ABSTRACT

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	Bingjie Hu, Ph.D., 2011
Directed By:	Professor Peter Murrell, Department of
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This thesis consists of three chapters on the choice of institutional governance. The first chapter provides empirical evidence on the effect of local norms on the contractual choice, using a comprehensive dataset on US agricultural leasing contracts. We focus on the choice between cash-rent and share-rent contracts and examine whether the prevalence of share-rent contracts has an effect on contractual choice. We use a generalized spatial two-stage least squares approach to address endogeneity issues. Our results show that there is a strong tendency for agents to choose the contractual form that conforms to local norms. Our study also suggests that share-rent contracts are more likely to be chosen when there is a higher likelihood or more severe consequence of opportunistic behavior by agents. This suggests that share contracts reduce transaction costs by helping to foster a productive governance atmosphere for the contracting parties. The second chapter explores whether the choice of institutions depends on the historical experience and the stock

of knowledge of economic agents. We provide firm-level evidence on the choice of between legal and relational governance, in the context of the transition economy of Romania. Our results show that previously state-owned businesses are more likely to rely on legal governance than other firms. We also find evidence that the legal knowledge held by firm managers affects the choice of governance, which is consistent with the path-dependence theory of institutional development. The third chapter is based on a cross-country study of the link between public spending on health care, quality of institutional governance and child health outcomes. We show that both public spending on health care and the quality of governance matter for the reduction of child and infant mortality rates.

THREE ESSAYS ON INSTITUTIONAL GOVERNANCE

By

BINGJIE HU

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Advisory Committee:
Professor Peter Murrell, Chair
Professor Harry Kelejian
Professor Erik Lichtenberg
Assistant Professor Raymond Guiteras
Assistant Professor Razvan Vlaicu

Dedication

To my parents and my husband for their patience, encouragement, and support.

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Chapter 1: The Impact of Local Norms on Contractual Structure: Evidence from the US Agriculture

Section 1 Introduction

Economists have recently expressed much interest in the observation that local norms, apart from standard economic factors, strongly influence decision making. In particular, local conformity in contractual terms has recently received attention in the theoretical literature (Young and Burke 2001). However, systematic empirical evidence on the effects of local norms is limited. While most empirical studies of contractual determinants have ignored local norms, this paper fills the gap by providing evidence on their effect, taking advantage of a comprehensive survey dataset on US agricultural leasing contracts.

The central hypothesis of this paper is that contracting parties can either derive social utility (Young and Burke 2001) or reduce transaction costs (Murrell 1983) by following local norms. The parties observe what type of contract is prevalent in their neighborhood and guide their contractual choice with that observation. In this study we focus on the choice between two types of agricultural leasing arrangements, cash-rent and share-rent contracts. The key variable of interest is the prevalence of share-rent contracts within the county where the farm is located.[1] Because the prevalence variable is endogenous as a result of simultaneous decision

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[1] We also consider other determinants of contractual choice, namely, the characteristics of contracting parties, such as age and wealth, and farm characteristics.

making, we use a generalized spatial two-stage least squares (GS2SLS) approach. The spatial lags of exogenous characteristics are used as instruments for the prevalence variable. Our results show that the likelihood of a share contract being chosen increases by 0.8% if there is a 1% increase in the prevalence of such contracts in the same county: there is a strong tendency for agents to choose the contractual form that conforms to local norms. Given that we have controlled for agent and farm characteristics and instrumented for prevalence using spatial lags of these characteristics, we have mitigated the potential omitted variable problem that our estimated local norm effects are due to common characteristics of agents in the same county.

Delving more deeply into the determinants of contractual structure, we also address the perplexing question of why share contracts are still common in modern US agriculture.[2] As American agriculture has experienced remarkable technological advancements, it is tempting to assume that share contracts would vanish from this highly developed economy. However, in the US approximately 20% of agricultural land leases are share contracts according to the Agricultural Economics and Land Ownership Survey (1999) by the United States Department of Agriculture. In some regions such as the Corn Belt states and wheat producing region in Kansas, share contracts are more widely used. Why do some landlords and tenants choose share instead of cash contracts, even though a share contract does not provide optimal work incentives?

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[2] In US the sharecropping and tenant farming system first became prevalent as a solution to the economic crisis after the civil war. This system was deemed as inefficient and believed to have trapped sharecroppers and tenants in poverty cycles (See Kirby 1984).

Numerous previous studies have attempted to explain the existence of share contracts. Early theories of share contracts focus upon risk-averse agents. Even though share contracts do not provide first best work incentives, the adoption of these contracts is justified by their ability to accommodate agents' risk preferences (Bardhan and Srinivansan 1971, Stiglitz 1974). It is controversial whether this theory is supported by empirical evidence (Allen and Lueck 1992, Ackerberg and Botticini 2002). More recently, Huffman and Just (2004) argue that the risk preferences of landlords also affect leasing contractual choice. Other theoretical studies abstract from risk factors and seek alternative explanations. For instance, Eswaran and Kotwal (1985) show that share contracts may serve as a way to pool resources for which no market exists by providing incentives for both parties.[3]

Incorporating Williamson's (1979) transaction cost approach into his analysis, Murrell (1983) offers an alternative theory that is able to address the inconsistency between traditional theories of share contracts and the actual features of farming practices. The author argues that with the presence of a high likelihood of opportunistic behavior, the contractual form should "provide atmosphere and facilitate adaptive sequential decisions" (Murrell 1983).[4] Where long-term contracts are not possible, a share contract that follows local norms can provide security for contracting parties and reduce incentives for opportunistic behavior. This idea has been formalized by Young and Burke (2001), who note that share contracts exhibit a great extent of uniformity and explain that landlords and tenants consider not only expected returns, but also conformity with local practices when contracting.

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[3] Other examples include Reid (1977), Hallagan (1978) and Laffont and Matoussi (1995).
[4] See Bajari and Tadelis (2001) for a model that demonstrates how low incentive contracts may better facilitate adaptive sequential decisions.

In order to test the above theories on share-rent contracts, we rely on an unusually informative survey dataset that contains both landlord and tenant characteristics. Supplemented by data from the US Census of Agriculture (1987) and National Resources Inventory (1997), our comprehensive dataset sheds light on the interrelations among contractual choices, contract prevalence, and characteristics of farms, landlords and tenants.

Our findings suggest that share-rent contracts are more likely to be chosen when there is a higher likelihood or more severe consequence of opportunistic behavior by agents. For instance, we find that those farmlands with a higher erodibility index are more likely to be associated with share-rent contracts. This suggests that share contracts reduce transaction costs by helping to deter opportunistic behavior by contracting parties.

With comprehensive information on characteristics of contracting parties, we also attempt to test theories based on risk sharing and imperfect factor markets. We have found mixed evidence for risk sharing models and evidence that supports Eswaran and Kotwal's (1985) theory of imperfect factor markets. For example, our results suggest that more experienced landlords are more likely to choose share rent contracts, which provides more incentive for the landlord than cash rent contracts.

A detailed description of our dataset is given in Section 2 with a discussion on our main variables of interest. Section 3 explains the specification of the econometric model and addresses the endogeneity issue. Section 4 presents the main findings and discusses the results. Section 5 examines the robustness of our results. Section 6 concludes with a discussion of limitations and future work.

Section 2 Data and Main Variables of Interest

Methods of Data Collection

Our main data source is the Agricultural Economics and Land Ownership survey (AELOS) conducted by the National Agricultural Statistics Service (NASS) in 1999. The survey is conducted in a special way. First, randomly selected farm operators (tenants) are mailed the operator questionnaire. One of the questions requires them to provide the names and addresses of their landlords, if there are any. Then the landlords are asked to complete their portion of the survey, namely the landlord report. In the survey there is an ID variable that keeps track of all the tenants. With this ID variable, we are able to merge the data on both landlords and tenants and the unit of observation is a landlord-tenant pair. Therefore each observation is a leasing arrangement, rather than a single tenant or a land owner.[5]

The original farm operator (tenant) sample selected by AELOS contains 42,328 farms, of which 4,743 farms were out of business, 266 farms were out of scope and 26,690 farms returned complete usable reports. The initial landlord sample size was 67,178, but only 34,158 complete reports were received[6]. Due to nonresponses, there are some missing observations for variables of interest, such as

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5 The ID variable identifies tenants only. Therefore if a landlord is reported by different tenants, he or she is considered to be more than one landlord. It would be ideal to identify these repetitive landlords and include them only once, but due to data limitations, we will focus on contractual pairs instead of tenants or landlords. However, this problem is not severe in our case because there are more landlords than tenants in our data.

6 Basic characteristics for nonrespondents, such as acres of land rented to others, are provided by the farm operators (tenants). Other landlord attributes for nonrespondents are imputed using landlord reports for farms of similar size in the same area. Observations with imputed information cannot be distinguished from other observations in the data set.

age and value of assets owned by the tenant. Furthermore, our attention is restricted to those leasing contracts that do not involve any rent-for-free arrangements. As a result, our sample size is reduced to 38,896. In order to define the share contract prevalence variable measured by the proportion of share rent arrangements within the same county, we have to drop observations from farms that are the only ones selected from their county. As a result, 37,290 observations are available for regression purposes.

Compared to other data used by previous empirical studies on contractual structure, the Agricultural Economics and Land Ownership Survey data are more informative in at least two aspects. First, it is a very comprehensive data set with a large sample size. Second, these data contain information on both tenant and landlord characteristics. Both the tenant report and the landlord report include questions on demographic attributes as well as household and farm characteristics, such as age, race, wealth, occupation and size of the farm, etc. With both tenant and landlord attributes taken into account, the AELOS survey provides new information on the empirical determinants of contractual choice. Here follows a description of our main variables of interest. Descriptive statistics appear in Table 1.

Main Variables of Interest

Dependent Variable

The dependent variable is an indicator variable that takes the value 1 if a share-rent contract is chosen over a cash rent contract and 0 otherwise. It is denoted as y_{cfl}, which equals one if a given leasing agreement l used by farm f in county c is a share rent contract and zero otherwise.

In the tenant report there is a question on the number of acres that are rented under a specific type of contract, be it cash or share or free rent contract. Similarly in the landlord report one of the questions is about the number of land leases that are certain types of contracts such as cash rent, share rent or mixed rent contract. Through these variables, one is able to identify those contracts that involve share rent arrangements only.[7]

Explanatory Variables

1) The prevalence of share rent contracts

Previous theoretical studies of local norms and conventional contracts (Young 1998; Young and Burke 2001) suggest that the prevalence of a certain form of contract may affect the likelihood of this particular type of contract being chosen by economic agents. Early works on transaction cost theory (Williamson 1979, Murrell 1983) also emphasize the importance of convergent expectations obtained by following local norms. One of the predictions of transaction cost theory in the context of agricultural land leasing is that tenants tend to feel more secure about their tenure under share contracts if it is widely used in their neighborhood. Opportunistic behavior is less likely when share contracts are chosen in a neighborhood where such customary contracts are common. More recently, Young and Burke (2001) propose a theoretical model in which the likelihood of a certain contractual form being chosen depends upon the expected returns from choosing that contract as well as the "salience" of the

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[7] The alternative categories are cash rent contracts and arrangements that involve both cash and share rent. Note that this identification is not possible for the 1987 Census of Agriculture, for which cash rent contracts could not be distinguished from mixed rent contract.

contract. One element of salience leads agents to attach value to following the type of contract that is frequently adopted in their neighborhood.[8]

In our study, the measure of how frequently share rent contracts are used is the proportion of share leases among all leases signed by *other* farms within a county, which is given by the following expression: share contract prevalence for farm i in county r is

$$SP_{ri} = \frac{1}{n_r - m_i} \sum_{\substack{f \neq i \\ fl}} y_{rfl}$$

where n_r denotes the number of observations from county r, m_i is the number of observations in farm i and y_{rfl} is the indicator variable that equals one if a given leasing agreement l used by farm f in county r is a share rent contract.

Figures 1 and 2 show the prevalence of share rent contracts in 1987 and 1999, respectively[9]. A comparison between the two suggests that there is a shift from share towards cash contracts over time in general. However, share contracts have become more prevalent in some areas, such as the wheat-producing counties in Kansas and the Californian counties that specialize in fruits, vegetables and melons.

2) Land erodibility

Land erodibility is related to the transaction costs involved if the leasing contract fails to support a relationship with well aligned incentives. For instance, the returns within cash leases do not automatically respond to changed circumstances, resulting in frequent renegotiations. If tenants do not feel secure about the probability of contract

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[8] In Young and Burke's terms, the salience of the contract could be either exogenous, for instance, whether the terms are based on easy shares and round numbers, or endogenous in which case it could be measured by how frequently it is used by others.

[9] Note that the AELOS (1999) sample is smaller than the US Agricultural Census (1987) sample. On the base map in Figure 2, the area which is not covered by the AELOS sample is colored in pink.

renewal, they will not have optimal incentives to invest in land quality in the long run (Murrell 1983). Therefore for those farms with more erodible land, the consequences are more severe under cash leases if tenants do not expect a secure relationship with their landlords. As a result, it will be more likely for the parties to adopt share-rent contracts.

In addition, tenants under share rent contracts may have more incentives than those under cash rent contracts to adopt land conservation practices, if such practices allow them to increase the use of shared inputs such as pesticide or fertilizer, or decrease the use of tenant-provided inputs such as machinery or labor (Soule et al 2000). Considering that landlords could invest in durable conservation measures or enforce such investment by the tenant, Lichtenberg (2007) shows that in theory, landlords are more likely to use share rent contracts combined with investments in durable conservation measures in areas where land value is highly sensitive to soil degradation.

Previous studies of the relation between land erosion and tenancy choice have modeled the choice of share rent contracts as resulting from the tradeoff between work incentives and incentives for tenants to exploit land attributes (Allen and Lueck 1992; Dubois 2002; Lichtenberg 2007). A prediction under the assumption of risk neutral tenants is that cash contracts are preferred to share contracts for most fertile plots whereas share rent contracts are preferred when farmland is less fertile and more vulnerable to erosion (Dubois 2002). Empirical studies have tested the hypothesis using crop types as proxies for land erodibility. For instance, row crops are found to be more likely to be associated with share-rent contracts (Allen and Lueck 1992;

Dubois 2002; Fukunaga and Huffman 2009), because these crops tend to allow more land erosion with bare soil between the rows.

In the present study, an improvement over previous empirical studies is that land erodibility index may be a better measure than crop types of how vulnerable farm land is to overuse by tenants. We use the county-level mean and standard deviation of land erodibility index calculated from the 1997 National Resources Inventory data base (NRI)[10]. A higher erodibility index implies that a greater investment in land improvement is needed to maintain the quality of the soil (USDA 2000). Since a tenant could abuse the land, there is a higher transaction cost for the contractual parties if the erodibility index is greater. The variation in land erodibility within a county may also affect contractual choice. Since it is easier for different farms to compare contractual terms if farms are homogeneous in land attributes, a farm located in a region with less variation in land erodibility will be more likely to be associated with share-rent contracts.

3) Tenant and Landlord Age

Empirical studies of the relation between risk preferences and agricultural contractual choice have been inconclusive (Allen and Lueck 1992, Ackerberg and Botticini 2002). Assuming that elderly people are more risk-averse than young people, tenant and landlord ages could be a proxy for risk preferences. [11] Intuitively, more risk-averse tenants would prefer share contracts and more risk-averse landlords would prefer cash contracts, other things equal. Indeed, in developed economies such as the

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[10] Details on erodibility index for the sample points in NRI 1997 are in the Appendix. The mean erodibility index is calculated using the sample points on crop lands only.

[11] For instance, Palsson (1996) explores how risk aversion varies with household characteristics finds that risk aversion increases with age.

United States agriculture, where credit markets are well developed, cash rent contracts are becoming more common, as "tenants have become wealthier, and landowners have become older and likely more conservative" (Huffman and Just 2004).

Age may also be a proxy for farming experience and expertise. Assuming that tenant age is positively correlated with farming experience, older tenants are more likely to operate the farm under a cash rent contract to maximize their payoffs (Eswaran and Kotwal's theory 1985). Along similar lines, older landlords may be more experienced at farm management and play a more important role in decision making. Therefore older landlords are more likely to sign share contracts whereas older tenants prefer cash contracts. Note that the age effect due to farming experience and that due to risk version move in opposite directions, for both tenants and landlords.

4) Distance between landlord residence and the farm

This is related to the transaction cost involved in the relationship between a landlord and a tenant. We expect that the transaction cost is greater when the landlord lives farther apart from the farm. In such a situation, landlords prefer to use share contracts to reduce the tenants' incentive to overexploit the land, since they could not monitor the tenants' behavior closely. (Dubois 2002, Soule et al 2000).

When the contracting parties are located farther apart from each other, communications may also be less effective. There might be less trust and the atmosphere may not be as good as when the landlord lives on or close to the farm. Assuming that share rent contracts could improve the atmosphere and trust because

rental payments automatically adjust in the face of uncertainty, we may expect a higher likelihood of share rent contracts being chosen when landlord residence is farther from the farm.

Our descriptive statistics[12] implies that share rent contracts are more likely to be chosen when the landlord lives farther from the farm. For instance, less than 14% of the contracts are under share rent for those landlords whose residence is within 5 miles from the farm, whereas more than 25% of the contracts are share leases when the landlord lives farther than 150 miles away.

5) Farm types

In the AELOS survey, farm types are defined according to the reported sales in previous years for different categories of agricultural products. Thus dummy variables of farm types are predetermined. Different types of farms are associated with different production technologies, which may affect which type of contract is optimal. For instance, some fruit farms have a longer production cycle and long term investment in the quality of land is essential. Contracts are incomplete in the sense that investment in land quality is not verifiable and the tenants do not have proper incentives to make long term investments in land quality unless they expect a long term relationship with their landlords. In such situations share-rent contracts may have an advantage over cash-rent contracts because it is easier to sustain a long term relationship under a share contract due to its flexibility in terms of the payment streams. Another example of advantages of share contracts is when a crop can be easily measured and divided. Allen and Lueck (1992) have found measurement costs a significant determinant of contractual choice. They find that it is easier to measure

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[12] Table 3 shows the frequency of share rent contracts by the distance between landlord residence and the farm.

and divide outputs for some types of farms, and that share contracts are more likely to be chosen by these farms. The AELOS data shows that grains and oilseeds are more likely to be under share rent contracts, which is in line with the measurement cost theory, since it is less costly to measure and divide outputs.

6) Crop yield variability

Since share rent contracts may serve as a risk-sharing device and provide insurance to risk-averse tenants, we expect a higher likelihood of share contracts being chosen if there is more uncertainty in agricultural output. Following a previous study by Fukunaga and Huffman (2009), we control for an aggregate measure of the crop yield variability at the county level. It is measured by the weighted average coefficient of variation for county crop yields during the period of 1990 through 1999.

