

Caveat Venditor: The Conditional Effect of Relationship-Specific Investment on Contractual Behavior

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We examine the effect of relationship-specific investment on the use of detailed contracts using data on transactions from a survey of Romanian firms. In those transactions, seller relationship-specific investment increases the amount of contractual detail, while buyer relationship-specific investment decreases it. We interpret these results using a hostages model applied to cash-flow and credit constrained firms. Sellers are more likely to be vulnerable to hold up than buyers are, implying that seller losses from hold up (and consequently the incentive to use a more detailed contract) increase with seller investment and decrease with buyer investment. This leads to the asymmetric effects of buyer and seller relationship-specific investment. Asymmetry is present in empirical estimates using a variety of methods that counter bias due to the endogeneity of the specific-investment variables, but is not present in OLS estimates. The hostages model with cash-constrained firms predicts the differences between OLS and consistent estimates. (JEL D23, K12, L14, P3)

1. Introduction

We use data on transactions between Romanian firms to estimate the effect of relationship-specific investment on the use of detailed contracts. In the literature germane to Williamson's discriminating alignment

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hypothesis, one recent focus has been on whether variables related to specific investment can have opposite effects on choice of transactional mode when characterizing opposite sides of a transaction (Saussier 2000; Woodruff 2002; Whinston 2003; Gibbons 2005; Lafontaine and Slade 2007; Acemoglu et al. 2010; Lileeva and van Biesebroeck 2013). In our estimates, seller relationship-specific investment increases the amount of detail in contracts, while buyer relationship-specific investment decreases it. We interpret this result by applying a hostages model (Williamson 1983) to an environment in which sellers are more likely to be vulnerable to hold up than buyers are, a likely scenario when firms are cash-flow and credit constrained, as in transition economies.

The data are from a 2001 survey of 254 Romanian firms, selected to be representative of the sectoral and size distribution of firms within industry, construction, and wholesale and with at least 50 employees. The survey collected comprehensive information on a set of transactions broadly representative of agreements between Romanian firms. The information is on agents on both sides of each transaction, an important feature when examining the effects of both seller and buyer investment.

We adapt the Koss and Eaton (1997) formulation of the hostages model to interpret our main empirical result—the asymmetric effects of buyer and seller investment. Sellers usually invest more than buyers do at the beginning of a transaction and buyer pre-payments are usually precluded by cash-flow and credit constraints. Therefore, in the absence of a formal contract, sellers are vulnerable to hold up. In the bargaining attendant on hold up, seller losses would be increasing in their relationship-specific investment. If the seller's potential loss is large enough, detailed contracts would be used to prevent hold up. In contrast, increases in buyer relationship-specific investment reduce the seller's potential losses from hold up, reducing the incentive to use detailed contracts.

Our asymmetry result is present when using a variety of methods that produce consistent estimates even if the specific-investment variables are endogenous. However, this result is not present in OLS estimates. The hostages framework predicts the differences between OLS and consistent estimates. When there are tight cash-flow and credit constraints, the error term in the OLS regressions is negatively correlated with seller investment and positively correlated with buyer investment. Hence, the coefficient on seller relationship-specific investment is biased downwards in OLS while the analogous coefficient for the buyer is biased upwards, reducing the probability of finding asymmetric effects. The empirical support for these predictions on OLS biases lends credence to our general premise that the asymmetric effects of relationship-specific investment can be viewed as reflecting the logic of the hostages approach.

A broader interpretation of the paper has two dimensions. First, pertinent to the microeconomic effects of institutions, the empirical results show that the amount of contractual detail—an indicator of the use of law—reflects the characteristics of transactions. Firms invest more in the

law when they are more vulnerable to hold up, even in a country whose legal system was quite underdeveloped.¹

Second, the hostages interpretation rests on a lack of financial development, reflected in the tightness of credit and cash-flow constraints. Legal tools would not be necessary if buyers could make significant prepayments (Koss and Eaton 1997). Thus, the law is more important in supporting relationships when finance functions less well.

Section 2 presents the model that is used to interpret our empirical findings, relating that model to the existing literature and showing the appropriateness of its assumptions for the Romanian context.² Section 3 sets up the empirics, describing the data and variables. Section 4 presents the paper's core results, applying a variety of techniques that counter bias due to the endogeneity of relationship-specific investment and comparing their results to those from OLS. Section 5 provides robustness tests, repeating the empirical exercises of Section 4 but varying the way in which key variables are constructed from the survey data. The concluding section summarizes and considers broader implications of our results. Appendices provide information on the data set, its collection, and the construction of variables.

2. Predicting Effects of Relationship-Specific Investment and Interpreting Estimates

2.1 Choosing More or Less Detailed Contracts³

We analyze firms deciding on the level of contractual detail assuming that vertical integration is not feasible, perhaps because law or the necessary finance is inadequate (Acemoglu et al. 2009). The simplest empirical relationship capturing this decision is:

$$C_i = \alpha + \beta I_i + Z_i \gamma + \epsilon_i, \quad (1)$$

where the unit of observation, i , is a transaction between two firms. C_i is a measure of the amount of detail embodied in the contract used for

1. The rule of law in Romania at the time of our survey was weaker than in any comparable East European country (Kaufmann et al. 2007).

2. For surveys of the relevant literature, see Shelanski and Klein (1995), Masten (1996), Masten and Saussier (2001), Chiappori and Salanié (2003), Sykuta (2005), Lafontaine and Slade (2007, 2012), and Macher and Richman (2008).

3. We assume that the objective of an increase in contractual detail is to increase contract completeness or the degree of formality. At the same time, an increase in detail would usually increase contract complexity and the cost of contracting. The four notions—completeness, complexity, cost, and formality—have a stronger basis in theory than contract detail, but are harder to measure in practice. An index of contractual detail would be correlated with indexes of these four other notions, were they available. Indeed, in the literature these notions are often used interchangeably. See for example Poppo and Zenger (2002) and Ryall and Sampson (2009) for the use of indexes of contractual detail as proxies for formality, completeness, and complexity of contracts.

transaction i , I_i is a measure of relationship-specific investment, and Z_i is a vector of other characteristics of that transaction. ϵ_i is an error term.

One motivation for Equation (1) can be provided by Williamson's (1983) hostages model and his observation that relationship-specific investment could provide transactional benefits, possibly implying a negative β . Some empirical papers are based on this observation using the intuitive notion of the balancing of dependencies (Anderson and Weitz 1992; Fein and Anderson 1997; Joshi and Stump 1999; Koss 1999; Ahmadjian and Oxley 2005, 2013; Sertsios 2015). These papers usually focus on whether credible commitments by buyers can encourage more specific investment by suppliers (Ahmadjian and Oxley 2013: 485). However, none of these studies examines explicitly whether a negative β can be found when estimating Equation (1).

The possibility of a negative β is easily shown using a hostages model based on the framework of Koss and Eaton (1997).⁴ A transaction occurs between a producer–seller (S) and a buyer (B) of an intermediate good or service. The seller must initially commit financial resources, V , that are dedicated to the transaction. Production and use of the good also entails relationship-specific investments by both parties, denoted I^S for the seller and I^B for the buyer. The I^j and V are completely relationship specific—once implemented, their value in the next best use is zero. The distinction between I^S and V has no importance to the seller and buyer, but in Section 2.3 this distinction provides a means of formulating assumptions about what the econometrician can and cannot observe. After purchasing the good, the buyer sells it to an end-user for R . V , I^S , and I^B vary in cross-section but are fixed in a single transaction.

The seller and the buyer are risk-neutral profit maximizers who engage in Nash cooperative bargaining and have equal bargaining strengths implying equal sharing of gains from agreement. There are two potential agreements. One (no contract) has no details and therefore incurs no contracting cost, but is not enforceable in court. Another contains sufficient detail for court enforcement, but costs C to construct. We assume that there is a convention that either party can insist on using a detailed contract or, if the other party refuses, exit the transaction before making a commitment. This assumption is appropriate because cash-flow and credit constraints make it difficult to implement the initial side payments that would ensure that participation constraints are satisfied.⁵

Under an agreement that is not backed by a detailed contract, if both parties assumed the agreement would be fulfilled, they would anticipate

4. Koss and Eaton (1997) assume that cash-flow constraints are not binding and examine how loans between the parties can ameliorate transactional hazards. We assume cash-flow constraints are binding and focus on the benefits of legally enforceable contracts.

5. The contracting literature usually assumes participation constraints are satisfied by an initial monetary exchange, which our assumptions rule out. Without this exchange, pre-contract negotiation is analogous to a battle-of-the-sexes game and the assumed convention is our equilibrium assumption.

gross payoffs of $V + I^S + (R - I^S - I^B - V)/2$ for the seller and $I^B + (R - I^S - I^B - V)/2$ for the buyer, leading to profits of $(R - I^S - I^B - V)/2$ for each. But these anticipated payoffs will not necessarily materialize. If the agreement is not backed by an enforceable contract, either party could demand renegotiation once investments are sunk. Nash bargaining during renegotiations then leads to gross payoffs of $R/2$ for both parties after hold up. The difference between the renegotiated payoffs and those originally anticipated is $(-V - I^S + I^B)/2$ for the seller and $(V + I^S - I^B)/2$ for the buyer. Hence, one party has an incentive to threaten hold up. We assume that it is the seller who is vulnerable (i.e., $-V - I^S + I^B < 0$), justifying this in the next subsection.

The seller chooses between the profit made with no contract (and the inevitable hold up), which is $R/2 - V - I^S$, and the profit of $(R - V - I^S - I^B - C)/2$ when a detailed contract, costing C to create, ensures fulfillment. Therefore, the seller chooses a detailed contract if and only if $V + I^S - I^B > C$. Hence, in a cross-section of transactions with varying levels of V , I^S , and I^B , detailed contracts will be observed more often the greater is seller relationship-specific investment and the smaller is buyer relationship-specific investment. The following replaces Equation (1), with $\beta^S > 0$ and $\beta^B < 0$:

$$C_i = \alpha + \beta^S I_i^S + \beta^B I_i^B + Z_i \gamma + \delta V_i + \epsilon_i. \quad (2)$$

2.2 Financial Constraints and Vulnerability in Romania

The model's predictions rest on two key assumptions—that firms are cash-flow and credit constrained and that the seller is vulnerable in the absence of an enforceable contract. The first leads to the prediction that β^S and β^B have opposite signs. The second determines which is negative and which positive.

