ABSTRACT

Title of dissertation:	THREE TRANSACTION COST ECONOMICS ESSAYS WHICH USE ROMANIAN DATA
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The first chapter of the dissertation considers the complexity of contracts to be determined by transacting partners based on their exposure to the opportunistic behavior of the other. A transaction cost economics model generates the hypothesis that buyer and seller relationship-specific investments have opposite effects on the exposure to opportunism, hence on contract complexity. The precise direction of the effect is thought to depend on partners' relative vulnerability. The treatment-effects model estimated by maximum likelihood indicates that sellers' relationship-specific investments increase contract complexity, while buyers' investments reduce it. This is the first transaction cost economics analysis that simultaneously counters the problems of unobserved heterogeneity, generates estimates of the effects of relationship-specific investments that are opposite in sign on opposite sides of the agreement, and explains the patterns in the biases of ordinary least squares estimates. The quality of court services and the impact of buyers' prepayments are also investigated.

The second chapter presents a simple methodology for measuring transaction

costs at agreement level by using reports from business officials who supervise companies' buying and selling activities. In a practical implementation in Romania, those transaction costs directly related to the buying and selling activities are assessed as large, accounting for more than a fifth of value added. The recorded transaction costs estimates correlate significantly with variables suggested by theory, indicating validity. The quality of the data is also analyzed.

The third chapter of the dissertation investigates the determinants of transaction costs by using the information collected by the survey question proposed in the second chapter. Given the limited nature of the data, the Tobit model is first employed. The sample selection model is then adopted. However, combined evidence indicates that a two-equation approach is more appropriate. Results show that the existing theory is somewhat successful at predicting the size of transaction costs and very successful at predicting the existence of these costs. The two-sided nature of the decision to invest in relationship-specific assets is discussed, and the potential endogeneity of several factors is investigated.

THREE TRANSACTION COST ECONOMICS
ESSAYS WHICH USE ROMANIAN DATA

by

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Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2007

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Părinţilor mei, Gheorghe şi Anişoara

ACKNOWLEDGEMENTS

I would like to acknowledge and thank the many people who helped me bring this dissertation to fruition. First and foremost, I extend my deepest gratitude to my academic adviser, Professor Peter Murrell, for giving me the opportunity to pursue my Ph.D. in USA and under his guidance. His understanding and expertise in the field added greatly to my graduate experience, while his constant interest in the subject matter made this dissertation possible.

I am deeply indebted to Mrs. Elizabeth Allehaut for giving me the chance to be part of the IRIS Center Romania team. I must express my appreciation to her and to my many friends in the Bucharest office for making my job there such a pleasant experience. They have also offered the help Professor Murrell and I needed in collecting the data this dissertation rests upon.

I also owe a special debt of gratitude to Dr. Cynthia Clement of the IRIS Center for being such a good friend and for making things so much easier for me during the graduate program.

Last but not least, I am grateful to have such a wonderful family, which has provided continued and unwavering support throughout these years.

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LIST OF ABBREVIATIONS

AQR   Appropriable quasi-rents

IV   Instrumental variables

LR   Likelihood ratio

ML   Maximum likelihood

OLS   Ordinary least squares

PRT   Property rights theory

TCE   Transaction cost economics

TE   Treatment-effects

VI   Vertical integration

An Overview of the Dissertation

We provide below an overview of this dissertation, interweaving the commonalities with the particularities of the three essays it contains.

Part of the New Institutional Economics, Transaction Cost Economics considers transaction costs to arise from two inherent features of human nature (bounded rationality and opportunistic behavior) and to take a wide array of forms. Following Coase, firms are considered to conduct their activities and shape the governance structure of their agreements in an attempt to save on transaction costs. The most important common feature of the three essays which compose this dissertation is that they all adhere to these ideas, each of them exploring particular topics within the transaction cost area of research.

Another common element of the three essays in this dissertation is that they all rely on data collected by a survey of Romanian companies. Implemented in the middle of 2001, the survey targeted middle and large companies, and two hundred fifty-four establishments were included in the sample. The goal of the survey was to understand the way Romanian companies conduct business and, in particular, to assess their reliance on the formal legal system. To achieve this goal, four different respondents were interviewed in face-to-face meetings: the general manager, the legal adviser, and the managers of the sales and procurement departments. Responses of

the latter two managers provide most of the information we use in the three essays. The main feature of the survey, with direct implications on the types of analyses that could be conducted, is the richness of information it provides. We will elaborate on this below and in a later section of the dissertation.

The first chapter investigates the use of contracts, the complexity of which is seen as a decision firms make. This decision is considered to be analogous to that on vertical integration, hence the analysis is directly relevant to the current debates on theories of the firm. Transaction cost economics theory is commonly viewed to imply that the presence of specific assets in a transaction governed by an incomplete contract leads to the existence of appropriable quasi-rents, the distribution of which creates tensions between the trading partners.

To limit the scope of opportunism, firms design more integrated governance structures for their agreements, hence more complex contracts are expected when asset specificity is present. We investigate relationship-specific investments made by both partners in an agreement, and a simple model based on the rent-seeking branch of the transaction cost economics generates the hypothesis that buyer and seller relationship-specific investments have opposite effects on the exposure to opportunism, hence on the complexity of the contract.

The precise direction of the effect is thought to depend on partners' relative exposure to the opportunism of the other. Our results indicate that, at least in Romania, sellers are vulnerable to buyers' opportunism even without undertaking dedicated investments in physical assets.

The first essay also analyzes companies' reliance on the formal legal system in a transition economy and investigates the effects the prepayments buyers make have on the contract complexity.

The second chapter constitutes a methodological addition to the transaction cost literature. Despite the importance of the transaction cost concept, the multitude of forms this cost takes, combined with its hidden nature, led to the existence of very few studies which analyze the size of transaction costs, in particular at the agreement level. We aim at filling this gap by proposing a simple methodology for assessing the size of transaction costs that firms incur in exchanges.

To achieve our goal we use reports from business officials who supervise companies' buying and selling activities. The transaction cost estimates collected in the survey correlate significantly with variables suggested by theory, indicating validity of the method. In Romania, those transaction costs directly related to the firms' buying and selling activities are assessed as large, accounting for more than a fifth of the value added.

The third chapter of this dissertation is very much related to the second one given that it uses the transaction costs information collected as indicated in the second chapter. The objective of the third essay is to investigate the impact of the factors theory proposes on both the probability of existence and the size of transaction costs. To accomplish this objective, the first step we take is to survey the determinants of transaction costs – this step confirms our earlier comments on the scarcity of existing empirical work using transaction cost information at agreement level. Our results

indicate that theory is very successful in predicting the existence of transaction costs, and moderately so in predicting their size when such costs are incurred.

The multitude of questions contained by the survey instruments provides information on various transaction and firm features, allowing for a deep analysis of the theoretical predictions. For instance, researchers in the transaction cost area have frequently encountered difficulties in measuring asset specificity directly, and so proxies are often used instead. The choice of proxies is always open to debate. Our measure of relationship-specific investment, despite being a binary variable, captures the precise information of interest and is consistently measured across firms and industries. Also, the survey provides variables which can be used as instruments for the likely endogenous decision to invest in specific assets.

One of the concerns economists raised with the existing empirical studies in the transaction cost area is related to the particularities of the data they rely on. Namely, given companies' reluctance to publicize their contracts, many studies have focused on agreements in which the state is involved or have concentrated on agreements from highly regulated areas of activity. Doubts arise given peculiarities of these agreements, especially in what concerns partners' tendency to behave opportunistically. In response to this concern, our survey has targeted firms with various ownership structure, which conduct business in various productive sectors of activity of the Romanian economy.

An extremely useful feature of the questionnaires addressed to these sales and procurement managers is a two-fold symmetry. We have called *symmetry between*

the two survey instruments the fact that they contain almost identical questions, once addressed to the person most knowledgeable on firm's sales, and once to the person most knowledgeable on firm's acquisitions. In addition, apart from being asked about their own firm's activity in a particular agreement, the sales and procurement managers are also asked about their partner's activity in the same transaction. We have called this feature *symmetry within* the two questionnaires.

The two-fold symmetry has an important implication on the sample size: we collect information about two agreements each company has entered into, hence the dataset the three essays rely on consists of approximately five hundred observations (agreements). This sample is larger than those used elsewhere, thus answering another concern in the literature. For the first chapter in particular, the survey's two-fold symmetric feature is crucial. We could not have tested the predictions of the theoretical model if we would not have collected information on both the buyer and the seller in each agreement.

Lastly, this dissertation (in particular the first essay) constitutes advances in the field also in terms of the precision of the empirical methods. We will briefly elaborate on this below.

Unlike many other studies, the first chapter takes into account the endogenous nature of the decision to invest in relationship-specific assets. Moreover, this is the first transaction cost economics analysis which explains the patterns in the biases of ordinary least squares estimates (given that a particular scenario is adopted).

The second essay analyzes the quality of the transaction cost information col-

lected by the proposed survey question. Various biases are investigated: potential (upward and downward) biases at respondent level, which may arise from a different understanding of the question, and potential biases at aggregate level, which may primarily be the results of a sample selection process.

The third chapter of this dissertation uses the transaction cost information gathered by the second one. Given the limited nature of the data, we first employ Tobit, the model most commonly used in such situations. The sample selection model is found to be more appropriate. However, combined evidence indicate that sample selection bias would not affect the estimates obtained by distinct regressions: an ordinarily least squares estimation using the positive transaction cost responses, and a probit estimation using a transaction cost dummy variable. The potential endogeneity of various factors is also discussed.

Chapter 1

The Contingent Effect of Partners' Relationship-Specific Investments: Evidence from Romania on the Use of Complex Contracts

Abstract

The complexity of the contract governing an exchange is considered to be determined by transacting partners based on their exposure to the opportunistic behavior of the other. Complex contracts are believed to play an analogous role to that of vertical integration, making the present analysis directly relevant to the current debates on theories of the firm. Investments in relationship-specific assets have a direct impact on partners' vulnerability to opportunism. We investigate investments in dedicated assets made by both partners in an agreement, and a transaction cost economics model generates the hypothesis that buyer and seller relationship-specific investments have opposite effects on the exposure to opportunistic behavior, hence on the complexity of the contract. The precise direction of the effect is thought to depend on partners' relative vulnerability to the opportunism of the other. Biases in ordinary least squares estimates are investigated: unobserved heterogeneity is shown to bias downward the difference between the effects of buyer and seller specific investment, thus making it difficult to find supporting evidence for the above hypothesis. We use agreement-level data collected from a cross-section of Romanian firms, and

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employ the treatment-effects model estimated by maximum likelihood. The results indicate that sellers' relationship-specific investments increase contract complexity, while buyers' investments reduce it, supporting our view that, even in the absence of a concrete investment sellers are exposed to buyers' opportunistic behavior. Ordinary least squares estimates do not generate this result. This is the first transaction cost economics analysis that simultaneously counters the problems of unobserved heterogeneity, generates estimates of the effects of relationship-specific investment that are opposite in sign on opposite sides of the agreement, and explains the patterns in the biases of ordinary least squares estimates. Other significant results consider the quality of court services and the impact of buyers' prepayments. The limited regional variation in court quality is shown to affect the complexity of contracts, suggesting even moderate amounts of legal reform can have appreciable effects in Romania. Prepayments buyers make are shown to provide credible signals of commitment, balancing partners' vulnerability to opportunism, with direct implications on the complexity of contracts.

1.1   Introduction

This dissertation chapter examines microeconomic evidence and analyzes the way in which companies in Romania (a typical transition, developing country) organize transactions between them.

Despite the numerous papers examining the determinants of the structure of transactions, the continuing interest in this topic suggests that issues are far from

settled (Whinston, 2003; Garrouste and Saussier, 2005; Gibbons, 2005). The most frequently discussed form of governance in the literature is vertical integration (VI), while one of its alternatives, contracting, is much less analyzed. Even when contracting is discussed, most papers deal with the length of contracts (expressed in time units or number of discrete transactions), while very few authors have investigated the complexity of contractual arrangements.

We will try to fill the gap between the work on VI and contracting by analyzing the latter. An important feature of this chapter is that we consider contract complexity to be chosen by firms in accordance to their exposure to the opportunistic behavior of their trading partners. We view the decision on contract complexity to be analogous to the make-or-buy decision, meaning that our results are probably relevant to debates on the determinants of VI.

Recent theoretical discussions of VI have focused on why the effect of relationship-specific investment might vary (Whinston, 2003; Acemoglu et al., 2005; Gibbons, 2005). In particular, under the assumptions of the property-rights theory (PRT), the specific investments made by the two partners in an exchange have opposite effects on the likelihood to integrate. In contrast, transaction cost economics (TCE) has usually been interpreted to indicate that relationship-specific investments made by any party in a transaction increase VI chances. The comparison between PRT and TCE is a good example of the existence of competing theories, which employ different methodologies and different conceptions of the core ingredients of a theory of transactions (Whinston, 2003).

In this chapter we use a transparent model based on the rent-seeking branch of TCE (Gibbons, 2005), and show that specific investments can have either positive or negative effects on contract complexity. The variation in the sign of the effect appears strongly in our empirical results: relationship-specific investments sometimes induce the use of more costly legal mechanisms and sometimes reduce their use, depending on whether the buyer or the seller is undertaking the investment. This finding is inconsistent with the almost universal assumption in the literature that the chief feature distinguishing TCE from PRT is variation in the sign of the effect of specific investment (Whinston, 2003, p. 2; Acemoglu et al., 2005; Gibbons, 2005, p. 204)[1].

Despite the impressive number of papers examining the determinants of transactional characteristics, mostly from the TCE perspective, doubts about methodologies remain (Chiappori and Salanié, 2002, p. 27–28; Masten and Saussier, 2002, p. 13). Many methodological problems stem from the difficulty to obtain data on transactions and their determinants, which limits the econometric methods that can be used and the precision with which theoretical constructs can be rendered empirically.

In this chapter we make progress on this front by using detailed survey data on transactions conducted by a broad cross-section of Romanian firms. Also, we show that it is crucial to address standard methodological problems in empirical work when investigating whether there is a conditional effect of relationship-specific investment on contract complexity. Collecting very detailed data on individual transactions is

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[1]Whinston (2003, p. 21) remarks on the possibility of a negative effect of specific investment, but he regards this as inconsistent with the TCE. Within the business economics literature, there has been research on that negative effect in the context of the TCE.

a key step in being able to address these problems. Our data set has information on both partners to a transaction, allowing investigation of the asymmetry between seller and buyer effects.

A simple econometric framework, which nevertheless incorporates the insights of the TCE theory, indicates why unobserved heterogeneity leads to biases in the ordinary least squares (OLS) estimates, which blur the differences between estimated effects of buyer and seller specific investment. This analysis is substantiated by the Romanian data: OLS estimates of the effects of buyer and seller relationship-specific investment are similar, while consistently estimated effects are opposite in sign. Benefiting of detailed data, we are able to address the problem of unobserved heterogeneity. Once this is addressed, the conditional effect of specific investment appears.

Another feature of this chapter is that is discusses companies' reliance on the legal system in a developing country – designing more complex contracts implies the use of the formal legal system. We believe it is fruitful to discuss such reliance in the context of Romania, despite the prevailing view of the courts as being ineffective in developing countries. The essays in Murrell (2001) suggest that this view is misplaced, while Johnson et al. (2000) provide evidence that Romanian companies use the formal legal system more than other countries in the region.

This dissertation chapter shows that the use of the law does respond to variations in the nature of the transactions, with firms investing more in legal arrangements when they are more vulnerable to the opportunism of their partners. Moreover, firms use a more law-intensive form of transaction when courts offer services of a higher

quality. Since only small variations in court quality are possible in the centralized Romanian legal system, this is evidence that even minor court reforms could have significant effects on the use of law.

This chapter is organized as follows. Section 1.2 provides an exposition of the core notion of opportunistic behavior and of the solutions firms adopt to counteract it. We focus on contracting, regarded as an alternative to VI. Section 1.3 briefly presents related existing studies and points out some concerns raised elsewhere. These two sections do not present a comprehensive discussion of the theory or the empirical findings. For this, the following survey studies are exhaustive: Shelanski and Klein (1995), Masten (1996), Chiappori and Salanié (2002), Masten and Saussier (2002), Sykuta (2005), Macher and Richman (2006).

Section 1.4 provides the theoretical support of our analysis, including a simple TCE model which shows how the conditional effect of relationship-specific investment arises from standard assumptions of the theory. Section 1.5 presents the econometric details of our analysis, exploring the consequences of unobserved heterogeneity for estimates of the effect of specific investment on contract complexity. We show that OLS estimates tend to blur the difference between estimated effects on different sides of the transaction. Section 1.6 sets up the empirics, describing the data and variables, while Section 1.7 hints on the existence of hold-up in the Romanian business environment.

Section 1.8 presents the core estimates, focusing on maximum likelihood (ML) estimates of the determinants of contract complexity. Robustness of the results is

examined, followed by a discussion on how the effects of relationship-specific invest-ment vary with prepayment by the buyer. This constitutes supporting evidence for our proposition that the critical factor in determining the sign of the effect of specific investment is which partner is naturally vulnerable to opportunistic behavior. Section 1.9 concludes this chapter.

1.2   An overview of the opportunistic behavior

It is commonly accepted that the causes of transaction costs can be reduced to two inherent features of the human nature: bounded rationality and opportunistic behavior, and the focus of this dissertation chapter is on the latter. After presenting various sources and forms of opportunistic behavior, we briefly go over some of the solutions presented in the literature. Our focus will be on contracting, which can be regarded as an alternative to the often discussed VI.

1.2.1   Opportunistic behavior: notion and forms

Opportunistic behavior generally refers to any misbehavior that appears in the course of a transaction. It is considered to be particularly acute in the presence of asset specificity, which leads to the existence of appropriable quasi-rents (AQR)[2]. Masten (1996) discusses two sources of opportunism: inevitable gaps and ambiguities in contracts, and imperfect and costly nature of the judicial enforcement. Masten

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[2]In their seminal 1978 article, Klein, Crawford, and Alchian provide a discussion of AQRs and consider that "after a specific investment is made and such quasi-rents are created, the possibility of opportunistic behavior is very real" (Klein et al., 1978, p. 298)

(1996, p. 6–7) also presents two distinct forms the opportunistic behavior can take. The first form is represented by deviations from joint-surplus maximizing behavior, when the breaching party would like his actions to be undetected by his partner and courts. Examples include shirking, cutting corners, degrading quality in undetectable fashion or in dimensions that have not been specified in contracts. The second form of opportunism is represented by those efforts to hold-up a trading partner, when actions are taken to set new terms rather than in reaction to existing ones, and the goal is reaching renegotiation of the contract. During contract execution, such behavior includes suing for trivial deviations and making false claims of dissatisfaction.

Rogerson (1992) defines hold-up more precisely. According to him, hold-up is the ex post request for renegotiation after a relationship-specific investment has been made in a transaction governed by an incomplete contract. A common element in the definitions of opportunistic behavior and its particular form of hold-up is therefore the presence of asset specificity[3], which usually takes the particular shape of relationship-specific investment. However, despite being used interchangeably sometimes, the terms "hold-up" and "opportunistic behavior" bear distinctions, as hold-up is just an element in the set of opportunistic measures a partner in a transaction may adopt.

1.2.2   Solutions to opportunistic behavior

Following Coase, firms are considered to adopt different governance structures in an effort to reduce transaction costs. As these costs are triggered by the exposure

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[3]Williamson (1983) identifies four different types of asset specificity: dedicated assets and site, physical asset, and human-capital specificity. Masten (1996) adds a fifth type – temporal specificity.

to partner's opportunism, firms will try to employ the least costly deterrents of such behavior (Klein et al., 1978; Gibbons, 2005).

Integration (the situation when trading partners act under unified ownership and control and their actions are guided by a single objective: profit maximization) is the most prominent solution found in the economics literature. Apart from economics, the business area of research is also abundant with articles investigating VI from a TCE perspective. For example, Anderson and Schmittlein (1984) and John and Weitz (1988) are two of the papers incorporating TCE concepts into marketing and distribution strategy[4]. Given the extent to which VI has been debated in the literature, it will not constitute the main interest of the present chapter.

VI is a form of governance placed at one end of a spectrum. At the other end are spot market exchanges, when one-time agreements take place between independent economic actors. In this case, all relevant information is contained in the price and there is no deterrent of partners' opportunistic behavior, hence this governance mode is used mainly for simple transactions. According to Shelanski and Klein (1995, p. 337), "[b]etween the two poles of market and hierarchy are a variety of 'hybrid' modes, such as complex contracts and partial ownership arrangements." This view is shared by others, such as Williamson (1991a), Hubbard (2001), and Sykuta (2005).

A distinct body of research is therefore dedicated to intermediary forms of governance (placed on the spectrum between VI and spot market transactions) which

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[4]Despite providing a critique of TCE, Ghoshal and Moran (1996) list other strategic and organizational areas of great importance to managers where TCE principles have been implemented: international expansion, strategic alliances, optimum financial structure, and design of internal incentive systems.

are employed in an attempt to limit the scope of partners' opportunism. Examples include long-term contracts[5], complex contracts, quasi-vertical integration[6], option contracts[7], hybrids[8], and informal agreements[9]. Since our focus is on complex contracts, in what follows we will examine in detail this possible deterrent of opportunism.

1.2.3 Complex contracts as an alternative to vertical integration

Rogerson (1992) considers that if arbitrarily complex contracts (that will remove the need for renegotiations) can be signed, problems caused by opportunistic behavior in general and hold-up in particular would be resolved. Nevertheless, bounded rationality, limited foresight, skill, knowledge and time, combined with increasing costs of designing more complex contracts, imply that, regardless their complexity, all complex contracts are unavoidably incomplete (Williamson, 2000, p. 599).

Since contracts usually imply written agreements, designed based on a clear set of rules, an important characteristic of contracting is that it takes partners beyond

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[5]The fact that long-term contracts provide a viable solution to the opportunistic behavior pf the partners has been long recognized: Klein et al. (1978) view these contracts as the primary alternative to integration.

[6]As Monteverde and Teece (1982) have defined it, quasi-vertical integration represents a situation in which the downstream firm owns the specialized tools and the patterns used in the fabrication of components, but parties use contracts to govern the production process.

[7]An option contract is one that gives sellers the right (but not the obligation) to deliver a fixed quantity of the good and makes buyers' contractual payment contingent on the sellers' delivery decision – see Noldeke and Schmidt (1995) for details.

[8]Some examples from are franchise agreements, joint ventures, exclusive dealing contracts, the prime-contractor/subcontractor organizational unit, reciprocity agreements, or equity linkages.

[9]Some informal agreements imply the use of outside connections (with the state, other companies, or even criminal groups), while others imply an exchange of hostages. A hostage can be any asset that has some value for partners, is exchanged to show commitment, thus leading to balanced exposure to opportunism. Hostages may take various forms: Shelanski and Klein (1995) discuss reciprocal buying arrangements, Williamson (1983) considers the use of security bonds buyers present to cover part of relationship-specific investment producers undertake, while others have investigated offsetting specific investments.

simple promises. Partners in a contract agree to follow certain procedures when disputes arise, and to present their case before arbitrators (which usually take the form of commercial courts). When entering a contract, partners are discouraged to behave opportunistically by the penalties imposed by the legal system. Hence, we see reliance on the formal legal system to be the main feature of both long-term and complex contracting.

However, differences exist. Long-term contractual agreements also act as deterrents of opportunism by relying on economic incentives arising from repeated exchanges: the prospect of missing future gains from trade reduces one's current propensity to such behavior. Complex contracts however rely solely on the use of the formal legal system. A direct implication of this slight difference between long-term and complex contracts is that the latter are probably equally efficient at any stage of the transaction, while the efficiency of the former is expected to decrease as transaction progresses and approaches its closure.

Another important feature of contracting is that the costs of designing proper contracts is assumed to increase with the level of appropriable rents. The main implication for this chapter is that VI is more likely to be the governing structure when large AQRs are at play, while complex contracts probably constitute a less costly alternative for moderate levels of specialized quasi-rents. Complex contracts may also be the preferred choice when financial resources are scarce so as to limit the possibility of integration, or when integration is not possible for other reasons, such as government regulation.

A main obstacle in organizing any transaction is the delicate balance between the possibility of ex-post adjustments (necessary in any complicated interaction) and the safeguards that encourage partners to undertake relationship-specific investments. VI avoids this obstacle. We believe that complex contracts can also do so, as they can be used to anticipate the types of adjustments that have to be made and how they are to be accomplished.

This view is by no means novel. In the TCE area of research, it has been expressed by others, such as Joskow (1985, p. 38–39), who notes that "[c]onsiderable emphasis has been placed on the proposition that vertical integration is more likely to emerge when cost-minimizing (in the neoclassical sense) transactions involve durable transaction-specific sunk investments. Williamson's recent work and a great deal of Klein's work, however, consider contractual alternatives to vertical integration where transactions costs are important. [. . .] The structure of these market contracts will reflect efforts to create incentives and restrictions that reflect anticipated performance problems so that agents will perform as initially promised when different contingencies arise." Crocker and Masten (1991) also share this view. In the business literature, the existence of contractual alternatives to the make-or-buy decision has been underlined by Adler et al. (1998) and others.

Hence, the parallels with VI become apparent as both complex contracts and integration can be viewed as ways to facilitate adjustment without consequent increases in vulnerability. In addition, one could easily imagine detailed contracts mimicking

the set of arrangements ascribed to VI in many formal models[10]. To conclude, we believe that VI and complex contracts can be seen as alternative measures against opportunism, alternatives which bear many features in common.

In this context the following comment, made by Gibbons (2005, p. 234), seems all too relevant: "the adaptation theory applies not only to the make-or-buy problem, but also (and at least as well) to the class of contracting problems where two firms with fixed boundaries pass decision rights across their boundaries by contract. [...] In short, the make-or-buy theories described here may have as much to say about contracts *between* firms as they do about the boundaries of firms."[11]

1.3   Some related existing studies

This dissertation chapter investigates the use of complex contracts as a solution to the potential opportunistic behavior of partners. Before presenting our insights, we consider useful to display some of the findings in the existing studies which have also analyzed the complexity of contracts. In addition, the model we will present in Subsection 1.4.3 bears some features found elsewhere in the literature, resembling work on dependence balancing between partners in a transaction. In what follows, we will briefly go over some of these finding as well.

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[10]In an early contribution, Kessler and Stern (1959) compared "contract integration" to VI. Also, in his analysis of long-term contracts, Joskow (1985, p. 50) considers that very long and tight contracts can "simulate the opportunism-mitigating features of vertical integration."

[11]Gibbons (2005) also cites the work of Maskin and Tirole (1999), who show the formal equivalence between the property-rights theory and certain contracting models.

1.3.1 Previous results on contract complexity

The option researchers frequently adopt is to construct a measure of contract characteristics, denoted C below, representing contract length, complexity, choice of pricing scheme, or such. This is usually regressed on a set of independent variables, of which the most important is considered to be specific investment, denoted I. The other explanatory variables represent transaction and firm characteristics, and encapsulated into the set Z_1. The most common regression equation is therefore:

$$C = \alpha_1 + \beta_1 I + \gamma_1 Z_1 + \epsilon_1, \tag{1.1}$$

where the unit of observation is a particular transaction between two firms[12].

One point worth noting is that C in this study plays the same role as the decision to vertically integrate does in other studies. Another point is that, in the context of this chapter, where C denotes the complexity of contracts, the meaning of β_1 is straightforward: it captures the increase in contract complexity given that a relationship-specific investment is made.

In the TCE literature the usual reasoning is that asset specificity raises the threat of opportunistic behavior. In particular, specific investments undertaken in incomplete contracts are considered to increase the likelihood of hold-up. To counter such a behavior, partners rely on more integrated governance structures – longer-term or more complex contracts are signed, stricter pricing schemes are adopted,

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[12]For presentation purposes we choose not to display a subscript for C, I, Z_1, and ϵ_1.

etc. Hence, the common expectation is that β_1 is positive. Joskow (1988, p. 105) mentions that "we expect the parties to more frequently choose vertical integration or a long-term contract as the quasi-rents associated with specific investments become more important.", while Gibbons (2005, p. 204) states that the unifying theme in empirical work following the rent-seeking version of transaction cost theory is that larger AQRs make integration more likely, where relationship-specific investment is the source of these rents.

The literature on contracting is rather young, especially when compared to the vast VI literature (Chiappori and Salanié, 2002). Moreover, within the area of contracting, many authors have investigated the implications various factors have on contract length, while contract complexity has been discussed by only a handful of papers. Some of these papers will be briefly presented below.

Crocker and Reynolds (1993) analyze pricing procedures used in U.S. Air Force engine procurement contracts. The authors expect that contracts will be more complex when opportunistic behavior is more likely, and when the environment is less intricate and uncertain. They use a panel dataset of forty-four contracts signed between 1970 and 1987, and run an ordered probit for the type of the contract (a discrete value ranging from one to eight) on variables which proxy for uncertainty, and on the reputation of the supplier to behave opportunistically. An exogeneity test is employed, suggesting that estimated coefficients are not ridden by endogeneity bias. The results support the theoretical prediction[13].

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[13]A possible drawback of this paper is that authors use pricing schemes as a measure of contract complexity, while they are more an indicator of contract rigidity. For example, if the contract sets a

Gompers and Lerner (1996) use a sample of one hundred-forty venture partnership agreements and consider the number of contractual covenant classes included in these agreements (out of a total of fourteen) to be the dependent variable. Part of authors' endeavor is to test whether more restrictive contracts (which include more covenants) are employed when the potential for opportunistic behavior is greater. The authors use variables suggested by the standard literature (they focus on high-technology investments) and conclude that results support their hypothesis.

Saussier (2000) considers the complexity of contracts to be the result of parties' willingness to save transaction costs, a view we also adopt in the present chapter. However, unlike the contract complexity measure we use, Saussier constructs an diametrically opposite one, called "contract incompleteness", and discusses the degree of incompleteness as a result of transaction characteristics. The data the author relies on represents the twenty-nine contracts signed between 1977 and 1997 by Eléctricité de France for transportation of coal to its power plants. The author uses the discrete contract incompleteness score (ranging from zero to six) to tests two basic propositions: an increase in the level of asset specificity will lead to more complete contracts, while an increase in the uncertainty level will lead to less complete contractual agreements. Results, which take into consideration the possible endogeneity of asset specificity, match author's predictions.

The three studies mentioned above lead to two remarks. The first is that they

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fixed price the authors consider this contract to be most restrictive (which it is) but also to be most complete (which it is not necessarily the case). Another limitation is that asset specificity is not directly observed and instead the authors use a proxy for seller's tendency to behave opportunistically – number of disputes a seller was involved into in the previous 5 years. As always, the choice of proxies is open to debate.

all follow the TCE approach, thus predicting a positive β_1. The second relates to the parallel between VI and complex contracting, which appears strongly in these empirical studies; the independent variables used to explain the make-or-buy decision are those employed as determinants of the choice between simpler and more elaborated contract forms.

To conclude, the main link, following the TCE theory, is between the AQRs at play, the partners' opportunistic behavior, and the chosen governance structure of the transaction. As it appears from both theory and empirical applications, the existence of AQRs has become almost synonymous with the amount of specific investment. The relation mostly investigated in TCE is between relationship-specific investment and the decision to integrate (Whinston, 2003), hence, in focusing on the link between the degree of contract complexity and the presence of relationship-specific investment, this chapter's results are directly relevant to the voluminous literature on VI.

1.3.2 Previous results on dependence balancing

At this stage, we believe it is worth mentioning a particular area of transaction costs research focusing on the effects of partners' bilateral exposure (especially through relationship-specific investments), which follows Oliver Williamson's insights on hostages.

In his 1983 paper modeling the use of hostages, Williamson discusses reciprocity, which transforms a unilateral supply relation into a bilateral one. He notes that "reciprocity can serve to equalize the exposure of the parties, thereby reducing the

incentive of the buyer to defect from the exchange" Williamson (1983, p. 531).
Williamson believes that when accepting reciprocal exposure of specialized assets,
the buyer shows commitment to exchange and so defection hazards are mitigated.
The argument is therefore that specific investments might have advantages purely for
transactional reasons.

Several empirical papers followed this line of reasoning: Anderson and Weitz
(1992) use questionnaires addressed to managers and show that relationship-specific
investments are positively related to "commitment" between manufacturers and dis-
tributors, where commitment is probably inversely related to the formal rigor of
contracts. Fein and Anderson (1997) show that the specific investments of manufac-
turers and distributors affect the degree to which each is willing to become tied into
a relationship with the other, suggesting that there is reciprocity in the willingness to
make specific commitments. Joshi and Stump (1999) suggest that the presence of two-
sided relationship-specific investments might diminish the tendency for the creation
of formal cooperative agreements between manufacturers and their suppliers, while
obtaining the standard result that specific investments lead to more formal arrange-
ments. Koss (1999) shows that buyers of fresh fish in British Columbia are more likely
to invest in seller's boats if the seller has undertaken relationship-specific investments,
a standard result if one views the buyer's investment as a partial VI. Ahmadjian and
Oxley (2006) examine how the equity stakes taken by Japanese auto assemblers in
their suppliers vary with the dependence of the suppliers on the assemblers.

Regarding the particular aspect we are interested in, none of the empirical stud-

ies above focuses directly on the issue of whether it is possible that increases in specific investments actually reduce the likelihood of VI or the complexity of contracts. Even though the discussions of theory in these studies would certainly be consistent with a negative β_1 (the model we present in the next section also shows this possibility), none of the corresponding empirical results is clearly inconsistent with a positive β_1, that is, with the basic hypothesis that relationship-specific investments always induce more complex contracts or VI.