7) Other tenant and landlord characteristics

We examine tenant characteristics such as size of the farm measured by the log of the sales in the survey year (1999) and tenant wealth measured as the log of the market value of non-farm assets owned by the tenant. Size of the farm and non-farm wealth could reflect the presence of credit constraints faced by the tenant and therefore may affect the choice of contractual form (Laffont and Matoussi 1995).

Huffman and Just (2004) argues that not only the tenant, but also the landlord may be risk-averse. Thus we control for the landlord wealth variables such as landlord farm assets, and the market value of land and buildings owned by the landlord. Previous studies show that leasing contractual choice is associated with the race of tenants and landlords (Fukunaga and Huffman 2009), so we also include the race indicators as explanatory variables.

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Section 3 Specification of the Econometric Model

A generalized spatial two-stage least squares (GS2SLS) approach (Kelejian and Prucha 1998) is adopted for the present empirical analysis of contract determinants in order to examine whether the prevalence of share contract has any impact on contractual choice. The econometric model in this paper is a special case of the general GS2SLS model, which is both conceptually intuitive and computationally feasible. The general case can be written as the following if we assume a linear probability model:

$$Y = X\beta + \lambda WY + u \tag{1}$$

Y is an $n \times 1$ vector of observations on the dependent variable. In the present case Y is a dummy variable that equals one if share-rent contract is chosen and zero otherwise. X is an $n \times k$ matrix of exogenous explanatory variables. The columns of X include explanatory variables such as landlord and tenant characteristics as well as farm and land attributes. W is an $n \times n$ weighting matrix used to capture the spatial interactions. WY is the spatial lag of the dependent variable, which will be shown to be equal to the prevalence variable, when using one intuitive version of W.

The present case is a special case of (1) in that W is a large sparse block diagonal matrix, given the assumption that there is no spatial correlation among observations from different counties. Under this assumption, W could be rewritten as

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$$
\begin{pmatrix} W_1 & & 0 \\ & \ddots & \\ 0 & & W_R \end{pmatrix}_{n \times n} \tag{2}
$$

where observations are ordered by county and $W_r \, (r = 1, 2, \ldots R)$ is the submatrix of spatial weights for county r. R is the total number of counties in our sample.

Each W_r can be written as

$$
\begin{pmatrix}
O & \dfrac{1}{n_r - m_1} & \ldots & \dfrac{1}{n_r - m_1} \\[2ex]
\dfrac{1}{n_r - m_2} & O & \ldots & O \\[2ex]
\ldots & \ldots & \ddots & \dfrac{1}{n_r - m_i} \\[1ex]
& & & \ldots \\[1ex]
\dfrac{1}{n_r - m_{n_r}} & \ldots & \dfrac{1}{n_r - m_{n_r}} & O
\end{pmatrix}_{n_r \times n_r} \tag{3}
$$

where n_r is the number of observations in county r, m_i is the number of observations on the farm where the i th observation is located. The block diagonal elements are zero and a typical off-diagonal element in submatrix W_r is equal to $1 / (n_r - m_i)$.

It is easy to show that the generic element in the $n \times 1$ vector WY is equal to

$\dfrac{1}{n_r - m_i} \sum\limits_{\substack{f \neq i \\ fl}} y_{rfl}$, where y_{rfl} is the contractual choice variable defined in the previous

section. Therefore WY is equivalent to the prevalence variable defined as the fraction of share rent contracts adopted by all the other farms within the same county.

The prevalence variable is endogenous if contractual parties within the same county interact with one another and contractual choice is determined simultaneously.

To counter the biases from endogeneity, instruments are needed. The likelihood of share-rent contracts being chosen by a farm in a given county is affected by landlord, tenant and farm characteristics. Likewise contractual choices made by other farms in the same county are also affected by corresponding characteristics of contracting parties and farms. The contractual choice by a given farm does not depend directly on the characteristics of other farms in the same county, but it is affected by the prevalence of a type of contract within the county. Therefore the spatial lags of exogenous landlord, tenant and farm characteristics can serve as instruments for the prevalence variable WY, since they are correlated with prevalence while they are excluded from the contractual choice equation.

The use of the spatial lags of exogenous variables as instruments follows Kelejian and Prucha (1998), who use the linearly independent columns in matrices WX and WWX as instruments for WY. These instruments are vectors of dimension $n \times 1$. Let the columns of X be $X_1, X_2, ... X_k$, which are exogenous landlord, tenant and farm characteristics. Then we have

$$WX = W[X_1, X_2, ... X_k]_{n \times k}$$
$$WWX = WW[X_1, X_2, ... X_k]_{n \times k} \tag{4}$$

The generic element in $n \times 1$ vector WX_k is equal to $\dfrac{1}{n_r - m_i} \sum_{\substack{f \neq i \\ fl}} X_{k,rfl}$, where $X_{k,rfl}$

denotes the observation on exogenous variable X_k for leasing agreement l by farm f in county r. Because of the simple structure of W, the generic element in the column WX_k equal to the average value of variable X_k over the observations from all

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the *other* farms in the same county. [13] Therefore we could easily define the column vectors of the instrument matrix WX. The columns of WWX can also be expressed in a similar fashion. Let WWX_k be the k-th column of matrix WWX. The generic element in WWX_k is obtained by taking the mean value of WX_k over the observations from all the other farms that belong to the same county.

So far we have addressed the endogeneity of the prevalence variable and assumed that all explanatory variables in matrix X are exogenous. However, the distance variable might also be endogenous: the landlord may choose where to live after the contract has been signed. To address the endogeneity of the distance variable, we instrument for it. The landlord survey asks the respondents: "at which occupation did the landlord spend the majority of her work time" (AELOS 1999 Landlord Report). Assuming that occupation choice is an exogenous determinant of the location of landlord residence and occupation does not directly enter the contractual choice equation[14], it is a valid instrument for distance. We define the following categorical variables according to landlord occupation: farm operator, employed by government or private businesses, self-employed in the farming industry, self-employed in a non-farming industry, retired from farming, retired from non-farming activities and other occupation. Our first stage results (Table 3B) show that apart from those who have retired from non-farming-related activities, all other categories of landlords are significantly less likely to be located more than 150 miles away from the farm, compared to the omitted group of landlords who report "other occupation". In particular, landlords who are farm operators, self-employed farmers,

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[13] "other farms" refers to those farms in the same county except the farm where the current observation is located.
[14] Huffman and Just (2004) propose that retired landlords may be more risk-averse and prefer cash to share contracts. However, this hypothesis is not supported by our data.

or those who were previously farmers are significantly more likely to locate their residence closer to the farm.

Kelejian and Prucha (1998) have shown that in the case of additional endogeneity (apart from that of the spatial lag WY), instruments are given by the linearly independent columns in $[X^*, WX^*, WWX^*, P, WP, WWP]$, where X^* is the matrix of exogenous regressors and P is an instrument for the additional endogenous explanatory variable. In the present case, landlord occupation is the instrument for distance between landlord residence and the farm.

In an alternative specification, we include the county level proportion of share rent contracts back in the year 1987 as an explanatory variable instead of contemporaneous prevalence. Assuming that agents form their expectations about the prevalence of a given type of contract based upon past information, this lagged prevalence could be a determinant of contractual choice. Since this proportion variable is determined 12 years prior to the survey year, it may be considered as exogenous.

Section 4 Results and Discussions

Table 4 shows the main results on the effects of prevalence of share contracts and other characteristics of the contracting parties and the farmland.

The first column contains GS2SLS estimates of Equation (1). We use a linear probability model to examine the impact of local norms on contractual choice. The linearly independent columns in $[X, WX, WWX]$ are used as instruments in order

to address the endogeneity of prevalence. Column 1 shows that the likelihood of a share contract being chosen will increase by 0.74% if there is a 1% increase in its prevalence, which implies that contracting parties have a strong tendency to choose the contractual form that conforms to local norms.

However, an over-identification test for the specification in the first column raises doubts about the particular instruments used. The spatial lags of exogenous characteristics of tenants, landlords and farms will fail the over-identification test unless they are uncorrelated with the error term in the contractual choice equation. For example, suppose that there is clustering in the crop types due to some unobserved environmental or land attributes that are identical within a county. In this case, the spatial lag of crop types is correlated with the error term in contractual choice equation.

In the second column of Table 4, we instrument for the prevalence variable using only a subset of spatial lags that do pass the over-identification test, namely, the spatial lags of the age variables, the logs of tenant nonfarm assets and value of land and buildings owned by the landlord. We note that the estimated effects of local norms are only slightly weaker than in the first column, but still significant at the 1% level. The results imply that the likelihood of a share contract being chosen will increase more than 0.7% if there is a 1% increase in the prevalence of share contracts.

In Column 3, we use the same subset of spatial lag variables to instrument for the prevalence variable, but we also instrument for the distance between landlord residence and the farm using landlord occupation indicators. The estimated effect of prevalence is higher than in the second column and statistically significant at the 1%

level. However, we note that the sign of the distance effect is reversed once we instrument for distance. This result is consistent with the hypothesis that landlords under cash leases are more likely to be located closer to the farm than those under share leases (Dubois 2002) so that they could closely monitor land use and prevent land overexploitation, or enforce land conservation practices by the tenants at lower costs (Soule et al 2000). In line with this logic, the distance variable is positively correlated with the error term in the contractual choice equation. Therefore, the estimated distance effect in Column 2 is biased upward when we do not account for the endogeneity of distance.

In Column 4, we exclude the log of landlord farm assets from the set of explanatory variables since it may be endogenous. A landlord will likely make a greater investment in farm-related assets under a share contract than under a cash contract. Therefore, the estimated landlord wealth effect on contractual choice may be biased upward. Results in Column 4 are similar to those in Column 3, except that the estimated prevalence effect on contractual choice is now lower: for each percent increase in share prevalence, the likelihood of a share contract will increase by 0.78%. Remember that in Column 3, we have included the spatial lag of landlord farm assets as an instrument for the prevalence variable, and the value of this instrument may be higher when share contracts are more prevalent, so the estimated prevalence effect is higher in Column 3.

Column 5 is similar to Column 4 except that we instrument for the prevalence variable with the proportion of share-rent contracts in 1987. The results are similar to those in the first three columns, but the estimated effect of prevalence is greater: the

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likelihood of a share contract may increase by 0.95% if the prevalence level increases by 1%. In the last column in Table 4, we use the historical proportion of share contracts as a proxy for prevalence. Using such a specification, our estimates suggest a greater effect of local norms: if there is a 1% increase in the historical proportion of share contracts, then the likelihood of a share contract being chosen will increase by more than 1%. Our interpretation is that economic agents may use historical observations as a reference when making their choice of contractual form.

In all the above specifications, the estimated effect of our key explanatory variable, the prevalence of share contracts is statistically significant at the 1% level and the magnitude of the effect is large. The results lend strong support to the transaction cost theory and the theory on local norms.

Turning to the results on other explanatory variables, first, landlord age is found to affect contractual choice. Table 4 indicates that older landlords are significantly more likely to be associated with share-rent contracts. This effect can be interpreted with the theory of imperfect factor markets by Eswaran and Kotwal's (1985). If an older landlord is more experienced in farm management, then it is optimal for the parties to choose a share contract so that the landlord has proper incentive to provide managerial inputs. Our findings suggest mixed evidence for the risk sharing theory of tenancy choice. On one hand, older landlords are found to prefer share contracts, which is opposite to the prediction by the hypothesis that more risk-averse landlords prefer cash contracts. On the other hand, tenant age is found to be positively associated with the choice of share contracts, which is consistent with the idea that more risk-averse tenants prefer share rent contracts. However, the effect

of tenant age is insignificant, except when we use the historical prevalence of share contracts as the proxy for share prevalence.

The estimated effect of crop yield variability is statistically significant in five out of six specifications. The results indicate that as there is more uncertainty in agricultural output, the contracting parties are more likely to choose a share contract. The magnitude of this effect is not negligible: for each unit increase in crop yield variability, the likelihood of share contracts will go up by about 0.07%.

Our results also indicate a significant wealth effect on the choice of contract. We use the value of tenant-owned non-farm related assets as well as tenants' sales of agricultural products as proxies for tenant wealth. All columns in Table 4 show that wealthier tenants are more likely to sign cash-rent contracts. This finding is consistent with principal-agent models with the presence of financial constraint or limited liability. For instance, Laffont and Matoussi (1995) show that share contracts may be preferred when the tenant is faced with financial constraints. In the meantime, assuming that risk aversion decreases as wealth increases, our finding that less risk-averse tenants are more likely to choose cash over share-rent contracts is in support of the risk sharing theory of share contracts (Stiglitz 1974).

Results on landlord wealth are also consistent with the risk sharing theory based on the risk attitudes of landlords (Huffman and Just 2004).We find that the likelihood of share contracts increases with landlord wealth, which indicates that the landlord risk aversion may affect contractual choice. However, we acknowledge the fact that the value of landlord farm assets may be a proxy of landlord's agricultural investment, which is likely to be higher under a share contract.

Farm type dummies, which are defined according to the percentage of sales for different categories of agricultural products in previous years, are also included in the regressions. Certain types of farms, such as fruit farms, are more likely to be under share-rent contracts. As discussed previously, these farms involve a long production cycle and there is a greater need for long term investment incentives (Bandiera 2007). The contracting parties can build a sustainable long term relationship more easily under share contracts (Murrell 1983), thus we should find a greater likelihood of fruit farms using share-rent contracts. This hypothesis is consistent with our results in Table 4: in all columns we find that fruit farms are more likely to be under share contracts. Another example is farms that produce grains and oilseeds. Allen and Lueck (1992) argue that it is less costly to measure outputs for this type of farm and therefore easier for landlords and tenants to divide and share outputs. In all specifications we find that farms that grow grains or oilseeds are more likely to be under share contracts, which lends support to the theory of measurement costs.

It is also worth noting that farms with a higher erodibility index are more likely to be under share contracts, which is consistent with the prediction of previous theoretical studies (Dubois 2002, Soule et al 2000, and Lichtenberg 2007). Moreover, the results suggest that if there is more heterogeneity in land erodibility within the county, then contracting parties are less likely to adopt share contracts, which is also consistent with our expectation.

We obtain consistent results for our explanatory variables in Table 5, which explores nonlinear effects of prevalence of share contracts, as well as in all robustness

tests. The columns in Table 5 are comparable to columns 2 and 4 in Table 4, except that we consider nonlinear functions of prevalence. In line with Table 4, we instrument for the distance variable in the second column in Table 5. Note that in Table 5 we use the squares of the spatial lags of age variables and the log of landlord wealth as instruments for the square of prevalence so that the set of instruments pass the over-identification test. Both columns in Table 5 show that the square of prevalence has a negative coefficient, which implies that the speed of increase of the prevalence effect decreases as prevalence increases. Figure 3 is based on the estimation in the second column in Table 5. It shows the relationship between the estimated likelihood of a share contract being chosen and the prevalence of share contracts, with the value of other contractual determinants held at the mean value. The estimated probability of share contracts is extremely low when the prevalence of share contracts is low, but the likelihood increases as share contracts become more prevalent. The speed of increase of the estimated likelihood of share contracts being chosen first increases as share contracts become more prevalent, but then it decreases as prevalence exceeds a certain threshold. This finding suggests that as share contracts first emerge and gradually become the local norm, the likelihood of individual adoption of them increases most rapidly. As they become more and more prevalent, the speed of increase will diminish eventually.

Section 5 Robustness

Our results may be biased if we have omitted some tenant or landlord characteristics that affect the choice of contractual form. In this section, we implement several

robustness exercises. First of all, we control for additional financial characteristics of the tenant and the landlord, such as the debt-asset ratio[15] and farm income share of total household income. These variables may proxy for the risk preferences of the contracting parties. Results appear in Table 6. The prevalence effect is slightly lower in its magnitude (0.61 compared to 0.74 in our main findings), but statistically significant at the level of 1%.

In the first column, we treat distance as exogenous. The spatial lags of tenant age, landlord age, log of tenant nonfarm assets, and log of landlord land and buildings market value are used as instruments for the prevalence variable. Column 1 shows similar results to those in Table 4. Among the additional financial variables, the only statistically significant one is tenant farm-related debt-asset ratio. Not surprisingly, we find that this ratio is significantly lower under a share contract. As the landlord is more likely to provide the tenant with farming inputs under a share contract, the tenant has less need for financing. This effect may be interpreted by the credit constraint theory of share contracts: a financially constrained tenant is more likely to choose a share contract so that she or he could directly borrow resources from the landlord (Laffont and Matoussi 1995).

The effects of other additional variables are not statistically significant, but the signs of coefficients are as expected. For instance, the likelihood of share contracts increases with the tenant non-farm debt-asset ratio. This ratio is a proxy for the tenant's exposure to financial risks and therefore the tenant risk aversion. Our result suggests that a more risk-averse tenant is more likely to use a share contract. Farm

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[15] The AELOS survey does not provide information on the non-farm assets and debts of the landlord, so we only have the farm-related debt-asset ratio for the landlord.

income as a share of total household income may be a proxy for risk preferences, but it could also reflect whether the party is engaged in farming. Our findings suggest that tenant (landlord) farm income share is negatively (positively) correlated with the use of share contracts. This is in line with the incentive theory by Eswaran and Kotwal (1985): a cash contract provides more incentives for the tenant, while a share contract gives the landlord more incentives to participate in farming.

In Column 2 of Table 6, we instrument for the distance variable using landlord occupation indicators. Results are similar to those in Table 4. The effect of share prevalence is again statistically significant. We find that for each percent increase in the level of prevalence, the likelihood of a share contract may increase by 0.63%. The estimated effects of other variables are consistent with our main results.

We note that the occupation indicators may reflect the landlord's farming experience and therefore could directly affect contractual choice, since it is less costly for a landlord with more professional farming experience to supervise the tenant. Thus a landlord with more agricultural experience may be more comfortable with a cash contract. However, on the other hand, a share contract provides more incentives for the landlord to participate in the production process and a more experienced landlord may prefer share to cash contracts.

We construct an indicator of landlord farming experience. It takes value 1 if the landlord is a farmer, self-employed in the farming sector, or retired from a farm-related business. In Column 3, we include this landlord farming experience indicator as an explanatory variable. The estimated effect is not statistically significant, but its sign is not unexpected. We find that a landlord with more farming experience is more

likely to use a share contract. This finding is in line with the incentive theory of share contracts.

In Column 4 we use the historical share prevalence as an instrument for the prevalence variable and in the last column we use it as an explanatory variable. Results on the prevalence effect are consistent with those in Table 4. The estimated effects of other variables such as age, wealth, land erodibility, and crop yield variability are also in line with our main results.