Financial resources were hard to obtain in Romania in the time period covered by our data, with bank loans rarely available (National Agency for Small and Medium Sized Enterprises and Cooperatives, Government of Romania 2004; Rizov 2004).⁶ As Johnson et al. (2000) and McMillan and Woodruff (2002) document, transition is a time when producers must scramble to find financial resources to fund the set-up costs of production. Buyers were usually unable or unwilling to pay before delivery, meaning that producer–sellers had to commit financial resources before buyers did (McMillan and Woodruff 2002: 163). In our data, only 6% of buyers paid more than half of the total bill before delivery and over half did not prepay anything. Thus, when there is financial underdevelopment, it is very difficult to use appropriately timed prepayments to balance the risks of hold up arising from differences in the amounts of each party's relationship-specific investment.

6. In surveys undertaken in 1999 and 2002, Romanian firms rated access to financing as a primary obstacle to achieving growth (EBRD 2002: 43). The firms also reported large unplanned inter-enterprise debts, an indicator of credit tightness in transition economies.

Our data contain indirect evidence that sellers perceived themselves to be more vulnerable than buyers did. The survey asked both the sales and procurement managers in each firm about the use of 16 methods of preventing and resolving transactional problems, such as requesting local-government intervention or filing suit in court. Sales managers reported using 2.3 methods per transaction on average, while procurement managers reported using 1.5, indicating more concern on the sales side.

Simple, standard ways of reducing seller vulnerability were difficult to implement. Reputation or the shadow of the future would be less productive in the turbulent environment of transition, with ongoing deep reforms and inflation high and variable (45.7% in 2000 and 34.5% in 2001).⁷ Non-possessory collateral was uncommon, a reflection of poorly developed legal mechanisms in this area.⁸ In our survey, 22.8% of firms reported using possessory collateral while only 8.3% reported using the more efficient non-possessory collateral, with the former sometimes implying quite baroque arrangements to enforce agreements.

2.3 Interpreting Empirical Results

Given the foregoing, there remains the question of why there are many examples in the literature of positive estimates of coefficients like β^S or β^B , but few examples of negative estimates. One reason might lie in the difficulty of obtaining consistent estimates (Masten and Saussier 2001; Chiappori and Salanié 2003; Lafontaine and Slade 2007, 2012). For example, Lafontaine and Slade (2012: 971) comment that “most authors ignore the potential endogeneity issue” in the empirical literature on contracts that is pertinent to Williamson’s discriminating alignment agenda. Adapting the above model, we show why such endogeneity can lead to biases that lessen the probability of estimating a β^S and a β^B that differ significantly from each other.

We build upon Section 2.1 to provide an example that allows us to sign the biases within OLS estimates of Equation (2). This requires modeling the endogeneity of the I^j . Keeping the model at a basic level requires strong assumptions. Nevertheless, the results are quite intuitive, suggesting that the insights apply more generally.

We use five assumptions to build a characterization of an environment where finance is the main constraint to growth and financial imperfections imply that buyers do not prepay enough to negate seller vulnerability. First, we assume that V is financed by both parties. V^S (>0) is the seller contribution and V^B (≥ 0) is the buyer contribution (a prepayment), with

7. See Gow et al. (2000) for this connection between inflation, very tight credit, the strengthening hand of the buyer, and hold up in a transition environment.

8. See USAID (1999). At the time of our survey, a law was being implemented that provided a new framework for using personal property as collateral and establishing a registry for assigning priority over collateral (De la Peña and Fleisig 2004). Our survey indicates that few firms had availed themselves of the new opportunity.

$V^S + V^B = V$. Second, consistent with the Romanian context, we assume that V^B is relatively small and $V^S > V^B$. Third, we assume that V^B is exogenous, reflecting customary practices and the transacting parties' prior relationship. Fourth, consistent with the transition context with many opportunities for profitable ventures but investment constrained by scarce credit, we assume that cash-flow is the main constraint, with firms investing to the extent that financial resources are available. The typical firm finds borrowing too costly and is constrained by limited internal financial resources that have been committed to this project, denoted by F^S and F^B for seller and buyer. Fifth, consistent with the assumption of seller vulnerability, we assume that the seller commits more financial resources to the transaction than the buyer does ($F^B < F^S$).

Under these assumptions, if they reach an agreement, firms have an incentive to spend as much on relationship-specific investments as they have committed to this transaction: $I^j = F^j - V^j, j = S, B$. Then, using the same analysis as in Section 2.1, the parties choose a detailed contract iff $V^S - V^B + I^S - I^B > C$. Hence, Equation (2') now provides the basic estimating equation, with V in Equation (2) replaced by $V^* = V^S - V^B$:

$$C_i = \alpha + \beta^S I_i^S + \beta^B I_i^B + Z_i \gamma + \delta V_i^* + \epsilon_i. \tag{2'}$$

Since V_i^* is unobserved, $\delta V_i^* + \epsilon_i$ is the composite error term of (2').

Importantly, there are now relationships between the unobserved V^S and V^B and the observed I^S and I^B , and hence between the explanatory variables in (2') and its composite error term. Since $I^j = F^j - V^j, j = S, B, I^S$ is negatively related to unmeasured seller vulnerability ($V^* = V^S - V^B$), while I^B is positively related to V^* . Therefore, when estimating (2'), it is important to take into account relationships such as the following:

$$I_i^j = v^j + W_i^j \lambda^j + \varphi^j V_i^* + \eta_i^j, j = S, B. \tag{3}$$

The $W_i^j, j = S, B$, are vectors of variables affecting relationship-specific investments, the v^j are intercept terms, and the η_i^j are error terms. Because I_i^S is inversely related to V_i^* and I_i^B is positively related to V_i^* , $\varphi^S < 0$, and $\varphi^B > 0$.

The above leads directly to predictions on estimates of β^S and β^B , particularly on the biases that result from not observing V_i^* . If the seller is the vulnerable party, then:

- as in Section 2.1, β^S is positive and β^B is negative;
- given the additional results of this section, the OLS estimate of β^S is biased downwards and that of β^B is biased upwards;
- there is a negative correlation between the composite error term of Equation (2'), $\delta V_i^* + \epsilon_i$, and the composite error term of Equation (3) when using seller data, $\varphi^S V_i^* + \eta_i^S$;

- there is a positive correlation between the composite error term of Equation (2'), $\delta V_i^* + \epsilon_i$, and the composite error term of Equation (3) when using buyer data, $\varphi^B V_i^* + \eta_i^B$.

These conclusions imply that an OLS estimate of the absolute value of $\beta^S - \beta^B$ is downward biased, lessening the probability of finding differences between β^S and β^B when using OLS. Additionally, estimated error correlations with the predicted signs would be evidence of the predicted biases in OLS estimates of β^S and β^B .

This example relies on strong assumptions but its conclusions are quite intuitive. In a cash-flow and credit constrained environment, unobserved and observed specific investments are negatively correlated. In a hostages framework, both observed and unobserved specific investment by the vulnerable party increase the use of detailed contracts. Therefore, there is a negative correlation between the error term in the contract-choice equation and the vulnerable party's (the seller's) observed specific investment, which is an explanatory variable in that equation. This results in downward bias in the OLS estimate of the effect of seller specific investment. With the unobserved specific investment by the non-vulnerable party having the opposite effect on contract choice, the OLS bias is of the opposite sign for the effect of buyer specific investment.

3. Data and Variables

We surveyed 254 Romanian firms in 2001. Our information reflects a broad cross-section of firms.⁹ The sample is representative of the size and two-digit sectoral distribution of the population of Romanian firms within industry, construction and wholesale and with at least 50 employees. This section presents the core facts on the data and variables. Appendix A provides details on the construction of variables, linking variable descriptions to Appendix B, which lists the survey questions that generated the data. Summary statistics appear in Table 1.

We obtained data on both parties to a transaction by surveying specialists who had intimate knowledge of the characteristics of trading partners. In each firm, we interviewed both sales and procurement managers, each being asked about an agreement in which each had been closely involved (a different agreement for each). The questions for each manager were virtually identical and addressed the characteristics of the respondent's own firm and those of the trading partner. Therefore, the data set contains information about both the buying and selling side of one sales and one

9. Chiappori and Salanié (2003) comment that "...many papers in this field use similar data and/or focus on similar problems ... We would certainly want to see wider-ranging empirical work in the future". While the use of sectors with highly specialized characteristics might lead to unrepresentative findings (Chiappori and Salanié 2003), it has also facilitated progress since knowledge of context is often important in justifying the use of measurable proxies for the theoretical concepts that underlie empirical specifications (Hubbard 2008: 345).

Table 1. Descriptive Statistics

Variables	Number of observations	Mean	Standard deviation	Min	Max
Index of contractual detail	423	4.101	1.763	0	8
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 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 manufacturing	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 buyers, construction	400	0.038	0.190	0	1
Few buyers, heavy	400	0.068	0.251	0	1
Few buyers, light	400	0.020	0.140	0	1
Few buyers, other	400	0.045	0.208	0	1
Many buyers, construction	400	0.195	0.397	0	1
Many buyers, heavy	400	0.240	0.428	0	1
Many buyers, light	400	0.178	0.382	0	1
Many buyers, other	400	0.218	0.413	0	1
Few sellers, construction	403	0.079	0.271	0	1
Few sellers, heavy	403	0.194	0.396	0	1
Few sellers, light	403	0.092	0.289	0	1
Few sellers, other	403	0.124	0.330	0	1
Many sellers, construction	403	0.149	0.356	0	1
Many sellers, heavy	403	0.112	0.315	0	1
Many sellers, light	403	0.112	0.315	0	1
Many sellers, other	403	0.139	0.346	0	1

procurement agreement for each firm. We excluded agreements involving international trade because such agreements are usually covered by different bodies of law than intra-Romanian agreements, implying different contracting decisions for international and domestic transactions. There remained 423 observations.