1.3.3   Concerns with the existing studies

To conclude this section, we present below some concerns with the existing TCE empirical studies, which are mainly related to data availability and measurement of concepts of interest. Additional concerns, regarding econometric details, are presented in Section 1.5.

Since contracts among firms are often confidential, companies are generally reluctant to allow them to be studied, hence the areas of research are limited to those where contracts are available. As a consequence, researchers have frequently investigated contracts between state and private entities (as governments publicize their contracts), or contracts between private entities, which are public because the sector of activity is strictly regulated. Chiappori and Salanié (2002, p. 34) note that "many papers in this field use similar data and/or focus on similar problems, as shown by the number of papers on sharecropping or natural gas we surveyed. We would certainly want to see wider-ranging empirical work in the future." Despite

the meaningful insights such contracts uncover, most of the agreements are reached between private companies acting in diverse, unregulated sectors.

Focusing on contracts involving the state (either directly or through strict regulation of a sector) may lead to several drawbacks. First, it is plausible that state interference has particular implications on partners' incentives and behavior, especially regarding opportunism. Second, the low number of economic agents usually acting in regulated sectors (e.g. coal transportation, gas extraction) may also affect the propensity of opportunistic behavior. Chiappori and Salanié (2002, p. 27) also note that "[m]ost of the empirical tests of transaction costs theory have been implemented on data from relatively thin markets, where quasi-rents are large. An interesting question is whether these intuitions extend to thicker markets." Lastly, the TCE papers tend to use samples of reduced size, with direct implications on the quality of the estimates. Sykuta (2005, p. 20) comments that "[g]iven the costs associated with these data collection efforts and the proprietary nature of contract documents, sample sizes in this field tend to be small – so small as to preclude effective use of most of the econometric techniques described above."

Another concern comes from the measurement of the primary concepts. As frequently argued, opportunistic behavior is driven by the presence of asset specificity, but researchers have encountered difficulties in measuring specificity directly, and so proxies are often used instead. The choice of proxies is always open to debate. Regarding asset specificity, Shelanski and Klein (1995, p. 340) comment that "[f]urther refinement and analysis need to be done [. . .] particularly in the area of measure-

ment. Proxies such as capital intensity of fixed costs are very imperfect." Masten and Saussier (2002, p. 13) note that "[a] variety of issues should temper our confidence in the findings to date. Probably chief among those is the quality of proxies used for the explanatory variables identified by the theory. Often, these proxies are crude and imprecise stand-ins for the variables of true interest." Macher and Richman (2006) express a similar concern.

Sykuta (2005, p. 26) raises an additional question regarding the measurement of asset specificity. According to him, the theory predicts that investments in relationship-specific assets give rise to potential quasi-rents and associated behavioral ills, while it is less clear whether, or when, assets that are firm-specific or industry-specific are necessarily relationship-specific[14].

Since the survey and variables will be presented in a later section, we only mention here that our data address many of the limitations found elsewhere. In particular, the survey we use targeted Romanian companies which undertook activities in various productive sectors of activity, and our sample consists of four hundred twenty-three agreements signed between firms with different ownership structures. In addition, our measure of the relationship-specific investment (despite being a binary variable) captures the precise information of interest and is consistently measured across firms and industries.

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[14]For instance, Acemoglu et al. (2005) use a firm-specific measure such as technology intensity.

1.4 Theoretical support of our analysis

When examining VI, those who contrast TCE and PRT focus on the sign of β_1. PRT implies that the sign of β_1 depends on transaction circumstances and which party is undertaking the relationship-specific investment. Namely, if β_1 is positive for specific investment undertaken by one party to the transaction, it will be negative for the other side. In contrast, the existing TCE theory predicts that any investment in relationship-specific assets increases the likelihood of integration (Whinston, 2003 p. 2, 21; Acemoglu et al., 2005, p. 1)[15].

Even though the focus of this dissertation chapter is on TCE issues, and not on PRT concepts, the distinction between the two views is of great interest to us – this chapter may help reconcile TCE and PRT in what concerns the expected sign of β_1.

1.4.1 A description of the buyer-seller relationship

In what follows we will try to briefly present our view on the relationship between the buyer and the seller in a simple transaction, including the consequences this may have on the complexity of contracts governing these transactions.

Some simplifying assumptions will be made. The first is that one of the two parties is exposed to the opportunism of the other. The main cause of exposure is considered to be the presence of asset specificity, which is mainly triggered by partners' decisions to undertake investments in dedicated physical assets. However,

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[15]Gibbons (2005, p. 226) cites Williamson (1979) and Masten (1986) and claims that transaction costs of non-integration increase with asset specificity. Whinston (2003, p. 21) states the prevailing consensus but also notes counter-examples such as Koss and Eaton (1997).

asset specificity can have other sources, such as the precise role each party has in the agreement, combined with macroeconomic conditions. In particular, we believe that at least in Romania, even in the absence of a concrete investment in a dedicated asset, the seller is usually the vulnerable party in an exchange (the following subsection will provide the arguments for this second assumption).

The third assumption we make is that the exposed party in a transaction has more to say about contract terms than the other party does. Let us consider an overly simplified contracting process, in which only two types of clauses can be discussed: technical and safeguarding. In a given agreement it is plausible that parties have equal bargaining power in negotiations over the technical aspects of the transactions. However, the prospects of opportunism may make the vulnerable partner reluctant to enter an agreement which does not stipulate satisfying safety terms, thus this party may have greater bargaining power in negotiations over the safeguarding clauses.

The possibility of opposing impacts of buyer's and seller's specific investments on contract complexity appears naturally. When the seller undertakes a relationship-specific investment this increases his initial exposure to buyer's opportunism, and he will probably argue for additional safeguarding clauses to be included, thus leading to a more complex contract. A relationship-specific investment by the buyer however is likely to lead to a balanced exposure of the parties. In this case the net exposure (of the buyer or seller) is lower than seller's initial vulnerability, unless buyer's exposure from specific investment is tremendous (more than double compared to seller's initial vulnerability). Hence, the complexity of the contract governing such a transaction is

likely to be lower. In addition, the exchange would now be governed by a different type of agreement: a transaction which has both parties exposed to the opportunistic behavior of the other has self-enforcing features. For such transactions extended written clauses are no longer needed.

1.4.2 Support for the vulnerability assumption

The second assumption we have made above is crucial for our argument. We believe that in the simplest situation the partners can face, with no contract governing the exchange, no prepayment offered by buyer, and no investment in a dedicated asset, asset specificity can still be present. In particular, at least in Romania, it is likely that the seller is the vulnerable party even without undertaking a relationship-specific investment. Since our predictions depend on the validity of this assumption we present below evidence supporting the background vulnerability of the seller.

For a typical industrial sector, where market power is the same on both sides of a transaction, this assumption is standard. It is common practice in Romania and elsewhere for buyers to pay on or after delivery, which means that sellers have to commit financial resources to contract fulfillment before buyers do (McMillan and Woodruff, 2002, p. 163).

In addition, as in most other transition countries, external financing in Romania is hard to obtain. A recent study (National Agency for Small and Medium Sized Enterprises and Cooperatives, 2004) shows that bank loans were inaccessible for small enterprises in 2004, 60% of them being started with owners' private savings. The

study also indicates that 87.5% of small companies use their own resources to make investments. A similar argument is provided by Rizov (2004, p. 725), who uses a panel of medium and large Romanian manufacturing firms for the 1995 – 1999 period. The survey provinding our data was conducted in the middle of 2001, and was focused on medium and large establishments. Therefore, we infer that at the time of our data collection the business environment was harsh in what concerns external financing.

As McMillan and Woodruff (2002) document, transition is a time when sellers are scrambling for financial resources to invest in inputs and production. The scarcity of external financing increases the pressure on sellers' shoulders: they have to find other sources of finance since buyers are not cooperating in this process, especially when there are no contractual guarantees.

Our data show that over half of the buyers do not pay the seller anything before delivery. It also appears that when buyers pay something before delivery, they do this reticently – only 13% of buyers pay at least half of total bill before getting the ordered goods, while a mere 3.5% pay the bill in full before delivery. Hence, most of the sellers have to rely exclusively on internal financial resources to produce the goods, meaning that they commit resources before the buyers do and hope to recover them following the successful completion of transactions.

The macroeconomic environment also has major implications on sellers' vulnerability. Despite being in transition for ten years at the time data were collected, Romania was still confronting high levels of inflation: 45.7% in 2000 and 34.5% in 2001. Thus, any delay of payment for the goods already produced is equivalent to an

interest-free loan for the buyer, which must impose real losses for those sellers who have not protected themselves through tight contractual provisions.

Our data indicate that, in addition to receiving most of the payments after delivery, 22% of sellers have to wait more than a month after provision of goods for the buyer to pay its obligations. Therefore, for an important share of sellers, it takes a long time from making the good until receiving the payment. Even though we do not have clear information whether some of these waiting periods are actually agreed upon, it must be that some customers delay their sellers.

The data also indicate that there are more buyers who are late with payments than sellers who are late with delivery. Precisely, the prepayments buyers make are lower than initially agreed in 16.78% of the investigated agreements[16]. Since a seller faced with a delay in prepayment is likely to react by postponing the delivery of the product, one would expect the percentage of sellers delaying their customers to be at least as high. However, in only 12.53% of transactions the delivery of the product took more than parties agreed initially.

Lastly, the inter-enterprise debt problem, a symptom of this interaction between the state of the macroeconomy and the relative vulnerability of seller, was one of the most discussed phenomena in the first decade of transition. In Romania at the time of the survey, firms did report the presence of large inter-enterprise debts. The connection between tight credit, inflation, seller relative vulnerability, and opportunistic behavior is also documented in a Slovakian case study by Gow et al. (2000).

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[16]Our survey instruments only permit the investigation of the delays in payments made before delivery of the product, not of the delays in other payments buyers make.

In the above paragraphs we have tried to argue that the scarcity of external financing, combined with macroeconomic instability, induces many buyers to refrain from offering significant prepayments, which makes sellers advance (own) resources needed in the production process, thus leading to vulnerability. Then, the question which arises is why do suppliers accept such an exposure? The answer may be that there is a differential access to finance for buyers and sellers.

This view is supported by at least two factors. First, following the production process, suppliers own a good which is still valuable in itself since it can be sold for a fraction of the agreement value (or can be used as a collateral). In contrast, even if they decide to finance part of the production process by offering prepayments, buyers do not hold anything in their possession if the transaction fails. Second, one can see suppliers as being partially financed by their own workforce since it is common practice for employees (managers, in particular) to be paid later, following the successful completion of an agreement. This means that of the two parties suppliers are the ones most likely to be able to advance the resources for the production of the good (with direct implications on vulnerability).

1.4.3 A simple theoretical model

Based on TCE principles and bearing many common aspects to that presented by Koss and Eaton (1997), the model below hints on the possibility of a negative β_1.

A transaction occurs between a seller (S) and a buyer (B) of an intermediate good. The production process requires both parties to make investments, which we

denote by K_S and K_B. Once these investments are sunk their values in the next-best use are denoted by O_S and O_B, with $O_S \leq K_S$ and $O_B \leq K_B$. Thus, $K_i - O_i$, where $i = S, B$, is a measure of the specificity of the investments made by the two parties in the transaction.

Similarly as before, we consider the seller to be exposed to buyer's opportunistic behavior even without undertaking an investment in a specific asset. This background vulnerability is modeled as a cost V the seller incurs for engaging in the exchange.

After purchasing the good, the buyer sells it to an end-user, obtaining a gross return of R. If $K_S + K_B + V < R$, then on efficiency grounds the good should be produced (the transaction should take place).

We consider throughout that K_i, O_i, and V are common knowledge between the two parties. An important assumption we make is that one party is exposed to the opportunistic behavior of the other, hence we rule out the case $K_S - O_S + V = K_B - O_B$. In particular, we assume that it is the seller who is more exposed to hold-up than is the buyer, hence that $K_S - O_S + V > K_B - O_B$.

In the initial stages of the exchange partners take the investment decision and, at the same time, they decide on the governance structure of the agreement. In particular, we assume there are two types of contracts parties may adopt. One ('no contract') costs nothing to implement, but cannot be enforced by the courts, leaving one party possibly vulnerable to the opportunistic behavior of the other. Another, costing C, is an ex ante perfectly enforceable contract[17].

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[17]C can be viewed as a proxy for the dependent variable in (1.1).

As it will appear below, given the assumptions we have made so far it is the seller who has the incentive to ask for a contract to govern the transaction. Without such a contract the seller does not enter the exchange and realized payoffs are zero for both parties. Hence, in this framework, the vulnerable sellers can be seen to impose on their partners some of the contracting terms (at least in what concerns the safeguarding clauses we have mentioned before).

If we consider the seller and the buyer to engage in Nash cooperative bargaining and to have equal bargaining strengths, then with no contract, but assuming no opportunistic behavior, the agreed-upon ex ante gross returns to each party are:

$$R_S^a = K_S + V + \frac{1}{2}(R - K_S - K_B - V)$$

$$R_B^a = K_B + \frac{1}{2}(R - K_S - K_B - V).$$

If there is no contract, once K_S, K_B, and V are sunk, one of the parties might ask for the initial agreement to be renegotiated. Nash bargaining leads to the following ex post gross returns:

$$R_S^p = O_S + \frac{1}{2}(R - O_S - O_B)$$

$$R_B^p = O_B + \frac{1}{2}(R - O_S - O_B).$$

For the seller, the difference between ex post and the ex ante returns is:

$$R_S^p - R_S^a = -\frac{1}{2}[(K_S - O_S) + V - (K_B - O_B)] < 0,$$

so it is the seller who might have an incentive to ask for a contract (to protect against buyer's opportunism). Then, the seller's choice is between the net return when there is no contract and hold-up occurs, which is $O_S + \frac{1}{2}(R - O_S - O_B) - K_S - V$, and the net return when a contract is used and the buyer is constrained by law to follow it, which is $\frac{1}{2}(R - K_S - K_B - V - C)$.

The seller will opt to have the transaction governed by a contract if:

$$O_S + \frac{1}{2}(R - O_S - O_B) - K_S - V < \frac{1}{2}(R - K_S - K_B - V - C),$$

which upon simplification implies $(K_S - O_S) + V - (K_B - O_B) > C$.

When the seller is the more vulnerable of the two parties, the model has three simple predictions. Most importantly, it shows that greater relationship-specific investment by the seller (higher $K_S - O_S$) makes adopting a contract more likely, while greater relationship-specific investment by the buyer (higher $K_B - O_B$) makes the use of a contract less likely. Greater seller background vulnerability (higher V) also makes adopting a contract more likely.

1.5 The econometric details of our analysis

1.5.1 The estimation approach

The transparent model we have presented above shows that the possibility of a negative β_1 is very plausible. However, the empirical studies on contracting relying on a regression equation similar to (1.1) have usually led to positive estimates for

β_1. One reason for this might lie in the difficulty of obtaining consistent estimates of parameters such as β_1, a fact well recognized in the literature. Chiappori and Salanié (2002, p. 27–28) consider that "it is hard to feel completely satisfied with the methodology of [transaction costs theory] studies. [...] A problem with this literature is that it usually does not control for the possible endogeneity of the right-hand side variables." Masten and Saussier (2002, p. 13) comment that "the specificity of assets and the level of investment in those assets, which are treated as exogenous variables in much of the research, are themselves decision variables [...and] should, by rights, be treated as endogenous variables. Only a few studies have made tentative steps in that direction." Sykuta (2005) expresses a similar view.

As mentioned above, Crocker and Reynolds (1993) use exogeneity tests to support their results. Our data fail such tests. The endogenous nature of the decision to invest in relationship-specific assets leads us to employ the instrumental variables (IV) technique when estimating an equation such as (1.1). We will show below that IV is the proper approach under various scenarios since it avoids several potential problems a researcher may encounter.

A first scenario is that the decisions on contract characteristics and investment are taken at the same time, each motivated by transaction and firm features. Then, the true model is represented by a system of two equations of the following form:

$$C = \alpha_2 + \gamma_2 Z_2 + \epsilon_2 \tag{1.2}$$

$$I = \alpha_3 + \gamma_3 Z_3 + \epsilon_3, \tag{1.3}$$

where Z_2 and Z_3 may contain similar variables, but need not necessarily be the same. Under this scenario, using OLS to estimate equation (1.1) alone would be problematic, in particular given the focus on β_1 while I does not in fact belong there. Since ϵ_2 and ϵ_3 may be correlated (because of unobserved variables which may affect both C and I), I is correlated with the error term of equation (1.1), and this endogeneity leads to biases. Hence, instead of obtaining a zero estimate for β_1, one would end up with different result, leading to spurious conclusions. Nevertheless, in case equations (1.2) and (1.3) represent the true model, if proper instruments are used for the decision to invest in specific assets, the IV technique will correctly estimate equation (1.1) and will return a zero estimate for β_1.

A second (more plausible) scenario considers the following system of equations:

$$C = \alpha_1 + \beta_1 I + \gamma_1 Z_1 + \epsilon_1 \tag{1.1}$$

$$I = \alpha_4 + \gamma_4 Z_4 + \epsilon_4 \tag{1.4}$$

That is, contract characteristics depend on the specific investment and other variables, while the decision to invest in specific assets depends on the set Z_4 of exogenous variables. Same as above, if error terms ϵ_1 and ϵ_4 are correlated, then an OLS estimate of equation (1.1) alone will be ridden by endogeneity bias. Also as above, employing the IV method for equation (1.1) will lead to unbiased estimates, provided that valid instruments are used for the relationship-specific investment.

The third scenario we may consider has the decisions on contract characteristics

and investment taken at the same time, depending on each other and on transaction and firm features. This would imply the following system of equations:

$$C = \alpha_1 + \beta_1 I + \gamma_1 Z_1 + \epsilon_1 \tag{1.1}$$

$$I = \alpha_5 + \beta_5 C + \gamma_5 Z_5 + \epsilon_5 \tag{1.5}$$

In this framework it is likely that an increase in I leads to an increase in contract complexity, followed by a subsequent increase in I. Hence, an OLS regression of equation (1.1) alone is problematic, and in this case the result would be an overestimate of β_1. Note that for this to happen, the error terms of equations (1.1) and (1.5) need not be correlated. As mentioned, our main interested in the effect of specific investment on contract complexity, and in this setup an IV approach on equation (1.1) serves us fine: it returns an unbiased estimate of β_1. As before, the choice of instruments is fundamental.

A fourth scenario may be discussed. The specification of equation (1.1) may be erroneous and the story reversed, hence equation (1.5) alone may represent the true relationship between C and I. In this case, running OLS on equation (1.1) would lead to spurious conclusions, and the same would happen with the IV approach. However, this scenario has not been a part of the TCE literature since it implies that, despite varying across firms, contract features are exogenous (predetermined), and that investment decisions have no impact on contract characteristics.

Going back to the theoretical model we have presented in Subsection 1.4.3, one

of its important features is that the choice of contract complexity is shown to be contingent. That is, contract complexity depends on the relationship-specific investment of one party, but also on other factors which determine that party's vulnerability to opportunistic behavior. The model also uncovers fundamental differences between buyers and sellers in a transaction, with direct implications on the governance structure of the agreement. For these reasons, we decide to estimate equation (1.1) using data on each side of the transaction: we investigate separately the impact of buyer's specific investment on contract complexity from that of seller's. This approach has several advantages. One is that it allows us to relate to existing studies in the TCE literature, most of which have investigated the impact on governance structure of one partner's decision to invest in specific assets. Another advantage of this approach is related to the particular estimation method we employ – details on this will be presented further in the chapter.

1.5.2   Predictions which can be taken to data

Even though IV is the proper approach when estimating equation (1.1), as Chiappori and Salanié (2002) and Masten and Saussier (2002) clearly point out, most of the existing empirical studies rely on OLS to estimate equations similar to (1.1). In what follows, we will try to show the consequences of employing IV, rather than OLS, on the estimates of main interest. For this, it is useful to consider an exogenous measure of vulnerability to partner's opportunism when no enforceable contract is in place. We denote this by V – it can be interpreted as background vulnerability,

capturing all factors not explicitly named as explanatory variables in equation (1.1).

We continue to make the same two assumptions on partners' vulnerability. The first is that at any specific instance in a transaction one and only one party will be vulnerable to the opportunistic behavior of the other. The second is that, at least in Romania, the seller is the vulnerable party, even in the absence of a concrete relationship-specific investment (evidence supporting this assumption was provided in Subsection 1.4.2).

The following system of equations is considered to represent the link between the decision to invest in relationship-specific assets and the choice of governance structure (this model resembles the second scenario presented above):

$$C = \alpha_6 + \beta_6 I + \gamma_6 Z_6 + \delta_6 V + \epsilon_6 \qquad (1.6)$$

$$I = \alpha_7 + \gamma_7 Z_7 + \delta_7 V + \epsilon_7, \qquad (1.7)$$

In this model V represents a measure of seller background vulnerability (when the seller does not undertake any relationship-specific investment). Thus, we expects that $\delta_6 > 0$. As before, subscripts indicating transactions have been omitted.

The theoretical model indicates that specific investment by the seller increases the hazards of exchange for that party, requiring greater contract complexity (higher C). Hence, if seller data is used to estimate equation (1.6), β_6 is expected to be positive. On the other hand, the model indicates that relationship-specific investment by the buyer decreases the likelihood of opportunistic behavior, leading to lower

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contract complexity (lower C). Thus, if buyer data is used, the estimate of β_6 is expected to be negative. In respect to equation (1.7), it is reasonable to assume that $\delta_7 < 0$ when the equation is applied to seller data (because more vulnerability on the part of the seller increases the transaction-related costs of seller specific investment), while $\delta_7 > 0$ when using buyer data (because increased seller vulnerability implies that buyer relationship-specific investment has greater transactional advantages).

Since V is unmeasured, it is part of a composite error term. When equation (1.6) is estimated by OLS, this unobserved heterogeneity leads to biased estimates of β_6. Given the above arguments, we can predict the direction of these biases.

When using seller data for C, I, and Z_6, the negative relationship between I and the composite error term (of which V is part of) leads to the OLS estimate of β_6 being biased toward zero relative to the consistent positive estimate of β_6. When using buyer data for C, I, and Z_6, the positive relationship between I and the composite error term also leads to the OLS estimate of β_6 being biased toward zero, relative to the consistent negative estimate. Hence, the directions of bias are such that the difference between the OLS estimates on the buyer and seller sides will be smaller than the difference between the consistent estimates.

The above offers several predictions that can be taken to data:

- if consistently estimated, β_6 is positive using seller data for C, I, Z_6, and Z_7;

- if consistently estimated, β_6 is negative using buyer data for C, I, Z_6, and Z_7;

- using seller data for C, I, Z_6, and Z_7, the OLS estimate of β_6 is biased downward

(toward zero) relative to the consistent estimate;

- using buyer data for C, I, Z_6, and Z_7, the OLS estimate of β_6 is biased upward (toward zero) relative to the consistent estimate;

- using seller data for C, I, Z_6, and Z_7, the correlation between the error terms of equations (1.6) and (1.7) ($\delta_6 V + \epsilon_6$, $\delta_7 V + \epsilon_7$) is negative;

- using buyer data for C, I, Z_6, and Z_7, the correlation between the error terms of equations (1.6) and (1.7) is positive.

One thing to underline regarding these predictions is that they all depend on the form of the model being investigated. Precisely, when stating the above we have considered the relationship between investment and governance structure to be represented by equations (1.6) and (1.7), which constitute an extension of the second scenario presented in Subsection 1.5.1. Should a different relationship be investigated, such as the last two scenarios discussed in that subsection, the use of OLS combined with the endogeneity issue would lead to different predictions. Such alternative forms are possible, however, as we have pointed out, they have not been equally successful in the transaction costs literature.

It is also important to emphasize once again that all our empirical predictions depend on the assumption that, even in the absence of a concrete relationship-specific investment, the sellers are vulnerable to buyers' opportunism. Interestingly, the only other empirical study of which we are aware that contrasts the signs of the estimated coefficients for asset specificity on the two sides of the transaction, Acemoglu et al.

(2005), generates signs that are the opposite of ours. Namely, if equation (1.1) is applied to their theory of the make-or-buy decision based on the PRT framework, with C representing the decision to integrate, then β_1 is negative for the seller and positive for the buyer. But just as our prediction on signs depends on an assumption of whether buyers or sellers are vulnerable in Romania, the prediction of Acemoglu et al. (2005) rests on an assumption of whether backward or forward integration is most relevant. Precisely, to obtain their results, Acemoglu et al. (2005) compare the default situation of non-integrated partners with that of backward integrated firms, and acknowledge the fact that the opposite results apply when the relevant margin is forward integration.

Hence, in both TCE and PRT, it is the prediction of opposite signs on the two sides of the transaction that is likely to be a feature of empirical studies, not which sign is positive and which is negative. The latter issue depends on the background environment of the country under examination and the particular sectors that are being investigated.

1.6 The survey and main variables

In what follows, we discuss those features of the survey, data, and variables essential for understanding our argument. For presentation purposes, we choose to relegate to Appendix A details about the survey, and to Appendix B at the end of this dissertation details on variables' construction.

1.6.1   The survey generating our data

We use a survey of two hundred fifty-four Romanian companies conducted in the second quarter of 2001. The companies were medium- and large-sized, undertook activities in various productive sectors of activity, and were located in and closely around the twelve largest cities of the country.

Using different survey instruments, four different persons in each company were questioned in face-to-face interviews: the general manager, the managers of the sales and procurement departments, and the head of the legal department. For those firms that did not have a legal department constituted, the lawyer most frequently dealing with the company was interviewed instead.

The general manager questionnaire asked mostly about the organization of the company and the way it interacts with its partners, while the legal relations questionnaire focused on companies' approach on designing the contracts and on their reliance on the commercial court system. The other two questionnaires, administered to the sales and procurement managers, are the ones providing most of the data for this dissertation chapter. In one particular section of each of these two survey instruments the respondent is asked a large set of questions about a specific agreement its company entered into (a different agreement for each manager). By this we mean an agreement the respondent chooses freely and with which he is familiar, that provided for a sale or purchase in the past six months. The questionnaire instructed the respondent to choose a transaction which involved either a traditional or a new product, and to not choose the agreement on the basis of its success or failure.

An important feature of the survey instruments addressed to the sales and procurement managers is *symmetry between* and *symmetry within* them. Symmetry between the two questionnaires is given by the fact that they ask almost identical questions, but while one asks about firm's experience as seller, the other asks about the experience as buyer. Symmetry within the two survey instruments means that each of them contains two sets of similar questions in the specific agreement section; in addition to questions about his own side of the transaction, each respondent is asked his opinion on similar issues concerning the trading partner. Some examples of symmetric questions are provided in Appendix A at the end of this dissertation.

As theory suggests, transaction characteristics are the main cause for a particular governance structure, so our approach in using the data is to have the agreement, rather that the firm, as the unit of observation. Given the twofold symmetry mentioned above, we have information about sellers and buyers in two agreements for each interviewed company. We can therefore put together a larger data set by combining information on buyers from the two main survey instruments, on one hand, and information on sellers from the same two sources, on the other hand, leading to a sample of potential five hundred eight observations. What makes this feature of our data possible is that we questioned company officials who had specialized jobs in charge of transactions and who had knowledge of the characteristics of the partner firm's operations.

Lastly, we consider agreements between Romanian and foreign companies to be particular because they are governed by a different body of law and because of the

particular nature of the opportunistic incentives. We therefore exclude these transactions from our sample, and use four hundred twenty-three observations (agreements).

1.6.2   The main variables we employ

We now turn to a brief description of the main variables, while those variables we use as instruments for the possible endogenous specific investment are revealed in a subsequent section. Additional details on all variables we employ (including those used to test the robustness of the results) are presented in Appendix B at the end of this dissertation. The reader will also find there some of the actual questions contained by the survey instruments. Descriptive statistics for all variables we have constructed are presented in Table 1.1 at the end of this chapter.

In this chapter, **contract complexity** is an index created by assigning scores to various features of a contract. We construct such an index because contracts include many clauses which are highly dependent on each other, hence focusing on individual contract provisions ignores the important interactions between them. This view is expressed by Masten and Saussier (2002, p. 14) and is also adopted by Sykuta (2005).

The information we collect on contracts refers to their form and to a particular clause each partner may include. Regarding the form of the contract, we have asked whether the agreement was oral or written. If written, we were interested in contract's number of pages, whether it was authenticated[18] or not, whether it was specifically

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[18]Authentication is done by a notary public and is helpful if disputes arise, since such contracts are easier to enforce. The reason not all contracts are authenticated is lack of legal knowledge and the high fess notary publics charge for this service.

designed for the transaction, as opposed to being based on a form contract. We have also obtained information on the length of the discussions with the legal adviser for crafting the contract. Lastly, we have asked whether particular clauses were included in the written contract: a penalty clause for late delivery (protecting the buyer in the agreement) and a penalty clause for late payment (protecting the seller).

We use the above information to construct three contract complexity variables: buyer, seller, and overall, with the latter including all the information contained in the other two (there is a very high correlation between all three indexes). One reason we do this is to match the existing empirical work. Since other authors only had data on one side of the agreement, we also focus on just one side of the transaction and run distinct regressions, one for the buyer, and one for the seller. For example, we use the buyer contract complexity index in regressions that relate contract features desired by the buyer to buyer characteristics. As it will become apparent further in the chapter, this approach also allows us to employ more powerful estimating procedures. Finally, we also run a single regression, using the overall contract complexity index together with variables representing both sides of the transaction.

The presentation of the main independent variables begins with the **relationship-specific investment** dummy variables, whose sources of information are the managers of the sales and procurement departments. We have constructed a buyer and a seller specific investment dummy variable. The former equals one if the buyer undertook any special investment in dealing with the seller in the specific agreement (rather than an alternative supplier), zero otherwise. For the seller relationship-specific in-

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vestment we use information provided by a question focusing on customization in the production process. Details on these variables' construction are provided in Appendix B. As previously mentioned, although we use a simple dummy variable, even this is an advance on the information often used in empirical studies, who frequently rely on imprecise proxies for the variables of interest (Shelanski and Klein, 1995; Masten and Saussier, 2002; Sykuta, 2005; Macher and Richman, 2006). It is worth noting that these variables capture the investment into the process of using or producing the good, investment which is made prior to the exchange, and which is something very tangible and observable.

Quality of the courts is a dummy variable, equal to one if the commercial section of the court in respondent's region is considered to offer services of a higher than average quality, zero otherwise. Since complex contracts would only be useful if the relevant court can be trusted to enforce them, the inclusion of this variable tests whether the characteristics of courts affect the organization of transactions. This is a conservative test, since variations in court quality across regions must be relatively small within Romania, which has a highly centralized legal system. The use of this variable follows a small but growing literature on transition countries suggesting that variations in the quality of the legal system do influence firm behavior (Murrell, 2001; Johnson et al., 2002). Lastly, since the information on court services comes from the legal adviser, it is used twice in the sample of agreements and so interpreted as one party's view on court system, regardless that party is the buyer or the seller in the agreement.

Information dissemination is a variable which captures possible gains from an informal relationship. Namely, information dissemination among buyers is a dummy variable equal to one if other buyers of the good would learn about the seller in the specific agreement defaulting its obligations, zero otherwise. Constructed in a similar fashion, information dissemination among sellers is a dummy variable equal to one if other sellers of the good would learn about the buyer in the specific agreement not paying its obligations, zero otherwise. By using these variables we try to test whether dissemination of relevant information is an effective deterrent of opportunistic behavior in Romania, as generally assumed in the literature. Joskow (1985) and McMillan and Woodruff (1999) are only two of the papers providing a similar discussion. To conclude, the theory indicates we should observe less complex contracts when information spreads on the market.

First agreement is a dummy variable, equal to one if the specific agreement is actually the first agreement between the parties, zero otherwise. We use this variable to test the assumption that personal trust builds slowly, hence firms rely on more complex contracts with first-time partners. In a similar vein, Heide and John (1990) show that repeated transactions may develop a sentiment of continuity and trust between partners, leading to reduced threat of opportunism. Also, past interactions may lead to smoother current transactions due to improved coordination between the parties – for a similar argument on the effect of repeated interactions see Banerjee and Duflo (2000). To conclude, the development of trust and improved coordination imply that we should observe less complex contracts when partners in the specific

agreement have traded before.

Exogenous market uncertainty is a dummy variable equal to one if unpredictable changes in weather or transportation links would induce important variations in the demand or supply of transacted good, zero otherwise. We use this information, which is provided by the general manager, to investigate the effect of market uncertainty on the use of complex contracts. Expectations on the effects of market uncertainty on governance form of the agreement are mixed. In our framework, one may argue that more complex contracts will be designed when market exogenous uncertainty is acute, as more clauses would be included so that solutions are specified for the various possible situations. On the other hand, limited foresight and increasing costs of designing contracts could make transacting partners rely on more flexible (at the same time less complex) arrangements when market uncertainty plays an important role. Such contracts would consist of clauses that set up general rules for dealing with various situations, and rules to guide the renegotiations likely needed in such environments. For discussions on the effect of market uncertainty on transaction governance structures see Crocker and Masten (1991), Crocker and Reynolds (1993), and Chiappori and Salanié (2002).