As a further examination of the robustness of our results, we now move on to control for unobserved characteristics that are specific to the state where the farm is located using state fixed effects. Results appear in Table 7. The estimated prevalence effect is now lower: for a 1% increase in the prevalence of share contracts, the likelihood of a share contract will increase by 0.4%. However, the effect is still statistically significant at the 1% level. The results on state effects suggest that share contracts are more likely to be used in states such as Montana, Colorado and Kansas[16].

Other results are consistent with our main findings, except that the effects of county-level variables such as land erodibility and crop yield variability have now become statistically insignificant, possibly due to the lack of variation in these county-specific attributes. Interestingly, the estimated effects of landlord race and landlord wealth have become marginally significant. We find that white landlords are more likely to use cash contracts than landlords in other ethnic groups. In addition, our results suggest that those landlords who own more land and buildings (as

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[16] In these states, about 70% of the farms covered by the AELOS survey specialize in the production of grains, oilseeds or wheat, the output of which can be easily measured and shared.

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measured by market value) tend to use share contracts, which is consistent with the risk sharing theory.

In our last robustness exercise, we select an alternative subset of spatial lag instruments for the prevalence variable to check whether our estimated prevalence effect is driven by our particular selection of exclusion constraints. In order to ensure that these instrument variables explain the prevalence of share contracts, but do not directly affect the likelihood of share contracts, we run a regression of contractual choice on the prevalence of share contracts, all exogenous explanatory variables, and spatial lags of these exogenous variables. Controlling for share prevalence, only some of the spatial lag variables have a significant impact on contractual choice. We include only these spatial lags as instruments for prevalence and conduct the same regressions as in our main Table 4. Results appear in Table 8. In the first and third column, we regard the distance variable as exogenous. In Column 1 we use the spatial lags of the following variables as instruments for the prevalence variable: landlord age, the log of tenant nonfarm assets, the log of the value of land and buildings owned by the landlord. Statistically, we have found that these neighbor characteristics do not have a significant impact on individual contractual choice, controlling for contract prevalence. Intuitively, it seems reasonable to assume that these characteristics do not directly affect the contract preference of a given agent. The estimated prevalence effect is again statistically significant at the 1% level. For each percent increase in prevalence, the estimated likelihood of share contracts may increase by 0.64%. Results on the other explanatory variables are consistent with our previous findings.

In Column 2, we instrument for the distance variable. The estimated prevalence effect increased slightly to 0.69. Other results are consistent with the previous ones. Columns 3 and 4 are comparable to Columns 1 and 2, respectively, except that we drop the spatial lag of landlord age from the set of instruments, as it has a marginally significant effect on contractual choice, controlling for share prevalence. The estimated prevalence effect is now lower, but still statistically significant.

In summary, our results are robust to alternative specifications. We also note that our estimated magnitude of the local norm effect on contractual choice is comparable to that in the literature on social interactions. For instance, Dickinson and Pattanayak (2009) use data from a randomized sanitation intervention to study the effect of social interactions on households' decisions to build and use latrines. The estimated magnitude of such social effects is 0.4% in their entire sample and 0.8% in the treatment sample.

Following the previous literature, we estimate a "social multiplier" (Glaeser et al 2003) that is within a range between 1.6 and 3.3[17], implying a strong effect of local norms. Nevertheless, we remain cautious in the interpretation of our findings. If there is nonrandom sorting of the agent characteristics (Manski 1993, Durlauf 2004), our estimates for the local norm effect may be overestimated and the estimated effects of other contract determinants may also be biased (Ackerberg and Botticini 2002). However, given their large magnitude, our estimates seem to suggest the existence of a significant local norm effect on contractual choice.

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[17] Following the authors, the social multiplier is estimated as the ratio between the aggregate and the individual prevalence effect. It is calculated as $1/(1-x)$, where x is the estimated prevalence effect on individual contractual choice.

Section 6 Conclusion

This paper highlights some important determinants of contractual structure that are ignored by the previous empirical literature. Unlike previous empirical studies of determinants of contractual structure that suffer from insufficient number of observations or other data limitations, this study uses a large confidential survey data set from the US agriculture to show that local norms as well as the likelihood of opportunistic behavior play an important role in the process of contractual choice. The empirical results in the present paper support the transaction cost economics theory that emphasizes the likelihood of opportunistic behavior and the importance of adaptive sequential decision making. Besides transaction cost theory, the theories of conventional contracts and local norms are also consistent with the findings in this paper.

There are a number of limitations in this study. First of all, although our data set is a comprehensive one with information on both landlord and tenant characteristics, it has some limitations. For instance, the erodibility variable is calculated as the mean erodibility index for the sample points in National Resources Inventory data. The sample points contained by NRI data set do not directly correspond to the observations in the AELOS data set. Therefore the county level mean value of the erodibility index is used instead of a land erodibility measure for individual farms. If there is much heterogeneity in terms of land quality across farms within a county, the county level mean erodibility index will not be a good proxy for farmland characteristics. Another limitation is that an assumption on the structure of

weighting matrix is made in the spatial regression. Since there is no information on the geographical or social distance between one farm and another, it is difficult to construct a more realistic weighting matrix that better represents the spatial relationship among farms. Detailed information on the geographical locations of the farms is preferred for a more precise estimation of the effect of social interactions on contractual choice. In addition, it would be desirable to gain more knowledge on the structure of the social networks so that we may get a better understanding of how local norms emerge and evolve. So far we have focused on a more general aspect of local norms, that is, how economic agents are affected by the norms in their neighborhood in making contractual choices. However, there are other interesting aspects of local norms such as social norms or cultural beliefs held by agents. In our future work we will attempt to delve deeper into the impact of local norms by studying more specific aspects of local norms.

Tables and Figures

Table 1A. Descriptive Statistics-Main Variables

Variable	Mean	Std. Dev.	Min*	Max*
Share	.18	.38	0	1
Share prevalence	.19	.24	0	1
Share prevalence 1987	.23	.14	0	.79
Mean erodibility	6.14	5.29	.11	55.0
Std.dev. erodibility	5.30	5.66	0	100.79
Log (tenant nonfarm assets $)	13.84	1.28	-	-
Log (tenant sales$)	12.46	2.10	-	-
Tenant age	50.82	11.91	-	-
Landlord age	65.23	14.61	-	-
Distance (=1 if >150 mi)	.130	.34	0	1
Log (value of land and buildings owned by landlord)	12.26	1.33	-	-
Log (landlord farm assets)	7.67	4.56	-	-
Tenant race (=1 if white)	.98	.118	0	1
Landlord race (=1 if white)	.95	.21	0	1
Yield variability	.25	.095	0	.65

* Min. and Max. of age, sales and value of assets are confidential information.
Number of Observations: 37,290
Source: Agricultural Economics and Land Ownership Survey (AELOS1999), US Census of Agriculture (1987) and National Resources Inventory (NRI 1997)

Table 1B. Descriptive Statistics- Farm Type

Variable	Mean	Std. Dev.	Min	Max
Grains/oilseeds	.48	.49	0	1
Tobacco	.04	.18	0	1
Cotton	.07	.25	0	1
Vegetable/melon	.06	.25	0	1
Fruits	.017	.13	0	1
Other crop	.072	.26	0	1
Beef	.068	.25	0	1
Dairy	.11	.32	0	1
Hogs	.032	.17	0	1
Poultry	.022	.15	0	1
Other animals*	.0032	.056	0	1

* Min. and Max. of age, sales and value of assets are confidential information.
Number of Observations: 37,290
Source: Agricultural Economics and Land Ownership Survey (AELOS1999), US Census of Agriculture (1987) and National Resources Inventory (NRI 1997)

Table 2 Descriptive Statistics- Landlord Occupation Indicators*

Variable	Description	Mean	Std. Dev.	Min	Max
Farmer	=1 if operates a farm	.038	.191	0	1
Employed	=1 if employed by government or business	.252	.434	0	1
Self-employed-Farm	=1 if self employed in farm business	.034	.181	0	1
Self-employed non farm	=1 if self employed in non farm related business	.102	.303	0	1
Retired-farm	=1 if retired from farm business	.235	.424	0	1
Retired-non farm	=1 if retired from non farm related business	.288	.453	0	1
Other	=1 if other types of occupation	.051	.221	0	1

*used as instruments for the distance variable.
The omitted group in the regressions is "other types of occupation"
Source: See Table 1.

Table 3A. Contract choice by distance between landlord residence and farm

Contract type	Distance					
	0-4.9miles	*5-24.9miles*	*25-49.9miles*	*50-150miles*	*>150miles*	*Total*
Cash	18,088	5,862	1,713	2,098	3,540	31,293
	(86.22)	(78.44)	(78.61)	(80.85)	(74.28)	(82.39)
Share	2,890	1,611	466	497	1,226	6,690
	(13.78)	(21.56)	(21.39)	(19.15)	(25.72)	(17.61)

Source: See Table 1.
Note: Number in parenthesis is the column percentage.

Table 3B. Landlord Occupation & Distance

	Distance (=1 if > 150 miles)
Farm operator	-0.1125
	(0.0117)***
Employed	-0.0295
	(0.0103)***
Self-employed (Farming)	-0.1192
	(0.0118)***
Self-employed (Non-farming)	-0.0303
	(0.0111)***
Retired (Farming)	-0.1120
	(0.0101)***
Retired (Non-farming)	0.0034
	(0.0102)
Constant	0.1696
	(0.0102)***
Observations	37983
R-squared	0.02

Source: See Table 1. Omitted group is "Other occupation".
*significant at 10% level, **significant at 5% level, ***significant at 1% level.
County clustered standard errors are in parentheses.

Table 4 Main Results

	(1)	(2)	(3)	(4)	(5)	(6)
Share prevalence	0.744***	0.725***	0.825***	0.780***	0.948***	
	(0.0572)	(0.0666)	(0.0838)	(0.0971)	(0.0159)	
Share prevalence 1987						1.086***
						(0.0430)
Mean erodibility	0.00257*	0.00270**	0.00216	0.00241*	0.00133	0.00202
	(0.00131)	(0.00136)	(0.00132)	(0.00143)	(0.000915)	(0.00198)
Std. erodibility	-0.00245**	-0.00256**	-0.00208*	-0.00226*	-0.00131	-0.00523***
	(0.00119)	(0.00122)	(0.00124)	(0.00132)	(0.000936)	(0.00198)
Tenant age	0.000216	0.000281	7.69e-05	0.000121	-0.000374	0.00492
	(0.00462)	(0.00447)	(0.00466)	(0.00456)	(0.00492)	(0.00418)
Landlord age	0.00505***	0.00517***	0.00445***	0.00462***	0.00357**	0.00545***
	(0.00133)	(0.00137)	(0.00146)	(0.00151)	(0.00139)	(0.00139)
Distance (=1 if >150 miles)	0.0148**	0.0158**	-0.00432	1.29e-05	-0.0117	-0.0147
	(0.00671)	(0.00685)	(0.0484)	(0.0476)	(0.0427)	(0.0397)
Yield variability	0.0799**	0.0856**	0.0611*	0.0697*	0.0231	0.247***
	(0.0337)	(0.0355)	(0.0364)	(0.0401)	(0.0266)	(0.0616)
Log (tenant sales)	-0.00776***	-0.00775***	-0.00776***	-0.00731***	-0.00748***	-0.00503**
	(0.00240)	(0.00238)	(0.00230)	(0.00214)	(0.00209)	(0.00224)
Log (tenant nonfarm assets)	-0.0138***	-0.0140***	-0.0130***	-0.0124***	-0.0110***	-0.0123***
	(0.00436)	(0.00448)	(0.00425)	(0.00410)	(0.00379)	(0.00410)
Log (value of land and buildings owned by landlord)	0.00263	0.00261	0.00254	0.00302	0.00308	0.000780
	(0.00237)	(0.00230)	(0.00246)	(0.00241)	(0.00234)	(0.00239)
Log (landlord farm assets)	0.00224**	0.00230**	0.00201**			
	(0.000933)	(0.000935)	(0.000938)			
Tenant race (=1 if white)	0.0105	0.00981	0.0135	0.0134	0.0186	0.00261
	(0.0380)	(0.0370)	(0.0372)	(0.0370)	(0.0379)	(0.0374)
Landlord race (=1 if white)	-0.00923	-0.00873	-0.0111	-0.0104	-0.0148*	-0.0131
	(0.00849)	(0.00857)	(0.00879)	(0.00882)	(0.00894)	(0.00866)
cotton	0.0256	0.0252	0.0268	0.0276	0.0305	0.0475
	(0.0257)	(0.0266)	(0.0269)	(0.0267)	(0.0271)	(0.0293)
Grains/oilseeds	0.0438*	0.0452*	0.0384	0.0457*	0.0328	0.0432**
	(0.0233)	(0.0237)	(0.0248)	(0.0248)	(0.0255)	(0.0210)
fruits	0.143***	0.143***	0.146***	0.143***	0.149***	0.145***
	(0.0437)	(0.0443)	(0.0444)	(0.0449)	(0.0447)	(0.0458)
Constant	0.192***	0.195***	0.181***	0.176***	0.153**	0.0326
	(0.0705)	(0.0702)	(0.0688)	(0.0680)	(0.0694)	(0.0722)
Over-identification test	Chi-sq(21)=43.86; p=0.002	Chi-sq(9)=13.35; p=0.15	Chi-sq(21)=25.6; p=0.22	Chi-sq(19)=22.0; p=0.29	Chi-sq(5)=2.56; p=0.77	Chi-sq(5)=2.46; p=0.78
Observations	37290	37290	37290	37290	37263	37263
R-squared	0.140	0.142	0.126	0.133	0.097	0.179

Note: The dependent variable is a dummy variable which is equal to one if the contract chosen is a share rent contract and equal to zero otherwise. Results on the following farm types are omitted: tobacco, vegetables, dairy, hogs, poultry and other crop.
*significant at 10%, ** significant at 5%, *** significant at 1%. Bootstrapped standard errors are in parentheses (using 1000 replications with clusters at the county level)

Table 5 Nonlinear Effects

	(1)	(2)
Share prevalence	1.007***	1.016***
	(0.190)	(0.184)
Share prevalence^2	-0.273	-0.275
	(0.212)	(0.210)
Mean erodibility	0.00228*	0.00241*
	(0.00120)	(0.00125)
Std. erodibility	-0.00177	-0.00188
	(0.00116)	(0.00121)
Tenant age	0.000123	0.000277
	(0.00466)	(0.00468)
Landlord age	0.00447***	0.00430***
	(0.00155)	(0.00152)
Distance	0.0103	-0.0113
(=1 if >150 miles)	(0.00796)	(0.0420)
Yield variability	0.0640*	0.0686*
	(0.0363)	(0.0382)
Log (tenant sales)	-0.00739***	-0.00733***
	(0.00208)	(0.00208)
Log (tenant nonfarm assets)	-0.0117***	-0.0117***
	(0.00396)	(0.00394)
Log (value of land and buildings owned by landlord)	0.00349	0.00323
	(0.00226)	(0.00230)
Tenant race	0.0176	0.0182
(=1 if white)	(0.0372)	(0.0371)
Landlord race	-0.0131	-0.0130
(=1 if white)	(0.00897)	(0.00898)
Constant	0.143**	0.145**
	(0.0678)	(0.0678)
Overidentification test	Chi-sq(4)=3.29; p-value=0.51	Chi-sq(9)=4.06; p-value=0.90
Observations	37290	37290
R-squared	0.137	0.135

Note: The dependent variable is a dummy variable which is equal to one if the contract chosen is a share rent contract and equal to zero otherwise. Results on farm types are omitted.
*significant at 10%, ** significant at 5%, *** significant at 1%.
 Bootstrapped standard errors are in parentheses (1000 replications with clusters at the county level)

Table 6 Robustness results: more tenant and landlord characteristics

	(1)	(2)	(3)	(4)	(5)
Share prevalence	0.613***	0.629***	0.618***	1.032***	
	(0.0743)	(0.0735)	(0.0736)	(0.0281)	
Share prevalence 1987					1.095***
					(0.0490)
Mean erodibility	0.00452**	0.00476**	0.00462**	0.00265**	0.00223
	(0.00189)	(0.00193)	(0.00189)	(0.00129)	(0.00246)
Std. erodibility	-0.00376**	-0.00398**	-0.00385**	-0.00226	-0.00516**
	(0.00175)	(0.00179)	(0.00175)	(0.00138)	(0.00250)
Tenant age	0.00127	0.00156	0.00144	0.000215	0.00542
	(0.00551)	(0.00552)	(0.00552)	(0.00615)	(0.00514)
Landlord age	0.00649***	0.00611***	0.00591***	0.00378**	0.00522***
	(0.00169)	(0.00175)	(0.00176)	(0.00167)	(0.00158)
Distance (=1 if >150 miles)	0.0170**	-0.0233		-0.0524	-0.0377
	(0.00837)	(0.0558)		(0.0515)	(0.0467)
Landlord farming			0.00462		
			(0.00567)		
Yield variability	0.122**	0.130**	0.125**	0.0109	0.277***
	(0.0548)	(0.0565)	(0.0549)	(0.0456)	(0.0770)
Log (tenant sales)	-0.00518*	-0.00505	-0.00513*	-0.00531**	-0.00317
	(0.00309)	(0.00307)	(0.00308)	(0.00254)	(0.00282)
Log (tenant nonfarm assets)	-0.0309***	-0.0308***	-0.0308***	-0.0238***	-0.0281***
	(0.00568)	(0.00566)	(0.00568)	(0.00531)	(0.00570)
Tenant nonfarm debt/asset	0.00985	0.0103	0.0101	0.0152	-0.000247
	(0.0130)	(0.0129)	(0.0130)	(0.0125)	(0.0121)
Tenant farm debt/asset	-0.0213*	-0.0211*	-0.0213*	-0.0128	-0.0332***
	(0.0109)	(0.0109)	(0.0109)	(0.0114)	(0.0112)
Tenant farm income share	-0.0135	-0.0126	-0.0130	-0.0229	-0.0152
	(0.0343)	(0.0340)	(0.0341)	(0.0331)	(0.0350)
Landlord farm debt/asset	0.00787	0.00531	0.00653	0.00491	0.00698
	(0.00810)	(0.00868)	(0.00802)	(0.00813)	(0.00837)
Landlord farm income share	0.00680	0.00418	0.00378	-0.00420	-0.00346
	(0.00881)	(0.00938)	(0.00889)	(0.00956)	(0.00920)
Log (value of land and buildings owned by landlord)	0.00290	0.00265	0.00255	0.00305	0.000671
	(0.00266)	(0.00269)	(0.00268)	(0.00285)	(0.00261)
Log (landlord farm assets)	0.000395	0.000262	0.000302	0.000865	0.000751
	(0.00301)	(0.00303)	(0.00301)	(0.00317)	(0.00309)
Tenant race (=1 if white)	0.0177	0.0175	0.0178	0.0200	0.0294
	(0.0449)	(0.0449)	(0.0449)	(0.0476)	(0.0460)
Landlord race (=1 if white)	-0.00268	-0.00256	-0.00269	-0.0116	-0.0109
	(0.0109)	(0.0110)	(0.0109)	(0.0103)	(0.0102)
Constant	0.424***	0.426***	0.429***	0.317***	0.230**
	(0.0970)	(0.0966)	(0.0969)	(0.0948)	(0.103)
Over-identification test	Chi-sq(3)=7.68; p-value=0.05	Chi-sq(8)=10.88; p-value=0.21	Chi-sq(3)=7.80; p-value=0.05	Chi-sq(5)=1.57; p-value=0.91	Chi-sq(5)=1.83; p-value=0.87
Observations	28735	28735	28735	28723	28723
R-squared	0.156	0.155	0.156	0.097	0.182