We now turn to a brief description of the variables. Note that standard constraints of the survey process—amplified by interviewing busy managers—mean that most variables used in the empirical analysis are based on closed-ended questions that had a few non-cardinal categories as possible answers. We use cutoffs to generate dummy variables, ensuring a set of variables that was manageable for regressions applied to a data set with

a relatively small number of observations. Section 5 examines the robustness of our results when varying the details of variable construction.

The dependent variable, the index of *contractual detail*, is a sum of sub-indexes characterizing the process of contract construction (e.g., how much lawyers were involved) or indicating the presence or absence of specific contractual features (e.g., penalty clauses).¹⁰ We include all resource-using features of contracting that were elicited in the survey and we count each feature equally.

The *relationship-specific investment* variables are dummy variables—one for the buyer and one for the seller—indicating whether relationship-specific investment was undertaken in connection with the transaction. In our 423 observations, there are 103 cases of seller specific investment and 50 cases of buyer specific investment.

Although contractual detail and specific investment are the focus of our analysis, we use other measures to provide context, facilitate robustness checks, and aid in interpreting results. *Information dissemination* is a dummy variable signifying whether information about breach of an agreement would spread to other buyers or sellers. It indicates a possible mechanism of enforcement of an informal relationship. A negative effect on the use of detailed contracts would suggest that informal constraints provide an effective deterrence against opportunistic behavior.

We use a dummy variable capturing whether the observed transaction results from the *first agreement* between the buyer and the seller. If there is slow accumulation of personal trust or of expectation of repeated interactions, first agreements need to rely on more detailed contracts (Heide and John 1990; Banerjee and Duflo 2000). In contrast, Ryall and Sampson (2009) find that contracts are more detailed when the two contractual partners interact frequently, suggesting that contractual and relational governance can be complements. Hence, the sign of the effect of this variable cannot be predicted *a priori*.

The *dependence on partner* variables are dummy variables equal to one when it takes a month or more for the buyer to find an alternative supplier or for the seller to find an alternative customer. These variables are directly relevant as explanatory variables, but also to serve to bolster our identification strategy, as discussed in Section 4.2.

Quality of the courts is a dummy variable equal to one if the respondent makes the judgment that the commercial court in the firm's region is of higher than average quality. This variable captures whether court characteristics affect transactions.

Exogenous uncertainty is a dummy variable equal to one if unpredictable changes in weather or transportation links affect the market for the

10. See Lerner and Merges (1998), Arruñada et al. (2001), and Ryall and Sampson (2009) for measures constructed in an analogous fashion. Hagedoorn and Hesén (2009) find that diverse objective measures of contract complexity are interchangeable and that they are highly correlated with subjective measures of cognitive complexity.

transacted good. More detailed contracts could be devised to address some types of uncertainty, but exogenous uncertainty could become so great that it cannot be handled by contract, with parties settling for an informal agreement (Crocker and Masten 1991; Crocker and Reynolds 1993; Chiappori and Salanié 2003).

Two other sets of variables are more appropriately described when they are introduced into the discussion. These are the determinants of relationship-specific investments (Section 4.2) and explanatory variables included for the purposes of examining robustness (Section 5).

4. Estimating the Effects of Seller and Buyer Relationship-Specific Investment

We present estimates of the effects of both seller and buyer relationship-specific investment on the use of detailed contracts. We begin with estimates matching those of many existing studies and then proceed to implement the insights of Section 2.

There is no consensus on the optimal method of estimation of the critical parameters of interest in systems such as Equations (1) and (3) or Equations (2') and (3) (Imbens and Wooldridge 2009: 7, 25, 51). Those systems match the framework studied extensively in the treatment-effects literature (Heckman and Vytlacil 2007; Imbens and Wooldridge 2009), with our “treatment” being specific investment. The absence of consensus is especially the case in situations like ours, where sample size is relatively small and selection for treatment is dependent on unobservables (i.e., endogeneity of treatment is central). Given this, we use a variety of methods and specifications, which allows us to pinpoint which particular aspect of our procedures is necessary for producing our most distinctive results.

There are two additional advantages of this approach. First, use of a variety of methods furnishes robustness tests. Second, comparison of estimates from different methods provides information when the different methods have differing features and known biases. Section 2.3 gave predictions on how OLS estimates of the coefficients on relationship-specific investment differ from consistent estimates and on the signs of the correlation between the error terms in Equations (1) and (3) (or Equations (2') and (3)). If these predictions are borne out in the data, then this is evidence favoring the interpretation suggested by the hostages model.

4.1 OLS Estimates

The first two columns of Table 2 contain OLS estimates of Equation (1), each column reflecting the characteristics of only one party to the transaction. These types of regressions match those most common in the literature (e.g., McMillan and Woodruff 1999; Banerjee and Duflo 2000; Hubbard 2001). Both seller and buyer relationship-specific investment coefficients are positive, the former statistically significant, the latter not. These results also match the large majority in the literature: greater

Table 2. OLS Estimates of the Determinants of Detailed Contracting

Explanatory variables	Dependent variable: Index of contractual detail		
	(1)	(2)	(3)
Seller specific investment	0.689*** (0.188)		0.651*** (0.191)
Buyer specific investment		0.275 (0.277)	0.247 (0.284)
Quality of the courts	0.334* (0.184)	0.343* (0.190)	0.314* (0.188)
Information dissemination among sellers	0.333 (0.214)		0.210 (0.241)
Information dissemination among buyers		0.348 (0.232)	0.106 (0.271)
First agreement	0.092 (0.199)	0.222 (0.194)	0.133 (0.204)
Exogenous uncertainty	-0.109 (0.190)	-0.091 (0.191)	-0.097 (0.196)
Seller dependence on partner	0.580*** (0.175)		0.400** (0.197)
Buyer dependence on partner		0.621*** (0.177)	0.376* (0.197)
Constant	3.227*** (0.228)	3.311*** (0.249)	3.149*** (0.270)
Observations	390	390	371
Clusters	231	230	227
Adjusted <i>R</i> -squared	0.071	0.040	0.069

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

relationship-specific investment leads to more elaborated modes of transactional governance.

The last column of Table 2 reflects data for firms on both sides of the transaction (i.e., corresponding to Equation (2')). A Wald test of the difference between the coefficients on buyer and seller specific investment (i.e., $\beta^S = \beta^B$ in Equation (2')) does not reject the null hypothesis of equality of the two (p -value = 0.26). A comparison of the coefficients in the third column of Table 2 to those in the first two columns suggests little is gained by estimating Equation (2') rather than the two versions of Equation (1).

4.2 Endogenous Specific Investment: Maximum-Likelihood Treatment-Effects Methods

We now address the endogeneity of specific investment, first on the system (1) and (3). As noted above, that system conforms to a standard case in the treatment-effect literature, where β^S (or β^B) is the parameter of interest, specific investment is the treatment, and selection for treatment depends on unobservables that are also determinants of the use of detailed contracts. One approach is to assume that the error terms of Equations (1)

and (3) have a bivariate normal distribution and use maximum likelihood (Heckman 1978). To implement this approach, we seek observable exogenous determinants of relationship-specific investment, that is data on the W_i^j , $j=S, B$ in Equation (3). Appropriate determinants are technological and market characteristics that do not directly affect the use of detailed contracts. We adopt a strategy similar to that of Akerberg and Botticini (2002) and Bajari et al. (2014) in using dummy variables that capture underlying characteristics of the interacting economic agents.

Suppose the producer–seller sector uses proprietary technologies that are restricted to a few sellers. Then, buyers do not have access to the technological information required to undertake relationship-specific customization. In contrast, if there are many producer–sellers, this could imply easy access to a standardized production technology, meaning that buyers can obtain the information needed to undertake their own customization using relationship-specific investment. The presence of buyer specific investment thus reflects key characteristics of seller technologies. Although it is difficult to observe directly the relevant characteristics of technologies, this example suggests that the number of potential producer–sellers can proxy the type of technology prevalent in a sector.¹¹

Of course there are other types of relevant variations in technologies, ones that do not reflect the diffusion of technological knowledge. Consider, for example, small-scale niche production versus mass manufacturing. With many niche sellers, products are likely to be already suited to the needs of particular customers: the buyer does not need to customize. In contrast, mass manufacturers will be less willing to cater to the specific needs of minor customers, leaving buyers to undertake their own relationship-specific customization. Under this alternative type of technological variation, the number of potential sellers is again a proxy for technological variations that influence the extent of buyer customization. However, the proxy relationship would have the opposite sign of that in the preceding paragraph.

There are therefore three essential elements to the construction of the explanatory variables for relationship-specific investment by buyers, the W_i^B . First, the type of technology within the producer–seller sector affects the propensity of buyers to undertake relationship-specific investment. Second, technological type is correlated with the number of potential sellers, which, in the absence of data on technologies, can be a useful proxy. Third, the direction of the proxy relationship could vary across sectors. These three considerations suggest that the predictors of relationship-specific investment are the interactions of sector dummy variables with dummy variables capturing whether there are few or many sellers (see Appendix A for details). It is worth emphasizing that the variable used

11. In general perspective, although not in details, the argument here parallels that of Hubbard (2001), which notes that for trucking services the seller's investment in specific capital is greater the fewer potential buyers there are in a region.

for the number of sellers is the total number in the market, not the number of sellers that could be relevant to this buyer during implementation.

Four highly aggregated sectors are used because the relatively small sample size suggests employing a small number of variables for the W_i^j , $j = S, B$. This results in eight dummy variables, few or many sellers in four different sectors. An analogous argument and construction of instruments applies in the case of seller relationship-specific investment.

