.1.

Bounded rationality implies (ex ante) incomplete contracting and potential opportunism implies (ex post) moral hazard. Were rationality unbounded, then it would not matter that agents could possibly act opportunistically, because any circumstance in which they would, could be dealt with in the (comprehensive) contract. If, alternatively, there were no opportunism, then it would not matter which circumstances would occur, because they would always be responded to in an honest and cooperative manner. Real contracting problems only occur, therefore, when bounded rationality and the possibility of opportunism are both allowed for, which TCE does.

1.1.2 Characteristics of Transactions

The dimensions relevant for describing and classifying transactions are uncertainty, frequency and—most importantly—asset specificity. The analysis of the role of asset specificity is one of Williamson’s (and TCE’s) main contributions to the study of economic organization (Williamson 1971, Klein et al. 1978); it will therefore be discussed first.

Asset specificity

Asset specificity refers to the specialization to a transaction of assets that were invested in to support it. To the extent that assets are specific to a transaction, sustaining the transaction during the period in which returns
on the investments are generated, is a necessary condition for generating those returns. An example is the construction of an iron-ore smelter near a steel production plant. The advantage of locating the smelter near the plant is that the molten iron can quickly be transported to the steel mill without having to be re-heated. The value of the smelter in this sense, however, is much lower for other transactions, i.e. transactions between the smelter and any other steel mill located farther away. In order to obtain returns on the investment in the smelter, therefore, the transaction with this particular steel mill has to continue for a particular period of time, and the investor in the smelter will want to set up a contract to guarantee the sale of enough molten iron during that period, so as to generate sufficient returns on his investment in the smelter. The dependence, however, works both ways, since the steel producer will want to guarantee the delivery of molten iron that he does not have to re-heat himself.

Another often-used example concerns the mould that a car-door manufacturer has to invest in to support his transaction with a car producer for whom he produces doors. The mould can only be used to produce car-doors for the cars that this particular car manufacturer produces, so the transaction between these two parties has to exist for as long as the car-door manufacturer needs, to generate the required returns on his investment in the mould. If the relation breaks prematurely, however, the car manufacturer will also experience problems in the supply of car-doors for his particular model.

Specialized assets allow products to be differentiated and profit margins to be increased (this is dealt with in more detail in Chapter 3). Specialized assets also generate production cost savings as compared to the use of ‘general purpose’ assets (a smelter located nowhere near the steel mill). Beside these positive effects on costs and returns, what is important about asset specificity, is the limited ability to redeploy such specialized assets outside the transaction in which they were invested, should the contract execution period be interrupted or terminated prematurely. This poses the dilemma that savings may result from investments in transaction specific, rather than general purpose assets, while costs have to be spent on a contract, to protect the period required for
generating returns on the investments, from ending prematurely as a result of the partner’s opportunism. Transaction specific assets effectively lock the parties involved in an exchange into one another, and give them a rationale for investing in (the governance of) the transaction itself, so as to guarantee the successful completion of the contract, lest investments in specialized assets be lost.

**Uncertainty**

Uncertainty can be exogenous or endogenous. Exogenous uncertainty refers to the possibility that circumstances arise during the contract execution phase, that were not foreseen at the moment the contract was drawn up, and to which the parties will therefore have to adapt the contract. This is where endogenous or behavioral uncertainty comes into play, which has to do with the fact that, at such moments, the partner may behave opportunistically.

The relevance of uncertainty is that if there is much uncertainty, there are many situations that may occur and that would require the partners involved in a transaction to adapt to. This is very expensive, and there are also many opportunities for agents to behave opportunistically. In principle, the higher the uncertainty surrounding the transaction, the more appropriate it is to organize the transaction internally rather than on the market. Within the organization, uncertainty can more easily be reduced, since authority can be used to exercise control over the activities of different agents within the organization. When different firms are involved, it is much harder to guarantee that the different sides of the transaction live up to their end of the contract.

**Frequency**

As Coase (1937) already noted, the frequency with which a transaction occurs matters. If a transaction occurs very often, it may be worthwhile to establish a specialized organizational form (i.e. a firm) in which to organize it, so as to economize on the costs of concluding separate contracts for each transaction on the market. If a transaction only occurs
rarely, it is probably best to organize that transaction with another firm, because otherwise the other end of the transaction would also have to be organized within the firm. Such investments can simply not be recouped when they are only used infrequently.

1.1.3 The Argument

According to Williamson, “the central problem of economic organization” (Williamson 1996, p. 153) is adaptation: of governance to transactions. Transaction cost economics relates governance forms to transactions in a discriminating—mainly transaction cost economizing—way. The economizing capabilities of different forms of governance depend on the attributes of transactions described above, given that agents are boundedly rational and potentially opportunistic. TCE looks mainly at transaction costs, but in general, the trade-off should be considered between costs of governance (transacting and organizing) and of production: “[a] trade-off framework is needed to examine the production cost and governance cost ramifications of alternative modes of organization simultaneously” (Williamson 1985, p. 61).