Dependence on partner dummy variables are constructed for both buyers and sellers. A buyer is considered to depend on the seller from the specific agreement if, should the supplier fail to deliver the contracted goods, it would take a month or more to find an alternative supplier. The dummy capturing seller's dependence on his customers is constructed in a similar fashion. We believe that the goods for which

and alternative buyer/supplier cannot be easily found constitute, in a sense, a specific asset. Then, firms which are dependent on the current trading partner are expected to behave accordingly, much in the same way firms which invest in relationship-specific assets do, and to take precautionary measures against opportunistic behavior of their partners. The similarity of the two concepts implies that the dependence variables will be used as explanatory variables (as the relationship-specific dummy variables are used) and that their effect on contract complexity should match that of the specific investment variables. Apart from their obvious relevance as explanatory variables, the dependence on partner dummy variables play an important role in the estimation procedure; as it will become apparent at a later stage, the inclusion of the dependence variables supports the choice of instruments used to counter the unobserved heterogeneity problem we have mentioned before.

1.7 A hint on the existence of hold-up

Before getting into a detailed analysis of the phenomenon, one question worth raising is whether opportunistic behavior is really present in the Romanian business environment, thus constituting a threat for transacting partners. One could consider that Romanian companies have not yet experienced the opportunism (at least in the forms discussed in the literature). This could be the case given the Romanian economic environment's relatively new development from a command-and-control system and given the arguably limited occurrence of this behavior under the former regime. A different view is that the human nature is fundamentally opportunistic (Lyons,

1994) and therefore such a behavior should be present in all economic environments, including the highly centralized and controlled ones. Our data tend to support the latter belief.

For each agreement in our sample, we have information on whether partners have made a relationship-specific investment and also whether they have asked for agreement renegotiation during its implementation. When we put this information together some interesting insights emerge, which we present in Table 1.2 at the end of this dissertation chapter.

Table 1.2 tends to indicate that when sellers undertake specific investments, buyers are more likely to ask for renegotiation of agreement. As one would mainly ask for renegotiations in order to get better terms for himself, we may in fact be faced with the definition of hold-up presented before. The χ^2 test of independence indicates we should reject the null hypothesis of no relationship between row and column frequencies and conclude that the change in percentages is significant (p-value = 0.062).

Given the symmetric nature of our study, Table 1.3 shown at the end of the chapter presents the reverse relationship, between buyers' relationship-specific investments and sellers' requests for renegotiation. Even though the row percentages look as before, the χ^2 test returns p-value = 0.395, which means the null hypothesis can no longer be rejected. At this point it remains an open question whether this result comes from the low number of buyers undertaking specific investments or it is an indication of the fundamental differences between buyers and sellers mentioned

above. However, without claiming this is solid proof of hold-up (since, for instance, the direction of causality may be debated) the two tables hint that opportunism may be present in the Romanian business environment. Thus, it would be fruitful to investigate whether companies rely on complex contracts to defend against such a behavior.

1.8 The results of our analysis

1.8.1 The effect of relationship-specific investment

We begin our presentation of the main results with the OLS estimates, and continue with the consistent ones. OLS is the typical approach found in the transaction costs literature, which, however, has been shown to not be the best practice. Our previous arguments have suggested that even though OLS estimates could be unsatisfactory, they may provide important interpretive evidence, especially when compared with the consistent estimates.

An important decision we made was to estimate the model separately for buyer's and seller's side of the agreement. Namely, we investigate the impact on seller (desired) contract complexity of seller's relationship-specific investment and of other variables assumed to influence the decision on contract's complexity. Conversely, we investigate the effect of buyer's specific investment, along with a similar set of explanatory variables, on the contract complexity a buyer would demand for the agreement.

As already noted, there are at least two reasons behind this approach. First, this approach allows a clearer diagnosis of causes of differences between our results and those previously obtained (comparison with previous empirical findings is sought, and the authors who only had information on one side of agreements have done exactly the same). Second, adopting this route avoids some econometric obstacles: due to the fact that our main independent variables (relationship-specific investment) are dummies, combined with their endogenous nature, we employ the treatment-effects (TE) model. Dealing with a single treatment is more accessible and allows us to use the full ML estimator[19]. Employing this powerful statistical technique is also preferred as it will permit testing the quality of our instruments. An approach less commonly used in the literature is also taken, and a single regression is used – it relies simultaneously on data from both sides of transaction and uses as dependent variable the overall contract complexity score we have constructed.

Another decision we made was to use the two dependence on partner dummies as explanatory variables for contract complexity. As pointed out when we have presented the construction of our variables (Subsection 1.6.2), this is natural given the similarities between the concepts captured by the dependence on partner and the specific investments variables. Moreover, this use of the dependence variables supports the choice of instruments for the decision to invest in relationship-specific assets. Should the reader not concur with our view, additional results coming from different uses of the dependence on partner variables are presented in Appendix C.

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[19]To our knowledge, ML with two treatments has not been implemented yet.

1.8.1.1 Ordinary least squares estimations

The first two columns of Table 1.4 at the end of this chapter present the OLS estimates of equation (1.1) for the two sides of the transaction. Both the seller and the buyer relationship-specific investment coefficients are positive, with the former highly statistically significant but the latter not significant. These results match the overwhelming majority in the literature: greater specific investment leads to more elaborated methods of transactional governance.

The last column of Table 1.4 shows the OLS estimates of the single regression, which uses data on both sides of the transaction simultaneously. The general picture does not change, suggesting that the choice of approach (either separate regressions or a single one) is not critical, a conclusion that is useful when interpreting estimates that are constrained by the data collection process.

The results in Table 1.4 indicate there is a positive relationship between contract complexity and the quality of services offered by commercial courts. This matches our expectations, indicating that firms do take into consideration court features when designing their contracts (one would construct a more complex contract only if would expect that contract to be enforced in court). This is evidence that contract complexity, as we measure it, is an element of a legal strategy that places emphasis on use of the formal legal system. This result is also interesting as it adds to the expanding literature on the importance of the formal legal system in transition and developing economies. In particular, this positive relationship indicates that, even in a legal system where regional variation in quality of court services is very limited, there is a

significant effect of court quality.

The estimated coefficients on information dissemination and first agreement are non-significant. One interpretation of these results is that choice between very different modes of transactional governance (between reliance on the formal legal system and reliance on relational agreements) is not based on the types of variables suggested by TCE analysis of developed countries. There is no inconsistency here. Choice between closely related alternatives, such as between more or less complex contracts, might be dominated by efficiency considerations, while choice between radically different alternatives might reflect a different calculus (Nelson and Winter, 1982). Murrell (2003) suggests that choice between formal law and informal relationships is dominated by the peculiarities of transition, such as firm history, ownership, and relations with the state.

While some of the results on relationship-specific investment change significantly when different estimation techniques are adopted in the next subsection, the results on other explanatory variables remain constant throughout this chapter. For example, exogenous market uncertainty never has a significant effect. Hence, no further comments are made on market uncertainty, reputation effects, and the quality of court variables. In contrast, comments on the seller and buyer dependence on partner variables are reserved for the next subsection, given their particular role in the regressions.

1.8.1.2 Maximum likelihood treatment-effects estimations

The econometric section has shown that, despite its frequent use, OLS is not the most suitable estimation procedure. Given specific investment's endogenous nature, other estimation methods should be employed instead, and we rely on the IV approach to obtain the estimates for the two sides of the transaction.

To counter the probable biases caused by unobserved factors that can simultaneously affect contract complexity and relationship-specific investment, proper instruments will be used. We rely on technological and market characteristics, which are exogenous determinants of specific investment, and which do not directly affect the complexity of contracts. We present below our choice of instruments, and start with those determining buyer's decision to invest in specific assets.

A plausible assumption is that the existence of many potential sellers of a good is an indicator that a standardized production technology is available, while the existence of few potential sellers is an indicator that a specialized production technology in needed for that particular good. This assumption has direct implications on the investments in specific assets the buyers may need to make. For a good with many potential sellers (and standardized production technology) it may be more efficient for buyers to undertake any desired customization themselves (by undertaking relationship-specific investments). Following the same line of thought, for a different good in that sector, with few potential sellers (and specialized production technology), the buyers may be less likely to undertake customization (through specific investment) as they probably lack the knowledge to do so. Hence, we believe that the

number of potential sellers in a sector is a proxy for those technological factors influencing whether the buyer undertakes customization, ultimately influencing whether the buyer makes a relationship-specific investment.

Alternatively, another plausible assumption is that the existence of many potential sellers of a good is an indicator of much niche production, meaning that the buyer does not need to undertake customization (does not need to undertake a relationship-specific investment). Conversely, the existence of few potential sellers of a good could mean there are large mass manufacturers, who do not adjust production to the particular needs of their customers, hence buyers have to undertake their own customization (through specific investment). Therefore, under this alternative scenario also, the number of potential sellers in a sector is a proxy for those technological factors influencing whether the buyer undertakes relationship-specific investments.

The two paragraphs above argue that the number of potential sellers is a proxy for technological factors that determine buyers' specific investment decisions. However, they provide competing arguments and opposite predictions on the direction of influence, suggesting that the proxy function can have different signs, depending on which type of technology exists, which can vary across sectors. Therefore, we use as explanatory variables for buyer's relationship-specific investment the interaction of two sets of dummy variables; one indicating whether there are few or many potential sellers, and a set of sector dummies. This leads to eight dummy variables (details on the way they are constructed are presented in Appendix B).

The above argument suggests that predicting the sign of the relationship be-

tween these dummies and buyer specific investment entails knowing features of the production technology, hence no predictions are explicitly made.

A similar reasoning holds for seller's decision to invest in specific assets. In one type of sector, many potential buyers implies a relatively homogeneous good that sellers do not customize (sellers do not undertake relationship-specific investments), while few potential buyers implies niche usage, leading to specific investments by sellers needed to deliver the particular good. The competing scenario considers a different sector, where many potential buyers indicates a differentiated product where there are many niche sellers each customizing the product to a different set of buyers (by undertaking relationship-specific investments), while few buyers indicates little demand for customization (hence fewer seller specific investments). The implementation is the same as on the buyer side: the determinants of seller relationship-specific investment are eight dummies representing the interaction between a dummy for the number of potential sellers and four dummies for the different sectors of activity considered.

We have tried to show above that the interaction of number of potential partners with the sector of activity has a direct impact on the relationship-specific investments made by buyers and sellers. However, in order to constitute proper instruments, our sets of dummies must not influence contract complexity directly and to be exogenously determined.

Given that Romania is a transition economy, we consider that old enterprises have simply continued the production processes initiated in the former regime, while

the new companies have been established to supply for the new needs, and only subsequently choose the transactional strategies. For a similar argument on the exogeneity of the sector of activity in transition see Murrell (2003). For the analysis in this chapter the implications are direct: since the sector of activity is predetermined, it is unlikely that it and the contract complexity are chosen subject to the same set of determinants, hence the sector of activity alone is not likely to affect the chosen complexity of contracts. In addition, contract complexity is chosen not on the basis of the potential number of buyers and sellers before a contract is signed but rather on the basis of the actual number of buyers or sellers that would exist after the contract is signed and relationship-specific investment is undertaken. Also, the number of potential partners in a particular sector is exogenously determined since it is a feature of the market, which cannot be influenced by firms individually.

To conclude, our instruments are technologically induced characteristics of the markets in which the firms are placed, rather than indicators of the firm's actual vulnerability to partners' opportunistic behavior.

Given the binary form of our specific investment variables, we employ the TE model and estimate the system made of equations (1.6) – the second stage equation – and (1.7) – the first stage equation – by ML. We use seller and buyer data separately and rely on the instruments presented above for sellers' and buyers' decision to invest in relationship-specific assets. As already argued, the sets of dummy variables we use constitute proper instruments, hence they do not appear in the second stage equation.

This is where the use of variables indicating dependence on the current trading

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partner becomes crucial. Their inclusion in the second stage equation counters the possibility that our instruments proxy some post-specific investment market thinness and enhance the acceptability of the exclusion restriction for our instruments[20].

As mentioned at the beginning of this section, for various reasons, we estimate the system of equations made of (1.6) and (1.7) on each side of the contractual relationship. The main results of this chapter emerge, and they are presented in Tables 1.5 and 1.6 for the seller's and buyer's side, respectively.

When endogeneity of relationship-specific investment is considered, the results differ significantly from the OLS estimates. Namely, there is a large increase in the size of the estimated coefficient for seller's specific investment variable, while the sign on the buyer's side is reversed. The two coefficients are now of roughly equal magnitude but of opposite signs, matching our expectations from Subsection 1.5.2.

The effects of relationship-specific investment on contracting behavior are quantitatively significant. The decision to undertake such investment produces a one standard deviation change in contract complexity. Specific investment by the seller necessitates a change equivalent to moving from no written contract to a contract that specifies all relevant details, whereas relationship-specific investment by the buyer would cause a change of equivalent magnitude in the reverse direction.

Moreover, the differences between the OLS and the ML TE estimates are also as predicted, and the signs of ρ (the correlations between the error terms of the first and

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[20]Moreover, while this exclusion restriction is useful if it is correct, making for more powerful tests, it is not absolutely necessary. When robustness are described, we show that dropping this exclusion restriction has no appreciable affect on the results.

second stage equations) follow the analysis in Section 1.5. In addition, the statistical significance of ρ indicates the necessity of employing estimation procedures which account for unobserved heterogeneity.

Regarding the dependence on trading partners, Tables 1.5 and 1.6 contain a result which may look troubling: the estimated coefficients for the dependence variables are positive for both sides of transaction. This contrasts the opposing signs we have predicted and obtained for the specific investment variables. We have argued above that, even in the absence of relationship-specific investment, sellers are more exposed buyers' opportunistic behavior. The sellers are therefore inclined to use more complex contracts in order to counteract buyers' possible opportunism: the positive coefficient of seller's dependence on partner variable should therefore not be a surprise for the reader. What may be surprising is the similarly positive (and significantly different from zero) coefficient of the buyer dependence on partner variable since, given the arguments in Section 1.5, one might expect a negative coefficient.

There are two possible reasons why this result does not appear. First, buyers may be unable to properly assure sellers of their own dependence: unlike some hard evidence of commitment such as specific investment (for which the parties must discuss technical specifications and particularities of the good), buyers' dependence on sellers may represent a vague notion which cannot be properly demonstrated. It may be that a buyer being dependent on its partner is not enough and instead it takes a strong sign of commitment, such as a relationship-specific investment, to move the relationship from one governed strictly by contractual clauses to one based on infor-

mal understanding of the partner. However, when buyers do depend on their sellers (even though they cannot demonstrate this dependence) they will accept the proposed complex contracts, and may even include additional clauses to safeguard them, thus leading to the positive coefficient we observe in our regression. The second possible reason behind this result is that we do not counter problems of endogeneity when obtaining the results for the dependence on partner variables. Hence, the results for specific investment and dependence on partners that are truly comparable are the OLS estimates in Table 1.4, which show the same direction of influence on contract complexity for the two pairs of variables[21].

These results confirm the observation that there are two important problems within the previous empirical literature that implements TCE to study the effect of relationship-specific investment. The first is that unobserved heterogeneity must be taken into account and must be countered. Second, the two sides of the transaction might face very different circumstances, with specific investments affecting the two sides in different ways, on one increasing transactional hazards and on the other mitigating them.

1.8.1.3   Instrumental variables estimation

After presenting the results on each side of the agreement, we not turn to the estimation which relies on all available data, and which uses as dependent variable

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[21]Whether dependence on partner is endogenous or not is debatable. One argument could be that dependence, as we measure it, is a feature of firm's sector of activity, hence exogenously determined (at least for firms in transition economies).

the overall contract complexity. Table 1.7 displays these results.

Since we now have two binary endogenous variables in the right hand side of the regression, we implement an IV procedure suggested by Wooldridge (2002, p. 642). In brief, the procedure is the following: a separate probit regression is run for each of our dummy endogenous variable using all relevant explanatory variables (both those included in the second stage regression and the instruments). The predicted probabilities thus obtained are used as instruments for the relationship-specific investment variables in the regression explaining the overall contract complexity. This procedure is asymptotically efficient among those procedures for which the instruments are functions of those variables included in the probit, and is also robust to misspecification of the choice of the functional form of first stage equations.

Despite the lower statistical significance of the estimated coefficients, which is probably due to the lower power of the procedure adopted, the results in Table 1.7 match the corresponding ones in the distinct specifications. The estimates we are mostly interested in are again those for seller and buyer specific investment variables, for which the contrasting signs are preserved. Given the lack of statistical significance of these coefficients, it is useful to check whether the difference between them is significant. For a Wald test of the null that the coefficients of the seller and buyer relationship-specific investment variables are equal, the probability level is 0.064.

The size of these estimates is also very close to the corresponding ones obtained relying only on data from one side of the transaction; Table 1.8 summarizes the estimated coefficients obtained from the separate and the single regression by employing

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the different procedures mentioned so far. This clearly indicates that the differences between the impact of buyers' and sellers' specific investments on contract complexity arise from accounting the unobserved heterogeneity, and not from our decision on how to use the data (separately for each side of the transaction, or combined).

One note should be made on the estimates presented in Table 1.8. Since we regress each party's demand for contract complexity on that party's features (the most important being the decision to invest in specific assets), the coefficients in Table 1.8 are obtained from sets of three regressions which use the seller, buyer, and overall contract complexity scores. Should the reader feel skeptical about the possibility to compare the estimates from regressions with different dependent variables, we have also run the regressions when only the overall contract complexity score is used. These results are displayed in Appendix D at the end of the dissertation and are very similar to those we have already presented.

To conclude, results indicate there are major changes as one moves from inconsistent estimates (OLS) to consistent ones, while there is little change as one moves from separate buyer and seller regressions to a single regression. Hence, while the latter move entails a real loss (giving up ML) there seems to be little gain in added perspective on the signs and sizes of the coefficients.

1.8.2   Robustness tests of the main results

As the above paragraphs have shown, using data on both sides of the agreement and relying on the overall contract complexity variable does not lead to additional

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insights, but rather returns weaker results (probably since lower power procedures are employed). We proceed and test the results from Tables 1.5 and 1.6, which constitute the main findings of this chapter, by examining variations from the basic setup used to generate them.

The first test we employ is the Hansen-Sargan overidentification test of instruments, which is implemented in the standard IV context (ignoring the fact that our endogenous variables are dummies). The null hypothesis of this test of overidentifying restrictions is that instruments are valid (uncorrelated with the error term) and that excluded instruments are correctly left out the estimated equation[22]. A rejection of the null hypothesis casts doubt on the validity of the instruments.

We employ this test of instruments using data on each side of the agreement[23]. When the buyer data is used, the test returns a Hansen J statistic equal to 7.621, leading to p-value = 0.267. Hence, the test confirms that the instruments we use to obtain our most important economic result (the negative impact the buyer's relationship-specific investment has on contract complexity) are valid. For the seller's side, the test returns Hansen J statistic = 11.957 and p-value = 0.063. Given the borderline p-value we obtain in this case we choose to employ the same test for the single regression as well. When data on both sides of the agreement are used the test returns a test statistic of 9.820 and p-value = 0.365, hence the null hypothesis cannot be rejected. An additional test is presented next, which also supports our choice of instruments

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[22]In this terminology, the *included* instruments are our usual independent variables, while the *excluded* instruments are the dummies obtained by interacting the number of potential partners with the sector of activity.

[23]The estimated coefficients are not reported given that they are similar to those previously obtained, and since the focus is now on the test statistic this procedure returns.

and the main findings thus obtained.

Two basic ingredients drive identification of the estimates in Tables 1.5 and 1.6. First, there is the omission of the IVs in the first-stage relative to the second-stage equation. Second, there is the non-linearity of the probit first-stage equation. This means that the ML approach has a very important advantage: we can drop the first element of the identification strategy and use the second, in order to evaluate the acceptability of that first element. The relevant results appear in Tables 1.9 and 1.10, and differ from those in Tables 1.5 and 1.6 by the inclusion of the first-stage explanatory variables in the second-stage equation.

Results indicate that the IVs maintain their significance in the first-stage and have low explanatory power in the main equation. Hence, the impact on the variables of interest from the addition of excluded instruments in the main equation is very limited – nothing in Tables 1.9 and 1.10 suggests the necessity of revising the conclusions that have been drawn so far.

As another robustness test of our main results we employ an alternative to the TE model estimated by ML and rely on the two-step consistent estimator proposed by Heckman. Table 1.11 presents the results for each of the two sides of the agreement separately using this popular two-step procedure. The estimates thus obtained closely match those discussed previously, therefore supporting our earlier comments.

Finally, the robustness of the main results is tested by the addition of some further explanatory variables in the second-stage equation. We choose to (individually) add variables that have sometimes been suggested to impact on contractual

relationships between companies in transition economies: there are three variables representing the past or present role of the state in the activity of one of the two firms[24], a variable indicating the location of the two partners, and two variables capturing information on the age and size of one of the two partners.

Tables 1.12 and 1.13 show these results, indicating that some of these newly added variables are significant. However, it is worth pointing out that none of these additional results alter any of the previous conclusions on specific investment. The results in Tables 1.12 and 1.13 indicate that one of the firms' ties with the state seem to have an impact on complexity of contracts: current ties (through shares owned by state) or past connections (stemming from state origins) lead to more complex contracts governing the transactions these companies enter into. Firm size also seems to matter: contracts which involve at least one large firm are more complex, probably indicating recourse to other methods of contract enforcement or economies of scale in using the courts. Finally, whether firms are located in the same region (indicating locational specificities) or one of the firms is old (established under the previous regime, indicating reputation) does not seem to influence the complexity of contracts.

1.8.3   Additional results: the effect of buyer prepayments

The theoretical model in Subsection 1.4.3 has shown that opposing effects on contract complexity are expected from buyers' and sellers' relationship-specific investments. However, the actual direction of influence was based on the particular

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[24]Since this is information gathered from the general manager of each interviewed firm, it is used twice in the sample of agreements, and hence needs to be interpreted accordingly.

assumption that sellers are exposed to buyers' opportunism even in the absence of an investment in a relationship-specific asset. Romanian evidence supported this assumption; some of the key factors assumed to lead to sellers' vulnerability were lack of external financing combined with the likely scarcity of internal financial resources, and the fact that sellers usually need to commit resources to produce the good and satisfy the agreement.

But the presence of this intrinsic (background) vulnerability is dependent on buyers not doing anything to relieve it. The easiest way for the buyer to do so would be to offer prepayments. As only one example, McMillan and Woodruff (1999) find evidence that Vietnamese firms use prepayments as a hostage exchange, to balance the risk between buyers and sellers.

Even though our data show that only 3.5% of buyers pay the bill in full before delivery, the data also show that some prepayments do happen: in a third of the contracts under study buyers made a payment of 30% or more of the total bill before delivery. We believe that when the buyers make important payments before goods are delivered, this constitutes a clear signal of commitment, which should convince sellers of their partners' good intentions. Since prepayments expose buyers to sellers' opportunistic behavior, the transactions are likely to become self-enforcing, which can be governed by less complex contracts. Therefore, there should be a large difference between the results for those agreements where buyers do not make significant prepayments and where they do. Namely, without significant prepayments the main results (presented in Tables 1.5 and 1.6) should hold. But in the opposite case,

the reduced sellers vulnerability (or even shifted vulnerability, to the buyers' side) would lead to significant changes of the impact of buyers' and sellers' investments in relationship-specific assets.

To formally test the above claims in a completely satisfying way would be an extremely challenging task. Difficulties arise from the likely endogenous nature of the decision to offer prepayment, combined with the relatively small number of significant prepayments, and the possible sample selection problem arising from buyers' decision to offer prepayment. Hence, the following results are merely suggestive.

To better highlight the impact of prepayments, we present the results after splitting the sample into two, depending on whether buyers made a significant prepayment or not. The analysis which led to our main results (TE estimated by ML) will be repeated for each subsample. This will lead to four sets of results: buyer and seller estimates with and without a significant prepayment. For presentation purposes, Table 1.14 at the end of this dissertation chapter does not include the first stage results and displays the main ones for all the four regressions together.

The estimates are suggestive for our analysis. When no significant prepayments are made the results are very similar to those previously obtained, the only difference being that the coefficients of the specific investment variables are greater in magnitude. This should have been expected. The current working sample excludes those agreements involving buyer prepayments, while our previous analysis uses data on all transactions, which were attenuating the effects of relationship-specific investments on contract complexity.

When buyers make significant prepayments the results change significantly from the main ones. The estimated coefficients presented in the third column of Table 1.14 seem to indicate that prepayments of 30% or more of the total bill act as a major sign of commitment from buyers' side. These prepayments appear to reverse the vulnerability, in the sense that buyers seem to be exposed to sellers' opportunism. Then, sellers' investments in relationship-specific assets attenuate this exposure, thus leading to less complex contracts (the positive and highly significant ρ supports this view). However, the last column of Table 1.14 could be seen to indicate that sellers are still the exposed party, with direct implications on the effect of buyers' specific investments on the complexity of contracts (the estimated coefficient of interest is negative, and the correlation between the error terms is positive, even though only marginally significant).

It is hard to conclude which is the true situation in this case. In fact, we are probably faced with a new setup, different from that we have considered before. Our theoretical model from Subsection 1.4.3 has assumed that one party is vulnerable to the opportunistic behavior of the other. However, when buyers make significant prepayments, it is likely that both parties are simultaneously exposed to each other. What are the implications on contract complexity of this bilateral exposure to opportunism? Our model does not provide an answer, hence this situation needs to be analyzed further.

To conclude on buyers' prepayments, the results must be treated with great caution given the obvious econometric issues that have been ignored. Nevertheless,

the results do provide support for the previous discussion. In particular, they show that the effect of relationship-specific investment on contract complexity is highly dependent on which side of the relationship is more likely to be vulnerable.

1.9   Conclusions

It is often mentioned that the main difference between TCE and PRT is the prediction on the impact of partners' specific investments on the likelihood of integration. While in TCE any asset specificity is considered to increase the level of AQRs at play, thus leading to more integrated forms of governance, in PRT the impact of buyer's and seller's relationship-specific investments on the probability of integration is considered to have opposite signs.

This dissertation chapter adheres to the view that contracting is an alternative to VI, and considers the choice of contract complexity as a measure firms take to counteract the exposure to the opportunism of their trading partners. Hence, the decision on contract complexity is similar to the make-or-buy decision which is frequently discussed in the literature.

A simple theoretical model based on the rent-seeking branch of TCE is proposed. The model indicates that, even under the assumptions of this theory, the impact of buyer's and seller's specific investments on contract complexity has opposite signs: while one increases, the other diminishes complexity of contracts. The particular signs of the two effects is shown to depend on the initial vulnerability of partners to the opportunistic behavior of the other. In the case of the Romanian

business environment, and probably in that of other transition, developing countries, the sellers are shown to be vulnerable to buyers' opportunism, even without making a specific investment. Then, the model predicts that sellers' investments in specific assets lead to greater exposure, and ultimately to more complex contracts, while buyers' investments balance the threats and lead to less complex contracts being adopted.

The chapter represents a significant improvement in what concerns data quality. In particular, detailed data is collected, which allows for the analysis to be conducted on both sides of agreements spanning a large variety of the Romanian economy. Also, the concept of specific investment is measured directly and consistently across firms and sectors.

But probably the main contribution regards the econometric analysis being conducted. It addresses important concerns raised with existing studies, most of which have relied on OLS as the estimation method, thus neglecting the potential endogenous nature of the decision to invest in relationship-specific assets. Unobserved heterogeneity is shown to blur the differences between the OLS estimates for buyer's and seller's relationship-specific investments. Precise predictions are made, all of which are confirmed by the data.

Apart from specific investment, other factors are investigated. Most significant among them is the quality of services provided by commercial courts, which is shown to impact on contract complexity: parties design more elaborated contracts when the quality of services is higher than average. This finding has two major implications. First, it corroborates with those on contract complexity, indicating that Romanian

companies do use the formal legal system in the way theory predicts. Second, it shows that in the highly centralized Romanian legal system, where only small variation in quality of court services is possible, even minor court reforms could have significant effects on the use of law.

Last but not least, the impact of buyer prepayments is investigated. Even though in this case the econometric analysis does not match the standards from the rest of the chapter, the insights are relevant. Buyer prepayments are shown to act as signs of commitment, thus balancing the initial seller vulnerability, with direct impact on the relationship between contract complexity and relationship-specific investments. This provides additional evidence for the contingent effect of partners' specific investments on contract complexity.
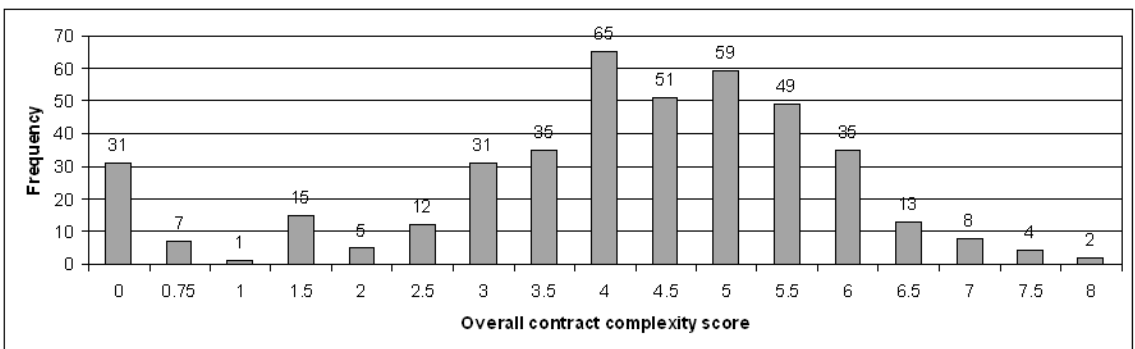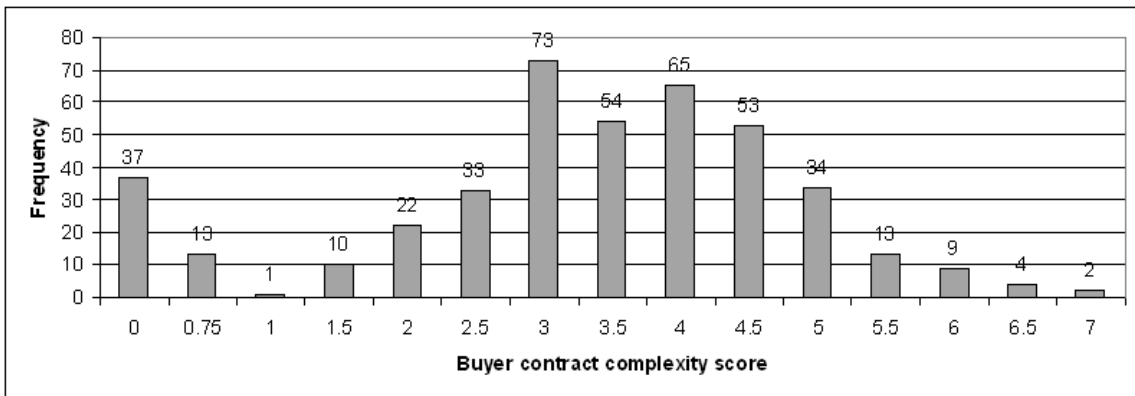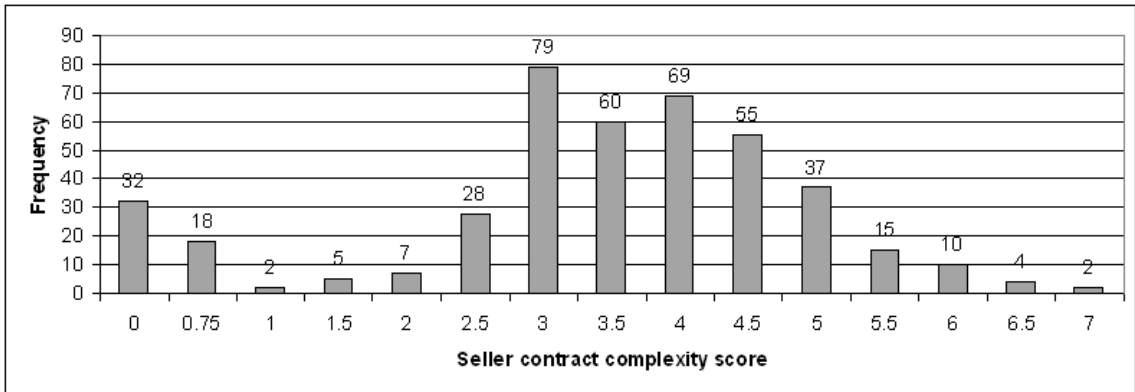
Figure 1.1: The distributions of the contract complexity scores

Table 1.1: Descriptive statistics

Variables:	Number of obs.	Mean	Standard deviation	Min	Max
Overall contract complexity	423	4.101	1.763	0	8
Seller contract complexity	423	3.416	1.508	0	7
Buyer contract complexity	423	3.296	1.536	0	7
Seller specific investment	418	0.246	0.431	0	1
Buyer specific investment	421	0.119	0.324	0	1
Quality of the courts	413	0.569	0.496	0	1
Information dissemination among sellers	415	0.800	0.400	0	1
Information dissemination among buyers	408	0.841	0.366	0	1
First agreement	423	0.286	0.452	0	1
Exogenous market uncertainty	421	0.247	0.432	0	1
Seller dependence on partner	411	0.440	0.497	0	1
Buyer dependence on partner	413	0.378	0.485	0	1
Construction	423	0.234	0.424	0	1
Heavy industry	423	0.303	0.460	0	1
Light industry	423	0.201	0.401	0	1
Other sectors	423	0.262	0.440	0	1
Few potential buyers	400	0.170	0.376	0	1
Few potential sellers	403	0.489	0.500	0	1
Few potential buyers in construction	400	0.038	0.190	0	1
Few potential buyers in heavy industry	400	0.068	0.251	0	1
Few potential buyers in light industry	400	0.020	0.140	0	1
Few potential buyers in other sectors	400	0.045	0.208	0	1
Many potential buyers in construction	400	0.195	0.397	0	1
Many potential buyers in heavy industry	400	0.240	0.428	0	1
Many potential buyers in light industry	400	0.178	0.382	0	1
Many potential buyers in other sectors	400	0.218	0.413	0	1
Few potential sellers in construction	403	0.079	0.271	0	1
Few potential sellers in heavy industry	403	0.194	0.396	0	1
Few potential sellers in light industry	403	0.092	0.289	0	1
Few potential sellers in other sectors	403	0.124	0.330	0	1
Many potential sellers in construction	403	0.149	0.356	0	1
Many potential sellers in heavy industry	403	0.112	0.315	0	1
Many potential sellers in light industry	403	0.112	0.315	0	1
Many potential sellers in other sectors	403	0.139	0.346	0	1
Significant buyer prepayment	421	0.335	0.472	0	1
State has control	423	0.165	0.372	0	1
State owns shares	423	0.188	0.390	0	1
Some state origins	423	0.662	0.474	0	1
In same region	423	0.482	0.500	0	1
Firm founded before 1990	419	0.558	0.497	0	1
Large firm	422	0.287	0.453	0	1

Table 1.2: A hint on the existence of hold-up (I)

Did the seller make a relationship-specific investment	Did the buyer ask for contract renegotiation?				Total	
	Yes		No			
Yes	24	23.30%	79	76.70%	103	100%
No	48	15.29%	266	84.71%	314	100%
Total	72	17.27%	354	82.73%	417	100%

Notes:

1) Each cell of the table contains the number of observations and the row percentage.