In the analyses in Sections 4.2–4.4, our identification assumption is that the W_i^j are excluded from Equation (1) or (2') because the W_i^j are proxies for technologically induced characteristics of the markets in which the firms participate, rather than determinants of the firm's response to vulnerability to hold up. This exclusion restriction is a strong one. For example, it might be the case that firms in different sectors have different types of strategies for responding to vulnerability and therefore our W_i^j might be related to these strategy choices. Or, the potential numbers of buyers and sellers could proxy alternatives available once relationship-specific investment has occurred. The following paragraphs offer a number of arguments in support of our exclusion assumption.

First, we examine the exclusion restriction directly, using data separate from that used to generate our core empirical results. In the survey we interviewed the general managers of the firms, but these respondents contributed little of the data used for our formal empirical results.¹² General managers set overall strategy, including the firm's transactional strategy. We asked general managers to rate on a scale of 0–10 the importance to their firm of using agreements that facilitated filing suit in court if disputes did arise.¹³ When regressing this measure on sector dummy variables, we found that we could not reject the null hypothesis that sectors had no explanatory power (F -statistic = 0.67).¹⁴ In other words, we found no evidence that sectors affect the importance the firm generally accords to using agreements that facilitate the use of courts, if necessary.

12. Most of the data used in the empirical tests come from the responses of sales and procurement managers, not the general manager.

13. A preamble to the relevant question referred to methods "that businesses use when constructing viable trading relations and when preventing or resolving problems that arise when implementing transactions." Then the question went on to ask "Please rate the importance of each of the following methods for your firm. Your rating should reflect both frequency of use and effectiveness. Please use a scale from 0 to 10: '0' means that either you never use the method or the method is totally ineffective; '10' means that you use the method in a very large percentage of transactions and it is very valuable to your business." One of the methods was "When supplier or customer frame their agreements so that they can easily file suit in court (or threaten to file suit) if disputes do arise." The responses concerning this method were regressed on the set of sector dummy variables.

14. The sector dummy variables used in this analysis reflected the responses of general managers when asked to classify their firms by naming the single sector that contained the product that accounted for the greatest share of the firm's revenues. The survey instructed the general managers to choose one of 28 sectors listed on the questionnaire. Our sample contained firms in 25 of these sectors.

Second, although the exclusion restriction is essential for some of the empirical methods we use, one method does not rely solely on that restriction. The maximum-likelihood approach uses two methods of identification—the exclusion restriction plus functional form assumptions. In Section 4.5 we drop the exclusion restriction, obtaining results very similar to those presented in this subsection.

Third, in Section 4.4 we report the results of over-identification tests from a two-stage least-squares estimation of an equation corresponding to that in the third column of Table 2. Although such tests are not definitive in isolating problems with overidentifying restrictions, their results are often taken to be indicative of the existence of such problems. In the current case, there are no such indications.

Fourth, to counter the possibility that the potential numbers of buyers and sellers proxy the alternatives available once relationship-specific investment has occurred, we include in Equation (1) (or Equation (2')) the dependence-on-partner variables. These variables capture the ex post market thinness that directly affects hold-up probabilities during the implementation of transactions. Therefore, their inclusion should counter the possibility that the W_i^j are proxying ex post thinness.

Fifth, one remaining source of doubt about our exclusion restriction might be that it entails omitting from Equations (1) and (2') variables capturing the firm's commitment to a particular transactional strategy. In the robustness tests of Section 5, we add to Equations (1) and (2') a set of explanatory variables that are determinants of the use of law-based strategies in transition countries (Murrell 2003). There is no resultant change in the qualitative features of the results. This suggests that our core conclusions are robust to the inclusion of variables capturing a firm's commitment to a law-based strategy.

We now use the exclusion assumption within a maximum-likelihood treatment-effect procedure, estimating two separate systems, one for each side of the contractual relationship. The results appear in Table 3. These results correspond to those in the first two columns of Table 2.¹⁵

As predicted in Section 2, the coefficient on buyer-investment has a negative sign. Moreover, the effects of relationship-specific investment on contracting behavior are economically important. Such investment by either party produces a one standard deviation change in the index of contractual detail.¹⁶ The signs of the correlations between the error terms of Equations (1) and (3) are as predicted in Section 2 and are statistically significant. This result on the error correlation has two

15. Sample sizes vary across analyses because different analyses rely on different combinations of variables and the amount of missing data varies across variables.

16. A referee of an earlier version of this paper asked whether the results are driven by specific respondents—whether regressions using only buyer respondent data are similar to those using only seller respondent data. We divided the sample by respondent and ran regressions matching Tables 2 and 3. The qualitative characteristics of the results do not change. These results are available on request from the authors.

Table 3. Maximum-Likelihood Treatment-Effects Estimates of the Effect of Relationship-Specific Investment

Determinants of index of contractual detail		Determinants of index of contractual detail	
Seller specific investment	1.808*** (0.621)	Buyer specific investment	-2.318*** (0.372)
Quality of the courts	0.387** (0.189)	Quality of the courts	0.397** (0.186)
Information dissemination among sellers	0.251 (0.219)	Information dissemination among buyers	0.321 (0.228)
First agreement	0.088 (0.199)	First agreement	0.177 (0.189)
Exogenous uncertainty	-0.093 (0.196)	Exogenous uncertainty	-0.111 (0.189)
Seller dependence on partner	0.505*** (0.175)	Buyer dependence on partner	0.545*** (0.175)
Constant	3.051*** (0.281)	Constant	3.679*** (0.239)
Determinants of seller-specific investment		Determinants of buyer-specific investment	
Few buyers, heavy	0.715** (0.280)	Few sellers, heavy	-0.197 (0.238)
Few buyers, light	-0.009 (0.608)	Few sellers, light	-0.514* (0.271)
Few buyers, construction	1.126*** (0.375)	Few sellers, construction	-0.989*** (0.378)
Few buyers, other	0.746** (0.335)	Few sellers, other	-0.576** (0.249)
Many buyers, heavy	0.106 (0.226)	Many sellers, heavy	-0.770*** (0.262)
Many buyers, light	0.037 (0.247)	Many sellers, light	-0.326 (0.276)
Many buyers, construction	0.463* (0.251)	Many sellers, construction	-0.549** (0.260)
Constant	-0.999*** (0.169)	Constant	-0.738*** (0.182)
Observations	373	Observations	374
Clusters	227	Clusters	224
rho (correlation between the error terms)	-0.398*** (0.167)	rho (correlation between the error terms)	0.746*** (0.085)
Log-likelihood	-916.5	Log-likelihood	-850.6

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

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

implications for the interpretation of this paper's results. First, looking backward, testing the significance of the error correlations is implicitly a test of whether omitted-variable bias affects OLS estimates. Second, looking forward, the strong statistical significance of the error correlations

suggests that the full-information methods of Table 3 will have more power than limited-information methods, such as instrumental variables.

Turning to other estimated coefficients, there is a statistically significant positive relationship between court quality and the use of detailed contracts. This suggests that the legal system facilitates the use of detailed contracts, thereby reinforcing the interpretation that the estimated relationships reflect firms' decisions as they consider how the use of legal instruments should vary with levels of specific investment. The estimated coefficients on first agreement and information dissemination are not statistically significant. This lack of significance might reflect the fact that these variables affect transactional choice at a different level from other variables. Perhaps they affect the choice between different modes of transactional governance (e.g., law versus relational agreements), rather than the choice to use more or less detailed contracts.¹⁷

4.3 Heckman Two-Step Treatment-Effects Estimates

Heckman and Vytlacil (2007) differentiate between control function and instrumental variable approaches to consistent estimation of treatment effects. This subsection uses a control function approach—Heckman's two-step procedure (Heckman 1979). The next uses instrumental variables.

The two-step estimates appear in columns (1)–(3) of Table 4. The specifications for the estimates in the first two columns match those in Table 3. Corresponding estimates in the two tables have similar magnitudes, but the estimates in Table 4 are less precise than those in Table 3, with many of the coefficients losing significance at standard levels. The positive sign of the inverse Mills ratio in the buyer equation suggests the presence of an omitted variable that has a positive effect on the use of detailed contracts and simultaneously increases the probability of buyer specific investment. One interpretation of that variable is that it is unobserved seller vulnerability.

The Heckman two-step procedure has the advantage that it can be readily adapted to produce estimates within one regression of the effects of specific investment on both sides of the relationship (i.e., a specification matching that of column (3) of Table 2).¹⁸ These estimates appear in column (3) of Table 4. It is now possible to test a null hypothesis of equality of the two specific investment coefficients (i.e., $\beta^S = \beta^B$ in Equation (2')). This hypothesis is rejected at a p -value of 0.059. While this is not a strong rejection of the hypothesis, it is supportive of our model and findings generally.

17. Choice between closely related alternatives, such as between fewer or more details in contracts, might be dominated by very different considerations than choice between radically different alternatives (Nelson and Winter 1982).

18. The two-step Heckman procedure is easily adapted for two treatments (Vella 1998), but analytical formulae for standard errors are not straightforward extensions of the one-treatment case. Here, standard errors are bootstrapped using 1000 repetitions.