Note: Results on farm types are omitted.
*significant at 10%, ** significant at 5%, *** significant at 1%.
 Bootstrapped standard errors are in parentheses (1000 replications with clusters at the county level)

Table 7 Robustness results: state fixed effects

	(1)	(2)	(3)	(4)	(5)
Share prevalence	0.420***	0.405***	0.404**	0.894***	
	(0.123)	(0.125)	(0.167)	(0.0372)	
Share prevalence 1987					0.679***
					(0.0618)
Mean erodibility	0.000700	0.000714	0.000614	0.000152	0.000552
	(0.00166)	(0.00175)	(0.00171)	(0.000908)	(0.00217)
Std. erodibility	-0.00134	-0.00137	-0.00126	-0.000424	-0.00220
	(0.00164)	(0.00167)	(0.00165)	(0.000925)	(0.00215)
Tenant age	0.00105	0.00111	0.000822	-0.000945	0.00379
	(0.00428)	(0.00446)	(0.00456)	(0.00497)	(0.00413)
Landlord age	0.00460***	0.00462***	0.00452***	0.00363***	0.00464***
	(0.00123)	(0.00123)	(0.00129)	(0.00139)	(0.00130)
Distance (=1 if >150 miles)	0.00793	0.00812	0.0111	0.00126	0.0129
	(0.00621)	(0.00629)	(0.0357)	(0.0385)	(0.0358)
Yield variability	0.0417	0.0432	0.0425	-0.00740	0.0738
	(0.0582)	(0.0602)	(0.0623)	(0.0312)	(0.0745)
Log (tenant sales)	-0.00913***	-0.00915***	-0.00874***	-0.00805***	-0.00730***
	(0.00242)	(0.00244)	(0.00227)	(0.00230)	(0.00236)
Log (tenant nonfarm assets)	-0.0121***	-0.0121***	-0.0110***	-0.0109***	-0.00995***
	(0.00407)	(0.00403)	(0.00387)	(0.00392)	(0.00362)
Log (value of land and buildings owned by landlord)	0.00384*	0.00386*	0.00425*	0.00342	0.00438**
	(0.00222)	(0.00225)	(0.00236)	(0.00228)	(0.00205)
Log (landlord farm assets)	0.00221**	0.00222***			
	(0.000877)	(0.000845)			
Tenant race (=1 if white)	0.00861	0.00834	0.00999	0.0189	0.00677
	(0.0364)	(0.0374)	(0.0376)	(0.0382)	(0.0360)
Landlord race (=1 if white)	-0.0158*	-0.0157*	-0.0157*	-0.0185**	-0.0188**
	(0.00828)	(0.00831)	(0.00822)	(0.00818)	(0.00754)
Constant	0.295***	0.297***	0.284***	0.222***	0.164**
	(0.0787)	(0.0826)	(0.0813)	(0.0780)	(0.0808)
Observations	37290	37290	37290	37263	37263
R-squared	0.191	0.192	0.191	0.113	0.207

Note: The dependent variable is a dummy variable which is equal to one if the contract chosen is a share rent contract and equal to zero otherwise. Results on farm types and state fixed effects are omitted.
*significant at 10%, ** significant at 5%, *** significant at 1%.
Bootstrapped standard errors are in parentheses (1000 replications with clusters at the county level)

**Table 8 Robustness results: using a subset of spatial lags as instruments**

	(1)	(2)	(3)	(4)
Share prevalence	0.644***	0.694***	0.522***	0.655***
	(0.0858)	(0.0830)	(0.163)	(0.0936)
Mean erodibility	0.00320**	0.00293*	0.00401*	0.00316*
	(0.00154)	(0.00150)	(0.00222)	(0.00163)
Std. erodibility	-0.00295**	-0.00271**	-0.00365*	-0.00292**
	(0.00135)	(0.00136)	(0.00198)	(0.00146)
Tenant age	0.000445	0.000344	0.000831	0.000445
	(0.00459)	(0.00467)	(0.00443)	(0.00465)
Landlord age	0.00553***	0.00519***	0.00629***	0.00544***
	(0.00143)	(0.00147)	(0.00157)	(0.00146)
Distance	0.0193**	0.0102	0.0253***	0.0146
(=1 if >150 miles)	(0.00751)	(0.0493)	(0.00910)	(0.0485)
Yield variability	0.105**	0.0926**	0.140*	0.103**
	(0.0451)	(0.0429)	(0.0723)	(0.0474)
Log (tenant sales)	-0.00719***	-0.00723***	-0.00705***	-0.00719***
	(0.00227)	(0.00223)	(0.00246)	(0.00226)
Log (tenant nonfarm assets)	-0.0135***	-0.0131***	-0.0146***	-0.0135***
	(0.00429)	(0.00421)	(0.00442)	(0.00424)
Log (value of land and buildings owned by landlord)	0.00310	0.00304	0.00303	0.00305
	(0.00235)	(0.00251)	(0.00256)	(0.00253)
Tenant race	0.00880	0.0105	0.00480	0.00921
(=1 if white)	(0.0381)	(0.0379)	(0.0386)	(0.0380)
Landlord race	-0.00724	-0.00838	-0.00425	-0.00746
(=1 if white)	(0.00874)	(0.00875)	(0.00991)	(0.00894)
Constant	0.194***	0.188***	0.212***	0.193***
	(0.0714)	(0.0701)	(0.0788)	(0.0710)
Over-identification test	Chi-sq(3)=0.64	Chi-sq(14)=20.7	Chi-sq(2)=0.78	Chi-sq(13)=18.84
	p-value=0.55	p-value=0.11	p-value=0.68	p-value=0.13
Observations	37290	37290	37290	37290
R-squared	0.149	0.145	0.154	0.149

Note: The dependent variable is a dummy variable which is equal to one if the contract chosen is a share rent contract and equal to zero otherwise. Results on farm types are omitted.
*significant at 10%, ** significant at 5%, *** significant at 1%.
 Bootstrapped standard errors are in parentheses (1000 replications with clusters at the county level)

Figure 1 Prevalence of share contracts in 1987
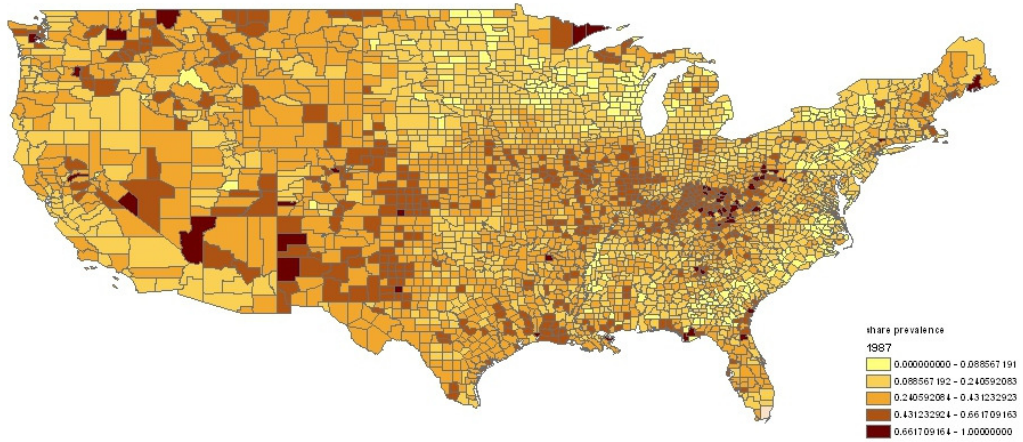
Source: US Census of Agriculture, 1987.

Figure 2 Prevalence of share contracts in 1999
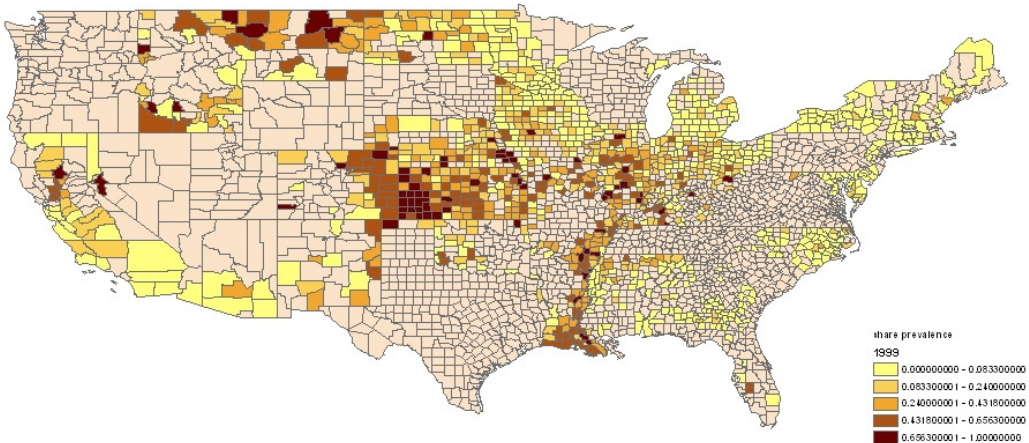
Source: Agricultural Economics and Land Ownership Survey, 1999
Note: Regions that are not covered by the AELOS survey are marked in pink.

Figure 3 Nonlinear Effects
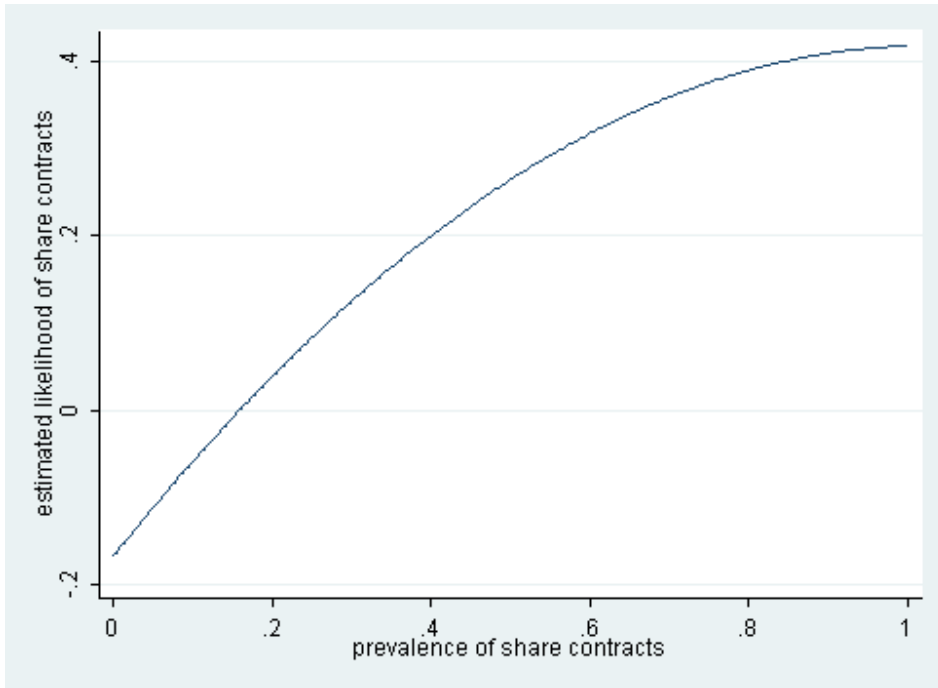
Source: Estimates from Column 2 in Table 5.

Chapter 2: The Path Dependence of Transactional Governance Choice: Evidence from Romania

Section 1 Introduction

The economic development literature has put emphasis on the important role of institutional environment in enhancing economic performance (Knack and Keefer 1995; Hall and Jones 1999; Acemoglu et al 2001). Previous studies provide support to the consensus that good institutions are essential to economic development and poverty reduction (Acemoglu et al 2002; Rodrik 2007). However, as pointed out by North (2005), there is still a debate on what the optimal institutions should be and there remains an important gap in the literature, which is how to achieve the institutional development objectives.

Institutions, which consist of formal rules, informal norms and their enforcement, are shaped by groups of economic agents with some common objectives, whose incentives are defined by their institutional environment (North 1990). The economic agents make their choices based on their perception about payoffs, which is a function of their stock of knowledge, cultural heritage and the way they interpret information received. Therefore, individuals from different cultural backgrounds will interpret the same information in different ways and make different institutional choices (North 2005). These choices in turn shape the development of institutions. As a result, there can be various patterns of economic development depending on the specific historical experience and cultural heritage of the economy

(Rodrik 2007). What works in one economy may not necessarily work in another. Since institutional development is "path dependent" (North 2004, 2005), it is key to recognize the way path dependence will constrain the process of institutional and economic change.

However, there has been little systematic empirical evidence that supports the idea of path dependent institution development at the macro level or path dependent choice of institutions by the firms at the micro level. To fill this gap, our present study provides micro level evidence on path dependent institutional choice, and analyzes the effects of two key factors: the stock of knowledge held by economic agents and their historical experience.

As highlighted by North (2005), within a particular institutional environment, the economic agents' stock of knowledge determines their perception about payoffs and therefore the incentive structure of an economy. The stock of knowledge includes not only scientific knowledge that helps promote economic development, but it also includes the beliefs held by a society that influence economic and institutional choices.

An important goal of our study is to analyze how knowledge affects the choice of which institutions to use. As a case study, we look at the effect of legal knowledge on the choice of transactional governance by firms in the transition economy of Romania. The Romanian economy is an advantageous context for our empirical study because it has some interesting features that are typical of a transition from planned to market economy. Although economic performance improved within a decade after privatization started (Earle and Telegdy 2002), the reforms towards a

market economy are taking place more gradually (Bueno 2010). Using a comprehensive firm level survey data, we construct measures of the amount of firms' knowledge about their legal rights and obligations, and examine how this knowledge affects their choice between legal and relational governance to protect their business transactions from opportunistic behavior. Interestingly, our results suggest that those who have more legal knowledge are less likely to use legal governance. This seemingly counterintuitive result is consistent with previous legal studies (Kim 1999; Gallagher 2006), which find those who are more knowledgeable about the law tend to rely on the legal institutions to a lesser extent.

Another objective of our study is to investigate the effect of economic agents' historical experience on their choice of which institutions to use. For instance, the Soviet heritage presents some special challenges for the transition economy of Romania. Policy makers were confronted by not only the problem of reforming the old institutional system but also the limitation of policy instruments which could only change the formal rules. A key problem is that economic agents are limited by their historical experience, such as traditional ties that are hard to abandon and illegal origins that make firms shy away from relying on the legal institutions (Murrell 2003). Therefore, it is a meaningful empirical exercise to investigate at the firm level whether the choice of institutions is significantly affected by historical experience.

In our study, we focus on the choice between the two forms of transactional governance: legal governance and relational governance. In the empirical analysis, we construct two different variables that independently measure the extent to which the firms rely on each of the above two forms of governance. Our results strongly suggest

that the choice of governance form is path dependent. We find that those firms that started business after the transition took place are significantly more likely to rely on relational governance to protect their transactions, compared to previously state-owned firms.

In our analysis, we also look into other empirical determinants of governance choice such as factors related to transaction costs. We follow a widely used empirical model of transactional governance proposed by Poppo and Zenger (2002). An important feature of this model is that the use of the two forms of governance are allowed to have an influence on each other. The interrelation between the two could be either complementary or substitutive, which remains an open empirical question. Apart from our findings on the effect of the firms' historical experience and legal knowledge on their choice of transactional governance, another contribution of our study is to further our understanding of the interaction between legal and relational governance of transactions, by providing new empirical evidence. We find that the extent to which the firms rely on legal governance has a positive effect on that of their reliance on relational governance, but the opposite effect is not present.

Our results have important policy implications for institutional reforms. Reform policies consist of changes in the formal rules only, so it is necessary to recognize the impact of formal institutions on informal relational governance. Equally important are whether there is a complementary relationship between legal and relational governance, and whether the interrelation is consistent with the expectations of reform policy makers (North 2005).

The next section elaborates on the interrelation between the two forms of transactional governance. Section 3 describes the data, discusses the variables and explains the empirical methodology. Section 4 discusses the results and Section 5 examines their robustness to alternative measurements of governance variables. Section 6 concludes. Definitions and explanations of how we construct the variables are in the appendix.

Section 2 The Interaction between Legal and Relational Governance

Economic development depends much upon the ability to honor binding exchange agreements (Greif 1993; MacLeod 2007), which could be enforced through formal rules enforced by the legal system or the informal business relationships based on norms, personal trust and conventions (North 1990). As there is vast heterogeneity in the quality of legal institutions across countries (Djankov et al 2002), it is important to further our knowledge of the interplay between legal and relational governance of inter-firm transactions, especially in developing countries.

The theoretical literature offers no consensus on the interrelation between the two. Early studies suggest that legal governance may signal distrust (Macaulay 1963) and have an adverse effect on "the atmosphere" of relational contracting (Williamson 1979). More recently, in a comprehensive review, MacLeod (2007) shows that as the quality of legal enforcement improves, the existence of formal enforceable contracts can render relational contracts unsustainable. Therefore, there may be a substitutive relationship between relational and legal governance. However, other studies suggest a complementary relationship between the two. On one hand, legal governance can

increase the effectiveness of relational governance by lowering information, monitoring and enforcement costs (North 1990). On the other hand, when there is much uncertainty in the contractual environment, relational governance allows for adaptation to unforeseen changes and conflicts (Macneil 1978).

Empirical evidence on the relationship between legal and relational governance of transactions has been mixed (Poppo and Zenger 2002, Kalnins and Mayer 2004, Gulati and Nickerson 2008, Ryall and Sampson 2009). Previous economic development studies show that trading partners use relational contracting (McMillan and Woodruff 1999) or reputation mechanism (Banerjee and Duflo 2000) in absence of appropriate legal institutions, which suggests a substitutive relationship between legal and relational governance. However, there is also evidence that access to legal governance may help firms build mutual confidence and form new relationships (Johnson et al 2002).