Because of the first of TCE’s two behavioral assumptions—that agents are boundedly rational—contracts are necessarily incomplete, so that before the end of the period during which the transaction needs to be sustained in order to gain returns on investments in specific assets (if any), unforeseen contingencies may arise to which the parties will have to adapt. However, when separate, autonomous firms are involved, then because of TCE’s second behavioral assumption—that agents are potentially opportunistic—this adaptation can not be assumed to be cooperative (i.e. in their mutual interest), but will rather result in costly haggling over the distribution of the unforeseen gains or losses (Williamson 1981a). If no specific assets have been invested in, then both parties can go their own way, but if transaction-specific assets have been invested in, then organizing the transaction between separate, autonomous, potentially opportunistic firms, will lead to costs of safeguarding returns on those investments. If those costs become too high, because assets are very specific, then organizing the transaction within a single firm’s hierarchy
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economizes on those costs, because in that case, both parties belong to the same firm and will be more likely to have the same interests (those of the firm); otherwise, a (hierarchically superior) manager will decide in the best interest of the firm.

This reasoning lead Williamson (1979) to the mapping depicted in Table 1.1. If assets are not specific, then they can easily be redeployed in another transaction. There is no need for specialized governance structures in this case, so, no matter what the frequency of the transaction, it can easily be organized on the market. Purchasing standard equipment or materials are examples of this type of transaction. When assets are specific in a non-trivial degree, there is an interest in seeing the contract through to completion. When such a transaction occurs only occasionally, setting up a specialized governance is too expensive, so a standard contract with the possibility of arbitrage by a third party such as a court should be used. When the transaction occurs frequently, on the other hand, investments in specialized governance are warranted, in the form of relational contracting. This can be in the form of bilateral governance of the transaction when asset specificity is not too high, but when it is, the benefits of specialization are not high enough to offset the cost of bilateral governance, so unified governance should be used in this case.

Table 1.1: Matching governance structures with commercial transactions (adapted from: Williamson 1979).
1.2 Extensions

Although we agree with the usefulness of much of transaction cost economics' approach, there are two main points on which we disagree with it. These points are addressed in this thesis by means of an alternative approach, which we will argue will lead to better explanations and predictions of organization. The first is that, although TCE assumes that people are boundedly rational, its main hypothesis is that people will use those organizational forms that—given their and other people's bounded rationality—are aligned with the attributes of the transactions to be organized. The problem is that the alignment results from a fully rational analysis. So, it is hypothesized that boundedly rational individuals will behave as if they were rationally able to make this alignment. This issue and the way we deal with it is taken up in the next chapter.

The second problem we have with TCE lies in the fact that the market is suggested as one of the forms in which a given transaction can be organized, while the fact that a market has to be made before it can be used, is neglected. Someone who decides to use the market for organizing a transaction, will have to find a specific other firm to be on the other end of the transfer that the transaction is. Moreover, the decision is more appropriately framed as one among a number of alternative sources of supply, one of which is internal to the firm and some of which are external. Finding the most appropriate one among these alternative sources is a search problem, in which, even if it is assumed that the relevant characteristics of the internal source are known, alternative external sources (i.e. suppliers) differ among each other and there is more information available about some potential partners than about others. This issue is taken up in the current section. It will be treated under two headings, trust and matching, in Sections 1.2.1 and 1.2.2, respectively.

1.2.1 Trust

TCE's view on opportunism is based on the assumption "that some individuals are opportunistic some of the time and that differential trustworthiness is rarely transparent ex ante" (Williamson 1985, p. 64). In
other words, since it is hard to tell who will be opportunistic and when, the possibility of opportunism is always reckoned with and measures to counter its effects are always necessary.

In regarding opportunism, it is instructive to make the distinction between room for and inclination towards opportunism (Nootboon 1999b) and to consider that actual opportunism is a function of the two. In TCE, however, information about the potentially opportunistic party’s inclination to behave opportunistically is not allowed to enter the analysis, simply because that would make it too complex (Williamson 1985, p. 59):

"[i]nasmuch as a great deal of the relevant information about trustworthiness or its absence that is generated during the course of bilateral trading is essentially private information—in that it cannot be fully communicated to and shared with others (Williamson 1975, p. 31-37)—knowledge about behavioral uncertainties is very uneven. The organization of economic activity is even more complicated as a result."