Table 4. Heckman Two-Step and Instrumental-Variable Estimates of the Effect of Relationship-Specific Investment

Explanatory variables	Dependent variable: Index of contractual detail					
	Heckman two-step estimates			Instrumental variable estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Seller specific investment	1.517* (0.922)		0.768 (1.053)	1.418 (1.026)		1.963 (1.264)
Buyer specific investment		-2.851 (1.746)	-2.952 (1.912)		-3.121 (1.994)	-2.022 (1.645)
Quality of the courts	0.383** (0.178)	0.339* (0.177)	0.355* (0.184)	0.330* (0.196)	0.292 (0.218)	0.266 (0.227)
Information dissemination among sellers	0.255 (0.220)		0.167 (0.246)	0.165 (0.247)		0.061 (0.315)
Information dissemination among buyers		0.349 (0.238)	0.162 (0.273)		0.447 (0.287)	0.228 (0.339)
First agreement	0.101 (0.193)	0.199 (0.196)	0.122 (0.202)	0.049 (0.226)	0.319 (0.230)	0.126 (0.261)
Exogenous uncertainty	-0.095 (0.202)	-0.097 (0.203)	-0.094 (0.199)	-0.125 (0.192)	-0.231 (0.236)	-0.269 (0.231)
Seller dependence on partner	0.529*** (0.186)		0.308 (0.217)	0.452** (0.229)		0.090 (0.274)
Buyer dependence on partner		0.604*** (0.185)	0.441** (0.204)		0.609*** (0.212)	0.386 (0.245)
Inverse Mills ratio for seller specific investment	-0.521 (0.544)		-0.099 (0.608)			
Inverse Mills ratio for buyer specific investment		1.666* (0.930)	1.727* (0.992)			
Constant	3.105*** (0.310)	3.719*** (0.341)	3.506*** (0.436)	3.286*** (0.240)	3.695*** (0.373)	3.372*** (0.331)
Observations	373	374	350	373	374	350
Clusters				227	224	218

Notes: 1) Standard errors in parentheses. For instrumental variable estimates, clustered at the firm level. 2) *Significant at 10%; **significant at 5%; and ***significant at 1%. 3) Standard errors in column (3) are bootstrapped, using 1000 iterations. 4) Test of equality of seller and buyer relationship-specific investment coefficients in column (3): p -value = 0.059. 5) F -test of excluded instruments for seller relationship-specific investment in the first-stage probit relevant to column (4): $F(1,226) = 11.71$, p -value = 0.001. 6) F -test of excluded instruments for buyer relationship-specific investment in the first-stage probit relevant to column (5): $F(1,223) = 9.51$, p -value = 0.002. 7) F -test of excluded instruments for seller relationship-specific investment in the first-stage probit relevant to column (6): $F(2,217) = 5.32$, p -value = 0.006. 8) F -test of excluded instruments for buyer relationship-specific investment in the first-stage probit relevant to column (6): $F(2,217) = 5.27$, p -value = 0.006. 9) Wald test of equality of seller and buyer relationship-specific investment coefficients in column (6): p -value = 0.064.

4.4 Instrumental Variable Estimates of Treatment Effects

We next use an instrumental-variable procedure (Wooldridge 2008, 2010: 939, 964). Like the Heckman two-step procedure, this has the advantage of being implementable when there are two treatment variables. The results appear in columns (4)–(6) of Table 4. To obtain the results in column (6), two separate probits are estimated with buyer and seller relationship-specific investments as dependent variables and the same determinants of specific

investment as in Table 3 and columns (1)–(3) of Table 4. Then predicted probabilities from these probits are used as instruments for the two relationship-specific investment variables in the regression explaining contractual detail. This procedure is asymptotically efficient within the set of procedures that use as instruments functions of the variables included in the first stage. It is robust to misspecification of the choice of the functional form of first-stage equations and is therefore less dependent than maximum-likelihood or Heckman two-step on the normality assumption of the probit first stage.

The results in columns (4)–(6) of Table 4 are consistent with those above. As in the case of the Heckman two-step procedure, significance levels are much lower than for maximum likelihood.¹⁹ But the estimated coefficients are close in magnitude to those for maximum likelihood. The contrasting signs of the coefficients of the two relationship-specific investment variables remain. A Wald test of equality of the coefficients of seller and buyer relationship-specific investment has a p -value of 0.064. As in the previous subsection, this is not a strong statistical rejection of the null hypothesis but, as emphasized in that subsection, it is one element of a consistent set of results.

Because this procedure uses a single instrument per endogenous variable (the predicted probability from the probit), it is just identified: tests for over-identification are not possible. However, if one replaces the probit first-stage equation with a linear probability model, then one obtains a standard linear two-stage least-squares regression model. This model is overidentified, allowing generation of a Hansen J -statistic, which is usually interpreted as testing the null hypothesis that the over-identification assumptions (i.e., the exclusion restrictions) are not violated. The p -values corresponding to columns (4), (5), and (6) of Table 4 are 0.108, 0.367, and 0.365: the null hypothesis of acceptability of the exclusion restrictions is not rejected at the 10% significance level.

4.5 Maximum-Likelihood Estimates Relying Only on Functional Form for Identification

Two elements drive identification in Table 3. First, there are the exclusion restrictions on the W_i^j , $j = S, B$. Second, there is the non-linear probit functional form for the first-stage equations. Because the estimates in

19. No doubt this low precision is partially a reflection of somewhat weak first-stage regressions. The F -test statistics for excluded instruments are all significant, but those for column (6) in Table 4 are less than 10, the standard weak-instrument rule of thumb. Because our instrumental variables procedure does not use linear two-stage-least squares, that benchmark of 10 and the tables of weak-instrument critical values (Stock and Yogo 2005) are not directly applicable for assessing the F -statistics of Table 4. If, however, one used the Stock and Yogo (2005: 100) critical values as a rough guide, then the F -statistics of Table 4 suggest we have achieved a bias reduction of 75% when we move from OLS estimates to instrumental variables. Because there is a large difference between the OLS and the instrumental-variable estimates of the effect of relationship-specific investment, the usual concern with weak instruments—bias toward OLS estimates—does not cause problems for the qualitative conclusions that we draw from our results.

columns (4)–(6) of Table 4 are robust to functional form assumptions on the first-stage equation (Wooldridge 2010: 939–941), they rest primarily on the exclusion restrictions.

In contrast, the results presented in this subsection rely solely on functional form assumptions and not on exclusion restrictions. This is accomplished by using the maximum-likelihood procedure of Section 4.2 without the exclusion restriction, that is, by adding the W_j^j , $j = S, B$ to the equation explaining the use of detailed contracts. The resultant estimates, appearing in Table 5, are very similar to those of Table 3 in both the absolute size and the statistical strength of the estimates of the coefficients for the specific investment variables. Hence, the signs and sizes of the estimated coefficients of the specific-investment variables are very similar when we rely solely on the exclusion restriction (columns (4)–(6) of Table 4), when we rely solely on the functional form assumption (Table 5), and when we use both (Table 3).

4.6 Summary

Our results reflect a variety of different approaches to estimation, varying specification, method of identification and estimation technique. Viewed in composite, the results are consistent. The coefficient on seller specific investment is always positive. The coefficient on buyer specific investment is always negative (except in OLS, which ignores endogeneity). Where the estimation methods provide direct information on why there might be bias in the use of OLS, as in error correlations or coefficients on inverse Mills ratios, they suggest the presence of an unobserved variable with the characteristics discussed in Section 2. The coefficients on the specific-investment variables are always large enough to suggest an economically significant effect. Where the specific-investment coefficients are not individually statistically significantly different from zero, they are statistically significantly different from each other (except in OLS), albeit sometimes weakly so. Moreover, there is consistency in the absolute sizes of the estimated coefficients for the specific-investment variables across Tables 3–5, suggesting robustness of those results that lead to our central conclusion. We turn now to further robustness tests, which also support this conclusion.

5. Robustness: Varying Variable Definitions and Adding Variables

In this section, we examine the robustness of our estimates when varying many of the decisions made in generating the results presented in Tables 2–5. The tables relevant to these robustness tests are contained in the [Supplementary Materials](#) posted online. Each robustness exercise produces estimates that match those in Section 4, with the presentation of results exactly following the format of Tables 1–5.

5.1 Alternative Indexes of Detailed Contracts

The index of detailed contracting reflects all features of contracts and contract construction elicited in the survey, both features of the contract

Table 5. Maximum Likelihood Treatment-Effects Estimates with Identification Based on Non-linearities

Determinants of index of contractual detail		Determinants of index of contractual detail	
Seller specific investment	1.636*** (0.439)	Buyer specific investment	-2.176*** (0.416)
Quality of the courts	0.357* (0.190)	Quality of the courts	0.378** (0.190)
Information dissemination among sellers	0.266 (0.220)	Information dissemination among buyers	0.333 (0.228)
First agreement	0.062 (0.193)	First agreement	0.148 (0.188)
Exogenous uncertainty	-0.054 (0.196)	Exogenous uncertainty	-0.068 (0.196)
Seller dependence on partner	0.469*** (0.173)	Buyer dependence on partner	0.436** (0.181)
Few potential buyers in heavy industry	-0.210 (0.422)	Few potential sellers in heavy industry	0.606 (0.385)
Few potential buyers in light manufacturing	0.255 (0.784)	Few potential sellers in light manufacturing	0.380 (0.392)
Few potential buyers in construction	0.518 (0.499)	Few potential sellers in construction	0.712 (0.435)
Few potential buyers in other sectors	0.435 (0.386)	Few potential sellers in other sectors	0.334 (0.399)
Many potential buyers in heavy industry	0.530* (0.311)	Many potential sellers in heavy industry	0.118 (0.476)
Many potential buyers in light manufacturing	0.188 (0.304)	Many potential sellers in light manufacturing	0.059 (0.420)
Many potential buyers in construction	0.662** (0.266)	Many potential sellers in construction	0.740** (0.345)
Constant	2.793*** (0.335)	Constant	3.318*** (0.365)
Determinants of seller specific investment		Determinants of buyer specific investment	
Few potential buyers in heavy industry	0.781*** (0.283)	Few potential sellers in heavy industry	0.025 (0.260)
Few potential buyers in light manufacturing	-0.065 (0.644)	Few potential sellers in light manufacturing	-0.387 (0.321)
Few potential buyers in construction	1.027*** (0.379)	Few potential sellers in construction	-0.747* (0.418)
Few potential buyers in other sectors	0.656* (0.344)	Few potential sellers in other sectors	-0.472 (0.298)
Many potential buyers in heavy industry	-0.010 (0.216)	Many potential sellers in heavy industry	-0.744** (0.317)
Many potential buyers in light manufacturing	-0.008 (0.246)	Many potential sellers in light manufacturing	-0.303 (0.306)
Many potential buyers in construction	0.315 (0.224)	Many potential sellers in construction	-0.291 (0.280)
Constant	-0.931*** (0.162)	Constant	-0.880*** (0.189)

(continued)

Table 5. Continued

Observations	373	Observations	374
Clusters	227	Clusters	224
rho (correlation between the error terms)	-0.341*** (0.102)	rho (correlation between the error terms)	0.722*** (0.104)
Log-likelihood	-911.6	Log-likelihood	-846.6

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

*Significant at 10%; **significant at 5%; and ***significant at 1%.

document itself (e.g., the presence of a penalty clause) and judgments about the process surrounding contract construction (e.g., how much lawyers were involved). We create two separate indexes, reflecting each of these types of information, referring to them as “textual” and “process” indexes of contractual details. The two indexes have a correlation coefficient of 0.61 indicating that they capture somewhat different aspects of contracting.