2) The χ^2 test of independence returns p-value = 0.062.

Table 1.3: A hint on the existence of hold-up (II)

Did the buyer make a relationship-specific investment	Did the seller ask for contract renegotiation?				Total	
	Yes		No			
Yes	12	24%	38	76%	50	100%
No	70	18.92%	300	81.08%	370	100%
Total	82	19.52%	338	80.48%	420	100%

Notes:

1) Each cell of the table contains the number of observations and the row percentage.

2) The χ^2 test of independence returns p-value = 0.395.

Table 1.4: OLS estimates of the determinants of contract complexity

Independent variables:	Dependent variable:		
	Seller contract complexity	Buyer contract complexity	Overall contract complexity
Seller specific investment	0.652		0.651
	(0.158)***		(0.191)***
Buyer specific investment		0.276	0.247
		(0.236)	(0.284)
Quality of the courts	0.284	0.340	0.314
	(0.155)*	(0.164)**	(0.188)*
Information dissemination among sellers	0.163		0.210
	(0.178)		(0.241)
Information dissemination among buyers		0.228	0.106
		(0.192)	(0.271)
First agreement	0.120	0.213	0.133
	(0.167)	(0.173)	(0.204)
Exogenous market uncertainty	-0.085	-0.142	-0.097
	(0.162)	(0.173)	(0.196)
Seller dependence on partner	0.502		0.400
	(0.148)***		(0.197)**
Buyer dependence on partner		0.602	0.376
		(0.153)***	(0.197)*
Constant	2.733	2.635	3.149
	(0.190)***	(0.203)***	(0.270)***
Observations	390	390	371
Clusters	231	230	227
R-squared	0.091	0.066	0.092

Clustered standard errors displayed in parentheses, where each cluster is a firm.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.5: ML TE estimates of the impact of seller specific investment

Main equation results		First stage results	
Independent variables:	Seller contract complexity	*Instrumental variables:*	Seller specific investment
Seller specific investment	1.806	Few potential buyers in heavy industry	0.694
	(0.516)***		(0.275)**
Quality of the courts	0.327	Few potential buyers in light industry	-0.045
	(0.158)**		(0.580)
Information dissemination among sellers	0.075	Few potential buyers in construction	1.166
	(0.182)		(0.364)***
First agreement	0.105	Few potential buyers in other sectors	0.758
	(0.168)		(0.323)**
Market exogenous uncertainty	-0.070	Many potential buyers in heavy industry	0.110
	(0.166)		(0.219)
Seller dependence on partner	0.439	Many potential buyers in light industry	0.063
	(0.148)***		(0.246)
Constant	2.560	Many potential buyers in construction	0.515
	(0.232)***		(0.245)**
		Constant	-1.018
			(0.167)***
Observations	373		
Clusters	227		
ρ (correlation between the error terms)	-0.474		
	(0.153)***		
Log-likelihood	-853.797		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.6: ML TE estimates of the impact of buyer specific investment

Main equation results		First stage results	
Independent variables:	Buyer contract complexity	*Instrumental variables:*	Buyer specific investment
Buyer specific investment	-1.911	Few potential sellers in heavy industry	-0.223
	(0.375)***		(0.244)
Quality of the courts	0.368	Few potential sellers in light industry	-0.535
	(0.160)**		(0.281)*
Information dissemination among buyers	0.246	Few potential sellers in construction	-1.036
	(0.191)		(0.397)***
First agreement	0.176	Few potential sellers in other sectors	-0.607
	(0.167)		(0.263)**
Market exogenous uncertainty	-0.154	Many potential sellers in heavy industry	-0.791
	(0.168)		(0.275)***
Buyer dependence on partner	0.526	Many potential sellers in light industry	-0.347
	(0.152)***		(0.282)
Constant	2.925	Many potential sellers in construction	-0.626
	(0.196)***		(0.263)**
		Constant	-0.723
			(0.187)***
Observations	374		
Clusters	224		
ρ (correlation between the error terms)	0.726		
	(0.097)***		
Log-likelihood	-794.296		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.7: IV estimates of the impact of buyer and seller specific investments

Independent variables:	Overall contract complexity
Seller specific investment	1.963
	(1.264)
Buyer specific investment	-2.022
	(1.645)
Quality of the courts	0.266
	(0.227)
Information dissemination among sellers	0.061
	(0.315)
Information dissemination among buyers	0.228
	(0.339)
First agreement	0.126
	(0.261)
Market exogenous uncertainty	-0.269
	(0.231)
Seller dependence on partner	0.090
	(0.274)
Buyer dependence on partner	0.386
	(0.245)
Constant	3.372
	(0.331)***
Observations	350
Clusters	218

Notes:
1) Clustered standard errors in parentheses, where each cluster is a firm.
   * significant at 10%; ** significant at 5%; *** significant at 1%
2) F-test of excluded instruments for seller specific investment: $F_{(2,217)} = 5.32$, p-value = 0.006
   F-test of excluded instruments for buyer specific investment: $F_{(2,216)} = 5.27$, p-value = 0.006
3) Wald test of equality of seller and buyer specific investment coefficients: p-value = 0.064

Table 1.8: Comparing the estimates obtained by different methods

	Separate buyer and seller regressions		Regressions with both buyer and seller variables	
	OLS	ML	OLS	IV
Seller specific investment	0.652	1.806	0.651	1.963
Buyer specific investment	0.276	-1.911	0.247	-2.022

Table 1.9: ML TE estimates with identification based only on non-linearities (I)

	Main equation results		First stage results	
Independent variables:	Seller contract complexity	*Instrumental variables:*	Seller specific investment	
Seller specific investment	1.627	Few potential buyers in heavy industry	0.785	
	(0.416)***		(0.280)***	
Quality of the courts	0.295	Few potential buyers in light industry	-0.075	
	(0.159)*		(0.646)	
Information dissemination among sellers	0.094	Few potential buyers in construction	1.032	
	(0.182)		(0.373)***	
First agreement	0.076	Few potential buyers in other sectors	0.660	
	(0.162)		(0.347)*	
Market exogenous uncertainty	-0.049	Many potential buyers in heavy industry	-0.014	
	(0.164)		(0.217)	
Seller dependence on partner	0.414	Many potential buyers in light industry	-0.008	
	(0.145)***		(0.247)	
Few potential buyers in heavy industry	-0.224	Many potential buyers in construction	0.328	
	(0.347)		(0.226)	
Few potential buyers in light industry	0.095	Constant	-0.936	
	(0.668)		(0.162)***	
Few potential buyers in construction	0.503			
	(0.403)			
Few potential buyers in other sectors	0.340			
	(0.363)			
Many potential buyers in heavy industry	0.409			
	(0.264)			
Many potential buyers in light industry	0.215	Observations	373	
	(0.260)	Clusters	227	
Many potential buyers in construction	0.595	ρ (correlation between the error terms)	-0.409	
	(0.229)***		(0.118)***	
Constant	2.349	Log-likelihood	-848.698	
	(0.280)***			

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.10: ML TE estimates with identification based only on non-linearities (II)

Main equation results		First stage results	
Independent variables:	Buyer contract complexity	*Instrumental variables:*	Buyer specific investment
Buyer specific investment	-1.730	Few potential sellers in heavy industry	0.017
	(0.461)***		(0.261)
Quality of the courts	0.349	Few potential sellers in light industry	-0.396
	(0.163)**		(0.329)
Information dissemination among buyers	0.255	Few potential sellers in construction	-0.775
	(0.190)		(0.433)*
First agreement	0.146	Few potential sellers in other sectors	-0.491
	(0.165)		(0.306)
Market exogenous uncertainty	-0.116	Many potential sellers in heavy industry	-0.759
	(0.174)		(0.329)**
Buyer dependence on partner	0.424	Many potential sellers in light industry	-0.314
	(0.158)***		(0.310)
Few potential sellers in heavy industry	0.570	Many potential sellers in construction	-0.348
	(0.322)*		(0.283)
Few potential sellers in light industry	0.366	Constant	-0.879
	(0.331)		(0.191)***
Few potential sellers in construction	0.687		
	(0.360)*		
Few potential sellers in other sectors	0.317		
	(0.336)		
Many potential sellers in heavy industry	0.113		
	(0.400)		
Many potential sellers in light industry	0.069	Observations	374
	(0.353)	Clusters	224
Many potential sellers in construction	0.701	ρ (correlation between the error terms)	0.687
	(0.295)**		(0.132)***
Constant	2.579	Log-likelihood	-789.412
	(0.300)***		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.11: Heckman two-step estimates of the impact of specific investments

Independent variables:	Dependent variable:	
	Seller contract complexity	Buyer contract complexity
Seller specific investment	1.596	
	(0.792)**	
Buyer specific investment		-2.443
		(1.501)*
Quality of the courts	0.324	0.326
	(0.150)**	(0.152)**
Information dissemination among sellers	0.080	
	(0.186)	
Information dissemination among buyers		0.244
		(0.204)
First agreement	0.122	0.187
	(0.163)	(0.169)
Market exogenous uncertainty	-0.069	-0.149
	(0.171)	(0.174)
Seller dependence on partner	0.460	
	(0.158)***	
Buyer dependence on partner		0.582
		(0.159)***
λ (inverse Mills ratio)	-0.589	1.438
	(0.467)	(0.800)*
Constant	2.593	2.988
	(0.265)***	(0.293)***
Observations	373	374

Standard errors displayed in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.12: Robustness: Adding variables to the equation explaining seller contract complexity

Independent variables:	Seller contract complexity					
Seller specific investment	1.881	1.855	1.808	1.793	1.821	1.934
	(0.509)***	(0.502)***	(0.539)***	(0.508)***	(0.530)***	(0.536)***
Quality of the courts	0.322	0.316	0.302	0.331	0.341	0.285
	(0.157)**	(0.157)**	(0.157)*	(0.158)**	(0.160)**	(0.154)*
Information dissemination among sellers	0.059	0.049	0.083	0.073	0.057	0.088
	(0.182)	(0.183)	(0.180)	(0.182)	(0.181)	(0.180)
First agreement	0.124	0.125	0.136	0.102	0.117	0.179
	(0.171)	(0.171)	(0.169)	(0.167)	(0.169)	(0.166)
Market exogenous uncertainty	-0.082	-0.097	-0.075	-0.086	-0.055	-0.058
	(0.166)	(0.166)	(0.166)	(0.170)	(0.168)	(0.163)
Seller dependence on partner	0.433	0.434	0.444	0.430	0.445	0.465
	(0.147)***	(0.146)***	(0.146)***	(0.148)***	(0.148)***	(0.147)***
State has control	0.467					
	(0.205)**					
State owns shares		0.473				
		(0.192)**				
Some state origins			0.334			
			(0.172)*			
In same region				0.099		
				(0.151)		
Firm founded before 1990					0.107	
					(0.165)	
Large firm						0.511
						(0.170)***
Constant	2.479	2.489	2.330	2.525	2.490	2.368
	(0.232)***	(0.230)***	(0.261)***	(0.234)***	(0.257)***	(0.243)***
Observations	373	373	373	373	369	372
Clusters	227	227	227	227	225	226
ρ (correlation between the error terms)	-0.515	-0.509	-0.480	-0.465	-0.475	-0.530
	(0.146)***	(0.144)***	(0.161)**	(0.152)***	(0.158)**	(0.153)***

Clustered standard errors in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.13: Robustness: Adding variables to the equation explaining buyer contract complexity

Independent variables:	Buyer contract complexity					
Buyer specific investment	-1.855	-1.833	-1.897	-1.821	-1.940	-1.956
	(0.374)***	(0.383)***	(0.392)***	(0.412)***	(0.359)***	(0.367)***
Quality of the courts	0.355	0.354	0.347	0.380	0.375	0.323
	(0.159)**	(0.159)**	(0.161)**	(0.160)**	(0.162)**	(0.157)**
Information dissemination among buyers	0.218	0.204	0.244	0.231	0.235	0.222
	(0.190)	(0.190)	(0.187)	(0.193)	(0.188)	(0.189)
First agreement	0.191	0.187	0.187	0.168	0.192	0.255
	(0.171)	(0.170)	(0.169)	(0.167)	(0.168)	(0.166)
Market exogenous uncertainty	-0.180	-0.187	-0.159	-0.176	-0.142	-0.162
	(0.168)	(0.168)	(0.168)	(0.170)	(0.168)	(0.165)
Buyer dependence on partner	0.507	0.514	0.516	0.544	0.518	0.495
	(0.152)***	(0.151)***	(0.150)***	(0.151)***	(0.153)***	(0.151)***
State has control	0.442					
	(0.209)**					
State owns shares		0.466				
		(0.191)**				
Some state origins			0.185			
			(0.176)			
In same region				0.178		
				(0.150)		
Firm founded before 1990					0.157	
					(0.164)	
Large firm						0.529
						(0.159)***
Constant	2.886	2.880	2.812	2.837	2.839	2.816
	(0.199)***	(0.199)***	(0.236)***	(0.205)***	(0.223)***	(0.200)***
Observations	374	374	374	374	370	373
Clusters	224	224	224	224	222	223
ρ (correlation between the error terms)	0.719	0.713	0.720	0.707	0.736	0.747
	(0.095)***	(0.098)***	(0.101)***	(0.111)***	(0.091)***	(0.088)***

Clustered standard errors in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.14: ML TE estimates when the sample is split by significant prepayments

| Independent variables: | No significant buyer prepayment | | Significant buyer prepayment | |
	Seller contract complexity	Buyer contract complexity	Seller contract complexity	Buyer contract complexity
Seller specific investment	2.778		-1.725	
	(1.001)***		(0.374)***	
Buyer specific investment		-2.135		-1.403
		(0.512)***		(0.622)***
Quality of the courts	0.341	0.345	0.335	0.545
	(0.211)	(0.206)*	(0.198)*	(0.218)**
Information dissemination among sellers	0.088		0.006	
	(0.243)		(0.243)	
Information dissemination among buyers		0.339		-0.090
		(0.243)		(0.229)
First agreement	0.052	0.161	0.094	0.068
	(0.228)	(0.225)	(0.182)	(0.213)
Market exogenous uncertainty	-0.163	-0.319	-0.133	0.146
	(0.217)	(0.223)	(0.211)	(0.190)
Seller dependence on partner	0.341		0.260	
	(0.236)		(0.207)	
Buyer dependence on partner		0.424		0.673
		(0.192)**		(0.207)***
Constant	2.354	2.817	3.967	3.308
	(0.304)***	(0.249)***	(0.350)***	(0.251)***
Observations	248	246	125	126
Clusters	185	184	104	104
ρ (correlation between the error terms)	-0.739	0.796	0.938	0.586
	(0.197)**	(0.098)***	(0.038)***	(0.279)

Clustered standard errors in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Chapter 2

A Proposed Way to Measure Transaction Costs Using Survey Data on Sales Agreements

Abstract

The measurement of transaction costs, in particular at transaction level, has long been an important goal. This chapter of the dissertation presents a simple methodology for doing so, using reports from business officials who supervise companies' buying and selling activities. These are the economic agents who would possess quantitative knowledge of transaction costs at agreement level if such costs affected decisions. In a practical implementation in Romania, those transaction costs directly related to the buying and selling activities are assessed as large, accounting for more than 20% of value added. The recorded transaction costs estimates correlate significantly with variables suggested by theory, indicating validity. The quality of the data collected by the proposed survey question is also investigated. Potential upward or downward biases at respondent level, arising from a different understanding of the question, and potential biases at aggregate level, arising mainly from sample selection, are shown to not affect the transaction costs estimate.

2.1 Introduction

This chapter's goals are to describe a methodology for measurement of transaction costs and to present an example of this method's implementation, thus filling a gap in the existing empirical literature. Part of the new institutional economics, transaction cost economics (TCE) abounds with definitions of the "transaction costs" concept and with hypotheses on which institutions firms rely on in order to reduce such costs. By contrast, the measurement of transaction costs is still in its infancy (Allen, 2000; Benham and Benham, 2000; Wang, 2003).

The existing studies focusing on transaction costs' measurement generally fall into two categories. Some, such as Wallis and North (1986), examine the economy at the aggregate level, assessing the magnitude of those activities specifically focused on transactions. Others, such as Kuperan et al. (1998) and Lesmond et al. (1999), analyze niche sectors where transaction costs can be isolated from production and transportation costs. The literature reveals that there is still no accepted method of assessing how large transaction costs are in the operations of the broad spectrum of producers, where transactional and productive activities are inextricably bound. In this specific case, the following commentary seems all too relevant: "The main obstacle faced by researchers in industrial organization is the lack of available data on contracts and the activities of firms" Coase (1992, p. 718)

The measurement of transaction costs is unusually difficult for many reasons – Benham and Benham (2000) discuss why better measures do not currently exist. In particular, when these costs are explicitly incurred, they are usually mixed with

other costs from which they cannot be separated, hence accounting statements do not properly identify them. More frequently, transaction costs are hidden, reflecting missed opportunities (e.g. investments not implemented because of lack of confidence in trading partners).

Researchers have long recognized the difficulty of consistently measuring transaction costs across firms, which adds to the difficulty of obtaining transaction data in general. Hence, empirical studies have relied on imperfect proxies instead and have focused on specialized markets subject to government scrutiny (which includes the filing of contracts). According to Chiappori and Salanié (2002), these markets tend to be fairly thin and are characterized by large appropriable quasi-rents[1], which leaves doubts about the generality of the results.

Transaction costs' implicit nature indicates that many relevant facts reside only in the memories of company officials. But a central tenet of economics is that economic agents act on the basis of such information. If such costs do help to determine behavior, company officials must have some idea on their magnitude. Why not directly ask them about transaction costs' size?[2]

We propose a new way to measure transaction costs, by relying on survey questionnaires. While the actual question will be presented and discussed in detail in a subsequent section, we mention here its essence: interviewed sales and procure-

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[1]For an extensive discussion on appropriable quasi-rents see Klein et al. (1978).

[2]Blinder (1994, p. 118): "the theories share one aspect in common: each traces a chain of reasoning that allegedly leads the decision maker to conclude that [doing some particular thing is in the] firm's best interests. It struck me that if a particular [decision-maker] actually follows such a chain of reasoning, he might just know it." Hendley and Murrell (2003) follow this logic in investigating the mixture of dispute-resolution mechanisms used by firms.

ment managers were asked to choose one particular agreement their company was part of and, after answering a large set of questions about that agreement, they were questioned how much it would have been worth to reverse history and instead have reached an agreement with a non-opportunistic partner (one who would share business information, would keep his promises, and would negotiate equitably to solve problems). Alternatively, our question can be reinterpreted as asking how much the respondent would be willing to pay for what first-best institutions could do. While it is commonly accepted in the literature that transaction costs arise from two human features – bounded rationality and opportunism – the survey question proposed in this chapter places more weight on the latter.

We realize that the information extracted from company officials will be deemed imprecise and subjective. Nonetheless, information is obtained from exactly those respondents assumed to possess it and, given the present extent of ignorance in the field, even imprecise estimates would add to the sum of knowledge[3]. Also, despite being subjective, the data may still be meaningful. Researchers in other social science fields have also relied on survey questions to collect highly subjective information, and the collected data have been shown to possess appropriate features. For example, information on happiness and well-being is gathered through survey questions – see `http://www1.eur.nl/fsw/happiness/` and Kahneman and Krueger (2006). Di Tella and MacCulloch (2006) defend the measures of happiness thus gathered and their use.

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[3]A simple though experiment might persuade the reader. Suppose that accountants could obtain perfect data on the transaction costs incurred in trading the typical goods and services offered by a typical firm in a median income country. Would these costs be 0.5%, 5%, 25%, or 50% of value added? An extensive search of existing literature suggests there is no basis for picking between these numbers.

The proposed method provides a coherent and practical procedure for measurement of a phenomenon of central interest to economists, and we show that the transaction costs measure we obtain has appealing characteristics. First, since respondents are required to express their answers as a percentage of the sale price, the estimates we collect are comparable across sectors of activity, regions, and countries. Second, we show that the survey question is not capturing noise but relevant information, and for this we display correlates of our measure with many firm features and factors theory predicts to affect transaction costs. Lastly, we analyze upward and downward biases at respondent level as well as biases at aggregate level and show that our data is not affected by such problems.

Despite only focusing on part of the concept (inter-firm transactional impediments are only part of all transaction costs firms incur in their activity), the present dissertation chapter takes a much needed first step toward a consistent estimation of transaction costs at firm level for a cross-section of business activities. The implementation of the proposed method indicates that, at least in Romania, transaction costs directly related to buying and selling goods and services are large, accounting for more than 20% of value added.

This chapter of the dissertation proceeds as follows. Section 2.2 presents some of the various definitions the "transaction costs" concept has received in the literature, the sources of these costs, and the efforts that have been made to measure this concept. Section 2.3 describes the proposed methodology in the context of a sample application in Romania. Section 2.4 discusses the size of transaction costs

associated with exchange activities, and also debates on the validity of the proposed methodology. Section 2.5 analyzes the quality of our transaction costs measure by investigating various potential biases that may affect the proposed methodology, both at respondent and at aggregate level. Section 2.6 concludes the chapter.

2.2 Transaction costs: notion and difficulty of measurement

Simply put, the transaction costs paradox is that the wealth of definitions makes the concept less defined: TCE abounds with proposed definitions, the multitude of which leads to an abundance of forms transaction costs are considered to take, and ultimately to a broad and rather fuzzy concept. Consequently, one reason this concept is not consistently measured may reside in the lack of an unitary approach.

Since a review of the transaction costs literature exceeds the goals of this dissertation chapter, we will limit below to only a few definitions and some other aspects related to transaction costs, with a focus on existing measures of the concept. For two extensive expositions on the history, use, and meaning of the term the reader is guided toward Allen (2000) and Klaes (2000).

Arrow (1969, p. 48) referred to transaction costs as to "the costs of running the economic system", while Cheung (1998, p. 515) called them "the costs which do not exist in a Robinson Crusoe economy". The broad "transaction costs" notion covers all those expenses associated with an exchange, which do not directly stem from the physical processes of production or transportation. As mentioned in the introduction, this chapter's main goal is to describe a methodology for measurement

of transaction costs at microeconomic level, hence we will adhere to the slightly more precise definition presented by Masten (1996) and refer to transaction costs as to those costs arising from impediments to reaching and enforcing agreements.

In an attempt to categorize transaction costs, North and Thomas (1973, p. 93) consider them to take three forms: search costs (costs of locating information about opportunities for exchange), costs of negotiating the terms of the exchange, and costs of enforcing the contract. Furubotn and Richter (1997, p. 40) believe transaction costs to include "the costs of defining and measuring resources or claims, the costs of utilizing and enforcing the rights specified, and the costs of information, negotiation, and enforcement". In a similar vein, Masten (1996, p. 6) argues that transaction costs "are associated with such activities as bargaining, contracting, and monitoring performance, activities that are not directly productive but which are engaged in only as a consequence of the need to coordinate activities among transactors."

Regarding transaction costs' sources, Macher and Richman (2006) consider these costs to stem from individuals' limited ability to accurately predict and plan for all the various contingencies that may arise, from parties' difficulty to negotiate and develop a common language to describe situations with which they have little prior experience, and from the obstacles parties face to communicate their plans so that an uninformed party, such as a court, could reasonably enforce them. Referring to work of Oliver E. Williamson (the main contributor to the TCE field) and to other authors, Scott E. Masten states that the existence of transaction costs ca be traced

to two attributes of human nature: bounded rationality and opportunism[4].

Given their broad definition, wide array of forms, and significant impact on the decisions of economic agents, researchers were eager to assess the importance of transaction costs as a share of economy's expenses. Yet, there are few estimates of the size of transaction costs at macroeconomic level. Wallis and North (1986) have estimated that transaction costs accounted for 26.1% of U.S. GDP[5] in 1870, a share which has constantly increased to reach 54.7% in 1970 (the authors also maintain that throughout time an overwhelming proportion of these costs comes from the private sector). Steven N.S. Cheung provides a rough estimate of transaction costs level for 1998 Hong Kong – at least 80% of GDP – and argues that "in the modern world, it would be difficult to find a rich country where transaction costs sum to less than half of national income" Cheung (1998, p. 515).

Despite the importance of the transaction costs notion, empirical studies have long been hindered by lack of micro-level data since economists have found difficult to consistently measure this concept at firm or transaction level. Allen (2000) and Wang (2003) have expressed concern in this respect, while Benham and Benham (2000) have

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[4]Masten (1996, p. 6): "*Bounded rationality* refers to fact that, although individuals intend to act in a rational manner, their ability to realize those intentions is hampered by their limited knowledge, foresight, skill, and time. [...] *Opportunism* refers to the willingness of transactors to renege on promises, cheat on agreements, shirk responsibilities, circumvent rules, search out loopholes, or otherwise exploit the vulnerabilities of a trading partner in hopes of eliciting a more favorable distribution of the rents accruing to exchange."

[5]Wallis and North (1986, p. 121): "The method used to calculate [the transaction costs estimate] is roughly this: For each sector in the national account the number of workers in different occupations and a percentage of transactional work in each occupation is estimated. Then the salaries of these workers have been used to calculate the transactional part of the GDP in each sector. The weighted average of these figures is [the transaction costs estimate]. To illustrate, the following occupations have been deemed to be 100% transactional: accountants, lawyers and judges, personal and labor relations, farm managers, managers, clerical, sales workers, foremen, inspectors, guards, police, military, and postal service. Industries with many non-transactional jobs are: agriculture, mining, construction, manufacturing, and yes even transportation."

presented several reasons why few empirical estimates of transaction costs exist (of which, there are very few comparative estimates). Yet, some breakthroughs have been made in narrow sectors of activity, where researchers have found easier to separate transaction costs from the costs of production and transportation. For instance, Kuperan et al. (1998) have measured transaction costs of fisheries co-management in San Salvador Island, Philippines, Lesmond et al. (1999) have estimated transaction costs on financial markets, while Dietrich (2003) has provided an innovative approach by estimating production functions and relying on specific functional forms to isolate transaction costs from production costs. Unfortunately, such attempts represent exceptions in the field, since many researchers have considered the direct measurement of transaction costs to be an unachievable goal, and have instead relied on the use of proxies. The appropriateness of the chosen proxies has always been subject to debate, a view expressed by many researchers, such as Shelanski and Klein (1995), Chiappori and Salanié (2002), and Masten and Saussier (2002).

In his 1998 Presidential Address to the Western Economic Association, Steven N.S. Cheung has forcefully pushed for a change of attitude in this area of research: "It has been argued that it is fruitless to study transaction costs, because it is frequently impossible to measure them. This view is wrong. Fundamentally, measurement involves an assignment of numbers for the purposes of ranking, and precision in measurement can only be judged by the extent of agreement among different observers. To say that cost is measurable, or measurable precisely, does not necessarily mean it is measurable in dollars and cents. If we are able to say, ceteris paribus,

that a particular type of transaction cost is higher in Situation A than in Situation B, and that different individuals consistently specify the same ranking whenever the two situations are observed, it would follow that transaction costs are measurable, at least at the margin. Testable propositions may then be obtained, and that is the important thing." Cheung (1998, p. 516)

Following the comments above, we propose a new way to measure (part of) transaction costs which arise at agreement level, by relying on a survey question addressed to company officials who supervise the buying and selling activities. The next section presents our proposed survey question.

2.3 A new way to measure transaction costs

Probably chief among difficulties researchers face in their attempt to measure transaction costs is the predominant implicit nature of the concept. That is, many of the transaction costs components are not directly incurred (are hidden) or are incurred along with costs of other activities, and from which cannot be disentangled. For example, costs from missed trade and investments due to lack of confidence in potential partners are real expenses for which records can hardly be kept. On the other hand, search costs for locating potential trading partners or payments for consulting services are explicit costs. However, for those costs incurred at firm level, it is frequently impossible in practice to clearly assess which parts of the expenses relate to which precise transactions. To conclude, even when some transaction costs are explicitly incurred, one's attempt to investigate companies' accounting records to

obtain a transaction costs estimates may prove futile.

Despite their implicit nature, what matters for us is that information on transaction costs is available in the minds of company officials, and it is of prime importance that decision-makers use such information in conducting their business. Then, it seems natural to try and inquire company officials about the size of transaction costs faced in the course of their activity.

Our data are collected by means of a questionnaire. We acknowledge the fact that relying on survey instruments and respondents' memory regarding past transactions will lead to imprecise information. Nonetheless, given the above-mentioned paucity of attempts to measure the concept, we believe that any micro-level, consistent transaction costs estimate obtained for a cross-section of sectors of activity will represent a valuable addition to the sum of knowledge in the field.

Before discussing the actual question soliciting information on transaction costs, let us briefly present some details on the study which incorporated the question. In the middle of 2001, two hundred and fifty-four Romanian companies in country's largest twelve cities were surveyed in an attempt to understand the role of formal legal system in firms' activity. Given the goal of the study, only medium and large companies were included in the sample, but they covered a wide range of sectors of activity and represented various types of ownership structures. Four decision-makers were questioned in separate face-to-face interviews in each company: the company's general manager, the head of the legal department (when the company did not have such a department established, the lawyer most frequently dealing with the company

was questioned instead), and the managers of the sales and procurement departments.

The survey instruments addressed to the last two respondents contain a large section soliciting information on a specific agreement the company has been involved into (once as a seller, and once as a buyer)[6]. This agreement is one the respondent has chosen, which could have been written or oral, successful or unsuccessful, regarding the sale/acquisition of a new or traditional product. Our only constraints on the choice of agreement were that it provided for the exchange to have taken place within the last six months, and that the respondent had to be thoroughly familiar with the agreement and its implementation. Boxes 2.1 and 2.2 displayed at the end of this chapter contain the instructions for sales and procurement managers on how to choose the specific agreement.

The survey instruments addressed to the sales and procurement managers are almost identical, the only difference residing in questions' point of view: while sales managers were asked about companies' activity as sellers, procurement managers were questioned about companies' behavior as buyers. In the first chapter of the dissertation, this crucial feature was called *symmetry between* the two survey instruments. The first chapter has also pointed out another important feature of the questionnaires – the *symmetry within* the survey instruments addressed to the sales and procurement managers. That is, apart from being questioned on particular aspects on their side of the specific agreement, our respondents are asked about similar aspects on their partners' side. As just one example of the two-fold symmetry, sales and procurement

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[6]The section regarding the specific agreement is the largest of the questionnaire and includes sixty-three different questions on various features of this agreement.

managers were asked whether their company has requested the renegotiation of the specific agreement during its implementation. Also, the same respondents were asked whether their partners have asked for renegotiation of the agreement. Following the same approach as in the first chapter, the two features above allow us to construct a larger dataset of agreements. Even though we have interviewed two hundred and fifty-four companies, we have information on both sides of five hundred eight particular agreements these companies have entered into.

"Transaction costs" is not a term of art in the Romanian business world. Therefore, obtaining the pertinent information necessitated a question with wording to which the respondent could relate to, but which would be driven by economic concepts. The compromise entailed a focus on opportunism, which is central in all discussions of transaction costs. The question asks the respondent how much it would have been worth to reverse history and instead have reached an agreement with a non-opportunistic partner. Alternatively, it can be reinterpreted as asking how much the respondent would be willing to pay for what first-best institutions could do.

With slight customizations depending on respondent (see below), the question used to capture the transaction costs information was placed at the end of the section soliciting information on the specific agreement. It is crucial to note that the transaction costs question was asked in the context of a particular agreement, on which the sales and procurement managers had already answered many questions. It was asked only after respondents had recalled many of the details of the specific agreement, to ensure informative focus on problems and successes. Boxes 2.3 and 2.4 displayed at

the end of the chapter show the questions addressed to the two managers, and the conjecture is that if firms do make decisions based on transaction costs, then sales and procurement managers can provide the elicited estimates.

The two questions are highly similar and the only difference resides in their point of view: one is addressed to a seller and one to a buyer. Therefore, for brevity, we will further comment on that addressed to the sales manager (when the company acted as a seller in the specific transaction). Its essence is as follows: what percentage of the sale price would the firm be willing to pay to reverse history and deal with a different customer, an imaginary one, who would have the same characteristics as the actual one, but would be frank, trustworthy, and fair.