In this paper, we attempt to improve on previous studies of the interrelationship between the two types of governance by carefully examining the underlying determinants of governance choice. We follow a systematic approach proposed by transaction cost economists. The idea is that optimal governance choice depends on the characteristics of the product exchanged and the risks of opportunistic behavior involved in the transaction (Williamson 1975, 1985, 1991). In our analysis, we explicitly account for economic factors related to the transaction costs underlying each exchange agreement covered by the survey. We complement previous studies by using more appropriate measurements of the transaction cost variables and taking into account the variables that are specific to the transition economy of Romania.

Section 3 Data and Empirical Methodology

3.1 Data

Our data source is a firm-level survey entitled "The Commercial Relations of Romanian Enterprises" (Murrell and Paun 2001). 254 Romanian firms are covered by the survey. In order for the survey sample to be representative, firms from various industries are selected. From each firm that has been surveyed, four people are interviewed as survey respondents: the sales manager, the procurement manager, the general director and the firm lawyer or legal director. These people in general have expert knowledge about the characteristics of inter-firm transactions and their trading partners. Therefore, the data is derived from four survey questionnaires: the customer relations survey, the supplier relations survey, the general director's survey and the legal relations survey.

The first two surveys are similar in structure. The sales manager and the procurement manager are asked about the characteristics of the respondent's own firm and their trading partner. Both surveys ask detailed questions about a representative transaction between a firm and its partner. Thus the unit of observation in our survey data is a representative exchange agreement between a buyer and a supplier. We derive rich information on the characteristics of the transaction mainly based on the first two surveys, which also provide information on firms' historical origin.

The general director's survey asks about the general characteristics of the firms, the transactional strategies that the firms are pursuing in order to protect their interests, and their views on economic and legal matters that are representative of the

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enterprise. The legal relations survey asks about law-related aspects of the firms' operations.

All surveys have a section of questions about laws and ordinances that are intended to facilitate transactions in Romania. These questions are designed so as to test one's legal knowledge. Respondents are not allowed to look up source materials when answering these questions. Instead they are asked to provide their best guess of the correct answer. From these law-related questions, we extract information on the legal knowledge held by sales and procurement managers, general directors and legal directors.

In all four surveys the questions focus on two issues. One is transaction problems related to potential risks of the respondents' business interests being harmed by opportunistic trading partners. The other is how the firms prevent such transactional issues, through either legal means or relational means. The following subsection provides more details about the characteristics of their representative exchange agreements, and the methods used by the firms to protect their business interests from opportunistic behavior.

3.2 Dependent and Explanatory Variables

The transaction cost economics theory predicts that the optimal form of transactional governance is a function of the attributes of the product exchanged and the characteristics of the exchange environment, which could be described by the following simplified form of equations:

$R= f(L, transaction\ characteristics, firm\ characteristics)+error$

$L=g(R, transaction\ characteristics, firm\ characteristics)+error$

Again note that the unit of observation is a representative exchange agreement between a firm and its supplier or customer. *R* refers to the extent to which the firm relies on relational governance and *L* refers to the extent to which it relies on legal governance to protect its interests. We take into account the interaction between the two types of governance and allow them to affect each other. The right-hand-side variables of both equations include characteristics of a representative transaction of the firm, and firm attributes such as historical origin, and legal knowledge.

We construct an index for the legal (relational) governance variable so that the higher the index, the greater extent to which the firm relies on legal (relational) governance to protect its transaction from opportunistic behavior. Now we explain the rationale for building the two dependent variables.

Relational Governance

When a transaction between two firms is governed by a relationship that is based on repeated interactions or trust, incentives for opportunistic behavior may be mitigated and exchange hazards could be prevented without any resort to explicit contractual terms. Such relational governance may be based on two types of mechanisms.

First, transactions may be governed by a self-enforcing relationship that is built on repeated exchanges. Repeated transactions can play an important role in motivating long-term business relationships as expected payoffs from future exchanges may reduce incentives for short-run opportunistic behavior (Baker et al 2002; Klein 1996). A second mechanism of relational governance is based on social ties and trust that emerges from prior exchange relationships (Granovetter 1985, 1992; Uzzi 1997).

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When we construct the index for the relational governance variable, we consider both types of the abovementioned mechanisms and incorporate all relevant information from the four surveys. For example, both the customer and supplier surveys ask the managers if their firm and the partner firm trust each other to fulfill an agreement and to resolve issues in the interest of both parties. We increase the value of the index for relational governance if the answer is positive. Likewise, we also take into account of the reported perceived importance of personal relationships and trust in protecting respondent firms' business interests from opportunistic behavior so that a higher value is assigned to the index for those firms who consider trust and relationships as more important. More details on how we construct the index are provided in the Appendix.

Legal Governance

The other dependent variable is the extent to which transactions are governed by legal contracting. Under formal contracts, transaction parties specify obligations to perform particular actions in the future and procedures for dispute resolutions (Macneil 1978). Transaction cost economists point out that firm managers make contractual arrangements so that legally enforceable contracts can serve as safeguards against opportunistic behavior (Williamson 1985, Klein et al 1978), usually in the context of a hazardous exchange environment that involves asset specific investments, measurement difficulty and uncertainty.

In our view, the key attribute of legal governance is the legal formality that facilitates the enforcement of the contracts and the provisions that clarify exchange parties' obligations and promises so as to protect the firms from being held up by

their trading partners. When constructing the index for the legal governance variable, we look at the characteristics of the respondent firm's representative exchange agreement that help address the transaction cost related issues. For instance, we consider the use of penalty clauses that impose punishments for late delivery and for late payment, which help prevent the supplier and the buyer from holding up the other party. Our survey also asks whether the firms use contractual clauses to facilitate filing suits in courts. The reported frequency of using such clauses is utilized in the construction of the index for the legal governance variable.

In order for the index to reflect the extent to which firms rely on legal governance, we also incorporate firms' perceived importance of the legal system for their business, in terms of frequency of use and effectiveness. One survey question asks the general director whether they frame their agreements so that they could easily file suits in court or threaten to file suits if disputes do arise and if they do, whether they use this method very often and regard it as very effective.

It is worth noting that we have constructed the two dependent variables in such a way that the extent to which firms rely on either form of transactional governance could be measured separately and that the presence of one form of governance does not necessarily imply the presence or absence of the other. Figure 1 shows that there is no strong correlation between the governance variables (with a coefficient of correlation of 0.182). Indeed, a firm could adopt an arbitrary combination of both forms of governance to protect their transaction from opportunistic behavior.

Variables related to the characteristics of the transition economy

We now turn to a description of our main explanatory variables. These variables could be put into two categories: those that are specific to the transition environment and those related to transaction costs. Note that some determinants are common in both equations, thus the two sets of determinants are not separated in our description.

1) Origin of the firms

About 60 percent of the firms in the survey sample are previously state-owned businesses. A study by Murrell (2003) suggests that ex-state-owned firms tend to behave differently from firms that started business after institutional transition took place. The author finds that previously state-owned firms are less likely to rely on bilateralism or relational contracting as a strategy for transactional governance.

It is not difficult to understand this seemingly curious result. Prior to the transition that took place in the late 1980s, contractual disputes were resolved by a centralized state arbitration system. Previous studies of legal development used to view the state arbitration system as a purely administrative organization that hindered the development of legal contract enforcement (Hendrix 2001). However, a recent analysis of archival data by Belova (2005) suggests that the Soviet arbitration system, despite of its weaknesses, functioned as a legal contract enforcement institution respected by economic agents, especially in periods of economic liberalization. Belova (2005) argues that the contemporary court system in the post Soviet economies has been built upon a pre-existing institution with some expertise in inter-firm dispute resolution, through gradual reforms that transformed the state arbitration system into the current legal system. On one hand, previously state-owned firms are

relatively experienced in resolving disputes by formal means and thus are less likely

to rely on relational governance to enforce their (Hendley et al 2000). On the other

hand, firms founded as informal spinoffs from state firms are more likely to avoid

using legal governance since their creation based on the state-owned assets might

have been illegal (Murrell 2003). Therefore it is important to account for the

historical origin of the firms in our analysis of the transactional governance choice.

2) Legal knowledge

As highlighted by North (2005), it is the stock of knowledge held by economic agents

that affect their perceptions about payoffs and thus their institutional choices. In the

present study, we investigate the effect of agents' knowledge about the law on their

choice of transactional governance. Previous studies of legal development show that

economic agents' lack of legal knowledge leads to their misuse of legal governance.

For example, Kim (1999) documents New York and Californian workers' erroneous

belief about their legal rights and their persistent confusion of norms and law. The

author argues that when agents overestimate their legal rights offered by the law, they

do not behave as predicted by the "rational actor model" (Kim 1999). A recent case

study by Gallagher (2006) analyzes the development of legal consciousness among

Chinese legal aid plaintiffs in Shanghai. The author finds that these legal aid plaintiffs

have high expectations about the likelihood of protecting their interests despite the

fact that they have very limited knowledge about the legal procedure and their actual

legal rights.

    In the present analysis, we focus on the contracting parties' knowledge or

awareness of different economic agents' legal rights and obligations as codified by

the legal system. In our empirical analysis of governance choice, we examine three

legal knowledge variables: legal knowledge of the sales or purchase manager, legal

knowledge of the general director and legal knowledge of the company lawyer or the

legal director.

Variables related to transaction costs

The remaining explanatory variables are those determinants that relate to transaction

costs faced by the firms. Transaction cost economics scholars propose that the

optimal governance structure, under which transactions are negotiated and

implemented, varies with the characteristics of the transactions (Williamson 1975,

1979) in such a way that the risks of opportunistic behavior are minimized. The

transactional characteristics considered by previous studies usually relate to one or

more of the following: asset specificity, complexity of the product exchanged, and

uncertainty of the exchange environment.

1) Asset specificity

Parties to a transaction often make specific investments that have greater values in the

particular transaction than in their next best use to alternative exchange partners. If

the transaction involves such an investment that is specific to the exchange

relationship, there are risks of opportunistic behavior. The party who makes the

specific investment may be subject to hold-up by the other party, who may attempt to

appropriate the quasi rents generated by the asset specificity (Klein et al 1978).

Transactional issues due to asset specific investments can be resolved under vertical

integration or joint ownership. However, this is not the only solution. Alternative

solutions include legally enforceable contractual provisions that impose costs on the opportunistic party as well as implicit relational contracts enforced by the market mechanism of withdrawing future business in case of opportunistic behavior (Klein et al 1978, Williamson 1979). Since transaction specific investments may be positively associated with the use of relational or legal governance, we regard asset specificity as a potential determinant of both relational governance and legal governance.

2) Product complexity

In order to prevent or resolve transactional issues caused by opportunistic behavior, trading parties may choose to rely on a carefully specified enforceable contract with emphasis on legal rules, formal documentation and narrowly prescribed remedies. Consequences due to nonperformance must be predictable and observable, so that such a contract could be effective under the "classical contracting" mechanism (Williamson 1979). However, in presence of product complexity, such legally enforceable contracts are either infeasible or very costly, as contracts cannot depend on information which is not commonly observable to all parties, or product attributes which are subject to manipulation by one of the parties (Dye 1985).

Therefore, when it is difficult to observe the quality of the product due to its complexity, it is costly and unreliable to enforce the contract using the legal system since it is inefficient for the court or a third party to resolve disputes without the expertise associated with the specific product (Williamson 2002). In such a situation, it may be more efficient for the trading partners to rely on relational governance or more flexible contracting to safeguard their interests from hold-ups.

3) Uncertainty

As highlighted by previous theoretical studies (Williamson 1991, 2002), more uncertainty in the exchange environment would require more coordinated responses from the trading partners. When there are severe consequences due to unforeseeable disruptions of the exchange, there is a need for the contracting parties to facilitate renegotiations as required by unforeseen contingencies. In such a situation, as hinted by Williamson (1985), the form of governance adopted by exchange parties may be one of the extremes among various combinations of relational and legal governance. At one of the extremes along the spectrum of governance forms, very sophisticated contracts can specify clauses or procedures on how to proceed after the uncertainty has been realized. At the other extreme, incomplete but flexible relational contracts with reliance on bilateralism (Williamson 1979) could adapt to unforeseeable contingencies in a relatively inexpensive way.

In other words, uncertainty may have a positive effect on both governance variables. On one hand, relationships between suppliers and buyers can help reduce communication costs as unforeseen events become realized, and personal trust between contracting parties can mitigate incentives to behave opportunistically. On the other hand, complex contracts that specify renegotiation clauses on how to proceed after the uncertainty has been materialized can help safeguard against opportunistic behavior.

4) Quality of courts

Previous studies suggest that the quality of legal institutions can affect firms' contractual behavior (Lerner and Schoar 2005) and the governance of exchange (Hendley et al 2001, Johnson et al 2002). If courts are of poor quality, it is difficult to

enforce complex contracts. As pointed out by Johnson and others (2002), the courts play at least two roles in transactional governance. One simple role is to enforce payments. A more complex role is to facilitate the parties' day-to-day interactions, help prevent disputes with the shadow of law, and clarify the parties' responsibilities in case of a dispute (Williamson 1979). Therefore, we expect the firms to be more likely to rely on legal governance of their transactions if courts are of better quality.

5) The proportion of long term partners

In absence of third party enforcement of contracts, trading parties may rely on relational contracting based on long-term relationships, where nonperformance is penalized by the termination of the relationship (Williamson 1979; Brown et al 2004). If there is repeated interaction between the contracting parties, it is more likely for them to rely on relational governance (Baker et al 2002). Therefore, we consider the presence of long-term business relationship as a determinant of relational governance.

6) Legal knowledge interacted with firm origin

Previous studies of transition economies suggest that firm behavior is affected by their particular institutional context. Previously state owned firms inherit some cultural characteristics from their operation prior to the transition period, such as reliance on traditional ties that are costly to abandon, and dependence on state aids rather than self-enforcing relationships with customers (Murrell 2003). These businesses may also have a different legal culture. Although legal institutions are supposed to facilitate market-based transactions, firm managers in post-Soviet economies may have had a special historical experience of law which leads them to believe that political or personal connections are more relevant than legal formality in

transaction enforcement (Hendley 1997). Therefore, we expect those previously state-owned firms with a better knowledge of the law to be more likely to use relational governance than other firms than other firms.

3.3 Empirical Methodology

Our research design requires us to estimate a system of simultaneous equations, as we are interested in analyzing the determinants of governance choice while accounting for the interrelation between legal and relational governance. Our objective is to test the following hypotheses. First, we test whether the extent to which firms rely on relational or legal governance is influenced by their historical origin. Second, we test whether the extent to which firms rely on either form of governance is affected by contracting parties' legal knowledge. Third, we test whether the characteristics of the product exchanged, and the transaction environment have influence on the choice of governance form, as predicted by the transaction cost economics theory. Fourth and simultaneously, we test whether the firms' reliance on one governance form is affected by that on the other.

Following the empirical strategy used by a previous study of the interaction between legal and relational governance by Poppo and Zenger (2002), we estimate the following system of equations using three-stage least squares approach.

$$R_i = \beta_0 + \beta_1 * L_i + \beta_2 * TC_i + \beta_3 * LT_i + \beta_4 * Origin_i + \beta_5 * Knowledge_i \\ + \beta_6 * Knowledge_i \times Origin_i + \beta_7 \times Industry_i + \varepsilon_{1i}$$ (1)

$$L_i = \gamma_0 + \gamma_1 * R_i + \gamma_2 * TC_i + \gamma_3 * CQ_i + \gamma_4 * Origin_i + \gamma_5 * Knowledge_i \\ + \gamma_6 * Knowledge_i \times Origin_i + \gamma_7 \times Industry_i + \varepsilon_{2i}$$ (2)

Note that in both equations, subscript i refers to the i-th exchange agreement. R and L are measures of the extent to which the firm relies on relational and legal governance, respectively. TC is a vector of transaction cost variables, the elements of which are measures of asset specific investment, uncertainty and product complexity. LT is a proxy for long term relationship, measured by the proportion of trading partners who have been dealing with the firm for more than two years. CQ is a dummy variable which takes value 1 if the quality of courts is higher than average. *Origin* is an indicator of the historical origin of the firm and it takes value 1 if the firm is previously a state enterprise. *Knowledge* is a vector of legal knowledge variables. *Industry* is a vector of dummy variables that indicate in which sector the firm does business.

We argue that apart from R and L, the other variables in the system are either exogenous or predetermined. Because the enforcement of relational governance does not depend on the quality of courts, the court quality variable does not have any direct impact on the relational governance variable. Since it only affects the use of relational governance through its effect on the use of legal governance, the court quality variable helps identify the effect of legal governance in equation (1).

Along similar lines, the proportion of long-term business partners does not directly affect the extent to which firms rely on legal governance. Thus variable LT can identify the effect of the use of relational governance on that of legal governance.

As we discussed previously, the theory predicts that interaction of firm origin and legal knowledge is a determinant of the use of relational governance. We do not expect the interaction variable to have a direct impact on the legal governance

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variable, as the theory of legal development in post-Soviet economies does not offer a prediction of the use of legal governance by those previously state-owned firms with good legal knowledge (Hendley 1997). Thus the interaction variable is a potential instrument for the relational governance variable.

The three-stage least squares method allows us to examine the effect of historical origin of the firms, agents' knowledge of the legal system and characteristics related to transaction costs on the choice of governance form, while accounting for the interrelation between the two forms of governance. The regression results are discussed in Section 4.

3.4 Measurement of Variables

We now turn to a description of the measurement of our main variables.

Dependent Variables

Our measurements of the extent to which firms rely on relational and legal governance of transactions are based on the general director's survey, the customer and supplier relations surveys. For both governance variables, we assign an initial value of zero to the variable, and adjust the value according to the relevant survey responses such that a higher value indicates a greater extent to which the firm relies on a certain governance structure to protect its transaction from opportunistic behavior. A detailed documentation of the measurement of governance variables is available in the appendix.

The index for the relational governance variable is a weighted sum of response values for the following survey questions: the perceived importance of personal relationships and trust, whether business decisions are made by informal

mutual agreements or by the contracting parties individually, and whether the exchange between trading partners is enforced through informal means, such as closely monitoring the partner's activity and holding part of the partner's assets as hostages.

Using a similar method, we construct an index to measure the extent to which firms rely on legal governance using survey responses in the following aspects. We consider the legal formality used in the contracts, such as penalty clauses and clauses that facilitate filing suits in courts. We also take into account the perceived importance of the legal institutions for the business and the actual use of the legal contract. A higher index indicates a greater extent to which firms use legal governance to enforce their exchange agreements.

Explanatory Variables

We measure our explanatory variables using all four surveys. The variables can be categorized into two classes: those variables that are specific to the institutional transition environment of Romania and those related to transaction costs.

Both historical origin of firms and legal knowledge are key explanatory variables. We obtain information on the former using the director's survey. If the firm is previously a state-owned enterprise, then we define the firm origin indicator to be equal to 1. Otherwise the indicator takes the value zero.