The qualitative features of the results match those of Section 4. Consider for example the estimate of the critical buyer specific-investment coefficient in Table 3 and the corresponding estimates in the Online Appendix. In Table 3, the estimated effect of buyer specific-investment is a 1.31 standard deviation change in the measure of contracting detail. In the robustness estimates, buyer specific-investment produces a 1.26 standard deviation change in the process measure of contracting detail and a 1.37 standard deviation change in the textual measure of contracting detail.²⁰ Moreover, the estimates of the correlation of error terms in the Online Appendix are of similar magnitudes to those in Table 3. For other tables, the significance levels on coefficients and error terms for analyses with the two alternative contracting indexes are similar to those for the single index contained in the body of the paper.²¹

5.2 Additional Explanatory Variables

We add explanatory variables that have been suggested as determinants of contractual relationships, especially in transition countries. These

20. 1.31 is the absolute value of the ratio of the coefficient on buyer-specific investment of -2.318 (Table 3) to the standard deviation of the index of contractual detail of 1.763 (Table 1). The analogous estimates for the process measure of contracting detail are -1.731 and 1.264 (Online Appendix Tables C.1 and C.3), yielding a ratio with an absolute value of 1.37. For the textual measure of contracting detail, the estimates are 0.855 and 0.679 (Tables D.1 and D.3), yielding the analogous 1.26.

21. For the process index, the p -value for the test of the difference between the specific-investment coefficients in the analysis corresponding to that in column (6) of Table 4 is now higher than 10%. However, there is a p -value of 0.054 in the analogous analysis of column (3) of Table 4 and the buyer specific-investment coefficient is now statistically significant at the 10% level.

variables reflect the past or present role of the state in the transacting firms, whether the firms are in the same region, whether a firm is an old-established firm, and firm size. There is virtually no change in the qualitative features of the results. The test statistics for the difference between the two specific investment coefficients are now statistically significant at the 5% level in the analyses corresponding to those in Table 4.

5.3 Varying Definitions of Specific Investment

As discussed above and in Appendix A, the constraints involved in interviewing busy firm officials from a heterogeneous sample of firms meant that most survey questions were closed ended and had respondents choose one of a small set of ordered categorical alternatives provided in the questionnaire. Avoiding the proliferation of a large number of explanatory variables entails making judgments on the dividing line when converting an ordinal scale into a single dummy variable, as in the construction of the specific investment variables. Here, we vary those dividing lines.

We first make the definition of specific investment more restrictive. The original buyer specific-investment dummy variable equals one if any special investment was indicated. The dummy variable is now set to one when there is a significant amount of special investment. The original seller specific-investment dummy variable is equal to one if modification for other buyers required at least a small cost. It is now set to one only if modification for other buyers required at least a moderate cost. This results in the loss of (coincidentally) 37 cases of both buyer and seller specific investment, unfortunately leaving only 13 cases of buyer specific investment.

We then make the definition of specific investment less restrictive. This is possible only on the seller side. The original variable is equal to one if modification for other buyers required at least a small expenditure. We now set it to one if modification entailed any expenditure. This results in 51 extra cases of seller specific investment.

In the case of more restrictive specific investment, the qualitative features of the results are very similar to those of Section 4, but with one exception. The 2SLS estimates corresponding to those in columns (4)–(6) of Table 4 no longer have a negative coefficient for the buyer specific-investment variable. This lack of robustness is hardly surprising given that only one quarter of the original observations on buyer-specific investment remain, resulting in exceedingly weak instruments.²²

22. When there is a reduction in the number of data points for which buyer specific investment occurs, there is an additional effect on the number of observations usable in the analysis. The 2SLS procedure uses a probit first stage, which is not identified when an explanatory dummy variable perfectly predicts the dependent variable for some observations. We obtain estimates by dropping the pertinent variables and observations. Generally, the loss in observations is greater the fewer are the data points where buyer specific investment occurs.

Using less restrictive specific investment, the qualitative features of the results are very similar to those of the corresponding results reported in Section 4, with one exception. The seller-investment variable in the results corresponding to those in Table 5 now appears with a negative sign.

5.4 Varying Definitions of the Determinants of Specific Investment

We previously defined few potential buyers as 10 or fewer buyers, with few potential sellers defined analogously. This is as broad a definition of few as is possible given the survey question. A narrower criterion defines few as four or fewer. Use of this alternative changes the values of the determinants of seller specific investment for 32 transactions, with 65 changes on the buyer's side.

The qualitative features of the resultant estimates are similar to those of Section 4, except those corresponding to Table 5, which are not robust. There is a strengthening of statistical significance in the test statistics for the difference between the two specific investment coefficients obtained using both the Heckman two-step and instrumental-variable procedures.

5.5 Changing the Definition of Court Quality

The original definition of higher court quality reflected whether the survey respondent rated the local court higher than the midpoint of a scale. We change this definition of higher quality to one where the court received a higher rating than the median of the rating of all courts. This results in a change of 25 observations for the court quality variable, with a greater number of enterprises rating court quality as high.

The qualitative features of the results are very similar to those in the corresponding tables in Section 4, except that there is some weakening in significance of the results for the court variable. We thus conclude that results on court quality are not robust.

6. Further Reflections on the Results

We have shown that seller and buyer relationship-specific investment have opposite effects on the use of detailed contracts by transacting Romanian firms. The key result—the opposite signs of the estimates of the coefficients of the two specific-investment variables—is robust across multiple empirical specifications and when using a variety of econometric methods. The generation of our results was dependent on the use of a comprehensive data set containing information on both parties to each transaction, which facilitated countering the bias due to the endogeneity of specific investment. Our empirical findings are consistent with Williamson's (1983) insight that asset specificity can provide transactional benefits when viewed from a hostages perspective.

Stepping beyond its immediate implications, this paper sheds light on the connection between financial development, legal development, and transactional behavior. The assumption that firms are acutely credit and

cash-flow constrained is central to our interpretation. This assumption is especially appropriate for transition and developing economies, but rarely used in formal theorizing on contracts.²³ When firms are not constrained financially *ex ante*, side payments can be used to mute the vulnerabilities that arise as transacting partners invest in the relationship in different magnitudes (Koss and Eaton 1997). Then, detailed contracts are less necessary. Hence, the use of financing arrangements and the use of detailed contracts are substitutes in supporting transactions.

From an even broader perspective, our results suggest that the legal system provided important benefits, even in a country where the rule of law was not strong. Romanian firms use more detailed contracts, which presumably rely partially on the legal system for their effectiveness, when relationship-specific investment increases vulnerability to hold up.

Lastly, our results are relevant to the interpretation of the recent empirical literature that has examined whether variables related to specific investment can have opposite effects on contractual governance when these variables characterize opposite sides of a transaction (Woodruff 2002; Lafontaine and Slade 2007; Acemoglu et al. 2010; Lileeva and van Biesebroeck 2013). Such asymmetry results are usually interpreted as supportive of property-rights theory (Grossman and Hart 1986). This paper provides an alternative interpretation and an empirical example of the phenomenon of the conditional effect of relationship-specific investment.

Supplementary material

Supplementary material is available at *Journal of Law, Economics, & Organization* online.

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References

- Acemoglu, Daron, Philippe Aghion, Rachel Griffith, and Fabrizio Zilibotti. 2010. "Vertical Integration and Technology: Theory and Evidence," 8(5) *Journal of European Economic Association* 989–1033.
- Acemoglu, Daron, Simon Johnson, and Todd Mitton. 2009. "Determinants of Vertical Integration: Financial Development and Contracting Costs," 64(3) *Journal of Finance* 1251–90.
- Akerberg, Daniel A., and Maristella Botticini. 2002. "Endogenous Matching and the Empirical Determinants of Contract Form," 110(3) *Journal of Political Economy* 564–591.
- Ahmadjian, Christina, and Joanne E. Oxley. 2005. "Using Hostages to Support Exchange: Dependence Balancing and Partial Equity Stakes in Japanese Automotive Supply Relationships," 22(1) *Journal of Law, Economics, & Organization* 213–33.

23. An important exception is Aghion and Tirole (1994) and the related empirical application by Lerner and Merges (1998). Aghion and Tirole (1994) show that cash-flow constraints can lead to the choice of sub-optimal transactional mechanisms, which is consistent with the results of this paper.