It should be noted that negative answers were not allowed. We believe that this restriction guides respondents to only think of their possible reduction of costs when dealing with an ideal partner, and not of the possibility of taking advantage of the desirable qualities of such a partner. This particular aspect of the question will be further discussed later in the chapter.

The survey question we propose obviously causes respondents to focus most closely on the costs of haggling, bargaining, and mis-alignment emphasized especially by Williamson (1985), but also present in agency and contract theories (Holmström, 1999; Salanié, 1997). The reason for posing a question with this focus is that respondents can only be expected to report on activities within their domain of competence. For the sales and procurement managers, this means the costs incurred after commitments had been made to a specific line of production activity and after basic decisions

on investment had been taken. They are the costs incurred as the firm chooses its trading partners, negotiates agreements, and proceeds from agreement to implementation. Since sales and procurement managers would probably not fully appreciate the costs of the investment distortions emphasized in incomplete contract theory, see Grossman and Hart (1986), the information gathered probably does not capture such costs completely.

2.4   The size and correlates of transaction costs

2.4.1   The size of transaction costs

After discussing the question soliciting the transaction costs information, we present below data on the magnitude of the phenomenon, as captured by our survey of Romanian companies.

Figure 2.1 at the end of the chapter displays the relevant information. The transaction costs responses we record are presented by means of three histograms: one for the answers provided by sales managers, one for those provided by procurement managers, and one for the data we obtain from both these sources. The figure indicates that many transactions go smoothly: 127 agreements (50.80%) in which responding firms have acted as sellers are characterized by zero transaction costs, and the figures are higher (164 agreements, representing 65.34%) when the responding firms were buyers in the specific agreement. Overall (when the responding firms were either sellers or buyers in the specific agreement), no transaction costs are incurred

in 291 agreements, representing 58.08% of the sample. Figure 2.1 also shows that transaction costs range from zero to a staggering 60% of the sale price, with many of the positive answers concentrated at the 5 and 10% values.

Table 2.1 at the end of this chapter uses the same data. The second row indicates that the average transaction costs as percentage of sale price, when the mean in computed for all agreements (with either positive or zero transaction costs), is 3.87% when the responding firms were sellers in the specific agreement, 3.11% when they were buyers, and 3.49% overall. Obviously, these means are higher when computed for only those agreements with positive transaction costs – the third row of Table 2.1 presents the relevant figures.

Are these figures suggestive of the true significance of transaction costs for Romanian companies? To appreciate the magnitude of these costs more fully, they must be placed in the context of the firm's operations as a whole. Firms incur costs as both a buyer and a seller in a transaction: the two should be aggregated. Then, assuming that transaction costs of purchasing labor and capital are commensurate with those incurred in purchasing intermediate inputs, and that profit is a negligible component of the value added, the transaction costs of a typical firm equal 6.98% of revenues. Moreover, comparing costs to prices is not the best guide to economic significance, even though it is the most useful approach for a survey question. The firm's production is best measured by value added, and transaction costs are incurred in producing this. A reasonable estimate would place value added at 30% of sales[7].

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[7]In Romania, firms are guarded on financial issues and are anxious to hide information pertinent to taxes (the value added tax has a rate of 19%). Survey information on the value added to sales

We need to multiply the previous results by a factor of 3.33. This way we obtain that the mean transaction costs (when we consider all agreements, with positive or zero reported transaction costs) as a share of firm's output are 12.90% for sellers and 10.37% for buyers, totaling an impressive 23.27% for the company as a whole.

Some points need to be considered. First, the figures above are mere estimates, and rest on some precise assumptions to provide a realistic image of the investigated phenomenon. If we alter one of those assumptions and consider the ideal situation of zero transaction costs in purchasing labor and capital (while using the same estimate of value added, 30% of sales), computations indicate that transaction costs equal 6.05% of revenues, or 20.16% of value added. These lower bounds are themselves a good indicator on the importance of transaction costs at firm level. Second, one should recall that we have restricted attention to the costs of haggling, bargaining, and mis-alignment, which are only part of the transaction costs incurred in agreements between firms. Third, we have to keep in mind that transaction costs may also be present within firms, as integration reduces but may not completely eliminate this problem (Gibbons, 2005, p. 220). Given all these, we must conclude that Romanian enterprises do face large transaction costs in the course of their activity.

2.4.2 The correlates of transaction costs

After presenting the impressive size of transaction costs in basic exchange agreements, the next step is to show that the question soliciting the transaction costs infor-

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ratio was unreliable. Value added as a percentage of sales in the 800 largest UK companies is 30.1% and 32.8% in the 600 largest European companies (Department of Trade and Indsutry, 2004).

mation is in fact capturing the sought concept. Validity can be indirectly assessed by examining whether our transaction costs measure correlates with variables suggested by the theoretical literature. If there is a number of such correlations that are statistically significant, then this suggests that the estimates represent something very real. Nevertheless, one should not expect significant correlations with all variables suggested by theory as some theories might not be applicable in Romania or might even be incorrect.

The questionnaires elicit information on characteristics of the firm and specific agreement, and twenty-three of these features are chosen for analysis in the present context. The use of some simply follows common suppositions (for example, larger firms are different from smaller ones). Some reflect the peculiar history of Romania and transition (for example, firms founded after 1989 behave differently from the firms inherited from communism). But most are based on standard predictions from commonly accepted economic theories (for example, agreements are easier to construct for the sale of standardized products rather than for goods subject to quality variation, the size of transaction costs correlates with market uncertainty and with the frequency partners transact).

For each characteristic separately, the sample of agreements was divided into two groups, one with the characteristic and one without. Then the difference between the transaction costs means of the two sub-samples was examined. Some details are worth noting. First, since some variables were categorical and some continuous, this uniform procedure allowed symmetrical treatment of all variables. The second note

is related to the way we use our data, and is particularly useful to remember that we investigate two agreements from each surveyed company. When our sample of agreements is split into two groups (one with and one without a certain characteristic), it is possible that one agreement the firm has entered into has the characteristic (hence belongs to one group), while the other agreement does not have it (hence belongs to the other group). Then, the statistical tests need to take into account the fact that errors might be correlated across the two agreements of one firm.

Table 2.2 at the end of the chapter presents the basic results. They are not intended to portray particular causal mechanisms, but rather correlations between variables that would naturally occur under some theory about the process that generates transaction costs. Results indicate that higher transaction costs occur in newer firms, when exogenous uncertainty is a very important factor, when exchanges occur less frequently, and when the transacted good is more complex. Table 2.2 also indicates that lower transaction costs characterize those agreements in which larger companies are involved.

In addition, transaction costs are related to firms' decisions to cease old activities or start new ones. Namely, lower transaction costs are reported when one of the firms has abandoned some operations in the last two years (since those activities were probably generating such costs), and higher transaction costs are observed when one of the firms has recently invested in building or equipment (since these investments are probably associated with new activities and the firm may lack the experience in conducting such new operations). Whether one of the firms in the specific agreement

has state origins seems to have a limited impact on reported transaction costs.

Regarding firms' ownership structure, despite their low statistical significance, results in Table 2.2 tend to indicate that state ownership is associated with lower transaction costs, while employees ownership is associated with higher levels of such costs. Last but not least, when distinction between buyers and sellers is made, results seem to confirm the first chapter's findings, which argue that sellers are more exposed to buyers' opportunism. For example, the mean transaction costs is significantly higher when the seller makes a relationship-specific investment than when the seller does not undertake such an investment, which is not the case for buyers.

To conclude, there are no contradictory findings: the direction of the relationship between our transaction costs measure and the characteristics does align with standard assumptions. Also, eight of the twenty-three test statistics are significant at the 10% level (of these, five are significant at the 5% level). Therefore, in sum, Table 2.2 presents a strong case that the empirical measure corresponds to what scholars have in mind when using the "transaction costs" concept to understand the nature of contract and firm behavior.

2.5 The quality of our transaction costs measure

In this section we investigate biases that may affect our transaction costs measure, and which may be encountered at two different levels:

- *respondent level bias* – arises if the interviewed managers have understood and answered our question in a manner different from our intentions. If so, then

some respondents' answers may constitute under-estimates, while others may be over-estimates of the true level of transaction costs. Even though these potential biases may cancel out at aggregate level, an unbiased transaction costs measure at respondent level would be ideal since it could be further used in agreement-level regressions.

- *aggregate level bias* – the overall picture we get on transaction costs may be different from reality even if our respondents have provided accurate estimates of the concept. Mainly, our data may be ridden by a sample selection bias given the non-random way investigated agreements have entered our sample. Apart from this, other sources of aggregate level bias will be discussed below.

2.5.1 Potential biases at respondent level

We begin by commenting the possibility of bias at respondent level, that is, the situation in which the interviewed managers have understood our question differently from our intentions, and consequently have provided under- or over-estimates of the transaction costs actually incurred in the specific agreement. This discussion requires us to present an additional theoretical argument regarding transaction costs.

Section 2.2 has tried to shed some light on the various definitions the "transaction costs" concept has received in the literature. Despite the impressive number of definitions, it is commonly agreed that transaction costs arise because of individuals' bounded rationality and opportunism. The latter refers to any misbehavior that appears in the course of a transaction when partners lack outside options, is triggered by

the existence of appropriable quasi-rents, and frequently takes the form of hold-up[8].

In general, one partner's opportunism is considered to lead to the renegotiation of the agreement. There is a multitude of new terms the opportunistic partner may impose on the exposed one, ranging from better trading conditions to in-kind or monetary transfers. For simplicity, we'll use the term "transfer" to denote any kind of amenity the opportunistic partner may obtain. According to theory, the distortions these transfers may lead to, and the negotiation costs incurred to reach the settlement, are included in the "transaction costs" concept, but the transfers themselves are not (one reason for this is that transfers are not in fact costs to society but can be seen as monetary amounts exchanged between trading partners, whose sum at aggregate level is zero).

The fine distinction between transfers and transaction costs is what may cause our measure of the latter to be biased: respondents who were held-up may include transfers *to* their opportunistic partners, hence biasing the transaction costs response upward, while opportunistic respondents may provide downward biased estimates by including transfers *from* their partners.

2.5.1.1   A potential upward bias at respondent level

We now discuss the possibility that our respondents have provided transaction costs estimates which are upward biased relative to the true level, by including the

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[8]Rogerson (1992) defines hold-up as the ex post request for renegotiation of an incomplete contract when assets are specific. Hold-up is the commonly discussed form of opportunism, but is only one of the many opportunistic measures a transacting partner may adopt – see Masten (1996) for other.

transfers they may have made to their opportunistic partners into the transaction costs response. We will discuss below two possible scenarios:

First scenario

For clarity, in what follows we'll continue to comment on the case of our responding firm acting as the seller in the agreement (the other situation is similar).

The transaction costs question, as presented in Box 2.3 at the end of the chapter, asks respondents to think back to the time *"before your enterprise began negotiating this specific agreement"*. Those who closely follow this instruction should have in mind what they have thought of the agreement and their partners at that initial time, regardless whether those expectations proved to be accurate or not during agreement's implementation. The following equality should then be in place for such respondents:

$$Expected\ per\ unit\ profit = X_1 - Y_1 - Z_1,$$

where X_1 denotes the expected agreement price (reflects seller's expectations on what the sale price will end up being after initial negotiations with its partner), Y_1 represents the expected per unit production costs (reflects seller's initial expectations on the usual production costs associated with the transacted good), and Z_1 denotes the expected per unit transaction costs (reflects seller's expectations on those costs incurred because of any undesirable features the buyer may be assumed to have).

In this setup, (expected) transfers do not appear as a distinct element in the equality. This rests on the assumption that, at the initial stage of the agreement, when forming its expectation about the agreement price, the respondent takes into

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account the potential troubles to reach that price. Those troubles translate into transaction costs and transfers. While transaction costs are captured by Z_1, transfers are encapsulated into X_1 (which does not represent the price the seller initially asks for, but rather his expectation on what the agreement price will end up being, thus including the foreseen transfers).

Having in mind the initial stage, respondents should then consider they could have faced another customer, who had the same features as those expected from the actual partner, only that the imaginary one would be frank, trustworthy, and fair. These three features may differ from what was expected from the actual partner, but are not likely to impact on Y_1 (expected per unit production costs remain the same for the imaginary and actual partner). However, since these features could lower Z_1 (expected per unit transaction costs), a lower price may be adopted without affecting the expected per unit profit. This is exactly what our question tries to measure and, under this scenario, our question is likely to accurately capture the expected transaction costs. As we will see below, some respondents may have thought of a different situation.

Second scenario

The second part of the question, especially the use of words *profiting* (without a direct mentioning of expected profit) and of syntagm *"the actual one used"* when referring to price, may have induced respondents to think of the situation at the end of agreement (at which stage the actual price used in transaction and the realized profit are known).

We have to consider this scenario since this is the latest information available to our respondents, so they may consider it when answering our question. Moreover, the tendency of our respondents was to choose specific agreements which have been completed: for 94.69% of agreements sellers have delivered the goods and buyers have paid in full by the time of the interview.

If this is the case, then transfers may have been included in our respondents' answers given that at the end of the agreement the following equality is in place:

$$Realized\ per\ unit\ profit = (X_2 - T) - Y_2 - Z_2,$$

where X_2 denotes the price agreed upon at the beginning of transaction, T represents potential unexpected transfers to the transacting partner, Y_2 denotes the realized per unit production costs, and Z_2 represents the realized per unit transaction costs. Hence, whereas X_1, Y_1, and Z_1 denote the expectations at the beginning of the agreement regarding the per unit agreed price, production costs, and transaction costs, X_2, Y_2, and Z_2 denote the realized values.

We continue to assume that per unit production costs (Y_2) are not affected by those three undesirable features the partner may possess. If the partner (the buyer, in the investigated situation) behaves opportunistically in the agreement, exceeding seller's predictions, then not only $Z_2 > Z_1$, but also the term T appears, lowering the agreed upon price. In this situation, the actual price used in the transaction is $X_2 - T$, and the realized per unit profit is lower than the expected one. This is where the

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fine distinction between transaction costs and transfers becomes important. When respondents have in mind the change in the actual price which would keep the realized per unit profit at the same level they may include both Z_2 and T in their answers. This would lead to an upward bias in the transaction costs responses provided by such respondents.

The question presented in Box 2.3 is surely the most elaborated in the survey instrument, and yet not as detailed as it should have been in order to avoid any possible confusion[9]. Still, the reader has to bear in mind that this question is just one of the approximately one hundred questions included in each survey instruments. Since these exhaustive questionnaires were addressed to the managers of sales and procurement departments, they had to be kept as short as possible.

Given that the second scenario is plausible, we need to take into account and analyze the possibility that our transaction costs estimate are biased upward.

Empirical investigations of the second scenario

As mentioned above, biases may arise only by inclusion of transfers into respondents' transaction costs estimates. But transfers are made only following partner's opportunistic behavior, and the most commonly discussed form of opportunism is hold-up, which entails a request to change the terms of the initial agreement (a renegotiation). The question below has been addressed to the sales and procurement department managers:

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[9]A comprehensive question soliciting transaction costs information, which, on the one hand, explains that transfers are not part of transaction costs, and which, on the other hand, makes a clear distinction between close notions such as initially expected and realized profits, and expected, initial, and actual price, can be constructed, but it would take the form of a questionnaire by itself.

Did your partner ask for the specific agreement to be

renegotiated during implementation?   Yes/No

Ninety-three managers (18.31% of the sample) have answered "Yes" to the question above, and within these responses the transaction costs estimate was zero for forty-five agreements[10]. Since four other observations have a missing value reported for transaction costs, the remaining forty-four observations represent agreements in which the partner has asked for renegotiations and the firm has incurred positive transaction costs. These are the only observations susceptible of being biased (we are confident that the other observations in our sample contain an unbiased transaction costs measure).

The average transaction costs percentage for the group of forty-four agreements mentioned above is 9.74%, while the average percentage for those agreements in which the partner has not asked for renegotiations and yet positive transaction costs were incurred (one hundred sixty-five observations) is 7.93%. The comparison between these two groups is the most relevant given our interest in the effect of the renegotiation request on positive transaction costs[11]. The t-test on the equality of the two means, which uses standard errors adjusted for intra-group correlations (since agreements corresponding to the same firm may be similar), shows that the null hypothesis of equal means cannot be be rejected for the usual confidence levels (p-value = 0.254).

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[10]This may happen for at least two reasons. First, firms may sometimes find costless detterents of hold-up (a well-designed contract may be such a tool, which implies higher costs when drafted, but which may reduce costs thereafter). Second, it may be that some of the renegotiation requests do not have an opportunistic nature, but are made in order to improve the transaction.

[11]We do not compare the group of forty-four agreements with the rest of the whole sample as the latter would include many zero responses and would lead to spurious conclusions.

The relative low difference between the means in the two groups and the statistic the test returns are both indicators that our transaction costs measure is not ridden by the investigated upward bias. In fact, a higher transaction costs mean for the group of forty-four agreements should have been expected since a request for renegotiation is likely to lead to additional costs due to possible negotiations, unrevealed information, and broken promises.

Another pair of questions in our survey helps us continue this investigation. Sales and procurement managers were asked to evaluate the overall success of the specific agreement on a scale from 0 to 10, where 0 represents a very unsatisfactory transaction and 10 a very satisfactory one. Our conjecture is that those agreements characterized as very successful did not probably involve opportunistic partners or, in case they did, our respondents have found effective tools against this behavior, hence a transfer was not needed. A dummy variable is constructed to equal one for very successful transactions, evaluated at 9 or 10 on the satisfaction scale, zero otherwise (58% of our two hundred nine observations representing agreements with positive transaction costs were deemed very successful).

This newly constructed dummy variable will be used together with that indicating whether respondents' partners have asked for agreement renegotiation during its implementation. Table 2.3 at the end of this dissertation chapter displays the transaction costs mean for those agreements characterized by positive transaction costs, splitting them by the two dummy variables.

Making use of the cell labels in Table 2.3, the difference between A and B is likely

to represent only additional transaction costs incurred because of the renegotiation request, while the difference between C and D is likely to include both additional transaction costs and potential transfers. Then, the difference of differences $(C - D) - (A - B) = 0.38$ would provide an estimate of those transfers that may be biasing upward our transaction costs estimate. The difference-in-difference regression of the transaction costs variable on the two dummies and their interaction returns a p-value $= 0.905$ for this estimated coefficient, making it non-significantly different from zero. Moreover, the 0.38 value may in fact be an over-estimate of the level of transfers. An implicit assumption made in the above computation is that the additional transaction costs arising from the renegotiation request are the same for all agreements (both the very successful and the rest). In fact, the transaction costs component of the difference $C - D$ may be larger than that of $A - B$ (answering 9 or 10 on the satisfaction scale may imply that partners have found efficient ways keep the transaction costs at a low level, but also to limit their evolution). Therefore, apart from the potential transfer, the difference of differences $(C - D) - (A - B)$ may also include a transaction costs component, which would make 0.38 an over-estimate of transfers' level.

The combined evidence above shows that respondents have not included transfers in their estimates of transaction costs, hence our measure of the concept is not biased upward at respondent level. We will now proceed and investigate a potential downward bias which may affect our transaction costs measure.

2.5.1.2   A potential downward bias at respondent level

If a person answering our transaction costs question thinks he could have actually benefited from the desirable features of the imaginary partner, then the answer provided may be below the true transaction costs value. Several arguments should persuade the reader that this is not in fact a plausible scenario.

First of all, it is unlikely that respondents would easily admit on behaving opportunistically if possibility would arise (we believe that such information would be hard to extract by a single question from respondents such as ours).

Second, the survey question soliciting the transaction costs information instructs the respondent to provide an estimate between zero and 100%, hence negative responses were ruled out. We do not believe that this constraint leads to a data censoring problem (that respondents who would otherwise have provided a negative answer have, for example, returned a zero).

Related to the one above, the third argument is that placing this restriction on the acceptable answers, combined with the precise wording of the question, encourages respondents to think of the potential reduction in costs, and not of the possible increase in benefits from trading with a frank, trustworthy and fair partner. This is because the features the imaginary partner possesses do not necessarily expose him to respondent's opportunistic behavior. Namely, the imaginary partner being willing to share all relevant business information does not mean he would share all information so as to become vulnerable. Then, the imaginary partner making it a priority to keep all promises does not immediately imply he would accept our respondent not keeping

his promises. In connection to this point, it is assumed that promises in a contract are contingent (a partner breaking his part of the deal should not expect the other partner to keep his promises any longer). Lastly, the imaginary partner negotiating equitably to solve any problems does not mean he would accept any terms, nor that he can be easily deceived by its partner (represented by our respondent).

An empirical investigation is also possible. Sales and procurement managers in our survey were asked whether their firm has demanded renegotiation of the specific agreement – same as before, transfers are used in case of opportunistic behavior, and we view a request for renegotiations as a necessary condition for such behavior. In our sample, 20.16% of interviewed firms have asked for agreement renegotiation and the mean transaction costs as percentage of price for these agreements is 3.42, while for the rest of the sample (79.84%) the mean is 3.50. Not surprisingly, these means are not significantly different from one another (the probability level using standard errors calculated under the assumption that agreements entered into by the same firm have correlated errors is 0.903). Hence, data seem to support our belief that the answers we record for each respondent are not biased downward relative to the true transaction costs level.

2.5.2 Potential biases at aggregate level

The next step we take in analyzing the quality of our transaction costs measure is to investigate whether it suffers from biases at aggregate level.

Despite the fact that, as shown above, our respondents have provided accurate

estimates of the incurred transaction costs, the overall picture of the phenomenon may be distorted. This may be caused by the fact that the specific agreements we observe have not entered our sample in a random way, hence it is possible that our data is ridden by a selectivity bias.

For obvious practical considerations, our sample contains those agreements respondents have chosen to discuss, which are not randomly drawn from the whole population of agreements the responding firms have entered into. Rather, the survey instruments have asked procurement and sales managers to choose one specific agreement and relate to it when answering the questions in survey's main section. The exact instructions communicated to our respondents, displayed in Boxes 2.1 and 2.2 at the end of the chapter, suggest that the choice of specific agreement should not depend on its success or failure. However, it is possible that our respondents had in mind particularly better or worse agreements and, if so, even though they have each provided accurate estimates of transaction costs, our aggregate view on the concept may be under- or over-estimated.

After choosing the specific agreement, one of the first questions addressed to sales and procurement managers is to compare the size of the chosen transaction to other transactions the enterprise typically undertakes. Responses indicate that specific agreements tend to have particular features (for instance, 40.55% are larger than the typical ones). What matters for us the most is whether the specific agreements posess particular features in what concerns transaction costs, and the way our questionnaires are structured permits investigation of this potential problem.

The survey section focusing on the specific agreement is preceded by a set of questions which extract information on all firm's operations. Some questions in these two sections are similar. For example, in connection to their activity and transactions in general, the sales and procurement managers were each asked:

After finalizing contracts with your partners, what percentage of them

ask to renegotiate those contracts during the period of implementation

(regarding any issues, major or minor)?   ____% of all contracts

and

After finalizing contracts with your partners, with what percentage of them does

your enterprise ask for contract renegotiation during the implementation period

(regarding any issues, major or minor)?   ____% of all contracts

These two questions are similar to those presented in Subsections 2.5.1.1 and 2.5.1.2, which ask whether the firm or the partner have requested renegotiations of the specific agreement. We will use these two pairs of questions in two ways. First, they will help us assess whether the responding firm or its partner have asked for agreement renegotiation during its implementation. Then, given that both pairs of questions have been addressed to both interviewed managers (once the firm has acted as a buyer and once as a seller), they will help us assess whether the buyer or the seller in the agreement has asked for its renegotiation. Apart from these, three other pairs of questions target both the specific agreement and all firm's agreements. One such pair asks about buyers' prepayments, one about the complaints of the responding

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companies to their partners, and one captures information about past transactions between the two partners.

Using similar information about the specific agreement and all firm's agreements will help determine whether the former have particular features in what concerns transaction costs. This is accomplished by constructing a predicted transaction costs mean over all firm's agreements and comparing it with the transaction costs mean over specific agreements. Table 2.4 shown at the end of the chapter contains the relevant information, and an example of the analysis it contains is presented below.

Let us consider partner's request for renegotiations. We observe that in 18.34% of the specific agreements the partner has asked for renegotiation, while this happened in 11.42% of all agreements the investigated companies have entered into, hence the chosen specific agreements tend to have some different features from the rest. As pointed above, what matters for us is whether these different features affect our transaction costs measure. We proceed and compute several transaction costs means (as percentage of sale price): for those specific agreements in which partners have asked for renegotiation the mean is 4.81, for those in which they have not done so it is 3.18, and for the whole sample of specific agreements it is 3.48. Then, we can compute the predicted transaction costs mean for all firms' agreements. The prediction uses the proportion of all agreements firms have entered into and in which partners have asked for renegotiations (11.42%) and applies it to the mean transaction costs for specific agreements with (4.81) and without (3.18) such a partner request. Computations $(0.1142 \cdot 4.81 + (1 - 0.1142) \cdot 3.18)$ lead to a predicted transaction costs

mean for all firm's agreements of 3.37, which is very close to the mean over specific agreements (3.48).

Based on the information presented in Table 2.4 it seems that the specific agreements constituting our sample have slightly different features from the rest of firms' agreements. In particular, except for the last two rows of Table 2.4, which have a different meaning, percentages in columns (b) and (d) tend to indicate that the chosen specific agreements are somewhat more problematic than the usual agreements firms enter into. As a result, the mean transaction costs for the sample of specific agreements – column (h) – tends to be slightly higher than that predicted for all agreements firms have entered into – column (i). Nonetheless, we don't consider these differences to be notable and conclude that, if present, the sampling bias is a relatively small one.

Another source of distortion at aggregate level is some type of sample truncation given that we do not observe agreements which never took place. That is, we do not observe any characteristics, including the level of transaction costs, for those potential exchanges for which the expected transaction costs exceed a certain threshold, and so were deemed to be too risky to be pursued further[12]. Ideally, the survey should have asked managers to choose an agreement their enterprise was or could have been part of (but was not due to high levels of expected transaction costs). Then, the same information on the real and potential/missed agreements should have been extracted.

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[12]In the present context it does not matter whether the alternative to an exchange characterized by too high transaction costs is an exchange with another partner, thus acceptance of lower profit combined with avoidance of the high transaction costs, or integration (unification of control rights), thus continued pursuit of the high profit, combined with reduction of transaction costs.

Unfortunately, the futility of such an attempt was obvious when designing the survey instruments[13] and led to our respondents being asked to pick one agreement their company has actually been part of.

Whether this issue leads to a distortion or not depends on researcher's goal. If one is interested in the level of transaction costs actually incurred by Romanian companies, the point presented above does not necessarily lead to our measure being biased at aggregate level compared to the true value. If instead the researcher wishes to investigate the size of transaction costs companies are exposed to and based on which decisions are taken, then the overall picture we have on transaction costs is actually an under-estimate of the true one (even though individual respondents have each provided accurate estimates). What is unfortunate in this case is that we cannot measure or counteract in any way this possible bias – in particular, we cannot make any claim on whether this downward bias outweighs the small upward sampling bias presented previously.

2.6   Conclusions

The burgeoning interest in institutions inevitably leads to a need to measure phenomena that are much more elusive than the standard financial, demographic, and policy measures that underpin most of empirical economics. Those who have been in the forefront of developing new measurement methods freely acknowledge the amount of error that must be present (Kaufmann, 2002). Thus, it is not appropriate to

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[13]As an entertaining exercise, the reader can try to rephrase the transaction costs question in terms of an agreement which never took place.

demand from a new methodology that it produces data as accurate as that of standard measures, but rather that it bears on an important as-yet-unmeasured theoretical concept, that it is eminently practical, and that resultant data avoid the worst biases.

This dissertation chapter has presented a methodology for measuring transaction costs that succeeds on all three fronts. Our data has been shown to be free of investigated biases, both at respondent and aggregate level, hence we believe it can safely be used in regressions along with other transaction- and firm-level data. However, we present below two solutions for those readers who may still feel skeptical about the arguments presented when discussing the potential upward bias at respondent level.

One approach could be to implement a slightly changed version of our question. The researcher may choose to construct a question similar to those displayed in Boxes 2.3 and 2.4, but more extensively worded so that to remove altogether the second scenario we have mentioned in Subsection 2.5.1.1. Alternatively, very precise additional questions could be included, to help the researcher assess whether respondents think of the initial stages of the agreement or the final one, and, if the latter, whether they have included transfers in their answers.

Another approach could be to re-code the collected data. A dummy variable equal to one when positive transaction costs are reported and zero otherwise may be used instead of the continuous variable we record. This approach leads to a loss of information but completely removes the possibility of an upward bias (when a transfer to partner takes place, transaction costs are surely positive since that transfer

is likely to follow a break of a promise, some hidden information, and probably some renegotiations).

To conclude, the methodology is speculative and refinements can undoubtedly be made. But there seems to be no reason why improved versions of this methodology cannot be used to obtain accurate measures of the transaction costs of trade that facilitate the comparison of firm behavior across sectors, regions, and countries.

Box 2.1: Instructions for sales managers on how to choose the specific agreement

Please choose one specific sales agreement entered into by your enterprise with one of your customers. In choosing an agreement, please consider the following:

- You must be thoroughly familiar with the agreement and its implementation.

- The agreement, as originally made, provided for sale in the past six months.

- Feel free to choose either a successful or an unsuccessful agreement; either one in which you and the customer fulfilled your obligations to each other satisfactorily or one where problems in implementing the agreement were present.

- The agreement may relate to efforts (either successful or unsuccessful) to sell a new product, or to the sale of traditional products of your company.

Box 2.2: Instructions for procurement managers on how to choose the specific agreement

Please choose one specific agreement entered into by your enterprise for the procurement of good or service from a specific supplier. In choosing an agreement please consider the following:

- You must be thoroughly familiar with the agreement and its implementation.

- The agreement concerns the purchase of a good or service.

- The good or service is important to your enterprise, but it is not an energy input.

- The agreement, as originally made, provided for delivery in the past six months.

- Feel free to choose either a successful or an unsuccessful agreement; either one in which you and the supplier fulfilled your obligations to each other satisfactorily or one where problems in implementing the agreement were present.

Box 2.3: The transaction costs question addressed to the sales manager

The next question is the last question on this specific agreement, but we ask you to make a very difficult estimation. But a very rough estimate of the information that we seek will greatly help our understanding of the market environment in Romania. Please study the information in the question carefully, reflect on the agreement you have just described, and then answer as best you can. We know that your answer will be a very approximate one.

Think back to the situation before your enterprise began negotiating this specific agreement. Suppose at that time you could have identified a different customer, an imaginary one, who had the same characteristics as the one with whom you made the agreement, except that the imaginary customer:

- would be willing to share all relevant business information with you;

- would make it a priority to keep all promises, written or oral;

- would negotiate equitably to solve any problems that arose during implementation of the agreement.

Your enterprise might have been able to offer to the imaginary customer a lower price than the actual one used, while still profiting as much.

How large a price discount (in percentage terms) could this have been? ___%

In forming your estimate, please consider the following:
A 0% discount means that the customer with whom you actually traded was the equivalent of the imaginary customer.
A 100% price discount means that agreement effectively resulted in your enterprise giving away the product.

Box 2.4: The transaction costs question addressed to the procurement manager

The next question is the last question on this specific agreement, but we ask you to make a very difficult estimation. But a very rough estimate of the information that we seek will greatly help our understanding of the market environment in Romania. Please study the information in the question carefully, reflect on the agreement you have just described, and then answer as best you can. We know that your answer will be a very approximate one.

Think back to the situation before your enterprise began negotiating this specific agreement. Suppose at that time you could have identified a different supplier, an imaginary one, who had the same characteristics as the one with whom you made the agreement, except that the imaginary supplier:

- would be willing to share all relevant business information with you;

- would make it a priority to keep all promises, written or oral;

- would negotiate equitably to solve any problems that arose during implementation of the agreement.

Your enterprise might have been able to offer to the imaginary supplier a higher price than the actual one used, while still profiting as much.