So, even though it is admitted that relevant information about trustworthiness is generated during the course of bilateral trading—information agents may use to reduce endogenous uncertainty—this information is not included in the analysis, because that would make the organization of economic activity to be explained too complicated. In this thesis, the suggested increase in the complication of the organization of economic activity is not admitted as a justification for not addressing it. On the contrary, it is proposed and subsequently shown that this complication can be dealt with using the appropriate apparatus. In particular, the consequences of incorporating relevant information about trustworthiness for the organization of economic activity will be explored by modeling the course of bilateral trading explicitly and at the appropriate level—i.e., the level of the individual firms involved in bilateral trading. This allows us to incorporate the effects of the accumulation and subsequent use of ‘relevant information about trustworthiness or its absence’. Furthermore, even if it is considered impossible to transfer this private knowledge, individuals will still use this private information about trustworthiness as
input for their own decisions about the ‘bilateral trading’ they are involved in. Obviously, TCE does not go this way because that would require going down to the level of individual agents and their boundedly rational processing of the information. In this thesis, we will go that way.

The way in which the accumulation and use of relevant information is modeled, can be informed by theories of trust. Since ‘some individuals are opportunistic some of the time and (…) differential trustworthiness is rarely transparent *ex ante*’ (Williamson 1985, p. 64), an agent’s trustworthiness is equal to his not behaving opportunistically. In fact, an agent’s trustworthiness is equal to his not wanting to behave opportunistically. This is where the distinction between room for and inclination towards opportunism (and that between exogenous and endogenous, or behavioral uncertainty) is relevant. This is also where the distinction between trust in intention and trust in competence can be explained (for a good overview of issues related to trust, see Nooteboom’s (1999b, p. 24–35) discussion). In this thesis, we will be concerned only with trust in intention; agents are always assumed to be able to live up to other agents’ expectations, so the question is always whether the agent wants to, rather than whether he is able to. If an agent’s trustworthiness is equal to his not behaving opportunistically, then another agent’s subjective interpretation of the probability of that trustworthiness, in turn, is that other agent’s trust in the first agent; the second agent’s subjective probability that something does not go wrong (Chiles and McMackin 1996, Dasgupta 1988, Gambetta 1988). It is interesting to see that transaction cost economics’ main propositions correspond closely to those derived from a theory of trust (Deutsch 1973). In his ‘trust problem in an exchange relationship’—modeled as a prisoner’s dilemma (see Section 2.1.2) in which two players have the options to give or to retain their own item—Deutsch (p. 161) mentions “three fundamental ways to guarantee that an exchange will be reciprocated: (1) to employ arrangements that will make for simultaneity of giving and receiving in the exchange; (2) to use third parties; and (3) to use ‘hostages’ or ‘deposits,’ which will enable each person to commit himself to the exchange and to be convinced that the other person has also committed himself”. The parallel with TCE’s governance structures is obvious. To a large
extent, both theories approach the same issues—just from different directions: TCE from the perspective of opportunism and Deutsch (1973) from the perspective of trust. In this thesis, they are both used in a complementary fashion.

1.2.2 Matching

The consequence of trust and of the fact that more relevant information about trustworthiness is generated during the course of some bilateral trading relations than others, is that agents have differential preferences for relations with different other agents. A convenient way of incorporating this fact is by using matching models (see (Roth and Sotomayor 1990) for an excellent introduction to and overview of matching theory). The seminal paper by Gale and Shapley (1962) uses marriage markets to illustrate the issues.4

Matching models are used to model and analyze situations where agents have to be assigned to other agents for certain interactions to proceed. For example, workers prefer working at some firms rather than at other firms, and firms will prefer some suppliers to others. The fact that agents will try to influence the outcome of the eventual assignment, has an effect on the outcome that results, and on its characteristics. This contrasts with standard economic theory where individual assignments are either not explicitly modeled but aggregated across, or assumed to be random or under the control of a central supervising agent (an auctioneer). When allowance is made for the fact that each agent will rather be involved with certain agents that with others, models can be made much more realistic, and predictions can be made for situations where this phenomenon occurs—for which many interesting situations qualify.

To get an idea of the range of possible applications, consider that Roth (1984) studied matching models of the market where medical students compete for internships at the best hospitals (and hospitals compete for the best medical students), Stanley et al. (1994) and Hauk (1997) applied

4Interestingly, the marriage metaphor has also often been used to analyze issues in relations between firms (Nootboon 1999b, appendix 4.1).
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Gale and Shapley’s (1962) model in studies of the prisoner’s dilemma, Tesfatsion (1997, 2001) has studied trade networks and labor markets, and Sherstyuk (1998) examines production coalitions between differentially skilled agents. Hauk (1997) mentions matching in the context of search—gathering of information to be used as an input for the matching; issues of information gathering and adaptive search for trading partners are also addressed in the context of industrial buying of fish on the Marseille fish market by Weisbuch et al. (forthcoming) and by Kirman and Vriend (2001). This is precisely the context in which a matching model was used in the current study; the way this was done is described in the following chapter.
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