- . 2013. "Vertical Relationships, Hostages, and Supplier Performance in the Japanese Automotive Industry," 29(3) *Journal of Law, Economics, & Organization* 485–512.
- Aghion, Philippe, and Jean Tirole. 1994. "On the Management of Innovation," 109 *Quarterly Journal of Economics* 1185–207.
- Anderson, Erin, and Barton Weitz. 1992. "The Use of Pledges to Build and Sustain Commitment in Distribution Channels," 29(1) *Journal of Marketing Research* 18–34.
- Arruñada, Benito, Luis Garicano, and Luis Vázquez. 2001. "Contractual Allocation of Decision Rights and Incentives: The Case of Automobile Distribution," 17(1) *Journal of Law, Economics, & Organization* 257–84.
- Bajari, Patrick, Stephanie Houghton, and Steven Tadelis. 2014. "Bidding for Incomplete Contracts: An Empirical Analysis of Adaptation Costs," 104(4) *American Economic Review* 1288–319.
- Banerjee, Abhijit V., and Esther Duflo. 2000. "Reputation Effects and the Limits of Contracting: A Study of the Indian Software Industry," 115(3) *Quarterly Journal of Economics* 989–1017.
- Chiappori, Pierre, and Bernard Salanié. 2003. "Testing Contract Theory: A Survey of Some Recent Work," in M. Dewatripont, L. Hansen, and S. Turnovsky, eds., *Advances in Economics and Econometrics—Theory and Applications*, Cambridge, UK: Cambridge University Press 115–149.
- Crocker, Keith J., and Scott E. Masten. 1991. "Pretia Ex Machina? Prices and Process in Long-term Contracts," 34(1) *Journal of Law & Economics* 69–99.
- Crocker, Keith J., and Kenneth J. Reynolds. 1993. "The Efficiency of Incomplete Contracts: An Empirical Analysis of Air Force Engine Procurement," 24(1) *RAND Journal of Economics* 126–46.
- De la Peña, Nuria, and Heywood W. Fleisig. 2004. "Romania: Law on Security Interests in Personal Property and Commentaries," 29(2) *Review of Central and East European* 133–217.
- EBRD. 2002. Transition Report. London, UK: EBRD.
- Fein, Adam J., and Erin Anderson. 1997. "Patterns of Credible Commitments: Territory and Brand Selectivity in Industrial Distribution Channels," 61(2) *Journal of Marketing* 19–34.
- Gibbons, Robert. 2005. "Four Formal(izable) Theories of the Firm?," 58(2) *Journal of Economic Behavior & Organization* 200–45.
- Gow, Hamish R., Deborah H. Streeter, and Johan F. M. Swinnen. 2000. "How Private Contract Enforcement Mechanisms Can Succeed Where Private Institutions Fails: The Case of Juhocukor a.s.," 23(3) *Agricultural Economics* 253–65.
- Grossman, Sanford J., and Oliver D. Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," 94(4) *Journal of Political Economy* 691–719.
- Hagedoorn, John, and Geerte Hesens. 2009. "Contractual Complexity and the Cognitive Load of R&D Alliance Contracts," 6 *Journal of Empirical Legal Studies* 867–903.
- Heckman, James J. 1978. "Dummy Endogenous Variables in a Simultaneous Equation System," 46(4) *Econometrica* 931–59.
- . 1979. "Sample Selection Bias as a Specification Error," 47(1) *Econometrica* 153–61.
- Heckman, James J., and Edward J. Vytlacil. 2007. "Econometric Evaluation of Social Programs, Part II: Using the Marginal Treatment Effect to Organize Alternative Econometric Estimators to Evaluate Social Programs, and to Forecast Their Effects in New Environments," in J. Heckman and E. Leamer, eds., *Handbook of Econometrics*, Vol. 6B. Amsterdam, NL: North Holland.
- Heide, Jan B., and George John. 1990. "Alliances in Industrial Purchasing: The Determinants of Joint Action in Buyer–Supplier Relationships," 27(1) *Journal of Marketing Research* 24–36.
- Hubbard, Thomas N. 2001. "Contractual Form and Market Thickness in Trucking," 32(2) *RAND Journal of Economics* 369–86.
- . 2008. "Viewpoint: Empirical Research on Firms' Boundaries," 41(2) *Canadian Journal of Economics* 341–59.

- Imbens, Guido M., and Jeffrey M. Wooldridge. 2009. "Recent Developments in the Econometrics of Program Evaluation," 47(1) *Journal of Economic Literature* 5–86.
- Johnson, Simon, John McMillan, and Christopher Woodruff. 2000. "Entrepreneurs and the Ordering of Institutional Reform. Poland, Slovakia, Romania, Russian and Ukraine Compared," 8(1) *Economics of Transition* 1–36.
- Joshi, Ashwin W., and Rodney L. Stump. 1999. "The Contingent Effect of Specific Asset Investments on Joint Action in Manufacturer–Supplier Relationships: An Empirical Test of the Moderating Role of Reciprocal Asset Investments, Uncertainty, and Trust," 27(3) *Journal of the Academy of Marketing Science* 291–305.
- Kaufmann Daniel, Aart Kraay, and Massimo Mastruzzi. 2007. "Governance Matters VI: Governance Indicators for 1996–2006." *World Bank Policy Research Working Papers Series* 4280.
- Koss, Patricia A. 1999. "Self-Enforcing Transactions: Reciprocal Exposure in Fisheries," 15(3) *Journal of Law, Economics, & Organization* 737–49.
- Koss, Patricia A., and Curtis B. Eaton. 1997. "Co-specific Investments, Hold-up and Self-enforcing Contracts," 32(3) *Journal of Economic Behavior & Organization* 457–70.
- Lafontaine, Francine, and Margaret Slade. 2007. "Vertical Integration and Firm Boundaries: The Evidence," 45(3) *Journal of Economic Literature* 629–85.
- . 2012. "Inter-Firm Contracts," in R. Gibbons and J. Roberts, eds., *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press 958–1013.
- Lerner, Josh, and Robert Merges. 1998. "The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry," 46 *Journal of Industrial Economics* 125–56.
- Lileeva, Alla, and Johannes van Biesebroeck. 2013. "Outsourcing When Investments Are Specific and Interrelated," 11(4) *Journal of the European Economic Association* 871–96.
- Macher, Jeffrey, and Barak Richman. 2008. "Transaction Cost Economics: An Assessment of Empirical Research in the Social Sciences," 10 *Business and Politics* 1–65.
- Masten, Scott E. 1996. *Introduction to Case Studies in Contracting and Organization*. Oxford, UK: Oxford University Press.
- Masten, Scott E., and Stéphane Saussier. 2001. "Econometrics of Contracts: An Assessment of Developments in the Empirical Literature on Contracting," in E. Brousseau and J.-M. Glachant, eds., *Economics of Contracts: Theories and Applications*. Cambridge, UK: Cambridge University Press 273–292.
- McMillan, John, and Christopher Woodruff. 1999. "Dispute Prevention Without Courts in Vietnam," 15(3) *Journal of Law, Economics, & Organization* 637–58.
- . 2002. "The Central Role of Entrepreneurs in Transition Economies," 16(3) *Journal of Economic Perspectives* 153–70.
- Murrell, Peter. 2003. "Firms Facing New Institutions: Transactional Governance in Romania," 31(4) *Journal of Comparative Economics* 695–714.
- National Agency for Small and Medium Sized Enterprises and Cooperatives, Government of Romania. 2004. "Situație și Necesități: Opinii ale Întreprinderilor Mici și Mijlocii" (Status and Necessities: Opinions of Small and Medium Sized Enterprises). http://www.animmc.ro/files/comunicate/Brosura_1_11oct2004_.pdf.
- Nelson, Richard R., and Sidney G. Winter. 1982. *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.
- Poppo, Laura, and Todd Zenger. 2002. "Do Formal Contracts and Relational Governance Function as Substitutes or Complements?" 23 *Strategic Management Journal* 707–25.
- Rizov, Marian. 2004. "Firm Investment in Transition: Evidence from Romanian Manufacturing," 12(4) *Economics of Transition* 721–46.
- Ryall, Michael D., and Rachele C. Sampson. 2009. "Formal Contracts in the Presence of Relational Enforcement Mechanisms: Evidence from Technology Development Projects," 55 *Management Science* 906–25.
- Saussier, Stéphane. 2000. "Transaction Costs and Contractual Incompleteness: The Case of Électricité de France," 42(2) *Journal of Economic Behavior & Organization* 189–206.

- Sertsios, Giorgio. 2015. "Bonding Through Investments: Evidence from Franchising," 31(1) *Journal of Law, Economics, & Organization* 187–212.
- Shelanski, Howard A., and Peter G. Klein. 1995. "Empirical Research in Transaction Cost Economics: A Review and Assessment," 11(2) *Journal of Law, Economics, & Organization* 335–61.
- Stock, James H., and Motohiro Yogo. 2005. "Testing for Weak Instruments in Linear IV Regression," in D. W. K. Andrews and J. H. Stock, eds., *Identification and Inference for Econometric Models*. New York: Cambridge University Press.
- Sykuta, Michael E. 2005. "New Institutional Economics: The Case of Contracting and Organizations Research," in E. Brousseau and J.-M. Glachant, eds., *New Institutional Economics: A Textbook*. Cambridge, UK: Cambridge University Press.
- USAID. 1999. "Commercial Legal and Institutional Reform (CLIR): Diagnostic Assessment Report for Romania." US Agency for International Development.
- Vella, Francis. 1998. "Estimating Models with Sample Selection Bias: A Survey," 33 *Journal of Human Resources* 127–69.
- Whinston, Michael D. 2003. "On the Transaction Costs Determinants of Vertical Integration," 19(1) *Journal of Law, Economics, & Organization* 1–23.
- Williamson, Oliver E. 1983. "Credible Commitments: Using Hostages to Support Exchange," 73 *American Economic Review* 519–40.
- Woodruff, Christopher. 2002. "Non-contractible Investments and Vertical Integration in the Mexican Footwear Industry," 20(8) *International Journal of Industrial Organization* 1197–224.
- Wooldridge, Jeffrey M. 2008. "Instrumental Variables Estimation of the Average Treatment Effect in Correlated Random Coefficient Models," in D. Millimet, J. Smith, and E. Vytlacil, eds., *Advances in Econometrics*, Vol. 21. Amsterdam, NL: Elsevier.
- . 2010. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: The MIT Press.

Appendix A

The Survey and Construction of Variables

A.1 The Survey

In the second quarter of 2001, we surveyed 254 Romanian firms located in the 12 largest Romanian cities. The firms were selected from a Romanian business register. The sampling design ensured responses in a wide variety of sectors: the sample was chosen to be representative of the two-digit-sectoral and size distribution of firms within industry, construction, and wholesale and with at least 50 employees.²⁴ Given that the survey's objective was to understand the law's role in the decisions of Romanian firms, the survey did not include the smallest firms.