How large a price increase (in percentage terms) could this have been? ___%

In forming your estimate, please consider the following:
A 0% price increase means that the supplier with whom you actually traded was the equivalent of the imaginary supplier. A 100% price increase means that it would be worthwhile for your enterprise to pay double the price to avoid the transacting problems presented to you by the supplier who was in the specific agreement.
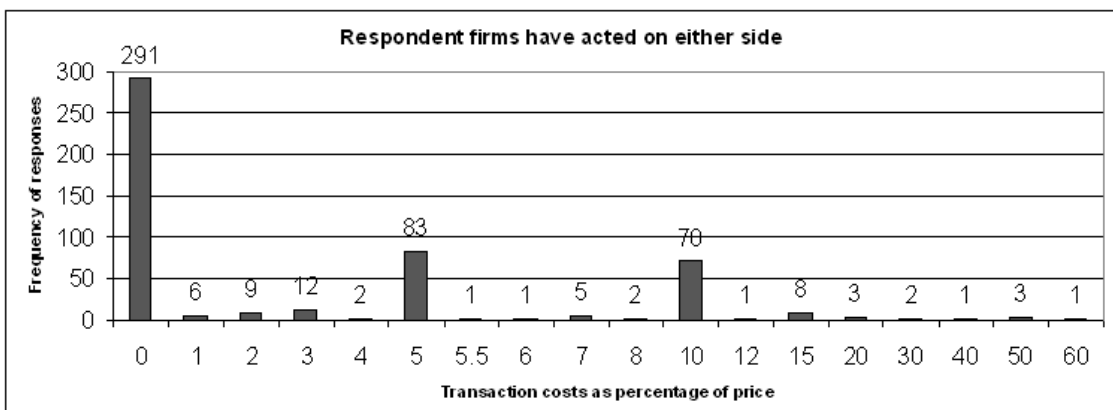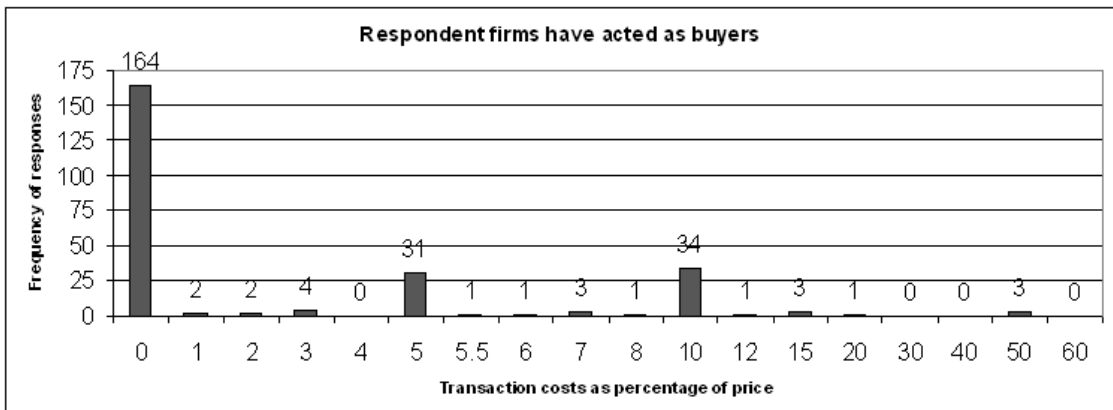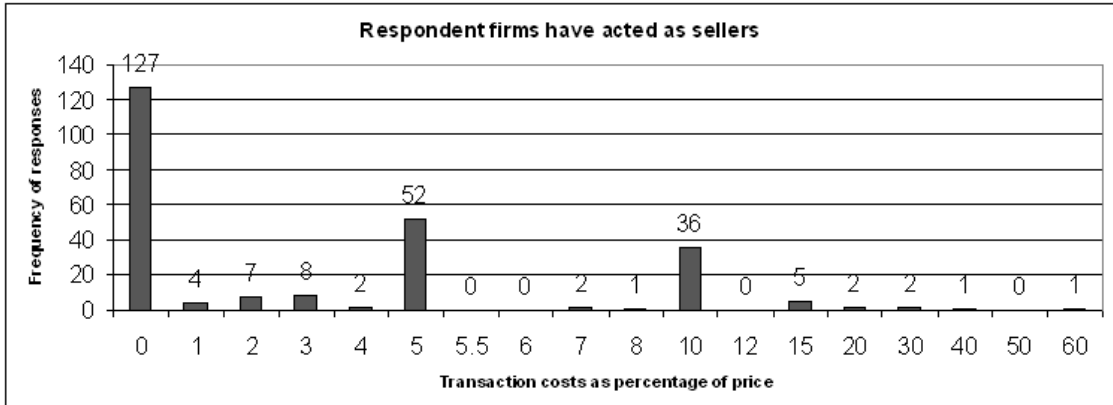
Figure 2.1: The distributions of the transaction costs responses

Table 2.1: The size of transaction costs

	Respondent firms have acted as sellers	Respondent firms have acted as buyers	Respondent firms have acted on either side
Percentage of agreements in which positive transaction costs were reported	49.20	34.66	41.92
Mean transaction costs as percentage of sale price (mean over all respondents)	3.87	3.11	3.49
Mean transaction costs as percentage of sale price (mean over all respondents reporting positive transaction costs)	7.86	8.97	8.32
Mean transaction costs as a percentage of value added (mean over all respondents)	12.90	10.37	11.63
Mean transaction costs as a percentage of value added (mean over all respondents reporting positive transaction costs)	26.20	29.90	27.73
Number of observations in each group	250	251	501

Table 2.2: The correlates of transaction costs

Characteristic of the agreement or firm:	Number of agreements with or without characteristic		Mean transaction costs for agreements with or without characteristic		Probability level for two-sided test of difference between means
	with	without	with	without	
One of the firms has more than 250 employees	156	350	2.679	3.829	0.058
One of the firms has been founded after 1989	240	264	4.072	2.955	0.071
One of the firms has some state origins	316	192	3.200	3.963	0.247
State owns shares in one of the firms	86	422	2.982	3.591	0.379
State owns the majority of shares in one of the firms	76	432	2.967	3.580	0.407
Employees own the majority of shares in one of the firms	226	282	3.768	3.262	0.420
One of the firms has recently invested in building or equipment	452	56	3.709	1.732	0.000
One of the firms has recently ceased some operations	102	406	2.683	3.691	0.054
Written contracts cover all important elements of the agreement	402	106	3.482	3.506	0.971
The seller has made a specific investment in the agreement	129	374	4.781	3.064	0.025
The buyer has made a specific investment in the agreement	59	447	3.672	3.452	0.843
The seller could not easily find another buyer in case of default	234	258	3.824	3.243	0.346
The buyer could not easily find another seller in case of default	207	289	3.578	3.500	0.901
It takes more than a quick inspection to ascertain good's quality	256	250	4.097	2.871	0.037
Quality defects are observable only by knowledgeable third-party	341	164	3.734	2.997	0.202
Exogenous uncertainty is very important	118	388	4.655	3.152	0.040
The agreement is part of a longer-term one (multiple exchanges)	358	149	3.369	3.792	0.521
Delivery of the good takes place at least four times a month	96	243	2.176	4.050	0.002
The seller has asked for agreement renegotiation	104	403	3.575	3.450	0.841
The buyer has asked for agreement renegotiation	91	411	4.653	3.231	0.129
The agreement has been renegotiated	111	395	4.299	3.259	0.189
The agreement is the first one between the two partners	150	358	3.907	3.309	0.371
The two partners are located in the same region	204	302	3.375	3.587	0.724

Probability levels use standard errors calculated under the assumption that observations on the same firm have correlated errors.

Table 2.3: Transaction costs information based on renegotiation requests and success of agreements

		Has the partner requested renegotiations of the agreement?					
		Yes			No		
Was the transaction	Yes	8.75	(20)	A	7.38	(101)	B
a very successful one?	No	10.56	(24)	C	8.81	(64)	D

Each cell of the table contains the transaction costs mean over the agreements satisfying the two criteria, the frequency of responses in each category (in parentheses), and a label.

Table 2.4: Investigation of biases at aggregate level

Characteristic of agreement:	Percentage of *specific agreements* with or without characteristic		Percentage of *all firms'* agreements with or without characteristic		Transaction costs as a percentage of price			
					Mean over *specific agreements* with or without characteristic		Mean over *specific agreements*	Predicted mean over *all firms'* agreements using (d), (e), (f), and (g)
	with	without	with	without	with	without		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
Partner has asked for agreement renegotiation	18.34	81.66	11.42	88.58	4.81	3.18	3.48	3.37
Firm has asked for agreement renegotiation	20.16	79.84	9.76	90.24	3.42	3.50	3.48	3.49
Buyer has asked for agreement renegotiation	17.98	82.02	10.02	89.98	4.65	3.23	3.48	3.37
Seller has asked for agreement renegotiation	20.51	79.49	11.16	88.84	3.58	3.45	3.48	3.46
Firm has complained to the partner	31.10	68.90	13.18	86.82	3.92	3.29	3.49	3.37
Buyer has made a partial prepayment	38.78	61.22	20.75	79.25	4.48	2.87	3.49	3.20
Partners have traded for at least two years	66.80	33.20	66.41	33.59	3.41	3.65	3.49	3.49

The values on column (h) vary slightly by row due to varying samples caused by missing observations on characteristic in column (a).

Chapter 3

An Analysis of the Factors Determining the Genesis and Size of

Transaction Costs

Abstract

This chapter of the dissertation investigates the determinants of transaction costs. To accomplish this task, various factors proposed by the transaction cost economics theory are gathered. This first step sheds light on the scarcity of existing empirical work using transaction costs information at agreement level. A survey of Romanian companies is employed. It contains the question which was proposed in the second chapter, and which collects the transaction costs information expressed as percentage of sale price. The data thus gathered is limited, in the sense that more than half of agreements are characterized by zero transaction costs, while the positive answers provided reach as high as sixty percent of the sale price. Since ordinary least squares on the whole sample is not advisable, we first employ the model commonly used for this type of data – Tobit. The sample selection model is found to be more appropriate. However, combined evidence indicate that sample selection bias would not affect the estimates obtained by distinct regressions: an ordinary least squares regression using the positive transaction costs responses, and a probit regression using a transaction costs dummy variable. These distinct regressions provide the main results of this

chapter. They indicate that the existing theory is successful at predicting both the existence and the size of transaction costs, with an emphasis on the former. Additional results include a discussion of the two-sided nature of the relationship-specific investment decision, and of the potential endogeneity of several factors.

3.1 Introduction

A new way to measure transaction costs incurred during basic exchange agreements has been presented in the second chapter of this dissertation. In short, in connection with a particular agreement, respondents in a firm study were asked to estimate how much it would have been worth to reverse history and deal with a non-opportunistic partner (instead of trading with the actual partner in the agreement). The answers to the proposed question, representing in particular those transactional costs stemming from haggling, bargaining and mis-alignment, were expressed as percentage of sale price, and range from zero to sixty percent.

The second chapter of this dissertation includes a discussion on the size of transaction costs faced by Romanian companies in dealing with their customers and suppliers. Data show that positive transaction costs are incurred in 41.92% of agreements, and that there seems to be some difference between buyers and sellers in an agreement (sellers reported positive transaction costs in more agreements). The average transaction costs, as percentage of the sale price, is 3.49 for the whole sample.

The goal of the present chapter is to use the same data and assess the impact of various factors on the size and the probability of existence of transaction costs. Since

details on the survey have been provided in the previous two chapters, we only mention here that in the middle of 2001, two hundred and fifty-four Romanian companies were surveyed in an attempt to understand the role of formal legal system in firms' activity. In each company four decision makers were interviewed: the company's general manager, the head of the legal department, and the managers of the sales and procurement departments. The survey instruments addressed to the last two respondents are similar, the only difference residing in questions' point of view; while the sales manager was asked about company's activity as a seller, the procurement manager was inquired about company's behavior as a buyer. Each of these two survey instruments contains a large set of questions soliciting information on a specific agreement the company has been involved into (once as a seller, and once as a buyer). To assure informativeness, the question soliciting the transaction costs information is the last one in the specific agreement section.

The transaction costs information we collect provides the dependent variables of our regressions, and we use respondents' answers in three ways – all recorded responses, the information coded as a dummy variable (as suggested in the second chapter of this dissertation), and, in some regressions, only the positive values recorded.

The organization of this dissertation chapter is as follows. The next two sections discuss those factors thought to influence transaction costs, and also provide details on the construction of our dependent variables. Interestingly, the transaction cost economics (TCE) literature hints indirectly on the factors affecting transaction costs, by mainly discussing the determinants of vertical integration (VI). However, in

his introduction to *Case Studies in Contracting and Organization*, Scott E. Masten provides a clear and concise review of the TCE literature, and presents a set of factors along with predictions on their impact on transaction costs – these factors are asset specificity, market uncertainty, frequency of exchange, ease of measurement, reputation, transaction complexity, and attitude toward risk. Apart from these, the impact on transaction costs of other factors is investigated, namely whether both partners are Romanian, the age of the firms, and their organization of legal matters.

Section 3.4 provides the econometric details of our analysis and reports the results. Given the limited nature of the transaction costs information we record, we first employ the Tobit model. However, this is shown to impose restrictions which are too restrictive in our case, and the sample selection model is found to be more appropriate. Combined results indicate that sample selection bias would not affect our estimates if the sample selection model would be replaced by two distinct regressions. Hence, we proceed and estimate a probit regression using as dependent variable a transaction costs dummy variable, and an ordinary least squares (OLS) regression having as dependent variable the positive answers our survey question records. These distinct regressions lead to the main results of this chapter. The most interesting finding is that TCE theory seems to be very successful in predicting the existence of transaction costs, and only moderately successful in explaining transaction costs' size when such costs are incurred. The econometric section closes with some additional results, which take into account asset specificity's two-sided nature and the endogeneity of some of our variables. Section 3.5 concludes the chapter.

3.2 Determinants of transaction costs proposed by theory

The first step in a research such as ours is to gather the hypotheses theory proposes (which are then tested by running the appropriate regressions). Interestingly enough, this first step proved more challenging than one would expect, confirming second chapter's comments on the scarcity of empirical work on transaction costs at agreement level.

Rather than directly providing the factors influencing transaction costs (and the direction of the influence), most of the literature on transaction costs hints indirectly on which those factors are. The central idea of TCE is that firms adopt different governance forms for their agreements in order to minimize transaction costs. Williamson (1991b, p. 79) states that "[t]he main hypothesis out of which transaction costs economics works is this: align transactions, which differ in their attributes, with governance structures, which differ in their costs and competencies, in a discriminating (mainly, transaction costs economizing) way."

The most often discussed governance structure is VI, when trading partners act under unified ownership and control – according to Shelanski and Klein (1995), the make-or-buy decision has been the paradigm problem of TCE, with much of the earliest empirical work addressing this topic. VI is seen as an alternative to contracting or spot market transactions when hazards associated with exchanges between independent partners are particularly severe. A significant number of papers propose and test factors assumed to impact on the decision to integrate[1]. These factors are asset

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[1]For examples of such papers the reader is guided toward surveys such as Joskow (1988), Shelanski

specificity, market or transaction uncertainty, transaction complexity and frequency.

Given that VI is considered to attenuate transaction costs associated with markets exchanges, implicitly, those factors increasing the chances of integration are those increasing the size of transaction costs in agreements between independent partners.

To avoid injustice, we have to mention two authors who discuss the determinants of transaction costs directly. The first is Joskow (1985, p. 36), who lists some characteristics of transactions that are considered to affect "the nature and magnitude of [. . .] transaction costs in important ways". The factors are those presented above. The other author, to the work of which we extensively relate below, is Masten (1996). In his introduction to *Case Studies in Contracting and Organization*, Scott E. Masten makes a clear and concise review of the TCE literature, and presents a set of factors along with predictions on their impact on transactions costs. Masten's factors include those previously presented, to which several others are added.

As mentioned before, transaction costs are considered to arise from two features of the human nature: bounded rationality and opportunism. Masten (1996, p. 6-7) provides details: "Opportunistic behavior can be divided into two principal types: (1) deviations from joint-surplus maximizing behavior that produces a de facto redistribution of gains from trade within the terms of an existing agreement, and (2) efforts designed to extract more favorable terms at the outset or to force a renegotiation and thus a de jure modification of terms previously agreed to. The first type of opportunism, which is a response to price signals contained in a contract, is what

and Klein (1995), Masten (1996), Sykuta (2005), and Macher and Richman (2006).

economists commonly refer to as moral hazard. [...] Ideally, the transgressor would like his behavior to go undetected by both the courts and his trading partner. The second form of opportunism consists of efforts to 'hold up' a trading partner and involves actions taken to set new terms rather than in reaction to existing ones." The author then discusses the factors which influence the relative efficiency of various organizational forms, hence the size of transaction costs, and the predictions associated with each of them. We follow the same order of exposition, and also briefly present the variables we will use in our regressions (details on variables' construction are available in Appendix E at the end of the dissertation).

Asset specificity

Following Klein et al. (1978), investments in relationship-specific assets generate appropriable quasi-rents, the distribution of which may create tensions between trading partners. Hold-up, the second form of opportunistic behavior presented above, is more likely to occur under such conditions, therefore transaction costs are expected to be higher in market exchanges where specific investments have been made.

One thing to note is that, in general, TCE does not make a distinction between relationship-specific investments made by one or the other party in a transaction (asset specificity is viewed as a singular concept for the transaction as a whole). However, the TCE analysis provided in the first chapter of this dissertation has shown that buyers' and sellers' relationship-specific investments have significantly different impacts on contract complexity. We will follow the same approach here: after discussing the impact on transaction costs of variable *Specific investment*, which represents invest-

ments made by either party in transaction, we also analyze the distinct implications of buyers' and sellers' relationship-specific investments (variables labeled *Buyer specific investment* and *Seller specific investment*).

Market uncertainty

Scott E. Masten considers that greater uncertainty makes it harder to design complete agreements, hence parties will either fail to adapt to changing conditions or will find it profitable to engage in costly efforts to evade performance. Uncertain environments are therefore likely to encourage the first type of opportunistic behavior, ultimately leading to higher transaction costs[2].

General managers of the interviewed firms were asked about the importance of certain events in their area of business. We focus on unpredictable changes in weather conditions and transportation links in order to capture truly exogenous events, and construct the *Exogenous market uncertainty* dummy variable to equal one if such sources of unpredictability were considered to be very important by general managers, zero otherwise.

Frequency of exchange

There seems to be a general consensus that transactions involving more frequent exchanges are likely to be characterized by lower transaction costs. One reason is that opportunistic behavior of the first type – deviations from joint-surplus maximizing behavior – is probably easier to detect and counteract in such agreements. In addi-

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[2]This view is different from that expressed by Shelanski and Klein (1995, p. 339), to which we do not concur: "Empirical studies sometimes treat [uncertainty about future events] as an independent variable, regressing the choice of organizational form on the variance of sales or another variable, but without including any measure of asset specificity in the model. Absent fixed investments, however, TCE does not predict that uncertainty would itself lead to hierarchical governance."

tion, sellers in exchanges involving multiple deliveries may reduce their exposure to trading partners' opportunism by threatening or actually imposing delays (or even cancellations) of subsequent deliveries for defaulting buyers.

In our regressions we employ a dummy variable which equals one if the specific agreement is part of a long-term deal involving an average of four or more separate deliveries per month, and equals zero if the transaction covered by the specific agreement is a one-time exchange or entails less than four deliveries per month.

Ease of measurement

Masten (1996) claims that problems of wasteful sorting and searching arise when it is difficult for a party to obtain information about the characteristics of a good. Ease of measurement is therefore considered to affect chances of opportunistic behavior of first type: market exchanges featuring goods whose true characteristics are observable are expected to be associated with lower transaction costs.

The interviewed procurement and sales managers were asked how easily can the buyer in the specific agreement ascertain the quality of the traded good. The dummy variable we construct, labeled *Good easy to measure*, equals one if the good's true characteristics are observable after only a quick inspection, and zero if they are hard to observe (it would take an intensive inspection or extended use for the buyer to assess the quality of the transacted good).

Reputation

Partners in a transaction are likely to take into consideration the impact of their current actions on future transactions, therefore, should information about current

events disseminate rapidly among firms, others may be reluctant to trade with those who have defaulted on their obligations or have otherwise behaved in a opportunistic fashion. In the words of Masten (1996, p. 15), "In such settings, the long-run loss of confidence of one's current or potential future trading partners tends to outweigh the short-run gain from cheating a trading partner." Thus, the testable hypothesis is that lower transaction costs should be observed for agreements between partners who act on markets characterized by rapid dissemination of relevant information.

Given the two-sided character of this market feature, we construct two distinct dummy variables: *Information dissemination among buyers* and *Information dissemination among sellers*.

Transaction complexity

The degree of complexity associated with the transaction is also assumed to influence the design of contractual agreements through its impact on transaction costs. Masten (1996, p. 14) elaborates on the role of transaction complexity: "The more complex the transaction, the harder it becomes to describe fully and accurately the responsibilities of each party in a contract, and the more difficult it will be for courts to assess whether those obligations have been fulfilled." The first type of opportunism (moral hazard or deviations from joint-surplus maximizing behavior) is more likely to take place for more complex agreements, hence transaction costs are probably higher for these exchanges.

As transactions may be complex in many dimensions and for many reasons, our survey instruments do not include a unique question capturing information on

transaction complexity, thus in testing the above hypothesis we rely on a proxy. Dummy variable *Customized contracts used frequently* is employed, and we use this piece of information under the assumption that more complex transactions usually require more attention, therefore custom contracts.

Attitude toward risk

Masten (1996) briefly discusses a factor which is generally absent from the transaction costs literature: risk aversion, and uses the term in in the textbook sense. However, in our framework a better name may be *attitude toward transactional risk* or even *acceptance of the risk of betrayal in an exchange.*

Since we do not measure directly respondents' attitude toward risk, we have to rely on a proxy in our regressions. We relate respondents' attitude toward risk to their reported attitude toward trusting people. We are not alone in making this inference. Bohnet and Zeckhauser (2004, p. 468) also mention that "a large body of work on trust, crossing many disciplines, assumes that the willingness to trust is closely associated with the willingness to take risk", and provide references to papers in economics, philosophy, and sociology. A similar view is expressed by Eckel and Wilson (2004, p. 447) and Karlan (2005, p. 1698).

However, some cautionary notes are needed. In a discussion of a survey question measuring trust, which is similar to the one we use, Glaeser et al. (2000, p. 812) mention that "while these survey questions are interesting, they are also vague, abstract, and hard to interpret." Based on experiments with monetary rewards the authors claim that attitudinal trust surveys at best weakly predict any individual's level of

trust, and instead they may be better at predicting the overall level of trustworthiness in society. Also, despite their conceptual similarities, some empirical results have pointed out the differences between trust and risk aversion – see Eckel and Wilson (2004, p. 463-464).

3.3   Other variables we construct

After discussing the factors proposed by theory and the corresponding variables we construct, we now proceed to briefly describe the other variables we employ in this dissertation chapter. We begin with those that will the used as dependent variables in our regressions, and continue with the additional variables we use in the right hand side of these regressions. We hold back from the presentation of some other variables, employed when the potential endogenous nature of the decision to invest in relationship-specific assets is discussed. These variables have been presented in the first chapter of this dissertation.

Dependent transaction costs variables

The second chapter of this dissertation has presented a new way to measure (part of) the transaction costs firms incur in their sales agreements, by means of a survey question. Sales and procurement managers in a sample of Romanian companies were presented the proposed question. Figure 3.1 contains the distribution of answers we collected (for presentation purposes, only the positive responses are displayed). The figure shows that many respondents have returned 5% and 10% as their answers, but also that a full range of other intermediate values have been chosen.

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The variable *Transaction costs: All responses* contains the information gathered by the proposed survey question (both the positive values displayed in Figure 3.1 at the end of this chapter and the two hundred ninety-one zero answers recorded). Apart from using the information exactly as collected by our question, we also proceed to some data transformations. In some regressions we need to use only the positive values recorded – this variable is called *Transaction costs: Positive responses*, and is the one Figure 3.1 actually displays. The econometric procedures we will employ also require us to construct a dummy variable equal to one if a positive answer was provided by our respondent, and zero if not transaction costs were reported – we call this variable *Transaction costs: Dummy variable*[3].

Apart from those theory proposes, our regressions will include additional factors assumed to have an impact on transaction costs Romanian companies face.

Both partners are Romanian

The particular features of the Romanian economic environment and legal system may influence the level of transaction costs. To investigate this impact, our regressions will contain a dummy variable called *Both partners are Romanian*, whose construction is evident from the name.

The testable prediction is that agreements of Romanian companies with foreign partners are characterized by higher transaction costs that those involving only Romanian partners. There are at least two reasons for this. First, exchanges between

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[3]The second chapter of this dissertation has argued that our data is not affected by investigated biases. It has also shown that employing *Transaction costs: Dummy variable* removes any residual doubts about an upward bias at respondent level.

Romanian and foreign companies are likely to require the use of translators and of specialized legal assistance (since they are probably governed by a different body of law). Second, such agreements are more exposed to opportunistic behavior since reputation safeguards are probably less efficient.

Age of the firms

The age of the firms may also have an effect on transaction costs: it is plausible that over time firms develop better trading practices, which lead to smoother transactions, thus the prediction is that the age of the companies is inversely related to the level of transaction costs they face. To investigate this, our regressions will incorporate a dummy variable called *One of the firms founded before 1990*. The particular year used to differentiate "new" from "old" companies represents the beginning of transition after the fall of the centralized system in Romania.

Organization of the legal matters

A significant number of papers in the comparative institutional literature consider the formal legal system to play a major role in the way businesses organize their activity. A somewhat different view is that, given the poor standards of the legal system in transition economies, firms in such environments rely more on informal measures when conducting and enforcing their agreements.

The first chapter of this dissertation has shown that Romanian companies seem to use the formal legal system, by designing more complex contracts as theory would predict, and when doing so, by taking into account the quality of legal services provided by courts. In this chapter we try to investigate whether firms' organization

of legal matters impacts on the level of transaction costs. We rely on two dummy variables in this endeavor, which are presented below.

Each of our survey instruments contains a set of true/false or multiple choice legal questions (details on the survey section incorporating these questions are presented in Appendix E). Given that most of the information we rely on in this chapter comes from the sales and procurement managers, our focus is on the answers these respondents have provided to the legal questions. Dummy variable *Respondent has some legal knowledge* is constructed to equal one if the respondent has correctly answered at least two of the five legal questions, zero otherwise.

As previously mentioned, one of the surveys was addressed to the head of the legal department – where the company did not have a legal department established, the legal consultant most frequently interacting with the company was interviewed instead. One piece of information this questionnaire gathers is the location of respondent's office relative to the general manager's office (when the respondent was a legal consultant from outside the enterprise, the interviewer was instructed to refer to respondent's office when working on site for the company).

Dummy variable *Legal adviser's office close to manager's* is constructed to equal one if the two offices are in the same building and within twenty meters from each other, zero otherwise. We believe this to be a reasonable proxy for the importance the company places on the formal legal system, one of whose goals is to provide a smooth trading environment.

3.4 Econometric details and results

This section goes over the econometric details of our analysis of transaction costs, and our goal is to assess the impact on such costs of the various factors presented above. We will first show that OLS estimation is not the best approach in our case. Then, we will discuss and apply the estimating procedures that are more suitable for the data at hand.

At least at the beginning of this section, we use *Transaction costs: All responses* as the dependent variable in our regressions. Given the limited nature of this variable (it is continuous over the set of positive values but has positive probability mass at one point – zero), OLS estimation using all observations is not advisable. Wooldridge (2002, p. 518) shows some weaknesses of this approach[4]. Employing OLS for only the positive transaction costs values is also *in general* not the right way to proceed. Apart from the fact that this would mean throwing away observations, OLS estimates of the coefficients of interest are likely to be inconsistent due to an omitted variable. Achen (1986, p. 76-79) presents details on this point, to which we will also return below. Therefore, the common approach for data such as ours is to employ censored regression models[5]. We follow this trend and first use the Tobit model.

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[4]Namely, there are three significant shortcomings: the fact that the dependent variable cannot be linear in the independent variables (unless the range of the latter is fairly limited), that the model implies constant partial effects, and that predicted values for the dependent variable can turn out to be negative in many instances.

[5]We use the term *censored regression model* only because it seems to be deeply rooted in the existing literature. As Wooldridge (2002) mentions, this is not quite appropriate for cases such as ours since the information we record is not in fact censored (for example, through top coding). He proposes the terms *corner solution outcome* and *corner solution model*, but these labels are not the most suitable in our case either – our framework does not assume economic agents solving an optimization problem, so that for some agents the optimal choice would be the corner solution zero. The generic term *limited dependent variable* is sometimes used in this dissertation chapter, with the

3.4.1   Tobit results

The first model we construct uses as independent variables only those proposed by existing theory and as dependent variable the one containing all answers recorded by the transaction costs question. The form of the model, known as "the standard censored Tobit model" or "type I Tobit model" is:

$$Y_1^* = \alpha_1 + \beta_1 \cdot X_1 + e_1,$$
$$Y_1 = max(0, Y_1^*),$$

where Y_1 = *Transaction costs: All responses*, X_1 = *(Specific investment, Exogenous market uncertainty, Four or more exchanges per month, Good easy to measure, Information dissemination among buyers, Information dissemination among sellers, Customized contracts used frequently, Distrustful sales/procurement manager)*, and $e_1|X_1 \sim N(0, \sigma_1^2)$. One thing to note is that in our setup the latent variable Y_1^* does not have a clear meaning and that emphasis is placed on Y_1.

The Tobit results for this first model are reported in the first column of Table 3.2. Since they are preliminary results, we refrain from commenting them in detail, and only state that existing theory seems to be strongly supported by data.

Apart from those variables theory proposes, others have been included in a similar model to the one above. X_2 is the new vector of explanatory variables, where X_2 = *(X$_1$, Both partners are Romanian, Respondent has some legal knowledge, One*

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cautionary note that we do not face data truncation.

of the firms founded before 1990, Legal adviser's office close to manager's).

The Tobit estimated coefficients for this model are presented in the second column of Table 3.2. These results are very similar to the first ones in the sense that theory's predictions are once again strongly supported. Some of the variables we propose also seem to have an impact on transaction costs firm incur in their exchanges. Given the similarities between the two sets of results, and the significance of the newly added variables, in what follows we will continue to use X_2 as the set of independent factors.

3.4.2 Sample selection results

As it will become apparent below, the Tobit model is not be the best way to proceed, and the more appropriate model is the sample selection one – the literature on sample selection is vast; two survey articles on this topic are Vella (1998) and Puhani (2000). In our terms, the usual form of the sample selection model is:

$$
\begin{aligned}
Y_2^* &= \alpha_2 + \beta_2 \cdot X_2 + e_2 \\
Y_3^* &= \alpha_3 + \beta_3 \cdot X_2 + e_3 \\
Y_3 &= 1 \ if \ Y_3^* > 0; \ Y_3 = 0 \ otherwise \\
Y_2 &= Y_2^* \cdot Y_3,
\end{aligned}
$$

where $Y_2 =$ *Transaction costs: Positive responses*, $Y_3 =$ *Transaction costs: Dummy variable*, Y_2^* is a latent endogenous variable with observed counterpart Y_2, Y_3^* is a

latent variable with associated indicator function Y_3 reflecting whether transaction costs are observed. Lastly, e_2 and e_3 are zero mean error terms with $E[e_2|e_3] \neq 0$[6].

There are several things to note about the above model. First, we fit the exact sample selection framework by construction, by employing the transaction costs dummy variable. Second (and related to the first point), the latent variables do not have a clear meaning in our model and instead, as before, the emphasis is placed on the transaction costs information we observe. Lastly, the above model incorporates an assumption which is not always made in sample selection models. Namely, we assume that those factors influencing the occurrence of transaction costs are the same as those influencing the size of transaction costs when they are incurred. For this reason, the extended vector of independent variables, X_2, was used in the first two equations of the model. As we will see, this assumption leads to some estimation difficulties, and will be relaxed later in the chapter.

An important feature of the sample selection model is that it includes two distinct equations, one determining the existence of transaction costs and one determining their size when such costs are incurred. The former is usually called the main or the substantial equation (since researchers are generally primarily interested in it), while the latter is usually called the selection equation (since it determines whether an observation is included in the sample). We will continue to use this common terminology despite the fact that we are equally interested in both of these equations.

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[6]Regarding the use of OLS for the subsample characterized by positive transaction costs responses, Vella (1998, p. 130) points that this generally leads to inconsistent estimates of β_2 due to the correlation between X_2 and e_2 operating through the relationship between e_2 and e_3.

A significant characteristic of the Tobit methodology is that it combines the two equations into one (for details see chapters 16 in both Kennedy, 2003, and Wooldridge, 2002). In our terms, this implies that the equation determining existence of transaction costs is the same as the equation determining their size, assumption which we believe to be unrealistic. Even though, as mentioned above, we find no reason why the factors in the two equations should not be the same, we also find no reason why the effects of those factors on the probability of existence and size of transaction costs should be the same.

Our framework is similar to that of Melenberg and Van Soest (1996), who discuss family expenditures on vacations. While similar factors are expected to exert influence on the decision to go on vacation and on the amount spent on taken vacations, the same factors' influence on the two decisions may be different. For example, while the number of small children may reduce the probability of taking a vacation, it may increase vacation expenditures when a vacation is taken. The authors' approach is to consider two-equation models, one for the decision to take a vacation and one for the decision on the amount to spend given that a vacation is taken.

3.4.2.1 Maximum likelihood estimation

Heckman (1974) has proposed a maximum likelihood (ML) estimator for the sample selection model, closely related to the Tobit one, but which removes the strict assumption mentioned earlier. The first and second columns of Table 3.3 shown at the end of this dissertation chapter report the estimated coefficients obtained by ML.

The difference in size and statistical significance between the two sets of coefficients shows that the Tobit model was not the most appropriate (the restriction it imposed was too strong). The results indicate that theory's predictions are strongly confirmed for the sample selection equation – see the second column, but not equally strong for the main equation – even though the signs of the coefficients are generally as expected, the statistical significance is weak, see the first column. Therefore, the theory seems to be very successful in predicting transaction costs' existence but only moderately successful in predicting transaction costs' size when such costs are incurred. In what concerns the factors we have added, the results are mixed, and we will return to them later.

Another significant piece of information is reported at the bottom of Table 3.3. ρ is the correlation between the error terms of the two equations and, because this parameter captures the dependence between e_2 and e_3, a test of whether ρ is equal to zero is in fact a test of sample selection bias. This statistic is of particular importance in our case since it has significant implications on the estimating strategy to follow.