The measurement of legal knowledge held by managers, directors and company lawyers is more complicated. All four survey questionnaires include specific questions about the laws and regulations in Romania that test the legal knowledge possessed by managers, general directors and company lawyers. For

example, the general director is asked the following question: in the commercial field, an obligation undertaken by several debtors is (choose one of the following): 1. always a joint obligation; 2. always an obligation that is divided equally among the debtors; 3. a joint obligation, unless the contract stipulates how to divide the obligation among the debtors; 4. divided equally among the debtors, unless the contract stipulates that it is a joint obligation. The correct answer to this question is 3. We assign an initial value to the legal knowledge variable. In this case, if the director's response is correct, then we increase the value of the legal knowledge variable by a certain amount. Otherwise, we keep the value of the variable. Likewise, we measure the legal knowledge held by the managers and company lawyers accordingly.

It is worth mentioning that the four sets of questions that test legal knowledge vary with the respondents' role. For example, the general director's questions are different from those of the sales or procurement managers' and those of the company lawyer's. While the director's legal knowledge questions are the most general among the four sets of questions, the company lawyer's questions are the most specific about legal rights and obligations under various circumstances. The legal knowledge questions for the sales managers are more focused on payment, creditor's rights and security rights in movable property, whereas the procurement managers' questions are more relevant to buyer's obligations.

Respondents were not allowed to look up related laws and codes when answering the questions. Therefore our measurement of the legal knowledge variable

is informative in the sense that it is an objective measure based on the working knowledge of laws and regulations, rather than book knowledge.

When it comes to the standard transaction cost variables, we follow previous studies and measure the following variables according to survey responses: asset specificity, product complexity and uncertainty. We extract information on asset specific investments and product complexity using questions in the customer and supplier relation surveys. The director's survey provides us with information on exogenous uncertainty of the transaction environment. Quality of courts is measured using questions on the reported quality of legal institutions in the legal relations survey. Lastly, we measure the extent to which firms have repeated interaction with their partners by the proportion of their partners who have been doing business with them for more than two years, using the supplier and customer relations surveys. Descriptive statistics appear in Table 1.

Section 4 Results

Informed by the previous studies of transaction costs, we first estimate the system of equations (1) and (2) using the standard variables as suggested by the theory (Williamson 1975, 1985), namely, asset specific investment, uncertainty and product complexity. Results are presented in Table 2. The results show that those transactions in which the seller has made a specific investment are significantly more likely to be under legal governance; whereas such effect of seller's specific investment on

relational governance is not significant. None of the other transaction cost variables appear to have a significant effect on governance choice.

In Table 2, we also find a positive effect of the use of legal governance on that of relational governance. However, we observe that the system of equations has been under-identified since neither the court quality variable nor the long term relationship variable shows up significant. Thus the results are only exploratory as we investigate the determinants on governance choice.

Now we move on to consider the historical origin of the firms and their legal knowledge. Three legal knowledge variables are used: legal knowledge held by the sales or procurement manager, legal knowledge held by the general director and legal knowledge of the firm lawyer or legal director. Table 3 shows the results. Interestingly, we find that firms which are previously state-owned businesses are significantly less likely to rely on relational governance than do firms founded after the institutional transition started. In addition, we find that legal knowledge held by general directors has a significant positive effect on the extent to which firms rely on relational governance and that legal knowledge of sales or procurement managers has a negative impact on the extent to which firms rely on legal governance.

Again, we find that the use of legal governance has a positive effect on that of relational governance but the opposite effect does not exist. The interrelation between the two governance variables seems to be unidirectional. Therefore, the relationship between the use of legal and relational governance may be modeled by a recursive system, where the two governance variables are determined sequentially. In this case, the effect of the use of legal governance on that of relational governance is identified.

A previous study by Poppo and Zenger (2002) finds no significant effect of asset specific investment on the use of relational governance. To explain the lack of this effect, Sheng and others (2006) argue that the association between asset specificity and relational governance is not universal because exchange hazards combined with bargaining power asymmetry between the trading partners may pose a challenge for the use of relational governance. Indeed, in an unstable transition economic environment with high inflation such as the Romanian economy at the time of our survey, it is usually the sellers who are the vulnerable party due to hold-ups such as late payments, if their exchange agreements are not enforced by detailed contracts (Murrell and Paun 2010). Thus the bargaining power of the transaction parties is not symmetric and it is difficult for the parties to use relational governance to protect their exchange from hold-ups. In line with this logic, we assume no impact of asset specificity on the use of relational governance in our case study and exclude the asset specific investment variables from the relational governance equation in subsequent regressions. Our results appear in Table 4. Note that Table 4 shows similar results to those in Table 3, providing preliminary evidence that historical origin and legal knowledge of the firms may affect their governance choice.

We now move on to investigate whether legal knowledge has a different impact on governance choice across firms of various historical origins due to their different legal cultures by analyzing the effect of interaction between historical origin and legal knowledge. Results are reported in Table 5. Again, we find that ex-state-owned firms are less likely to rely on relational governance than firms founded after the transition took place. Our results also imply that general director's legal

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knowledge is positively associated with firms' reliance on relational governance, and negatively associated with that on legal governance. Table 5 shows that the effect of general director's legal knowledge on relational governance is mainly due to such effect for previously state owned firms, which is statistically significant at the 5% level.

In Table 6, we run the same regression but do not include the interaction terms in the legal governance equation, as they seem to be weak predictors for the use of legal governance. Previously state-owned firms have a greater tendency to use legal governance but those firms with better legal knowledge are more likely to use relational governance. Therefore the effect of the interaction variable on the use of legal governance is unclear. Instead, relational governance is more relevant for such firms (Hendley 1997).

It is worth noting that in Table 6 our results on the interrelation between the two forms of governance are consistent with recent studies (Poppo and Zenger 2002, Mayer and Argyres 2004, Ryall and Sampson 2009). The results suggest a positive effect of the use of legal governance on that of relational governance, which supports the hypothesis of a complementary relationship between the two forms of governance. As we expected, results in Table 6 also suggest that firms who enjoy a higher quality of courts are more likely to rely on legal governance, and the estimated effect is now statistically significant at the 5% level. We also note that the general director's legal knowledge interacted with firm origin is a significant determinant of the extent to which firms rely on relational governance. Therefore, the mutual impact of the two governance forms on each other is identified.

Our other results in Table 6 are consistent with those in previous tables. Again we find that historical origin is a strong predictor of the use of relational governance and the estimated effect is statistically significant at the 1% level: previously state-owned firms are less likely to use relational governance than firms founded after institutional transition started. In addition, previously state-owned firms are also found to be more likely to rely on legal governance, and the effect is statistically significant at the 10% level. The effect of historical experience may be explained by the fact that the contemporary legal system in post-Soviet countries has been built by transforming the previous Soviet institutions (Belova 2005) and that the traditional political ties may still affect the way in which firms make governance choices (Murrell 2003). Thus other things equal, newly founded firms are less likely to use the legal institutions than older firms with more experience with the state arbitration system, and more likely to rely on relational enforcement of exchanges. Indeed, as exchange partners gradually learn how to contract with each other, the adjustment to optimal governance choice requires sophisticated knowledge and contract design capabilities (Mayer and Argyres 2004).

Consistent with our expectation that firms with historical experience of the old legal system tend to rely on relational governance to enforce their transactions, our results indicate that those previously state-owned firms with better legal knowledge held by the general director are significantly more likely to use relational governance. This effect is statistically significant at the 5% level. Holding the general director's legal knowledge at the mean level, the extent to which previously state-owned firms rely on relational governance is 1.14 units (equivalent to 90% of a standard deviation

in the relational governance index) less than that for other firms. However, holding the same legal knowledge variable at its top 10 percentile, previously state-owned firms' reliance on relational governance is only 0.2 unit (16% of one standard deviation) less than that for other firms. For those with the top 1 percentile general director's legal knowledge, previously state-owned firms use relational governance to a greater extent (by 8.6% of one standard deviation) than firms founded after the transition.

Another interesting result is that firms with better legal knowledge held by general directors are significantly less likely to rely on legal governance. This seemingly counterintuitive finding is consistent with the hypothesis proposed by previous legal development studies (Gallagher 2006, Kim 1999) that the lack of economic agents' legal knowledge would lead to an overestimation of their legal rights and thus a tendency to overuse formal legal means to protect their interests.

Section 5 Robustness

Our construction of the two indices for the governance variables and part of the explanatory variables[18] is based on a weighted sum of survey responses, in which the weights are defined subjectively. Therefore, our results on the interrelation between the two governance variables and the estimated effects of firm origin and legal knowledge on governance choice may be due to our particular measurements. In this

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[18]The complexity of product exchanged is also measured as a weighted sum of survey responses.

section, we examine the robustness of the results by using various methods to construct the survey-based variables[19].

For the relational governance variable, we revise the index in the following way. First of all, the use of informal meetings and visits between exchange partners might not necessarily reflect the use of relational governance. Therefore, in our first robustness exercise, we attach zero weight to the response to the following question: in what percentage of transactions did you use informal meetings between your enterprise and customers/suppliers? Then we assign zero weight to the question on visits between exchange partners: Does the customer/supplier visit your enterprise during the implementation of the agreement? In the meantime, we attach more weight to the reported use of individual decision-making and self-enforcement by exchange partners since this is an important aspect of the actual use of relational governance. We increase the index value by 1 instead of 0.5, if the response to either of the following questions is positive: 1) whether each party individually makes important decisions necessary for the contract to be implemented; 2) whether important decisions are made by informal mutual agreement during implementation of contracts.

Likewise, we re-define the legal governance index. More weight is assigned to the reported use of contractual clauses that facilitate filing suit in court. We increase the value of the legal governance variable by 1 instead of 0.5 if the reported use of such clauses is above average. We also vary the weight assigned to the reported use of authenticated written contracts. The advantage of contract authentication is that legal costs of enforcing the agreement may be reduced in case of

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[19] These include the governance variables and the complexity variable.

nonperformance. Its disadvantage lies in the extra fee of authentication. The optimal

choice of contract authentication is a result of the trade-off between the ex-ante fixed

fee of notarization and the risk of higher legal enforcement cost in case of

nonperformance. In our robustness exercise, we attach zero weight to the reported use

of contract authentication, since it might reflect the risk preferences of the firms

instead of their actual use of legal governance.

The results of our first robustness exercise appear in Table 7. As we have re-

defined the governance indices, the estimated effect of the use of legal governance on

that of relational governance differs slightly in its magnitude: for one standard

deviation increase in the legal governance index, there will be 48% (compared to 50%

in Table 6) of a standard deviation increase in the relational governance index. This

effect is still statistically significant at the 5% level.

Turning to the results on the determinants of relational governance, the impact

of firm origin and legal knowledge on the use of relational governance are consistent

with our main results in Table 6: previously state-owned firms are significantly less

likely to use relational governance, holding their legal knowledge at the mean level.

Again, the effect of firm origin is statistically significant at the level of 1%.

Now we look into the results from estimating the legal governance equation

and examine their robustness. The estimated coefficients vary slightly in their

magnitudes, but these results are consistent with those in Table 6. We still find that

asset specific investment by the seller has a significant positive impact on the use of

legal governance and that firms who have access to higher-quality courts are

significantly more likely to use legal governance. The estimated impact of firm origin

on the legal governance variable has become larger in both its magnitude and statistical significance than that in our main results. The measure of the extent to which firms rely on legal governance is 28% (compared to 23% in Table 6) of a standard deviation higher for previously state owned firms than others. This effect is statistically significant at the 5% level. Our estimated effects of legal knowledge held by the procurement/sales managers and general directors are consistent with those in Table 6: for each unit increase in the score for procurement/sales manager's legal knowledge and general director's legal knowledge, the legal governance index will decrease by 24% (compared to 21% in Table 6) and 39% (compared to 50% in Table 6) of a standard deviation, respectively. The effect of general director's legal knowledge is highly significant at the 1% level and that of procurement/sales manager's legal knowledge is still significant at the 5% level.

In our next robustness check, we alter the measurement of the complexity variable. Instead of using a weighted sum of survey responses, we use three categorical variables to measure complexity of the product exchanged based on responses to the following three questions: 1) whether quality problems of the product would be obvious to anyone who inspected the product; 2) whether quality problems would be observable to a third party who is knowledgeable in the area of business, who visited the customer and had the problem explained; 3) whether quality problems would be evident to one of the supplier's specialists who visited the customer and had the problem explained. We assign value 1 to the first categorical complexity variable if the response to question 1) is negative indicating a relatively low degree of complexity and 0 otherwise. We let the second categorical complexity variable equal

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1, indicating an intermediate degree of product complexity, if the response to 2) is negative and 0 otherwise. If the answer to the third question is "No", then we define the third categorical complexity variable to be equal to 1, indicating the highest degree of product complexity. We include all three categorical complexity indicators as explanatory variables in our regressions. The omitted category is an indicator of the lowest degree of product complexity, which equals 1 if anyone can observe the quality problems.

Results are shown in Table 8. We note that the estimated coefficient of the third categorical complexity indicator is positive and statistically significant at the 1% level, which suggests that firms are significantly more likely to rely on relational governance for transactions where it is most difficult to observe the quality problems of the product exchanged, than for transactions in which quality problems are observable to anyone. The effects of other categorical complexity variables are statistically insignificant. Results on the remaining explanatory variables are consistent with those in previous tables. Interestingly, we note that the effect of firm origin on the use of legal governance is statistically significantly at the 1% level (compared to a significance level of 5% in Table 7 and 10% in Table 6).

In a third robustness exercise, we further revise the measurement of the legal governance variable but maintain the same measurement of product complexity as in our main specification in Table 6. We attach zero weight to the reported use of security rights in property owned by the exchange partner, as the holding of security rights might not indicate the actual use of legal enforcement of transactions. Along similar lines, we assign zero weight to the reported frequency of discussions between

sales/procurement managers and legal advisors. The other variables are defined in the same way as in our first robustness exercise. Results appear in Table 9. All estimates are consistent with our main findings except that the estimated effect of general director's legal knowledge on the use of legal governance is not statistically significant. However, the estimated impact of procurement/sales manager's legal knowledge is still statistically significant at the 5% level.

Holding the same measurement for the dependent variables, we now use the categorical complexity variables as determinants of transactional governance choice in our regressions. Table 10 shows the results, which are comparable to the previous results in Table 8. We find that the effect of the use of legal governance on that of relational governance is statistically significant at the 10% level. Results on the complexity variables are similar to those in Table 8, which suggest that transactions of highly complex products are significantly more likely to be under relational governance than those that involve simple products. Our estimated effects of legal knowledge and firm origin on the use of relational and legal governance are also consistent with previous results.

In our simultaneous equations estimation, we treat the governance indices as cardinal instead of ordinal variables. However, given that our dependent variables and part of the explanatory variables are constructed using weighted sums of survey responses and that the weights are assigned using our best judgment, we need to interpret the regression results with caution. For instance, the interpretation of one unit increase in the relational governance index varies with different weighting schemes. After examining the sensitivity of our results to alternative measurements of

governance variables and the complexity variable, we find that our results are not driven by the specific weighting scheme used to construct the survey-based variables and we conclude that the estimated effects of firm origin and legal knowledge are robust.

Section 6 Conclusion

Among our results, one interesting finding is that apart from asset specificity and product complexity, other standard transaction cost variables do not seem to be good predictors of firms' transactional governance. In contrast, variables related to the special features of the transition economy have strong influence on economic agents' decisions of transactional governance strategies. We find that both the historical origin of firms and the legal knowledge held by their general directors have significant influence on the choice of transactional governance. In summary, our results are consistent with the hypothesis that transactional governance choice is affected by not only the standard characteristics related to transaction costs, but also the historical experience of contracting parties, their knowledge of the law, and their legal culture which is specific to the transition environment. We also find that the extent to which firms rely on legal governance has a significant positive effect on that on relational governance.

Our findings have important implications for institutional and legal reforms in developing countries. It is essential to understand that it is not possible to build a new institutional system without realizing that institutional development is path dependent. After all, institutional reform policy makers are limited by their policy

instruments and they can only reform formal rules (North 2005). It is dangerous to design reform policies without studying the particular economic and political context, historical experience and cultural heritage and perhaps no less importantly, investigating the interaction between legal institutions and relational enforcement mechanisms.

Tables and Figures

Figure 1 Weak correlation between the two dependent variables
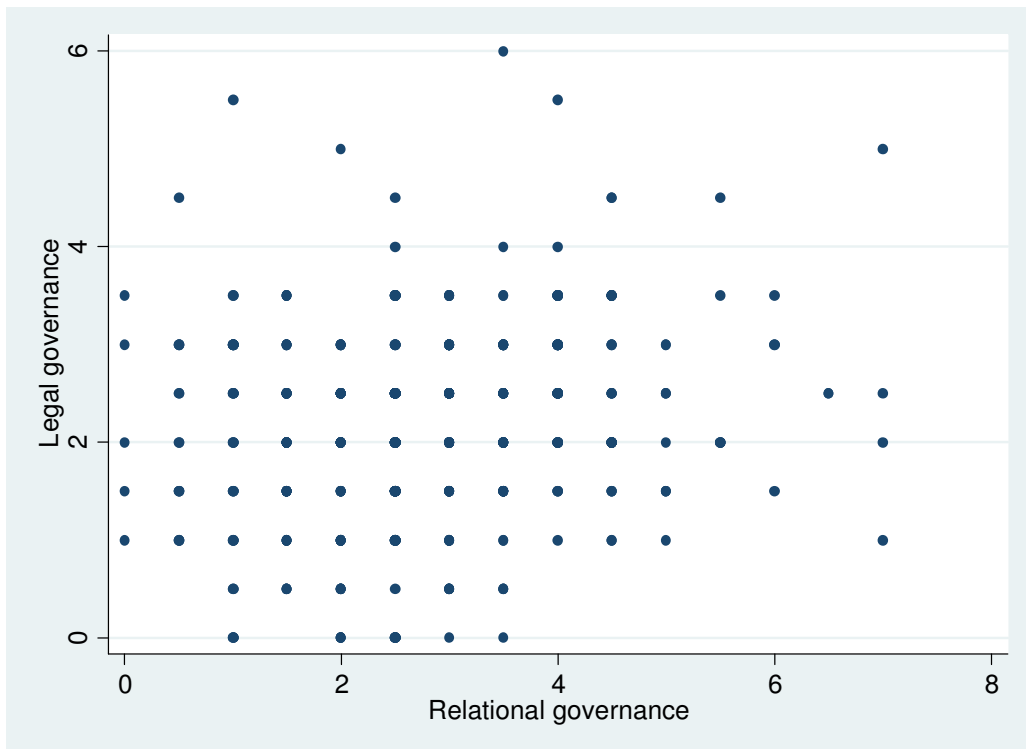
Note: 462 observations. The correlation coefficient is 0.18.