Exclusion of the smallest firms also followed from the objective of obtaining a wide variety of information from different firm officials who specialized in different aspects of transactions. Using different questionnaires, we conducted face-to-face interviews with four different officials

24. The sampling process was successful in these objectives. There is a cross-sectoral correlation of 0.9 between the proportion of sampled firms in each two-digit sector and the proportion of Romanian firms with employment over 50 in 2001 in the same sectors. Large firms are slightly over sampled relative to medium-size firms.

from each firm: the general manager, the sales manager, the procurement manager, and the head of the legal department.²⁵

Data from sales and procurement managers drive our empirical analyses, while data from the other two managers provide subsidiary information. The sales and procurement managers each answered many questions about a particular agreement (a different one for each). These two managers were each instructed to choose an agreement that they knew intimately and that had envisaged implementation in the previous six months. The pertinent instructions appear at B.1 in Appendix B, which reproduces relevant aspects of the questionnaires.

For the chosen transactions, sales and procurement managers were asked about their own firms and about trading partners. Corresponding questions in the two questionnaires were the same, *mutatis mutandis*. As a result, the data contain information about both the buying and selling side of two transactions for each firm, one sale and one purchase.²⁶

Two features of our research design—covering a wide cross-section of sectors and asking about both sides of a transaction—affected decisions on the nature of the data that were collected. Given sectoral variety, we chose to ask stylized non-technology-specific questions. These questions were even more general because of the need to ask about buyers and sellers in comparable ways. With lengthy questionnaires administered to busy managers, we asked simple closed-ended questions with a few non-quantitative response categories. The effect of these decisions is that many of the variables used in our empirical estimates are dummy variables that rely on combinations of categorical responses.

Two agreements for each firm provided information on 508 transactions. Exclusion of agreements involving international trade left 423.²⁷ Summary data appear in Table 1.

A.2 The Variables in the Equation of Interest

Index of contractual detail. This index reflects features of the contract and the contracting process, using all relevant features on which data were collected. The index was constructed by assigning point scores to answers on survey questions, with equal weights for each answer. It has the following elements.

- If written contracts were used but important elements of the transaction were subject to oral agreements, add 1 to the score. If written contracts covered all important elements of the transaction, add 1.5 (see the question at B.2).

25. In firms without a legal department, we interviewed an outside lawyer retained by the firm.

26. For some less important variables, information comes only from the general manager or the legal department and therefore reflects only one side of the transaction.

27. A small number of observations could not be used because of missing data.

- If discussions with legal staff on the contract occupied 2–8 h, add 0.5 points. If discussion lasted more than 8 h, add 1 point (B.3).
- If the contract was specifically designed for the transaction, rather than following a form contract, add 1 (B.4).
- If the written contract had 3–5 pages, add 0.5; if 6–10 pages, add 1; and if more than 10 pages, add 1.5 (B.5).
- In Romania, contracts could be authenticated by a notary and then become more easily enforceable in court. This entailed extra expense and greater precision. If the contract was authenticated, add 1 (B.6).
- A penalty clause for late delivery adds 1 (B.7).
- A penalty clause for late payment adds 1 (B.7).

Section 5's "process" index includes the first two, the "textual" index the remainder.

Relationship-specific investment. Buyer specific investment equals one if the response to B.8 was not no. Seller specific investment equals one if the product was custom-made for the customer and modification for other buyers would have required some cost (B.9).

Dependence on partner. Buyer dependence equals one if the response to B.10 was a month or more. Seller dependence is one if the response to B.11 was a month or more.

Information dissemination. For buyers, equals one if the response to B.12 was yes. For sellers, equals one if the answer to B.13 was yes.

First agreement. Equals one if the response to B.14 was yes.

Quality of the courts. Legal advisers rated the quality of the local Tribunal courts on eight dimensions, giving a score on each (B.18). Court quality equals one when the local court scored higher than the scale's midpoint on the sum of the eight scores.

Exogenous uncertainty. Equals one if uncertainty caused by weather or transportation links was considered very important by general managers (B.19).

A.3 Variables Used as Determinants of Relationship-Specific Investment

The instruments are the interactions of two sets of variables, four sector dummy variables (B.15)—construction, heavy industry, light manufacturing, and other (agricultural products, wholesale, etc.)—and dummy variables indicating either many or few potential sellers of the good (for buyer specific investment) or indicating either many or few potential buyers of the good (for seller specific investment) (B.16). "Few" is 10 or fewer for both potential buyers and sellers, with "many" the complement of few. The interactions produce *many or few potential buyers and sellers* by sector.

A.4 Variables Used in Robustness Tests

State control equals one if the government owns 50% or more of the firm and *state share* equals one if the government owns any shares (B.20). *State*

origin equals one if the answer to B.21 was yes. *In same location* equals one if the response to B.17 was location in the same județ, *Firm founded before 1990* equals one if the response to B.22 was before 1990. *Large firm* equals one if the responses to B.23 was more than 250.

Appendix B: The Survey Questions Used in the Construction of the Data

We conducted face-to-face interviews with four different officials from each firm. We reproduce here the relevant instructions and questions from the four questionnaires. The English and Romanian versions of the questionnaires were produced simultaneously, with consistency ensured through the standard process of iterative back translation. The full questionnaires are available on request to the authors.

Questions addressed to the sales manager

B.1 The questionnaire asked the sales manager to choose a specific transaction and focus on that one in responding. The instructions on choice of transaction were: throughout this section, we will ask you questions regarding a specific agreement your company has been involved in. The term used here, “*acord*”, is a general one, meaning any agreement of the parties, written or oral, that can have the form of a contract or not. Therefore, this term can often be replaced with a similar one, such as “*înțelegere*” or “*convenție*”.

Please choose one specific sales agreement entered into by your enterprise with a specific customer. 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 new products as well as sales of the traditional products of your enterprise.

Index of contractual detail. B.2 Were written contracts used at all in your interaction with this customer? YES/NO. If yes, how were written contracts used? Please choose the option that best applies: 1 = Written contracts were used, but important elements of this transaction were the subject of additional unwritten oral agreements. 2 = Written contracts covered all the important elements of this transaction.

B.3 Was your firm's legal staff or legal advisor involved in writing the contracts covering the specific agreement with this customer? YES/NO. If yes, how much time did you spend talking with the legal department or legal advisor when the contracts were being written? 1) Less than 2 h; 2) 2–8 h; and 3) more than 8 h.

B.4 Were any of the following used as a source of the written contracts? YES/NO for each option: 1) form contract of your enterprise; 2) form contract of the customer; 3) purchased form contract (from publications, internet, legal suppliers, etc.); 4) contract specifically made for this transaction; and 5) invoice used as a contract.

B.5 How many pages are in the written contracts in total? 1) 1; 2) 2; 3) 3–5; 4) 6–10; 5) More than 10.

B.6 Was the contract authenticated? YES/NO.

B.7 Which of the following were actually used in this transaction? 1. Penalty clause for late payment in a written contract. 2. Penalty clause for late delivery in a written contract.

Specific investment. B.8 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.

B.9 Were any elements of this product custom made for the specific needs of this customer? YES/NO. If yes, 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).

Dependence on partner. B.10 If you failed to deliver these goods, would the customer be able to find another supplier? YES/NO. If yes, how long would it take? Choose the closest option: 1) a day, 2) a week, 3) a month, 4) two months or more.

B.11 If this customer refused to accept delivery of an order, would you be able to find another customer for these goods? YES/NO. If yes, how long would it take? Choose the closest option: 1) a day, 2) a week, 3) a month, 4) two months or more.

Information dissemination. B.12 If your enterprise defaulted in its obligations under this agreement, do you think that your other customers would learn about this? YES/NO.

B.13 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.

First agreement. B.14 Is this your first agreement with this customer? YES/NO.

Sector. B.15 Managers were asked to classify the sector of the product that was the subject of the exchange agreement. They were to choose 1 of

28 sectors of the prevailing Romanian classification system. Responses were aggregated into the four sectors used in the empirical analysis.

Number of potential buyers. B.16 How many customers for this product exist in Romania, both customers presently trading with your enterprise and potential customers? 1) 0, 2) 1, 3) 2, 4) 3, 5) 4, 6) 5–10, and 7) more than 10.

Location. B.17 Where is the customer located? 1 = In your județ; 2 = Romania, excluding your județ; 3 = Eastern Europe or former Soviet Union; 4 = Western Europe, North America, or East Asia; 5 = Other.

Questions addressed to the procurement manager

These questions were identical to the ones for the sales manager, except that the procurement manager was being asked about buying a product from a producer instead of selling something the firm had produced. Hence, the questions are not repeated here.

Questions addressed to the legal manager

B.18 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.

Questions addressed to the general manager

B.19 How important are unpredictable changes in the area of business activity in which your enterprise is engaged? Your answer should reflect, as much 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. b) Weather-induced variation in supply of goods or services that enterprises like yours must buy. c) Problems in transportation links that cause changes in the level of demand for the good or service sold by enterprises like yours. d) Problems in transportation links that cause changes in supply of goods or services that enterprises like yours must buy.

B.20 Approximately what percentage of the enterprise is owned by each of the following entities? 1) State ownership fund; 2) Romanian State

(other than the state ownership fund); 3) The enterprise's Programul Acționarilor Salariați (PAS); 4) Employees of the enterprise as individuals; 5) Financial investment funds (SIFs—societate de investiții financiare); 6) Romanian natural persons, other than employees of the enterprise; 7) Romanian firms; 8) Romanian Investment Funds (other than SIFs); 9) Romanian Banks and Insurance Companies; 10) Foreign natural or legal persons; and 11) Other.

B.21 Did the origins of your enterprise lie in the state in some way, even quite indirectly? (e.g., because it was a state enterprise or because the enterprise was formerly a part of a state enterprise or because its founders formerly undertook the same activities within a state enterprise) YES/NO.

B.22 In which year did this enterprise first begin production?

B.23 Approximately how many permanent employees (including “collaborators”) does your enterprise presently employ?