The estimate of ρ is low, -0.075. However, its standard error is needed in testing the difference from zero, and the computation of this depends on particularities of the estimation method. When standard errors are adjusted for clustering, Stata returns a value of 0.036, while when clustering is not accounted for, a value of 0.311 is returned. More importantly in our case is that when clustering is used, the Wald test is employed, which returns p-value $= 0.038$, thus indicating that sample selection is present. However, when clustering is not used, the likelihood ratio (LR) test is

employed, and it returns p-value = 0.814, thus indicating that sample selection is not actually present. The fact that these two tests return contradicting results has serious consequences on the estimation approach to follow.

Thankfully, Nawata and McAleer (2001) shed light precisely on this issue: their Monte Carlo experiments of sample selection models estimated by ML show that the t-test (to which the Wald test is asymptotically equivalent) performs poorly under conditions very similar to ours. Precisely, for samples of four hundred observations and using the same regressors in the selection and main equations, the t-test rejects the correct null hypothesis (H_0: $\rho = 0$) in 40.7% of cases. The authors suggest using the LR test instead, which fails in only 5.2% of cases. Nawata and McAleer's findings are similar to those of Eklöf and Karlsson (1999) and Sartori (2003). They show that in a similar framework – binary-outcome selection models, also called probit models with selection – the ML estimation leads to estimates of ρ which may be misleading under similar conditions on sample size and choice of regressors.

The above paragraph indicates that we should place less confidence on the Wald test and more on the LR test. Since the latter implies that sample selection bias is not present, we could take another estimation approach, and use two distinct regressions. Namely, we can estimate the main equation by OLS (using the positive transaction costs responses) and the selection equation by probit (using the transaction costs dummy variable). The additional evidence we provide below also indicates that this approach is safe to take.

3.4.2.2 Two-step estimation

According to Vella (1998, p. 133) the ML procedures are relatively uncommon in empirical work and the two-step estimators are frequently employed for sample selection models. The approach proposed by Heckman (1976, 1979) is to fit the selection equation by ML probit on all observations, construct an estimate of a particular term λ called the inverse Mills ratio[7], use it as an additional regressor in the main equation, and then estimate the coefficients of this new equation by OLS over the selected observations. In our terms, this new equation is:

$$Y_2 = \alpha_4 + \beta_4 \cdot X_2 + \mu \cdot \hat{\lambda} + e_4,$$

where $\hat{\lambda} = \phi(\hat{c})/\Phi(\hat{c})$, with $\hat{c} = \hat{\alpha}_3 + \hat{\beta}_3 \cdot X_2$.

Running OLS of this equation over the selected subsample returns unbiased estimates of the coefficients of interest because the inclusion of λ leads to e_4 being a zero mean error term uncorrelated with the regressors. It has been shown that the t-test on the null hypothesis $\mu = 0$ is in fact a test of sample selectivity bias – for details see Vella (1998) and Wooldridge (2002).

The results of this two-step estimation are reported in the second part of Table 3.3. While the fourth column looks very much like the second one, the estimated coefficients and standard errors of the second-stage regression (see the third column) are surprisingly large. Vella (1998, p. 135) relates this to identification: "The un-

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[7]For any c, $\lambda(c) = \phi(c)/\Phi(c)$, where $\phi(\cdot)$ and $\Phi(\cdot)$ are the probability density and cumulative distribution functions of the standard normal distribution.

derlying economic model often imposes the same variables to appear in both steps of estimation. Thus many applications [...] identify β through the nonlinearity if the inverse Mills ratio. As the inverse Mills ratio is often linear, however, the degree of identification is often 'weak' and this results in inflated second step standard errors and unreliable estimates of β." Little and Rubin (1987) provide a similar argument. The solution therefore rests in having additional variables included in the selection equation relative to the main one.

3.4.2.3   A new specification

Based on the statistical significance of the ML estimators, we choose to remove *One of the firms founded before 1990* and *Legal adviser's office close to manager's* from the main equation. Also, given their minimal impact on the probability of observing transaction costs, we remove *Both partners are Romanian* and *Respondent has some legal knowledge* from the selection equation.

For this new specification of our model, we employ the ML and two-step procedures again, and report these results in Table 3.4 at the end of the chapter. The estimated coefficients and standard errors thus obtained are very similar to each other and also very much like the ML results in Table 3.3, which validates our exclusion decisions.

The results now indicate that sample selection should not be an issue. The ML estimation returns $\rho = 0.023$, which is lower in absolute value than it was before, and

is not different from zero[8]. Following the two-step estimation, λ (the coefficient of the inverse Mills ratio) equals 0.124, with a standard error of 3.092 and p-value = 0.969.

To conclude on the sample selection matter, its avoidance is not a goal in itself since Heckman's estimation procedures properly correct for it. However, since the new specification shows no evidence of this bias, we choose to estimate the two equations separately, by OLS and probit. These are the main results of this dissertation chapter, and are reported below.

3.4.3 Distinct ordinarily least squares and probit results

Table 3.5 at the end of the chapter displays the estimates obtained by OLS on the positive transaction costs values, and by probit on the transaction costs dummy variable. Apart from the estimated coefficients obtained by probit, the results also include the mean of marginal effects on the probability of observing transaction costs[9].

Unsurprisingly, the results of the probit regression are very much alike those presented in the second and fourth columns of Table 3.4. In what concerns the OLS results, the estimates in the first column confirm the fact that sample selection bias is not in fact present since they are very similar to the sample selection ones obtained by ML and two-step procedure.

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[8]Table 3.4 displays the standard error adjusted for clustering, which equals 0.860. The Wald test of independence of the two equations yields p-value = 0.978. When the clustering option is not used, the standard error is 0.655, and the LR test returns p-value = 0.965.

[9]One thing to note is that all our right hand side variables are binary. Hence, computing the marginal effect of an independent variable by evaluating the effect at the mean values of the other variables may not be the most appropriate approach. This is because the means of the binary variables can hardly be seen as a meaningful "observation". For each independent variable, an alternative approach is to evaluate the marginal effect using each observation for the rest of variables, and then take the mean over these marginal effects. The Stata code for these computations has been written by Jonah B. Gelbach, and is available at `http://glue.umd.edu/~gelbach/ado/`.

The overall image we are offered by these results is once again that theory is successful in predicting the existence and size of transaction costs. The first two columns both indicate that six of the eight variables theory proposes have the predicted effect on the transaction costs variables. However, same as before, theory seems to be more successful in what concerns the existence of transaction costs. The second column shows that five of the six coefficients having the expected sign are also significantly different from zero at the usual levels, while this is the case for only two of the six coefficients in the first column.

The OLS and probit results also indicate which particular factors have the expected impact on the existence and size of transaction costs. Table 3.5 shows that when specific investment is undertaken (by either party in the transaction), when exogenous market uncertainty is very significant, when exchanges are less frequent, and when good's true characteristics are hard to observe, not only the probability of incurring transaction costs is higher, but also the size of these costs increases.

The results in Table 3.5 also show that of the four coefficients representing the information dissemination two have the predicted impact while two have an effect opposite to what was expected. Also, of the two estimates which confirm our expectations only one is significantly different from zero. Hence, the aggregate impact of these factors can be characterized as mixed. The same can be concluded for the proxies we proposed for transaction complexity and risk aversion.

Regarding the factors we have added, the OLS results show that agreements between Romanian and foreign companies are characterized by higher levels of trans-

action costs. One thing to note is that both Table 3.3 and 3.5 indicate that partners' location influences the size of transaction costs but not their probability of appearance, thus corroborating with the earlier findings which differentiate the two concepts and lead to their separate analysis. The probit results indicate that newer firms are more likely to face transaction costs – the estimated coefficients of *One of the firms founded before 1990* in Tables 3.3 and 3.5 lead to a similar comment to the one we made above.

Last but not least, an interesting finding is the one related to companies' organization of legal matters, proxied in our analysis by the location of the two offices and the legal knowledge of two key employees. Both OLS and probit regressions indicate a significant relationship between transaction costs and companies' attitude toward the formal legal system: companies placing more weight on the law seem to be more likely to face transaction costs, and also report higher levels of such costs. Since one of legal system's main goals is fostering a smooth business environment, these results could be characterized as surprising. We will try to demonstrate below they are not.

We believe that firms placing significant weight on legal matters are likely to rely on the use of the formal legal system both when trying to defend against partners' opportunism and when trying to benefit from partners' exposure. But, on the one hand, the mere use of the system is costly – in particular it increases transaction costs. This view is similar to that of Wallis and North (1986) who consider salaries of lawyers and judges to be 100% transactional in nature. On the other hand, users

of the legal system benefit through the impact on transfers[10]. As the second chapter of this dissertation has shown, our survey question accurately collects information on transaction costs, but not on transfers. Then, our results provide evidence of the (rather limited) negative impact of the legal system on its users through increased transaction costs, and not of the (dominant) beneficial contribution of the legal system, through its impact on transfers.

To summarize, the argument is that using the law improves user's overall situation, but it also implies costs. Firms probably decide to use the legal system following a cost-benefit analysis. However, our particular result is driven by the fact that we only observe the costs (transaction costs) and not the benefits (transfers).

3.4.4 Additional results

3.4.4.1 The two-sided nature of the relationship-specific investment

As it has been discussed in the first chapter of this dissertation, the impact on contract complexity of buyers' decision to invest in relationship-specific assets is significantly different from that of sellers'. While the former lead to a decrease in the complexity of contracts governing sales agreements, the latter make contracts more complete (the arguments rests on partners' default unbalanced exposure to

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[10]Contract renegotiations provide a good example. In one scenario, a firm faced with a false claim of dissatisfaction submitted by an opportunistic partner may yield to the request and make a transfer to that partner, or can contest the claim, leading to renegotiations. Conversely, in another scenario, an opportunistic firm will increase its chances of receiving a transfer by turning to legal technicalities which trigger contract renegotiations. In both cases, renegotiations (which increase transaction costs) may improve the overall situation, by reducing transfers (in the first scenario) or by increasing them (in the second scenario).

the opportunism of the other due to particular transition conditions such as lack of external financing and high inflation).

Since opportunistic behavior plays a key role in the transaction costs discussion, a similar significant difference between the impact of buyers' and sellers' specific investments is expected on transaction costs. Thus, we separate buyers' from sellers' relationship-specific investments, and two variables now replace the unique specific investment variable previously used.

Given the different specification of our model, we again employ the sample selection model and estimate it by ML and by the two-step procedure. Results from Table 3.6 displayed at the end of this dissertation chapter show that sample selection bias is not present (neither ρ, the correlation between the two error terms, nor λ, the coefficient of the inverse Mills ratio, are significantly different from zero). Hence, as before, we can safely proceed and estimate the main equation by OLS using the positive transaction costs responses, and the selection equation by probit using the transaction costs dummy variable.

Table 3.7 contains the main results when we make the distinction between buyers' and sellers' specific investments. The overall picture we obtain is similar to our previous findings: the results of the sample selection equation are somewhat closer to existing theory than are those of the main equation. Regarding the particular aspect of interest at this stage, the first column indicates that in the main equation both estimated coefficients for the relationship-specific investment variables are positive. However, the second column confirms our expectations about opposing signs,

even though only one of the two estimates on that column passes the usual statistical significance levels. In addition, the Wald test of equality of the two coefficients yields $\chi^2(1) = 4.04$ and p-value $= 0.045$. The effects on the probability of existence of transaction costs match those from the first chapter of this dissertation: buyers' relationship-specific investments tend to decrease the chances of facing transaction costs, while sellers' increase them.

3.4.4.2 The potentially endogenous nature of some variables

This dissertation chapter has shown that the factors proposed by existing theory have the expected influence on the probability of existence and the size of transaction costs. However, since many of these determinants themselves represent firm decisions, one could question the reliability of our estimates. That is, endogeneity bias may affect our results, especially the estimated coefficients of relationship-specific investment, frequency of transaction, complexity of transaction, and companies' organization of legal matters.

In our setup, the endogeneity problem may arise for two reasons: reverse causality and omitted variables. In simplified terms, our approach is to consider a vector X of explanatory variables which affect a measure of transaction costs, denoted Y. If, under a specific scenario, Y can act as a determinant for one or more components of X, then this reverse causality will lead to biases in the estimates of those components. In addition, if there exists an unmeasured factor, denoted Z, which simultaneously influences Y and a component of X, then this omission will lead to our estimate of

the X component being even asymptotically biased. We will show below that the two channels through which endogeneity may affect our estimates are in fact limited.

The first argument rests on the dominant ex-post nature of the transaction costs information we collect. As discussed in the second chapter of this dissertation, contrary to our intentions, the large majority of managers answering our transaction costs question may have thought of the situation at the end of the agreement, thus the collected information is likely to represent transaction costs after the agreement has ended. This removes the possibility of reverse causality since the explanatory variables susceptible of being endogenous represent decisions taken before or during the agreement implementation. Our second argument refers to the vector of right hand side variables (denoted X above). We believe that we have successfully captured all factors theory proposes, either directly or indirectly (through proxies), thus greatly reducing the possibility that a significant factor Z has been omitted (this rests on our choices of proxies being valid).

The two arguments above hold for all the possibly endogenous variables we have listed. However, for the complexity of transaction there are additional arguments, arising from the indirect measurement of the concept. Namely, we rely on a proxy (the frequency the company uses customized contracts for all its operations), and the information is provided by the legal manager. As in the first chapter of this dissertation, technology and sector of activity are considered to be exogenously determined for firms. These two factors influence the complexity of transactions for the company as a whole, which in turn has an impact on the complexity of the inves-

tigated agreement. Our choice of proxy focuses on this channel of influence, which is free of endogeneity[11].

We acknowledge the fact that the reader may have residual doubts about the arguments presented above. Ideally, we would run exogeneity tests for each of the four possibly endogenous variables. Unfortunately, our survey of Romanian companies does not offer good instruments to be used in such tests for all suspicious variables. Nonetheless, there is one situation where endogeneity can be tested, namely for buyers' and sellers' decisions to invest in relationship-specific assets.

We employ the same instrumental variables as in the first chapter of this dissertation: the interaction effects between dummy variables for the number of potential trading partners and for companies' sectors of activity. Regarding the former, for buyers' specific investments we use a dummy representing the number of potential sellers, while for sellers' decision we use a dummy variable accounting for the number of potential buyers. The information on sector of activity is captured by four dummy variables labeled *Heavy industry*, *Light industry*, *Construction*, and *Other sectors*. The appropriateness of using these variables as instruments for partners' specific investments has also been discussed in the first chapter.

We test the exogeneity of buyers' and sellers' relationship-specific investments separately for the main and selection equation. For the former, we employ a test introduced by Hausman (1978, 1983) – the heteroskedasticity-robust joint F-test yields p-value $= 0.887$. For the latter we rely on a test proposed by Rivers and Vuong (1988)

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[11]Transaction-specific issues probably also affect the complexity of the investigated agreement, but our proxy does not capture this (endogenous) information.

– the joint Wald test returns p-value = 0.901. These results lead to the conclusion that we cannot reject the exogeneity of the two specific investment variables[12].

To conclude, we have argued above that endogeneity bias should not be a major concern in the current analysis. The reason is that in our setup two main features leading to such biases, reverse causality and omitted variables, play a minor role. In the one situation in which we can test for endogeneity, the results support our view, thus strengthening our confidence in the results of this chapter.

3.5   Conclusions

The second chapter of the dissertation has indicated that, despite the concept's importance, there is still no commonly accepted way to assess the size of transaction costs at agreement level. The lack of a consistent measure led to the vast majority of the TCE empirical work focusing on the impact of various factors on the governance structure of agreements rather than directly on the size of transaction costs.

The present chapter has first gathered all factors assumed by theory to have an impact on transaction costs. Then, these factors' effect on the probability of existence and size of transaction costs has been investigated. In this attempt, we rely on the transaction costs measure we have collected in a study of Romanian companies which included the proposed survey question discussed in the second chapter. Results

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[12]The same conclusion is reached when, similarly to first chapter's approach, we add to the set X two variables capturing buyers' and sellers' dependence on their partners, thus countering the possibility that our instruments proxy some post-specific investment market thinness. The reason we have not included these variables in the set of explanatory variables from the beginning of the analysis is that the investigated theory does not mention them.

indicate that theory is very successful in predicting the existence of transaction costs, and only moderately successful in predicting the size of these costs when they are incurred. We believe that the slight difference in strength between the two sets of results deserves more deliberation, and present below some thoughts on why this difference may arise.

First, this difference may arise naturally from the act of research; a theory can be expected to be more successful regarding something that is easier to predict, such as the existence of a phenomenon, but less successful regarding finer details of that phenomenon[13]. Second, a technical aspect may explain the observed difference in results. As one would expect, detail and accuracy level of the data entering the analysis are likely to impact on the quality of the outcome. Despite the multitude of transaction features we observe, since our data are generated by a survey most of the variables we employ are dummies, and this may also explain the difference in strength between the two sets of results[14].

Lastly, our results may be an indicator that the existing TCE theory needs to be improved, especially in what concerns its predictions on the size of transaction costs. However, attempts to refine a theory are futile without proper data (this is why we consider the second chapter of this dissertation to take a much needed step in the transaction costs area of research).

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[13]A weather-related analogy may persuade the reader: a meteorologist may find it easier to predict whether rain will fall, but will probably find it harder to predict the precise amount of water falling should the rain occur.

[14]If we continue the analogy above, the meteorologist can easily predict rain if he observes dark clouds (hence little information suffices) but he will need more detailed information to predict the amount of the rainfall (simply put, he will need to know how dark the clouds are).

Apart from the factors proposed by theory the present dissertation chapter has investigated the impact of other transaction costs determinants. Most importantly, firms' reliance on the formal legal system was shown to have a significant effect on these costs (we have provided arguments for the apparently surprising results). The age of the firms and whether they both belong to the same legal system and economic environment appear to have the expected impact on transaction costs. Additional results include an analysis of the two-sided nature of the relationship-specific investment and a discussion on the endogeneity of various factors.
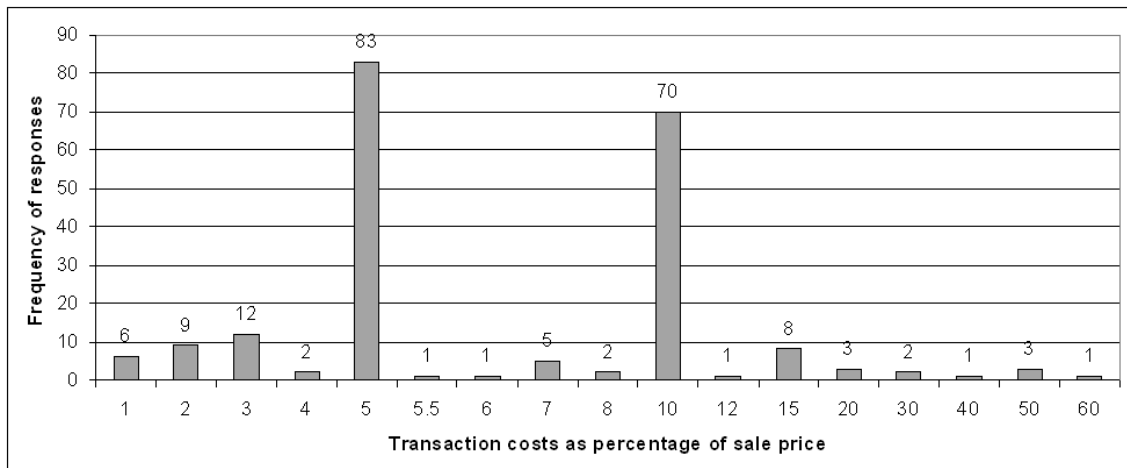
Figure 3.1: Distribution of answers to the transaction costs question

Note: For presentation purposes, this figure only shows the positive values recorded (variable *Transaction costs: Positive responses*). Two hundred ninety-one zero values have also been recorded.

Table 3.1: Descriptive statistics

Variables:	Number of obs.	Mean	Standard deviation	Min	Max
Transaction costs: All responses	501	3.488	6.518	0	60
Transaction costs: Positive responses	210	8.321	7.825	1	60
Transaction costs: Dummy variable	501	0.419	0.494	0	1
Specific investment	502	0.333	0.472	0	1
Buyer specific investment	506	0.117	0.321	0	1
Seller specific investment	503	0.256	0.437	0	1
Exogenous market uncertainty	506	0.233	0.423	0	1
Four or more exchanges per month	508	0.189	0.392	0	1
Good easy to measure	506	0.494	0.500	0	1
Information dissemination among buyers	488	0.836	0.371	0	1
Information dissemination among sellers	497	0.803	0.398	0	1
Customized contracts used frequently	500	0.408	0.492	0	1
Distrustful sales/procurement manager	507	0.268	0.443	0	1
Both partners are Romanian	506	0.836	0.371	0	1
Respondent has some legal knowledge	508	0.606	0.489	0	1
One of the firms founded before 1990	504	0.524	0.500	0	1
Legal adviser's office close to manager's	502	0.534	0.499	0	1
Dependence on partner	489	0.579	0.494	0	1
Buyer dependence on partner	496	0.417	0.494	0	1
Seller dependence on partner	492	0.476	0.500	0	1
Few potential buyers	478	0.203	0.403	0	1
Few potential sellers	483	0.511	0.500	0	1
Heavy industry	508	0.280	0.449	0	1
Light industry	508	0.262	0.440	0	1
Construction	508	0.201	0.401	0	1
Other sectors	508	0.258	0.438	0	1
Few potential buyers in heavy industry	478	0.065	0.247	0	1
Few potential buyers in light industry	478	0.050	0.219	0	1
Few potential buyers in construction	478	0.033	0.180	0	1
Few potential buyers in other sectors	478	0.054	0.227	0	1
Many potential buyers in heavy industry	478	0.218	0.413	0	1
Many potential buyers in light industry	478	0.209	0.407	0	1
Many potential buyers in construction	478	0.167	0.374	0	1
Many potential buyers in other sectors	478	0.203	0.403	0	1
Few potential sellers in heavy industry	483	0.176	0.381	0	1
Few potential sellers in light industry	483	0.135	0.342	0	1
Few potential sellers in construction	483	0.068	0.253	0	1
Few potential sellers in other sectors	483	0.133	0.339	0	1
Many potential sellers in heavy industry	483	0.106	0.308	0	1
Many potential sellers in light industry	483	0.128	0.335	0	1
Many potential sellers in construction	483	0.128	0.335	0	1
Many potential sellers in other sectors	483	0.126	0.333	0	1

Table 3.2: Censored regression estimates of two different specifications

Independent variables:	Tobit Transaction costs: All responses	
	Y_1	Y_1
Specific investment	3.090	2.971
	(1.382)**	(1.361)**
Exogenous market uncertainty	4.708	5.096
	(1.512)***	(1.491)***
Four or more exchanges per month	-4.119	-4.044
	(1.790)**	(1.760)**
Good easy to measure	-2.980	-3.271
	(1.328)**	(1.308)**
Information dissemination among buyers	-0.971	-1.135
	(1.956)	(1.921)
Information dissemination among sellers	-2.170	-2.002
	(1.844)	(1.811)
Customized contracts used frequently	-1.192	-0.972
	(1.346)	(1.324)
Distrustful sales/procurement manager	2.291	2.845
	(1.449)	(1.426)**
Both partners are Romanian		-2.831
		(1.734)
Respondent has some legal knowledge		1.734
		(1.344)
One of the firms founded before 1990		-3.536
		(1.324)***
Legal adviser's office close to manager's		4.197
		(1.323)***
Constant	-0.307	0.600
	(2.044)	(2.728)
Observations	460	448
Censored observations	263	253
Log-likelihood	-923.941	-900.066

Standard errors displayed in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.3: Sample selection estimates of the complete specification

Independent variables:	Heckman ML Transaction costs:		Heckman Two-step Transaction costs:	
	Positive responses Y_2	Dummy variable Y_3	Positive responses Y_2	Dummy variable Y_3
Specific investment	1.223	0.258	-2.582	0.256
	(1.167)	(0.133)*	(7.763)	(0.132)*
Exogenous market uncertainty	0.418	0.535	-7.467	0.535
	(1.189)	(0.166)***	(15.207)	(0.146)***
Four or more exchanges per month	-2.586	-0.274	1.605	-0.273
	(1.145)	(0.165)*	(8.848)	(0.163)*
Good easy to measure	-1.007	-0.290	3.336	-0.290
	(1.167)	(0.129)**	(8.716)	(0.125)**
Information dissemination among buyers	1.292	-0.218	4.556	-0.219
	(1.615)	(0.200)	(7.460)	(0.186)
Information dissemination among sellers	-4.311	0.071	-5.392	0.073
	(1.679)***	(0.181)	(4.483)	(0.176)
Customized contracts used frequently	0.297	-0.117	2.057	-0.116
	(1.255)	(0.144)	(4.459)	(0.127)
Distrustful sales/procurement manager	-0.214	0.321	-4.951	0.322
	(1.050)	(0.155)**	(9.502)	(0.137)**
Both partners are Romanian	-4.867	0.024	-5.111	0.024
	(2.120)**	(0.170)	(3.909)	(0.169)
Respondent has some legal knowledge	1.780	0.048	1.045	0.049
	(1.044)	(0.117)	(3.261)	(0.129)
One of the firms founded before 1990	1.094	-0.433	7.584	-0.432
	(1.077)	(0.144)***	(12.522)	(0.127)***
Legal adviser's office close to manager's	0.477	0.408	-5.711	0.407
	(1.142)	(0.143)***	(12.006)	(0.126)***
Constant	13.668	-0.159	35.142	-0.159
	(3.046)***	(0.269)	(40.246)	(0.262)
ρ (correlation between the error terms)	-0.075[a]			
λ (inverse Mills ratio)			-24.142	
			(43.667)	
Observations/Censored observations	448/253		448/253	
Clusters	240			
Log-likelihood	-952.614			

Standard errors displayed in parentheses, adjusted when clustering was used (a cluster is a firm).

* significant at 10%; ** significant at 5%; *** significant at 1%

[a] A discussion of ρ's standard error is provided in Subsection 3.4.2.1.

Table 3.4: Sample selection estimates of the reduced specification

Independent variables:	Heckman ML Transaction costs:		Heckman Two-step Transaction costs:	
	Positive responses Y_2	Dummy variable Y_3	Positive responses Y_2	Dummy variable Y_3
Specific investment	1.342	0.244	1.334	0.244
	(1.642)	(0.133)*	(1.231)	(0.131)*
Exogenous market uncertainty	0.595	0.546	0.577	0.546
	(2.440)	(0.165)***	(1.594)	(0.145)***
Four or more exchanges per month	-2.731	-0.289	-2.720	-0.289
	(2.021)	(0.164)*	(1.737)	(0.162)*
Good easy to measure	-1.118	-0.298	-1.108	-0.298
	(2.148)	(0.129)**	(1.279)	(0.124)**
Information dissemination among buyers	1.159	-0.231	1.163	-0.230
	(1.424)	(0.199)	(1.594)	(0.185)
Information dissemination among sellers	-4.107	0.069	-4.108	0.068
	(1.705)**	(0.181)	(1.522)***	(0.175)
Customized contracts used frequently	0.232	-0.116	0.235	-0.117
	(1.230)	(0.146)	(1.140)	(0.126)
Distrustful sales/procurement manager	-0.027	0.310	-0.034	0.310
	(1.154)	(0.154)**	(1.269)	(0.137)**
Both partners are Romanian	-4.649		-4.645	
	(2.267)**		(1.484)***	
Respondent has some legal knowledge	1.900		1.901	
	(1.049)*		(1.139)*	
One of the firms founded before 1990		-0.422		-0.421
		(0.149)***		(0.124)***
Legal adviser's office close to manager's		0.400		0.401
		(0.156)***		(0.125)***
Constant	13.470	-0.091	13.511	-0.092
	(5.653)**	(0.235)	(3.276)***	(0.205)
ρ (correlation between the error terms)	0.023			
	(0.860)			
λ (inverse Mills ratio)			0.124	
			(3.146)	
Observations/Censored observations	450/255		450/255	
Clusters	240			
Log-likelihood	-954.345			

Standard errors displayed in parentheses, adjusted when clustering was used (a cluster is a firm).
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.5: OLS and probit estimates

Independent variables:	OLS	Probit	
	Transaction costs: Positive responses Y_2	Transaction costs: Dummy variable	
		Estimated coefficients Y_3	Mean of marginal effects $Prob(Y_3 = 1)$
Specific investment	1.301	0.244	0.089
	(1.186)	(0.131)*	(0.048)*
Exogenous market uncertainty	0.532	0.546	0.201
	(1.197)	(0.166)***	(0.059)***
Four or more exchanges per month	-2.681	-0.289	-0.102
	(1.152)**	(0.165)*	(0.057)*
Good easy to measure	-0.990	-0.298	-0.108
	(1.181)	(0.129)**	(0.046)**
Information dissemination among buyers	1.172	-0.230	-0.084
	(1.579)	(0.199)	(0.072)
Information dissemination among sellers	-4.128	0.068	0.025
	(1.746)**	(0.180)	(0.064)
Customized contracts used frequently	0.250	-0.117	-0.042
	(1.280)	(0.144)	(0.051)
Distrustful sales/procurement manager	-0.066	0.310	0.112
	(1.015)	(0.154)**	(0.056)**
Both partners are Romanian	-4.641		
	(2.157)**		
Respondent has some legal knowledge	1.804		
	(1.083)*		
One of the firms founded before 1990		-0.421	-0.153
		(0.141)***	(0.050)***
Legal adviser's office close to manager's		0.401	0.145
		(0.143)***	(0.051)***
Constant	13.648	-0.092	
	(2.790)***	(0.231)	
Observations	197	450	
Clusters	136	240	
R-squared	0.119	0.080	
Log-likelihood		-283.394	

Clustered standard errors displayed in parentheses, where each cluster is a firm.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.6: Distinction between the two specific investments (I)

Independent variables:	Heckman ML Transaction costs:		Heckman Two-step Transaction costs:	
	Positive responses Y_2	Dummy variable Y_3	Positive responses Y_2	Dummy variable Y_3
Buyer specific investment	1.189	-0.086	1.192	-0.086
	(2.003)	(0.184)	(1.801)	(0.195)
Seller specific investment	1.150	0.394	1.144	0.393
	(1.329)	(0.142)***	(1.416)	(0.142)***
Exogenous market uncertainty	0.480	0.539	0.472	0.539
	(1.327)	(0.167)***	(1.604)	(0.145)***
Four or more exchanges per month	-2.689	-0.284	-2.683	-0.284
	(1.289)**	(0.164)*	(1.735)	(0.162)*
Good easy to measure	-0.986	-0.289	-0.982	-0.289
	(1.387)	(0.129)**	(1.271)	(0.125)**
Information dissemination among buyers	1.154	-0.237	1.157	-0.237
	(1.494)	(0.202)	(1.600)	(0.185)
Information dissemination among sellers	-4.055	0.059	-4.055	0.059
	(1.713)**	(0.183)	(1.522)***	(0.176)
Customized contracts used frequently	0.161	-0.112	0.162	-0.112
	(1.209)	(0.145)	(1.139)	(0.127)
Distrustful sales/procurement manager	-0.064	0.319	-0.067	0.319
	(0.967)	(0.154)**	(1.280)	(0.137)**
Both partners are Romanian	-4.511		-4.510	
	(2.106)**		(1.481)***	
Respondent has some legal knowledge	1.850		1.850	
	(1.061)*		(1.142)	
One of the firms founded before 1990		-0.414		-0.415
		(0.145)***		(0.124)***
Legal adviser's office close to manager's		0.390		0.389
		(0.147)***		(0.126)***
Constant	13.675	-0.096	13.695	-0.094
	(3.053)***	(0.232)	(3.332)***	(0.206)
ρ (correlation between the error terms)	-0.026			
	(0.248)			
λ (inverse Mills ratio)			-0.220	
			(3.216)	
Observations/Censored observations	450/255		450/255	
Clusters	240			
Log-likelihood	-952.057			

Standard errors displayed in parentheses, adjusted when clustering was used (a cluster is a firm).
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.7: Distinction between the two specific investments (II)

Independent variables:	OLS Transaction costs: Positive responses Y_2	Probit Transaction costs: Dummy variable	
		Estimated coefficients Y_3	Mean of marginal effects $Prob(Y_3 = 1)$
Buyer specific investment	1.180	-0.086	-0.030
	(2.101)	(0.184)	(0.065)
Seller specific investment	1.184	0.393	0.143
	(1.231)	(0.141)***	(0.051)***
Exogenous market uncertainty	0.536	0.538	0.197
	(1.199)	(0.167)***	(0.060)***
Four or more exchanges per month	-2.720	-0.284	-0.100
	(1.166)**	(0.166)*	(0.057)*
Good easy to measure	-0.928	-0.289	-0.103
	(1.176)	(0.129)**	(0.046)**
Information dissemination among buyers	1.139	-0.237	-0.085
	(1.596)	(0.202)	(0.073)
Information dissemination among sellers	-4.071	0.059	0.021
	(1.766)**	(0.183)	(0.065)
Customized contracts used frequently	0.161	-0.112	-0.040
	(1.255)	(0.145)	(0.051)
Distrustful sales/procurement manager	-0.054	0.319	0.115
	(1.016)	(0.155)**	(0.056)**
Both partners are Romanian	-4.530		
	(2.133)**		
Respondent has some legal knowledge	1.753		
	(1.080)*		
One of the firms founded before 1990		-0.415	-0.150
		(0.143)***	(0.051)***
Legal adviser's office close to manager's		0.389	0.140
		(0.145)***	(0.051)***
Constant	13.562	-0.094	
	(2.792)***	(0.232)	
Observations	197	450	
Clusters	136	240	
R-squared	0.121	0.087	
Log-likelihood		-281.259	

Clustered standard errors displayed in parentheses, where each cluster is a firm.