Source: Survey of the Commercial Relations of Romanian Enterprises, Murrell and Paun (2001)

Table 1 Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
Legal governance	2.16	.96	0	6
Relational governance	2.79	1.28	0	7
Seller investment	.24	.43	0	1
Buyer investment	.13	.33	0	1
Uncertainty	.55	.50	0	1
Complexity	.47	.42	0	1.5
Long term	.66	.25	0	1
Court quality	.44	.50	0	1
Origin	.62	.49	0	1
Procurement/sales manager's legal knowledge	-.10	.44	-.8	1
General director's legal knowledge	.09	.33	-.55	1
Lawyer's legal knowledge	.28	.34	-.53	1

Note: 462 observations.

Source: Survey of the Commercial Relations of Romanian Enterprises, Murrell and Paun (2001)

Table 2 Standard transaction cost variables

	Relational	Legal
legal	.976 (.545)*	
relational		-.026 (.872)
seller investment	-.171 (.268)	.391 (.202)*
buyer investment	-.057 (.205)	.062 (.133)
uncertainty	-.095 (.138)	.063 (.095)
complexity	.044 (.164)	-.035 (.108)
long term	.205 (.265)	
court quality		.255 (.234)
constant	.689 (1.122)	1.959 (2.329)

Number of observations: 462 Source: See Table 1.

Results on industry dummies are omitted.

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

The correlation between the estimated errors is in the following table.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.000	
$\hat{\varepsilon}_2$	-0.455***	1.000

Table 3 Transaction cost and transition variables

	Relational	Legal
legal	.860 (.500)*	
relational		-.240 (.773)
seller investment	-.113 (.237)	.406 (.184)**
buyer investment	.015 (.192)	.063 (.147)
uncertainty	-.022 (.130)	.036 (.101)
complexity	.072 (.154)	-.026 (.122)
long term	.299 (.251)	
court quality		.312 (.201)
origin	-.463 (.168)***	.089 (.259)
procurement/sales manager's legal knowledge	.105 (.185)	-.244 (.132)*
general director's legal knowledge	.819 (.259)***	-.274 (.405)
lawyer's legal knowledge	-.086 (.194)	.054 (.145)
constant	1.132 (.990)	2.472 (2.206)

Number of observations: 462 Source: See Table 1. Results on industry dummies are omitted.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.000	
$\hat{\varepsilon}_2$	-0.119**	1.000

Table 4 Transaction cost and transition variables

	Relational	Legal
legal	.678 (.2938)**	
relational		-.240 (.773)
seller investment		.406 (.184)**
buyer investment		.063 (.148)
uncertainty	-.023 (.124)	.036 (.101)
complexity	.063 (.146)	-.026 (.122)
long term	.293 (.239)	
court quality		.312 (.201)
origin	-.430 (.146)***	.0892 (.259)
procurement/sales manager's legal knowledge	.0682 (.158)	-.244 (.132)*
general director's legal knowledge	.754 (.210)***	-.274 (.405)
lawyer's legal knowledge	-.065 (.180)	.055 (.145)
constant	1.474 (.639)	2.472 (2.206)

Number of observations: 462 Source: See Table 1. Results on industry dummies are omitted.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.000	
$\hat{\varepsilon}_2$	-0.00005	1.000

Table 5 Transaction cost and transition variables

	Relational	Legal
legal	.663 (.291)**	
relational		-.151 (.614)
seller investment		.390 (.157)**
buyer investment		.051 (.138)
uncertainty	-.033 (.123)	.029 (.095)
complexity	.068 (.145)	-.031 (.115)
long term	.336 (.238)	
court quality		.293 (.167)*
origin	-.547 (.177)***	.015 (.311)
procurement/sales manager's legal knowledge	.115 (.228)	-.179 (.167)
procurement/sales manager's legal knowledge*origin	-.066 (.274)	-.080 (.216)
general director's legal knowledge	.206 (.340)	-.547 (.248)**
general director's legal knowledge*origin	.828 (.386)**	.341 (.640)
lawyer's legal knowledge	-.124 (.272)	-.070 (.227)
lawyer's legal knowledge*origin	.0694 (.358)	.198 (.291)
constant	1.586 (.649)	2.301 (1.843)

Number of observations: 462. Source: See Table 1. Results on industry dummies are omitted.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.000	
$\hat{\varepsilon}_2$	-0.097**	1.000

Table 6 Transaction cost and transition variables

	Relational	Legal
legal	.663 (.290)**	
relational		.185 (.248)
seller investment		.311 (.105)***
buyer investment		.044 (.110)
uncertainty	-.032 (.123)	.032 (.088)
complexity	.067 (.145)	-.044 (.104)
long term	.262 (.211)	
court quality		.233 (.097)**
origin	-.575 (.171)***	.218 (.121)*
procurement/sales manager's legal knowledge	.134 (.210)	-.204 (.099)**
procurement/sales manager's legal knowledge*origin	-.098 (.236)	
general director's legal knowledge	.196 (.334)	-.485 (.178)***
general director's legal knowledge*origin	.841 (.375)**	
lawyer's legal knowledge	-.182 (.251)	.0619 (.126)
lawyer's legal knowledge*origin	.169 (.310)	
constant	1.652 (.643)**	1.257 (.721)*

Number of observations: 462. Source: See Table 1. Results on industry dummies are omitted.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.000	
$\hat{\varepsilon}_2$	-0.515***	1.000

Table 7 Robustness: alternative measures of governance variables

	Relational	Legal
legal	.504 (.254)**	
relational		.258 (.290)
seller investment		.279 (.102)***
buyer investment		.093 (.124)
uncertainty	.115 (.106)	-.019 (.106)
complexity	.044 (.125)	-.032 (.113)
long term	.209 (.183)	
court quality		.245 (.112)**
origin	-.534 (.152)***	.296 (.130)**
procurement/sales manager's legal knowledge	.135 (.180)	-.255 (.110)**
procurement/sales manager's legal knowledge*origin	-.126 (.206)	
general director's legal knowledge	-.191 (.296)	-.407 (.150)***
general director's legal knowledge*origin	.814 (.333)**	
lawyer's legal knowledge	-.047 (.216)	.043 (.139)
lawyer's legal knowledge*origin	.135 (.264)	
constant	.790 (.605)	1.458 (.521)***

Number of observations: 462. Source: See Table 1. Results on industry dummies are omitted.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.000	
$\hat{\varepsilon}_2$	-0.524***	1.000

Table 8 Robustness: alternative measures of governance and complexity variables

	Relational	Legal
legal	.511	
	(.248)**	
relational		.275
		(.257)
seller investment		.287
		(.102)***
buyer investment		.086
		(.120)
uncertainty	.088	-.021
	(.106)	(.102)
complexity_1	.062	.0719
	(.120)	(.110)
complexity_2	-.242	-.086
	(.149)	(.147)
complexity_3	.753	-.066
	(.277)***	(.305)
long term	.227	
	(.178)	
origin	-.517	.314
	(.151)***	(.121)***
court quality		.242
		(.106)**
procurement/sales manager's legal knowledge	.156	-.248
	(.176)	(.109)**
procurement/sales manager's legal knowledge*origin	-.158	
	(.202)	
general director's legal knowledge	-.228	-.406
	(.295)	(.152)***
general director's legal knowledge*origin	.929	
	(.336)***	
lawyer's legal knowledge	-.046	.040
	(.213)	(.138)
lawyer's legal knowledge*origin	.110	
	(.258)	
constant	.783	1.382
	(.585)	(.466)***

Number of observations: 462. Source: See Table 1.Results on industry dummies are omitted.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.000	
$\hat{\varepsilon}_2$	-0.550***	1.000

Table 9 Robustness: alternative measures of governance variables

	Relational	Legal
legal	.691 (.366)*	
relational		.173 (.262)
seller investment		.191 (.091)**
buyer investment		.093 (.108)
uncertainty	.093 (.112)	.023 (.096)
complexity	-.012 (.135)	.059 (.102)
long term	.218 (.188)	
court quality		.193 (.100)*
origin	-.577 (.165)***	.271 (.117)**
procurement/sales manager's legal knowledge	.164 (.191)	-.235 (.099)**
procurement/sales manager's legal knowledge*origin	-.121 (.211)	
general director's legal knowledge	-.269 (.295)	-.186 (.136)
general director's legal knowledge*origin	.819 (.348)**	
lawyer's legal knowledge	-.020 (.225)	-.012 (.125)
lawyer's legal knowledge*origin	.137 (.269)	
constant	.618 (.726)	1.325 (.471)

Number of observations: 462.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.
Source: See Table 1.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.0000	
$\hat{\varepsilon}_2$	-0.5792***	1.0000

Table 10 Robustness: alternative measures of governance and complexity variables

	Relational	Legal
legal	.693 (.356)*	
relational		.192 (.232)
seller investment		.199 (.091)**
buyer investment		.085 (.104)
uncertainty	.066 (.112)	.018 (.092)
complexity_1	.021 (.133)	.114 (.099)
complexity_2	-.251 (.156)	-.052 (.133)
complexity_3	.710 (.297)**	.018 (.276)
long term	.233 (.183)	
court quality		.189 (.094)**
origin	-.561 (.165)***	.289 (.109)***
procurement/sales manager's legal knowledge	.183 (.186)	-.229 (.098)**
procurement/sales manager's legal knowledge*origin	-.154 (.207)	
general director's legal knowledge	-.310 (.294)	-.184 (.137)
general director's legal knowledge*origin	.932 (.352)***	
lawyer's legal knowledge	-.018 (.221)	-.015 (.125)
lawyer's legal knowledge*origin	.113 (.262)	
constant	.630 (.696)	1.247 (.421)***

Number of observations: 462.
*significant at the 10% level; **significant at the 5% level; ***significant at the 1% level
The correlation between the estimated error terms is shown in the following table.
Source: See Table 1.

	$\hat{\varepsilon}_1$	$\hat{\varepsilon}_2$
$\hat{\varepsilon}_1$	1.0000	
$\hat{\varepsilon}_2$	-0.6045***	1.0000

Chapter 3: Public Spending, Governance and Child Health Outcomes: Revisiting the Links

Section 1 Introduction

The importance of good governance has been emphasized by economists and policy analysts, mainly for its role in enhancing economic performance and supporting income growth (for instance, see Hall and Jones 1999). In line with this idea, some studies in the development literature have highlighted the impact of governance quality on the social outcomes that public policies are supposed to attain, such as education and child health (Pritchett 1996, Filmer et al 2000). One idea shared by these studies is that in countries where governance is poor, public resources suffer from leakages and fail to translate into social investments that could result in desirable social outcomes such as better child education and health.

However, much of the development literature on the role of governance has been based on anecdotal evidence, with only a small group of studies that provide empirical evidence on the effect of governance on social outcomes and the effectiveness of public spending. A cross-country study by Gupta et al (2002) suggests that public spending on health care only has an insignificant effect on child mortality rates, whereas corruption itself has a significant negative impact. Along similar lines, a more recent study by Rajkumar and Swaroop (2008) finds that governance quality affects the impact of public health spending on policy outcomes such as child education and health. Their results suggest that in countries that are poorly governed, public spending has little impact on the outcomes; by contrast, in

countries with good governance, public spending on health care has a significant effect on child education and child mortality rates.

Our present empirical analysis contributes to this small but growing strand of literature   on the role of good governance in enhancing social outcomes, using a comprehensive cross-country dataset on infant and child mortality rates, public spending on health care, indicators of governance quality and other factors that may affect child health. In this paper, we study the impact of public spending on health care on child mortality rates, and how governance affects the effectiveness of public spending. We attempt to improve on previous studies by using better measures of governance quality, and addressing potential reverse causality between public spending on health care and child health outcomes. To our knowledge, many empirical studies of child health determinants do not attempt to address endogeneity issues, with a few exceptions (for example, Rajkumar and Swaroop 2008) which may have relied on a problematic empirical strategy. In our view, the abovementioned authors fail to justify all their explanatory variables and the proposed instrumental variable. For instance, the authors have used the percentage of population under the age of five as a determinant of child mortality rate in their regression. This demographical variable may be endogenous, because it relates to the fertility choice made according to the contemporaneous mortality rates. The study has also included Muslim religion as a right-hand-side variable without explaining why. Their proposed instruments for public spending on health care are indicators of law origins. One of the assumptions that justify the use of such instruments is that countries with a common law system are less state-oriented than those with a civil law system, which

are in turn less state-oriented than the ex-Soviet countries. It is not clear how this assumption could be supported and how legal origin could affect public spending on health care.

In the present analysis, we contribute to the literature by instrumenting for the potentially endogenous public spending variable, utilizing variation across countries and over time, and using only those explanatory variables that could be justified by the theory. Unlike previous empirical studies that fail to find a meaningful effect of public spending alone on policy outcomes (Gupta et al 2002 on child health, Filmer and Pritchett 1999 on child education and health, Rajkumar and Swaroop 2008 on child education), our study does show that more public spending on health care leads to significantly lower infant and child mortality rates, controlling for governance quality. Our main regression results indicate that for one percentage point increase in public spending on health care as share of GDP, there may be a one percent decrease in child deaths per thousand children under the age of five. This impact of spending on outcomes is statistically significant at the 1% level.

In the meantime, we also find that the general quality of governance, as measured by the control of corruption and the quality of bureaucracy, plays an important role in helping to reduce infant and child mortality rates. For example, both our cross-section and fixed effect regression results lead us to believe that infant and child mortality rates could be significantly lowered if there were less corruption. Likewise, the effect of higher quality of bureaucracy on child mortality rates is also statistically significant.

The impact of a related but more specific aspect of good governance, the transparency of fiscal budgeting process has been covered by the development literature (World Bank 2003, Ablo and Reinikka 1998, Deles et al 2009). The key hypothesis is that the quality of budget institutions affects whether public resources are effectively spent and has an important impact on social outcomes. In the present study, we make an effort to empirically test that proposition by using an institutional quality indicator that directly measures the transparency of the budgeting process. Unlike previous studies of social budgeting that are based on anecdotal evidence, our empirical analysis is less clear about the impact of budget transparency on child mortality rates or the effectiveness of public spending. Data on this new indicator of budget governance is still less than comprehensive, with the transparency ratings available for one year only, so improvements could be made given more informative measures of fiscal transparency.

Apart from variables related to governance quality, we also look into other empirical determinants such as income, inequality and female education. Not surprisingly, we find income per capita to have a significant negative impact on infant and child mortality rates and income inequality to have an adverse effect on child health, implying that access to basic resources by the poor households does matter for child wellbeing.

In order to address endogeneity issues related to maternal choices that are made according to contemporaneous infant or child mortality rates, we use the lag of female illiteracy rate as an explanatory variable. We find a significant positive association between female illiteracy and child mortality rates. Our results provide

evidence that child mortality rate, measured as the number of deaths per thousand children under the age of five, may drop 1% if there is one percentage point reduction in female illiteracy rate. This finding is consistent with the previous literature on the importance of maternal education for child health (Caldwell 1982; Hojman 1996; Boyle et al 2006; McCrary et al 2011).

In summary, after a thorough examination of empirical determinants of child and infant mortality rates, our paper find evidence that apart from standard determinants covered by the child health and the development literature, governance quality in general, as measured by the quality of bureaucracy and the control of corruption, also plays an important role in enhancing child welfare. However, we obtain ambiguous results on the effect of budget transparency and the interaction between governance and public spending effectiveness, which suggests a need to keep searching for more precise measures of governance quality and better instruments for the public spending variable.

The remaining sections of our paper are organized as follows. Section 2 discusses the main determinants of child mortality rates and presents the empirical methodology. We discuss our results in Section 3. Section 4 presents our conclusion.

Section 2 Empirical Methodology

The present study seeks to build on past empirical analyses by employing an extensive panel dataset on child health indicators, as well as several alternative indicators of governance. This section outlines the framework for the empirical analysis. It begins with a discussion of the main determinants of child health

outcomes, followed by an explanation of the other variables. The regression model is then elaborated.

Determinants of Child Health Outcomes

There have been many empirical studies on the determinants of child and infant mortality rates (for instance see Anand and Ravallion 1993, Filmer and Pritchett 1999, Gupta et al 2002), but there are relatively few theoretical studies on the underlying mechanism through which the empirical determinants affect both intermediate and final child health outcomes. Cornia et al (2008) offer a comprehensive review of five theoretical mortality models and a discussion on how economic determinants may relate to the factors analyzed by these models. In addition, in the literature on child survival, one of the most cited analytical frameworks of child mortality is developed by Mosley and Chen (1984), who bridge the gap between social and medical science approach and model the interaction between socioeconomic determinants and proximate determinants of child mortality. Essentially, the argument is that socio-economic status influences the proximate determinants of health and the risk of disease, and these in turn directly influence health and mortality outcomes. Mosley and Chen (1984) argue that child mortality should not be treated as a single-cause health outcome and that it is important to study the possible interplay between social economic determinants and intermediate determinants.

In the economics literature, there are at least three schools of thought on the possible determinants of child health status. First, there is an economic growth oriented view (Filmer and Pritchett 1999, 2000 for example) that macroeconomic

conditions explain most of the variation in child and infant mortality rates and that public spending on health care fails to have a significant positive impact on health outcomes.

On the contrary, some empirical studies show that public expenditure on health does have an impact on health outcomes. For instance, Gupta et al (2001) use cross-country data to show that the relationship between public spending on health and health status is significant and stronger for the poor people and argue that public health policy matters more to the poor. This view is corroborated by the empirical study by Hanmer et al (2003), who show evidence that supports the importance of public health interventions and refute the view that economic growth is the main determinant of child health outcomes.

In addition, there is a third strand of literature which is represented by Rajkumar and Swaroop (2008), who offer an alternative explanation for the mixed evidence found on the link between public expenditure on health and health outcomes. According to the authors, it is not simply true that public spending per se is unimportant, but government effectiveness and bureaucratic quality determine whether public spending can have a significant impact on child health outcomes.

Our Choice of Explanatory Variables

1) Public Spending on Health Care

One of the implications derived from Mosley-Chen model of child mortality (1984) is that countries with the same income per capita will have different mortality rates if the relationship is mediated in different ways. Public health spending can reduce child

mortality rates either through promotion of reproductive health interventions or through the provision of reliable public health programs. On the other hand, the link between public spending on health care and health outcomes may be weak, due to a possible negative impact of public spending on the development of the private health sector (Filmer et al 2000). Therefore, the public spending effect could be ambiguous.