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendices to Chapter 1

Appendix A: Further details on the survey

We use a survey of two hundred fifty-four Romanian companies conducted in 2001 in an attempt to understand the way Romanian enterprises run their business, use the formal legal system, and the alternatives they rely on when interacting with each other. Located in and closely around the twelve largest cities of the country, the targeted companies were medium- and large-sized ones, which undertake activities in various productive sectors of activity (services were excluded, given the difficulty to phrase generic survey questions applicable to both goods and services).

Small companies were not included in the investigated sample since the goal of the survey was to understand whether law played a role in the day-to-day operations of the economy (it is commonly accepted that small companies frequently use informal arrangements to conduct their exchanges). Small companies were also excluded because of the objective of obtaining a wide variety of information from different company officials, specialized in specific aspects of the transactional process.

Four different persons in each company were questioned in face-to-face interviews, and different survey instruments were used. Given the multitude of questions and the fact they were addressed to top management, the duration of the interview had to be limited. This was accomplished by asking for quick estimates rather than precise figures that had to be looked up in books. Also, closed-ended questions were

frequently used. This is why our analysis is based mostly on dummy instead of continuous variables.

As already mentioned, an important feature of the questionnaires addressed to the sales and procurement department managers is a twofold symmetry. We provide below two examples which illustrate the *symmetry between* and the *symmetry within*.

The managers of the procurement departments were asked whether their firms (acting as buyers in the specific agreements) have made relationship-specific investments during the agreement in discussion. The same respondents were asked their opinion on whether the partners in the agreement (the sellers) have made such investments. Similarly, the managers of the sales departments were asked whether their firms (acting as sellers) have made specific investments when selling to the partner in the specific agreements, and whether their partners (the buyers) have made such investments.

In a similar fashion, we have information from both sides of the agreement on the possible requests for contract renegotiation. The precise questions addressed to the managers of the procurement and sales departments are presented below.

The procurement managers were asked:

Did your enterprise ask for the agreement to be renegotiated during implementation? YES/NO

Did the supplier ask for the agreement to be renegotiated during implementation? YES/NO

The sales managers were asked:

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Did your enterprise ask for the specific agreement to be renegotiated during

implementation? YES/NO

Did the customer ask for the specific agreement to be renegotiated during

implementation? YES/NO

A final point concerns information from the general manager and legal adviser surveys. As it is useful to match information on a specific agreement with non-transaction-specific characteristics (data on firm size, firm age etc.), information from the general manager and legal adviser surveys need to be used. Since this information is duplicated in the sample of agreements, the interpretation of these variables is altered. For example, instead of discussing about sellers' size, we comment on the influence of one of the two partners' size, regardless it is the seller or the buyer. Apart from interpretation, since same information is used twice in the sample, clustering has to be used, in order to account for this duplication and obtain corrected coefficients and statistics in regressions.

Appendix B: Further details on the variables

The variables in the equation of interest

Contract complexity

Contract complexity variables are indexes created by assigning scores to features of the contract and the contracting process. Buyer and seller contract complexity variables share significant information in common, referring to the form of the contract:

- Respondents were asked whether written contracts were used at all in their interaction with the partner in the specific agreement. If written contracts were used, we increased the contract complexity score by 1 if the respondent indicated that "written contracts were used in the transaction at all, but important elements of the transaction were subject to additional oral agreements" and by 1.5 if "written contracts were used in the transaction and, moreover, they covered all the important elements of the transaction"[15];

- We were interested whether the legal staff was involved in writing the contracts covering the specific agreement. If so, information on the duration of discussions with legal staff was extracted, and contract complexity score increased by 0.5 if discussions took between 2 and 8 hours, and by 1 if they took more than 8 hours;

- Contract length, in number of pages, was recorded. Contract complexity variables increased by 0.5 if the written contract is reported to include between 3 and 5 pages, by 1 it has between 6 and 10 pages, and by 1.5 if it has more than 10 pages;

- Respondents were asked whether the contract governing the specific agreement was authenticated or not. In Romania, contract authentication makes contracts more easily enforceable in court. Authentication is optional, is made by

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[15]We do not check whether the contracts were indeed properly designed to cover all the important elements of the transaction. Such an endeavor would be nearly impossible as it would basically require access to the actual contracts. However, this should not be an issue. We are mainly interested in our respondents' view on their contracts since respondent's beliefs are what guide their decisions.

a notary public, and leads to extra expenses and greater precision of the contract. Complexity scores were increased by 1 if the contract in discussion was authenticated;

- Another feature we observe on contract form is whether it was specifically designed for the specific transaction, case in which contract complexity increases by 1, as opposed to being a form contract provided by one of the partners.

What differentiates the buyer and seller contract complexity variables is a main clause each may contain. Buyer contract complexity score increases by 1 if a penalty clause for late delivery was included in the written contract, while seller contract complexity score increases by 1 if a penalty clause for late payment was included in the written contract. The delivery penalty is added to the buyer index, given that we use the index in regressions that follow existing work in relating this index to buyer characteristics. A similar argument applies to the penalties for late payment and the seller index. Minor flaws were encountered in respondents' answers: some indicated no written contracts were used at all but also that a penalty clause was used in a written contract. In these cases we only added 0.75 to the contract complexity score.

The overall contract complexity variable captures all collected information (both on the form of the contract and on the two penalty clauses that may be included). The histograms of Figure 1.1 presented at the end of the first chapter show the patterns in the data.

Relationship-specific investment

To construct the buyer specific investment dummy variable we have asked our

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respondents whether the buyer had to undertake a substantial amount of special investment to be able to use the product when supplied by the seller in the specific agreement rather than an alternative supplier. The given options were:

1. *No;*

2. *Yes, a small amount of special investment;*

3. *Yes, a significant amount of special investment;*

4. *Yes, a large amount of special investment.*

Buyer specific investment dummy is equal to one if the respondent indicated any amount of special investment is needed (answers 2, 3 or 4 above), zero otherwise.

The following pair of questions was used for the seller relationship-specific investment variable:

Were any elements of this product custom-made for the specific needs of the customer? YES/NO (If 'NO' then skip the next question).
At what cost could the product be modified to sell to other enterprises if the seller had surplus amounts?
1. *Virtually no cost;*

2. *Small cost;*

3. *Moderate cost;*

4. *High cost;*

5. *Prohibitive cost (could not be sold to other enterprises).*

We have constructed the seller specific investment dummy to equal one if any relationship-

specific investment has been made (answer "Yes" to the first question followed by answer 2, 3, 4, or 5 to the second one).

Quality of the courts

Legal advisers of each company[16] were asked to rate the quality of the commercial section of the local Tribunal courts on eight different dimensions. The exact question they were addressed was:

Below is a list of problems that might arise when filing suit in the commercial section of the Tribunal. Please evaluate how serious an obstacle each of these potential problems appears to you when you are considering filing suit. Give answers on a scale from 0 to 10. A '0' means the potential problem is not an actual problem. A '10' means that the problem is so great that it alone effectively prevents your using the court.

1. Filing a claim is expensive ___

2. Court procedures are complex ___

3. Legal counsel is expensive or not available ___

4. Judges are not impartial ___

5. Judges are not knowledgeable about market transactions ___

6. The time between filing a claim and obtaining a judgment is long ___

7. Judgments of the court are not executed ___

8. We are afraid our business secrets will become public knowledge ___

Without placing any weights on the different eight sub-parts, the answers were

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[16]Because the information comes from the legal adviser's questionnaire, it reflects the interpretation of only one side of the transaction.

added up for each respondent, leading to an overall score ranging from 0 to 80. Then, the quality of the courts dummy equals one if the court is considered to offer acceptable services (the above computed score is lower than 40), 0 otherwise.

Information dissemination

Information dissemination among sellers is a dummy variable, equal to one if suppliers of the same good would learn about the buyer in the specific agreement not paying its obligations, zero otherwise. The following question was included in the procurement manager questionnaire:

If your enterprise did not pay its obligations under this agreement, do you think that other suppliers would learn about this? YES/NO

A similar question was included in the sales manager questionnaire.

If this customer did not pay its obligations under this agreement to you, do you think that other enterprises like yours would learn about this? YES/NO

Information dissemination among buyers is a dummy variable, which equals one if other buyers of the good would learn about the seller in the specific agreement defaulting its obligations, zero otherwise. Similar questions to the ones above were used to extract this information.

First agreement

Both the sales and the procurement managers were asked whether the chosen specific agreement is the first one the company has entered into with that partner

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(buyer or seller, depending on respondent's position in the interviewed company). Based on their answers, the first agreement dummy variable was constructed.

Exogenous market uncertainty

This piece of information is provided by the general manager of each company participating in our study, therefore this variable is used twice in the sample of agreements, once representing buyers' and once sellers' opinion on the importance of unpredictable changes on the area of activity.

To focus on truly exogenous events, we have restricted attention to two main sources of unpredictability: weather-induced variation in demand or supply and problems in transportation links that cause changes in the level of demand or supply. Exogenous market uncertainty is a dummy variable which equals one if any of these sources of uncertainty is considered to be very important for enterprises in that particular area of business, zero otherwise (we have tried to capture general experience of firms in a that domain, rather than very specific experience of the interviewed company).

Dependence on partner

Buyer dependence on partner is a dummy variable which equals one when, in case the supplier fails to deliver the contracted goods, the buyer either cannot find a replacing seller, or finding another seller would take him a long period of time (a month or more). Conversely, buyer dependence on partner equals zero if the buyer is able to find another supplier in a short period of time.

Seller dependence on partner is a dummy variable constructed in a similar fash-

ion; equals one if the seller in the specific agreement depends on his partner since, in case the buyer refuses delivery of the order, finding an alternative buyer would take a month or more, or such an alternative could not be found, zero otherwise.

The instrumental variables

The instrumental variables are constructed as the interaction of two sets of dummies, representing the sector of activity and the market thickness.

Sector of activity

Several dummy variables were constructed to reflect the sector of activity of transacted good. These dummies are:

- Construction – Dummy variable, equals one if the good traded in the specific agreement belongs to the construction sector, zero otherwise;

- Heavy industry – Dummy variable, equals one if the good traded in the specific agreement belongs to the metallurgic, metallic constructions, tools and equipment, or office supplies sectors, zero otherwise;

- Light industry – Dummy variable, equals one if the good traded in the specific agreement belongs to sectors such as the textile industry, clothing industry, or leather and shoe industry, zero otherwise;

- Other sectors – Dummy variable, equals one if the good traded in the specific agreement belongs to other productive sectors than the ones presented above, zero otherwise. The list of other sectors includes 26 additional industries, such as

agriculture, forestry, minerals processing, coal processing, food and beverages, fiber industry, and transportations.

Market thickness

Few potential buyers is a dummy variable, which equals one if there are relatively few potential buyers (10 or less) in Romania for the transacted good, zero otherwise. Few potential sellers is a similarly constructed dummy variable, which equals one if there are relatively few potential sellers (10 or less) of the transacted good, zero otherwise.

Market thickness by sector

The market thickness dummy variables have been interacted with the sector of activity dummies, leading to an extended set of variables which constitute the instruments for seller and buyer specific investments in our regressions.

For seller relationship-specific investment the instrumental variables are: few potential buyers in construction, few potential buyers in heavy industry, few potential buyers in light industry, few potential buyers in other sectors, many potential buyers in construction, many potential buyers in heavy industry, many potential buyers in light industry, and many potential buyers in other sectors. The meaning of these variables is clearly reflected by their names.

Eight other dummy variables, representing the interaction between the sector of activity dummies and the one indicating the number of potential sellers, are used as instruments for the buyer relationship-specific investment in our regressions.

The variables used for robustness checks

State has control is a dummy variable which equals one if Romanian state owns 50% or more of the shares of any one of the parties, zero otherwise.

State owns shares is a dummy variable which equals one if Romanian state owns shares of any one of the parties, zero otherwise. **Some state origins** is a dummy variable which equals one if the origins of one enterprise lie in the state, even quite indirectly, zero otherwise. These connections to the state may be evident (firms may be the result of the privatization process) or less direct (the company founders may have undertaken similar activities in a state enterprise).

In same region is a dummy variable which equals one if the parties engaged in the specific agreement are located in the same county, zero otherwise (partners are both located in Romania, but in different counties).

Firm founded before 1990 is a dummy variable which equals one if any of the trading partners has been founded before 1990 (before transition began), zero otherwise.

Large firm is a dummy variable which equals one if one of the companies employs more than 250 people, zero otherwise.

Significant buyer prepayment is a dummy variable which equals one if the original agreement stipulated that the buyer had to pay at least 30% of the total bill before provision of the good or service, zero otherwise.

Appendix C: A different use of the dependence variables

We conclude the appendix to the first chapter with the presentation of some additional results. They are obtained by using differently than before the variables capturing information on firms' dependence on their current trading partners.

We have argued, especially in Subsection 1.8.1, that the dependence on partner variables should belong (only) in the second stage equation to explain part of the contract complexity partners choose for their transactions. One reason for this approach was given by the similarity between the concepts captured by these and the relationship-specific investment variables. Another argument is that the inclusion of the dependence variables in the second stage equation removes the possibility that our instrumental variables proxy some post-specific investment market thinness.

However, for those readers who do not agree with our view, we present below the results when the dependence on partner variables are used in a manner different than before. We first choose to remove these variables from the set of explanatory variables, hence Tables 1.15, 1.16, and 1.17 show the results when dependence on partner does not appear in either stage. Then, we decide to use these variables both as instruments (for relationship-specific investment) and independent variables (for contract complexity). Tables 1.18 and 1.19 present the findings when the dependence on partner variables are used in both stages. Finally, Tables 1.20 and 1.21 display the results when the dependence on partner variables are used only as instruments for the decision to invest in relationship-specific assets.

As the tables below indicate, the different use of the dependence variables does

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not lead to great changes in the magnitude and statistical significance of the coefficients of main interest. Namely, when its endogeneity is taken into account, the impact of the relationship-specific investment on contract complexity maintains the opposing signs for the buyer's and seller's side. The estimated coefficients are also of roughly equal magnitude as before (and to each other on the two sides of the agreement), while their high statistical significance is preserved. The OLS results we obtain are also very similar to those we have previously shown.

Table 1.15: OLS estimates when dependence on partner is not used

	Dependent variable:		
	Seller	Buyer	Overall
	contract	contract	contract
Independent variables:	complexity	complexity	complexity
Seller specific investment	0.742		0.805
	(0.158)***		(0.193)***
Buyer specific investment		0.366	0.261
		(0.237)	(0.268)
Quality of the courts	0.306	0.382	0.342
	(0.155)**	(0.163)**	(0.186)*
Information dissemination among sellers	0.157		0.168
	(0.176)		(0.241)
Information dissemination among buyers		0.274	0.174
		(0.186)	(0.255)
First agreement	0.109	0.188	0.099
	(0.169)	(0.176)	(0.204)
Exogenous market uncertainty	-0.136	-0.172	-0.180
	(0.156)	(0.169)	(0.184)
Constant	2.953	2.806	3.436
	(0.177)***	(0.188)***	(0.242)***
Observations	400	398	388
Clusters	232	232	231
R-squared	0.063	0.035	0.064

Clustered standard errors displayed in parentheses, where each cluster is a firm.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.16: Seller ML TE estimates when dependence on partner is not used

Main equation results		First stage results	
Independent variables:	Seller contract complexity	*Instrumental variables:*	Seller specific investment
Seller specific investment	2.127	Few potential buyers in heavy industry	0.720
	(0.439)***		(0.260)***
Quality of the courts	0.332	Few potential buyers in light industry	-0.061
	(0.160)**		(0.557)
Information dissemination among sellers	0.081	Few potential buyers in construction	1.226
	(0.182)		(0.340)***
First agreement	0.074	Few potential buyers in other sectors	0.839
	(0.169)		(0.314)***
Market exogenous uncertainty	-0.133	Many potential buyers in heavy industry	0.136
	(0.163)		(0.215)
Constant	2.710	Many potential buyers in light industry	0.100
	(0.218)***		(0.241)
		Many potential buyers in construction	0.602
			(0.218)***
		Constant	-1.065
			(0.163)***
Observations	380		
Clusters	227		
ρ (correlation between the error terms)	-0.559		
	(0.111)***		
Log-likelihood	-873.159		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.17: Buyer ML TE estimates when dependence on partner is not used

Main equation results		First stage results	
Independent variables:	Buyer contract complexity	*Instrumental variables:*	Buyer specific investment
Buyer specific investment	-2.067	Few potential sellers in heavy industry	-0.301
	(0.333)***		(0.233)
Quality of the courts	0.410	Few potential sellers in light industry	-0.608
	(0.158)***		(0.260)**
Information dissemination among buyers	0.290	Few potential sellers in construction	-1.126
	(0.187)		(0.382)***
First agreement	0.134	Few potential sellers in other sectors	-0.702
	(0.166)		(0.256)***
Market exogenous uncertainty	-0.187	Many potential sellers in heavy industry	-0.832
	(0.166)		(0.272)***
Constant	3.092	Many potential sellers in light industry	-0.332
	(0.184)***		(0.268)
		Many potential sellers in construction	-0.729
			(0.248)***
		Constant	-0.653
			(0.181)***
Observations	379		
Clusters	226		
ρ (correlation between the error terms)	0.766		
	(0.076)***		
Log-likelihood	-812.403		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.18: Seller ML TE estimates when dependence on partner is used in both equations

Main equation results		First stage results	
Independent variables:	Seller contract complexity	*Instrumental variables:*	Seller specific investment
Seller specific investment	1.787	Few potential buyers in heavy industry	0.569
	(0.541)***		(0.289)**
Quality of the courts	0.323	Few potential buyers in light industry	-0.168
	(0.158)**		(0.547)
Information dissemination among sellers	0.080	Few potential buyers in construction	0.968
	(0.181)		(0.380)***
First agreement	0.106	Few potential buyers in other sectors	0.601
	(0.168)		(0.328)*
Market exogenous uncertainty	-0.078	Many potential buyers in heavy industry	0.074
	(0.166)		(0.218)
Seller dependence on partner	0.328	Many potential buyers in light industry	0.035
	(0.173)*		(0.246)
Constant	2.613	Many potential buyers in construction	0.432
	(0.228)***		(0.263)*
		Seller dependence on partner	0.346
			(0.165)**
		Constant	-1.124
			(0.174)***
Observations	373		
Clusters	227		
ρ (correlation between the error terms)	-0.465		
	(0.164)***		
Log-likelihood	-851.290		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.19: Buyer ML TE estimates when dependence on partner is used in both equations

Main equation results		First stage results	
Independent variables:	Buyer contract complexity	*Instrumental variables:*	Buyer specific investment
Buyer specific investment	-1.933	Few potential sellers in heavy industry	-0.274
	(0.360)***		(0.253)
Quality of the courts	0.375	Few potential sellers in light industry	-0.579
	(0.160)**		(0.276)**
Information dissemination among buyers	0.250	Few potential sellers in construction	-1.094
	(0.191)		(0.394)***
First agreement	0.178	Few potential sellers in other sectors	-0.665
	(0.167)		(0.283)**
Market exogenous uncertainty	-0.149	Many potential sellers in heavy industry	-0.820
	(0.169)		(0.279)***
Buyer dependence on partner	0.591	Many potential sellers in light industry	-0.342
	(0.167)***		(0.279)
Constant	2.895	Many potential sellers in construction	-0.682
	(0.202)***		(0.260)***
		Buyer dependence on partner	0.161
			(0.179)
		Constant	-0.747
			(0.186)***
Observations	374		
Clusters	224		
ρ (correlation between the error terms)	0.733		
	(0.092)***		
Log-likelihood	-793.898		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.20: Seller ML TE estimates when dependence on partner is used only as an instrument

Main equation results		First stage results	
Independent variables:	Seller contract complexity	*Instrumental variables:*	Seller specific investment
Seller specific investment	2.219	Few potential buyers in heavy industry	0.512
	(0.400)***		(0.265)*
Quality of the courts	0.323	Few potential buyers in light industry	-0.157
	(0.159)**		(0.513)
Information dissemination among sellers	0.069	Few potential buyers in construction	0.970
	(0.181)		(0.347)***
First agreement	0.090	Few potential buyers in other sectors	0.617
	(0.169)		(0.301)**
Market exogenous uncertainty	-0.100	Many potential buyers in heavy industry	0.092
	(0.164)		(0.207)
Constant	2.673	Many potential buyers in light industry	0.059
	(0.217)***		(0.239)
		Many potential buyers in construction	0.485
			(0.227)**
		Seller dependence on partner	0.440
			(0.144)***
		Constant	-1.185
			(0.166)***
Observations	373		
Clusters	227		
ρ (correlation between the error terms)	-0.589		
	(0.098)***		
Log-likelihood	-852.887		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.21: Buyer ML TE estimates when dependence on partner is used only as an instrument

Main equation results		First stage results	
Independent variables:	Buyer contract complexity	*Instrumental variables:*	Buyer specific investment
Buyer specific investment	-2.086	Few potential sellers in heavy industry	-0.273
	(0.332)***		(0.243)
Quality of the courts	0.392	Few potential sellers in light industry	-0.568
	(0.158)**		(0.265)**
Information dissemination among buyers	0.277	Few potential sellers in construction	-1.072
	(0.189)		(0.378)***
First agreement	0.140	Few potential sellers in other sectors	-0.655
	(0.168)		(0.270)**
Market exogenous uncertainty	-0.198	Many potential sellers in heavy industry	-0.809
	(0.166)		(0.269)***
Constant	3.122	Many potential sellers in light industry	-0.337
	(0.189)***		(0.269)
		Many potential sellers in construction	-0.668
			(0.253)***
		Buyer dependence on partner	-0.109
			(0.153)
		Constant	-0.640
			(0.182)***
Observations	374		
Clusters	224		
ρ (correlation between the error terms)	0.765		
	(0.074)***		
Log-likelihood	-799.623		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix D: Other results using the overall contract complexity score

As mentioned at the end of Subsection 1.8.1, we display below the main results when the overall contract complexity score is the dependent variable for all three regressions (one for buyer's side, one for seller's, and one for both of them together).

Table 1.22: OLS estimates of the determinants of overall contract complexity

Independent variables:	Dependent variable: Overall contract complexity		
Seller specific investment	0.689		0.651
	(0.188)***		(0.191)***
Buyer specific investment		0.275	0.247
		(0.236)	(0.277)
Quality of the courts	0.334	0.343	0.314
	(0.184)*	(0.190)*	(0.188)*
Information dissemination among sellers	0.333		0.210
	(0.214)		(0.241)
Information dissemination among buyers		0.348	0.106
		(0.232)	(0.271)
First agreement	0.092	0.222	0.133
	(0.199)	(0.194)	(0.204)
Exogenous market uncertainty	-0.109	-0.091	-0.097
	(0.190)	(0.191)	(0.196)
Seller dependence on partner	0.580		0.400
	(0.175)***		(0.197)**
Buyer dependence on partner		0.621	0.376
		(0.177)***	(0.197)*
Constant	3.227	3.311	3.149
	(0.228)***	(0.249)***	(0.270)***
Observations	390	390	371
Clusters	231	230	227
R-squared	0.085	0.055	0.092

Clustered standard errors displayed in parentheses, where each cluster is a firm.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.23: ML TE estimates of the impact of seller specific investment on overall contract complexity

Main equation results		First stage results	
Independent variables:	Overall contract complexity	*Instrumental variables:*	Seller specific investment
Seller specific investment	1.808	Few potential buyers in heavy industry	0.715
	(0.621)***		(0.280)***
Quality of the courts	0.387	Few potential buyers in light industry	-0.009
	(0.189)**		(0.608)
Information dissemination among sellers	0.251	Few potential buyers in construction	1.126
	(0.219)		(0.375)***
First agreement	0.088	Few potential buyers in other sectors	0.746
	(0.199)		(0.335)**
Market exogenous uncertainty	-0.093	Many potential buyers in heavy industry	0.106
	(0.196)		(0.226)
Seller dependence on partner	0.505	Many potential buyers in light industry	0.037
	(0.175)***		(0.247)
Constant	3.051	Many potential buyers in construction	0.462
	(0.281)***		(0.251)*
		Constant	-0.999
			(0.169)***
Observations	373		
Clusters	227		
ρ (correlation between the error terms)	-0.398		
	(0.167)**		
Log-likelihood	-916.546		

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.24: ML TE estimates of the impact of buyer specific investment on overall contract complexity

	Main equation results		First stage results	
Independent variables:	Overall contract complexity	*Instrumental variables:*	Buyer specific investment	
Buyer specific investment	-2.318	Few potential sellers in heavy industry	-0.197	
	(0.372)***		(0.238)	
Quality of the courts	0.397	Few potential sellers in light industry	-0.514	
	(0.186)**		(0.271)*	
Information dissemination among buyers	0.321	Few potential sellers in construction	-0.989	
	(0.228)		(0.378)***	
First agreement	0.177	Few potential sellers in other sectors	-0.576	
	(0.189)		(0.249)**	
Market exogenous uncertainty	-0.111	Many potential sellers in heavy industry	-0.770	
	(0.189)		(0.262)***	
Buyer dependence on partner	0.545	Many potential sellers in light industry	-0.326	
	(0.175)***		(0.276)	
Constant	3.679	Many potential sellers in construction	-0.549	
	(0.239)***		(0.260)**	
		Constant	-0.738	
			(0.182)***	
Observations	374			
Clusters	224			
ρ (correlation between the error terms)	0.746			
	(0.085)***			
Log-likelihood	-850.652			

Clustered standard errors displayed in parentheses, where each cluster is a firm. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.25: Comparing the estimates obtained by different methods

	Separate regressions		One regression	
	OLS	Maximum likelihood	OLS	Instrumental variables
Seller specific investment	0.689	1.808	0.651	1.963
Buyer specific investment	0.275	-2.318	0.247	-2.022

Appendix to Chapter 3

Appendix E: Further details on the variables

In what follows, we provide details on the variables used in this dissertation chapter, including the actual survey questions posed to our respondents.

Asset specificity

One question addressed to the sales manager was:

To the best of your knowledge, does the customer have to undertake a substantial amount of special investment to be able to use the product when it is supplied by you rather than an alternative supplier?

1. No

2. Yes, a small amount of special investment

3. Yes, a significant amount of special investment

4. Yes, a very large amount of special investment

The procurement manager was addressed a very similar question to the one above. The information extracted by these questions is used to construct the dummy variable *Buyer specific investment* – it equals one if any amount of special investment was needed, zero otherwise.

Two questions addressed to the sales manager were:

Were any elements of this product custom-made for the specific needs of

this customer? YES/NO (If 'NO' then skip the next question)

At what cost could the product be modified to sell to other enterprises if

your enterprise had surplus amounts?

1. Virtually no cost

2. Small cost

3. Moderate cost

4. High cost

5. Prohibitive cost (could not be sold to other enterprises)

Using this pair of questions, along with a very similar pair addressed to the procurement manager, *Seller specific investment* dummy variable is constructed – it equals one if a small, moderate, high or prohibitive cost would be incurred to modify the product, and zero if no elements were custom-made, or virtually no costs would be incurred to modify the customized product.

Finally, the *Specific investment* dummy variable is constructed, and it equals one if either the buyer or the seller has made a specific investment, zero otherwise.

Market uncertainty

In order to capture truly exogenous events, the general manager of each interviewed firms was asked to assess the importance of uncertainty for his area of business activity. We have restricted attention to unpredictable changes in weather conditions and transportation links. The question addressed to company's general manager was:

How important are unpredictable changes in the area of business activity

in which your enterprise is engaged? Your answer should reflect, as much

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as possible, the general experience of enterprises in your area of business, rather than the very specific experience of your enterprise.

Please indicate whether the following sources of unpredictability are:

1. Not important, 2. Not very important, 3. Somewhat important, 4. Very important

a. Weather-induced variation in demand for the good or service sold by enterprises like yours. 1 2 3 4

b. Weather-induced variation in supply of goods or services that enterprises like yours must buy. 1 2 3 4

c. Problems in transportation links that cause changes in the level of demand for the good or service sold by enterprises like yours. 1 2 3 4

d. Problems in transportation links that cause changes in supply of goods or services that enterprises like yours must buy. 1 2 3 4

The *Exogenous market uncertainty* dummy variable equals one if any of these four sources of uncertainty is considered to be very important, zero otherwise.

Frequency of exchange

The following three questions were addressed to the sales department manager:

Was the specific agreement with this customer part of a longer-term framework agreement in which multiple sales of the product were anticipated? YES/NO (If 'NO' then skip the next two questions)

How long a time period, in months, did this longer-term framework agreement cover? ___ [number of months]

*Approximately, how many separate deliveries of your product did this
longer-term framework agreement cover? ___ [number of deliveries]*

The procurement department manager was asked very similar questions. The first step we took was to divide the number of deliveries by the number of months the agreement covered, after which a dummy variable was constructed, equal to one if the number thus obtained was greater than or equal to four, zero otherwise – this variable was labeled *Four or more exchanges per month.*

Ease of measurement

A question addressed to the sales department manager was:

*For the product in the specific agreement, how easily can the customer
ascertain quality?*

1. After a quick inspection

2. After an intensive inspection over a few days

3. Only after extended use by the customer

The procurement manager was asked an almost identical question, in which only the point of view is changed as it is the respondent who is in fact ascertaining quality. As mentioned before, the dummy variable *Good easy to measure* equals one if the answer to the question above was "after a quick inspection", zero otherwise.

Reputation

The sales manager was asked the following two questions:

If your enterprise defaulted in its obligations under this agreement, do you

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think that your other customers would learn about this? YES/NO

If this customer did not pay its obligations under this agreement, do you

think that other enterprises like yours would learn about this? YES/NO

The procurement manager was asked a pair of similar questions. Based on the information collected we have constructed two dummy variables: *Information dissemination among buyers* equals one if other customers would learn if the seller would default in its obligations under the specific agreement, zero otherwise, and, similarly, *Information dissemination among sellers* equals one if other potential sellers would learn if the current buyer did not pay its obligations under the specific agreement, zero otherwise.

Transaction complexity

One of the few questions addressed to legal advisers that we use here is:

How often does your enterprise use the following types of documents as the

basis for contracts for the selling of your enterprise's goods or services?

1. Never, 2. Sometimes, 3. Often, 4. Always

a. Form contract of your enterprise 1   2   3   4

b. Form contract of the customer 1   2   3   4

c. Form contract from legal suppliers, publications, internet 1   2   3   4

d. Contract specifically designed for transaction 1   2   3   4

e. Invoice used as a contract 1   2   3   4

Dummy *Customized contracts used frequently* equals one if contracts specifically designed for the particular transactions are used often or always, zero otherwise.

Attitude toward risk

In a distinct section focusing on respondents' opinions and attitudes, the interviewed managers were asked the following question (from which we only present the relevant part, resembling a question from National Opinion Research Center's General Social Survey):

We would like to obtain your views on certain issues. Below are pairs of contrasting statements. Please convey your views by choosing a point on a scale from 0 to 10. A '0' means you completely agree with the statement on the left and a '10' means you completely agree with the statement on the right.

Statement	Your mark (0 to 10)	Statement
Most people cannot be trusted		Most people can be trusted

Dummy variable *Distrustful sales/procurement manager* equals one if respondents tend to agree more with the view that most people cannot be trusted (by choosing scores lower than or equal to four), zero otherwise.

Age of the firms

The general managers of each company were asked about the founding date of their enterprises and dummy variable *One of the firms founded before 1990* was constructed. One thing to note is that, since information comes from the general manager, it is not transaction-specific in the sense that we do not have similar information from the partner in the specific agreement. We possess two hundred and fifty-four responses, from companies why act as buyers in some agreements and as

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sellers in others, therefore the slightly different interpretation, also apparent from variable's name.

Organization of legal matters

Each of our respondents was presented a set of legal questions – five commercial law medium difficulty questions (chosen from actual multiple choice or true/false questions asked at law-school examinations).

Given that the questions addressed to the sales managers are different from those addressed to the procurement managers, and considering their length, we choose not to present them here. Instead, we display below the introduction to this section, which tried to assure responsiveness and informativeness by stressing that we are not testing respondent's knowledge but rather legal system's ability to make pertinent information available to its users, and by instructing survey operators to make sure respondents provide their best guesses (without looking up answers). The exact introduction to this section and instructions for the survey operator were:

> *In this part of the survey, we ask you some questions about laws and ordinances that are intended to facilitate transactions. Please do not look up the formal laws and ordinances in answering these questions. We are interested in learning whether certain aspects of these laws and ordinances have become part of the business culture - whether they are known by professionals without using reference works. This is not a test of you; rather, it is a test of the ability of the legal system to make the law known to you. Please provide your best guess of the correct answer.*

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Interviewer: It is absolutely crucial that the respondent answers the questions without looking up source materials. Convince the respondent that we are interested in his or her personal opinion and that the answers are anonymous. If that does not work, then ask the respondent to skip this section if he or she absolutely refuses to answer it spontaneously.

Dummy variable *Respondent has some legal knowledge* is constructed to equal one if the respondent has correctly answered at least two out of the five questions, zero otherwise. In addition, the head of the legal department is asked:

Which of the following statements would best describe the location of your office?

1. Within 20 meters of General Manager's office

2. In the same building as General Manager's office but not close to it

3. In the same location as General Manager's office but in a different building

4. At a different location than the General Manager

Since some companies did not have a legal department established, and instead rely on services provided by an outside legal consultant, the interviewers were told to refer to that person's office when working on site for the company. *Legal adviser's office close to manager's* is a dummy variable which equals one if the two offices are located within 20 meters from each other, zero otherwise.

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