2) Effectiveness of Governance

The previous finding that public expenditure on health services is not significantly associated with child health outcomes is not surprising, because public expenditure on health care may not necessarily translate into effective health services due to several reasons. First, the mere allocation of public resources for health services may fail to reach health service providers if budget institutions, which involve budget formulation, execution, monitoring and auditing, do not function properly. Deles et al (2009) argue that if the budget process is characterized by more transparency and accountability, it is less likely for the public health sector to suffer from leakages and inefficiency. Second, even if the health service providers receive the allocated public resources, they may fail to supply effective services to consumers, especially poor people and children, due to moral hazard problems and information asymmetry between public health regulators and service providers (World Bank 2003). It may be necessary to innovate with non-traditional delivery arrangements so as to increase citizens' participation in public service provision, which enables consumers to monitor the health service providers.

The effectiveness of the public sector and the quality of institutions in general may even have a direct impact on child health outcomes. Cross-country empirical

studies of infant and child mortality rates reveal that governance quality in general and the presence of corruption in particular have a significant negative effect on health outcomes (Kaufmann et al 2004, Gupta et al 1999).

The interaction between the quality of governance, public spending on health care and child health outcomes hinges on how effectively the public sector produces key services which are inputs for child health. There are many leakages that could take place, some of which could be due to the systemic and institutional weaknesses of public policymaking in general and public finance management in particular. In addition, poor institutional quality and corruption could also diminish the resources channeled towards public sector spending and investments.

Recent studies have shown that public spending and investments in weak institutional and governance environments often do not translate into effective public services. Stronger evidence of better human development outcomes due to public sector spending is found in better governed countries (e.g. Gupta and others, 1999; Rajkumar and Swaroop, 2008). Previous studies also reveal that corruption could distort the composition of government expenditures, biasing it towards public sector investment projects that are easier to extract rents from, and ultimately undermining social sector investments in child education and health (e.g. Mauro, 1998; Tanzi and Davoodi, 1997).

3) Income

National income may affect infant and child mortality both directly and indirectly (Hojman 1998). First, there is a direct positive association between wealth and survival chances, since the ability of households to secure food supply and meet

medical needs depends on their wealth level. Second, national income may also affect survival chances indirectly through its impact upon the birth rate. The demand for children is affected by the household income. Third, a higher income is usually associated with a higher degree of female participation in the labour force (Handwerker 1992), which in turn may have an indirect effect on child mortality rates. Thus the relation between income per capita and mortality rates can be complex.

4) Inequality

A society's income distribution pattern may affect mortality rates. Waldmann (1992) finds that inequality still has an adverse impact on mortality even if the real income of the poor is accounted for. Thus one can expect inequality to have a positive association with infant and child mortality rates. Further, Agha (2000) documents the rural-urban disparity in child health outcomes as a consequence of income inequality in Pakistan. Alesina and Rodrik (1994) provide theoretical and empirical analyses to show that inequality in land ownership and income is negatively correlated with economic development, which may have an adverse impact on child mortality rates. Cornia et al (2008) propose that given an average GDP per capita, a more egalitarian income distribution can improve child health status by ensuring that most households have access to basic resources whereas high inequality adversely affect child health status.

5) Economic and Income Volatility

Ferreira and Schady (2009) show that aggregate macroeconomic shocks may have an adverse effect on child health outcomes. They argue that if macroeconomic shocks

reduce investment in child health, there may be a persistent negative impact on poor children and intergenerational transmission of poverty. Their theoretical analysis indicates that the relationship between macroeconomic uncertainty and child outcomes may be ambiguous due to the interplay between substitution and income effects[20]. Thus it remains an empirical question whether the volatility of the macroeconomic environment has a negative or positive impact on child health status.

6) Female Illiteracy

Education for women can help mothers improve child health through providing more effective child care at home and more efficient use of health services. It may also lead to delayed child bearing and longer birth intervals as well as more work opportunities for women to generate additional household wealth. As proposed by Caldwell (1979; 1986; 1994) female education may be an important mediating variable that is an important determinant of child mortality. In line with this hypothesis, Boyle and others (2006) conduct a cross-country study based on demographic and household survey data for the period between 1994 and 2003 and find that household wealth and maternal education are both significant determinants of child health status as measured by height and weight. Hojman (1998) suggests that access to modern, non-traditional forms of contraception and access to advice on the appropriate health care techniques are both important factors that impact child health outcomes. Thus the education of females may affect infant and child mortality rates. More remarkably, Basu and Stephenson (2005) argue that even a little education for women may have a positive impact on child health outcomes. The reason is that schools may not

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[20] During times of economic crises, the opportunity costs of child care may be lower so that parents choose to invest more in their children (Ferreira and Schady 2009).

necessarily teach women child-rearing skills but even very basic education can help them to know later in life how to acquire health care skills and how to obtain health-related information.

It is worth noting that female education is also a choice variable, which could be simultaneously determined as the child and infant mortality rates. Indeed, women may choose to invest less in education and to bear more children if they observe a higher mortality rate among children. In that case the female illiteracy variable will be endogenous. In order to solve this issue, we use the lag (by five years) of female illiteracy rate as a proxy for female education.

Empirical Methodology

The empirical model of child mortality rate determinants is specified by the following equation:

$$\ln(U5MR)_{i,t} = \beta_0 + \beta_1 \ln(GDPpc)_{i,t} + \beta_2 (PSH)_{i,t} + \beta_3 GOV_{i,t} + \beta_4 (GOV*PSH)_{i,t} + BX_{i,t} + u_i + \varepsilon_{i,t}$$

The under-five mortality rate (U5MR) is measured as the number of child deaths per thousand children before the age of five. We first examine U5MR and later undertake the same empirical analysis of infant mortality rates (IMR), which is measured as the number of infants dying before reaching one year of age, per thousand live births in a given year. GDPpc is income per capita, PSH is the public spending on health care as a percentage of GDP, and GOV is a measure of government effectiveness. X contains other country characteristics that can affect health status, such as illiteracy rates among females and the volatility of the macroeconomic environment. The *i-t* th observation refers to that of country *i,* year *t*.

GOV*PSH captures the interaction between governance effectiveness and public expenditure on health care. The idea is that given a level of public spending on health, a more effective government can translate the expenditure on health into resource allocations for the front-line health care providers so that households could receive more health care services. In our analysis we attempt to obtain insights from the use of various proxies for governance effectiveness, such as the Worldwide Governance Indicators by the International Country Risk Guide (Political Risk Group 2008), Kaufmann and others (2009), and the Open Budget Index (International Budget Partners 2008). We believe that the use of alternative governance indicators may reveal more information about the extent to which the effectiveness of the public health policies is affected by the quality of governance and institutions. In our empirical model, the impact of the public spending on health care on child health status can be expressed in terms of the sum of the impact of public spending itself and the impact through effective use of public resources by the government.

It is worth noting that there are some possible caveats as pointed out by Rodrik (2005), who warns that cross-country regressions can often be misleading due to econometric problems such as parameter heterogeneity, omitted variables, measurement errors and endogeneity. Since policy interventions are not random and they can be chosen in response to the unobserved country characteristics, cross-country regression analysis of the impact of public policy may be problematic.

Therefore, we address the abovementioned econometric issues by using an extensive and rich dataset. First, we make an effort to improve on previous studies by using cross-country panel data covering as many years as possible, so that it is

possible to capture more variation across time and account for heterogeneity across countries by using country fixed effects. Second, we aim to enhance the empirical specification of the economic determinants of child health outcomes by using better explanatory variables such as more informative proxies for governance quality. Third, we attempt to address the reverse causality problem associated with public spending on health care. If public spending on health care is chosen in response to child health outcomes, then it is systematically correlated with the error term in equations, and our estimates will be biased. Thus we need to find an instrumental variable that explains the variation in public spending on health, yet does not determine child health status through any other channels apart from its interaction with public spending. It is difficult to find an instrument that satisfies this criterion; and past studies have suggested instrumental variables which may be less than convincing and possible to improve on. For example, Gupta and others (1999) turn to public spending on education and the square of health spending other than primary care spending as possible instruments for public spending on health care. Unfortunately it is not very clear to what extent these variables satisfy the abovementioned conditions for good instruments. More recently, Rajkumar and Swaroop (2008) propose using legal origins of the countries as instruments for public spending on health care. The validity of the proposed instrumental variable relies on the assumption that countries with a common law system tend to have less public spending than those with a civil law system, which in turn have less public spending than those which are ex-Soviet countries. However, these legal origin variables may also capture other country-

specific characteristics such as cultural beliefs that affect fertility choices and thus infant and child mortality rates (Fernandez et al 2009).

In the present study, we propose using an indicator of democracy as the instrument for the spending variable, because the structure of the political system may affect public spending on health care. There is empirical evidence on the positive impact of democracy on public expenditure (Stasavage 2005; Chen 2008; Careja and Emmenegger 2009). The idea is that with the introduction of multiple competitions, governments are faced with electoral pressure and thus have a better incentive to increase public expenditure in sectors such as health and education.

In our analysis, the proxy for the extent of democracy is the democratic accountability index from the International Country Risk Guide (Political Risk Group 2009). The measurement of this variable is based on the actual political structure in a given country. For example, a de-facto one-party state is distinguished from a de jure one-party state. We believe that this democracy index is a valid instrument for the spending variable since it is plausible to assume that the form of political organization does not affect child health outcomes directly or through other within-country factors.

Section 3 Analysis of Results

The key results are reported in Tables 1 through 8. In order to confirm the robustness of the findings in the literature, we use both cross-section and panel data, to the extent data is available. The focus here is on the impact of public spending on health care, quality of governance, inequality and female education on child mortality rates.

Table 1 presents our baseline pooled OLS results. Not surprisingly, we find that income per capita has a significant negative effect on child and infant mortality rates (statistically significant at the 1% level). We also provide support to previous studies in that female illiteracy and income inequality are shown to have a significant positive association with mortality rates. However, unlike previous studies that find no significant impact of public spending on health care, we do find that higher public spending may lead to better child health outcomes. In fact, our results show that if there is one percentage point increase in public health spending, there could be 1 percent reduction in child and infant mortality rates, holding the quality of bureaucracy at the average level.

More interestingly, our governance variables show up highly significant. We obtain evidence that both the quality of bureaucracy and the control of corruption have a significant impact on child mortality rates, with both effects being statistically significant at the 1% level. The effect of quality of bureaucracy on infant mortality rates is statistically significant at the 10% level. However, our results on the interaction between public spending and the quality of governance are counterintuitive. It seems that for those observations with higher public spending on health care, the effect of governance quality on the child health outcomes is lower. Our paradoxical results suggest that there may be a need to keep searching for more precise measures of governance quality and public spending, as the former measure is perception-based and the latter is imperfectly measured, especially for developing countries.

We now turn to fixed effect estimates (Table 2) in order to account for unobserved heterogeneity that is specific to the country. Similarly, we find income per capita and female education to be significant explanatory factors for child and infant mortality rates. It is interesting to note that the estimated effect of income is higher here than in OLS estimates. Our interpretation is that there is relatively large variation in income across countries and relatively small variation in income within a country across time.

Our conjecture is that the improvement in child mortality rates is taking place slowly over time, whereas income growth is relatively fast. One puzzling finding is on income inequality. In our fixed effect results, inequality is negatively correlated with child mortality, a statistically significant effect which is both counterintuitive and inconsistent with previous findings in the literature (Cornia et al 2008). One explanation could be that as income grows over time, inequality may experience a hike and then become alleviated. In the meantime, child mortality rates could be reduced as more health resources become available to the society as a whole. In any case, we would need a longer panel data in order to investigate the inequality effect on child health over time and within a country.

Note that the estimated effects of the quality of bureaucracy on child mortality rates now have larger standard errors in Table 2 than in Table 1. In the first two columns of Table 2, we fail to find any significant effects of bureaucratic quality on mortality rates. This may be due to the lack of within-country variation in the bureaucracy variable over time, as our panel data only covers three years of

observations. In the following regressions, we focus on the results obtained using cross-country variations.

Table 3 shows OLS regression results using a cross section of mean levels of the same variables, which are similar to the pooled OLS estimates. The estimated effect of public spending on health, the quality of bureaucracy and the control of corruption are all higher than the corresponding estimated effects in pooled OLS. Female illiteracy again shows up highly significant, although the effect is slightly smaller. Other results are similar.

To address the potential reverse causality between public spending on health care and child mortality rates, we use the democracy index as an instrument for the spending variable. Again, we use the cross sectional data with mean levels of our variables, since there is little within-country variation in the democracy index over time. Results are presented in Table 4, followed by first stage results in Table 5. Again, income and inequality are significant determinants. Female illiteracy has a significant impact on mortality rates only in regressions represented by Columns 3 and 4, in which we use the control of corruption as the measure of governance quality. Note that standard errors are high and the estimated effect of public spending is now insignificant. However, the estimated magnitude is not unexpected in Columns 1 and 2. Indeed, if governments are more likely to increase their public spending on health care when facing higher infant and child mortality rates, our estimated effect of spending would be biased upwards. In regressions (1) and (2) in Table 4, we show that the bias is indeed positive as the spending effect is now larger in magnitude. However, we do not observe the same in the last two columns in the table, as the

estimates may suffer from imprecision. In fact, first stage results show the instruments do not perform well in the last two regressions in Table 5.

We now turn to alternative indicators for governance. As noted earlier, one measure is the Open Budget Index, which attempts to track the nature of the budgeting process closely. There is anecdotal evidence in some developing country contexts that more open and transparent public budgeting, procurement and spending processes are associated with less leakage and more effective policy interventions (Deles et al, 2009). The empirical results we obtain using this variable, however, were not significant (see Table 6). Note that we were unable to extend the data beyond 44 countries and the year 2005, and that it may be difficult to generalize our results on the transparency of the budgeting process.

Turning next to the quality of governance measured by Worldwide Governance indicators proposed by Kaufmann et al (2004 and 2009), we run the same baseline OLS and fixed effect regressions and obtain results in Tables 7 and 8. The estimated effects of female illiteracy and income per capita are weaker. The spending variable fails to show up significant. However, the estimated impact of governance quality has a larger magnitude than that in our regressions using the International Country Risk Guide governance indicators. Again the results on the interaction between public spending and governance quality are counterintuitive. In our view, these findings are broadly consistent with our benchmark results obtained using ICRG data and there should be potential improvements given more comprehensive data on public spending and governance.

Section 4 Conclusion

This paper examines the empirical determinants of child health, by revisiting the links across public spending, governance and child mortality rates. We use comprehensive data on public spending and child health, and various indicators of governance. Our main contribution to the empirical literature lies in our use of various indicators of governance, such as the Open Budget Index (OBI) data which is used as a proxy for budget transparency, and the use of plausible instruments to address the endogeneity of public spending on health care. Using a variety of specifications, the empirical analysis in this paper yields broadly consistent results on public spending and the quality of governance, which imply that both the level of public social spending and the quality of governance matter for child health outcomes. However, we obtain counterintuitive results on the interaction between the two. This in turn raises some questions about how precise the measures of the spending and governance are.

It is worth noting that previous studies have either ignored the endogeneity issues (e.g. Rajkumar and Swaroop 2008 using percentage of population under the age of five as an explanatory variable for child mortality, and the other problematic variables such as the Muslim religion indicator as a determinant without justification) or relied on a small cross-section of observations (e.g. Filmer and Pritchett 1999). We suggest that future research try to more directly address the links across public spending, governance and child health using alternative data and approaches. We see three promising areas for further work.

First, we recognize the limitations of broad governance indicators. It is possible to improve on measures of governance, by focusing on specific aspects of

the governance. For instance, in the context of the present analysis, governance indicators related to better public finance management might provide the most direct link between public spending and health outcomes. In addition, it might help to examine the same questions addressed in this paper, by using sub-national indicators of governance. In a growing number of countries, public service delivery has become highly decentralized, emphasizing the role of local government units. It is possible that the link between public spending and health is broken at points along the health production chain that are more related to local government public finance. Indeed, we are trying to extend the present study in this direction. Finally, it would be ideal to use household survey data to address the questions in this paper in a complementary way. One possible approach, for example, is to try and evaluate the impact of interventions that create space for public debate of government spending. For instance, it helps to look into the impact of social accountability and citizen participation in cases of sharp increases in the budgets of democratic village governments on the quality of public goods. It would also be interesting to see whether more citizen participation leads to stronger human development and child health outcomes. Such micro-level empirical analysis of effects of governance could complement studies based on aggregate indicators.

Table 1 Pooled OLS Estimates

VARIABLES	(1) Child Mortality Rate	(2) Infant Mortality Rate	(3) Child Mortality Rate	(4) Infant Mortality Rate
income	-0.502***	-0.456***	-0.478***	-0.451***
	(0.0693)	(0.0708)	(0.0654)	(0.0655)
volatility	-0.000350	0.00687	0.00272	0.0116
	(0.0164)	(0.0160)	(0.0160)	(0.0158)
inequality	0.0245***	0.0220***	0.0242***	0.0232***
	(0.00473)	(0.00469)	(0.00495)	(0.00460)
female illiteracy rate (lag)	0.0101***	0.00883***	0.0103***	0.00860***
	(0.00300)	(0.00270)	(0.00274)	(0.00235)
public spending on health care	-0.148**	-0.0858	-0.139**	-0.117***
	(0.0637)	(0.0538)	(0.0538)	(0.0425)
quality of bureaucracy	-0.193***	-0.145**		
	(0.0534)	(0.0587)		
spending_quality of bureaucracy	0.0548***	0.0333*		
	(0.0197)	(0.0191)		
control of corruption			-0.198***	-0.164***
			(0.0684)	(0.0576)
spending_control of corruption			0.0418***	0.0348***
			(0.0129)	(0.0108)
Constant	6.366***	5.748***	6.338***	5.819***
	(0.714)	(0.682)	(0.650)	(0.620)
Observations	159	159	159	159
R-squared	0.928	0.923	0.927	0.925

Robust standard errors in parentheses, clustered at country level.
*** p<0.01, ** p<0.05, * p<0.1

Table 2 Fixed Effect Estimates

VARIABLES	(1) Child Mortality Rate	(2) Infant Mortality Rate	(3) Child Mortality Rate	(4) Infant Mortality Rate
income	-0.604***	-0.555***	-0.563***	-0.515***
	(0.0628)	(0.0621)	(0.0768)	(0.0737)
volatility	-0.00266	0.00195	-0.00137	0.00241
	(0.0120)	(0.0116)	(0.0130)	(0.0126)
inequality	-0.0148**	-0.0131**	-0.0156**	-0.0132**
	(0.00685)	(0.00615)	(0.00678)	(0.00609)
female illiteracy rate (lag)	0.00818**	0.00741*	0.00935*	0.00852*
	(0.00390)	(0.00375)	(0.00482)	(0.00457)
public spending on health care	-0.0585	-0.0326	-0.146***	-0.150***
	(0.0641)	(0.0600)	(0.0419)	(0.0442)
quality of bureaucracy	-0.0704	-0.0421		
	(0.0613)	(0.0532)		
spending_quality of bureaucracy	0.00564	-0.00375		
	(0.0185)	(0.0175)		
control of corruption			-0.100*	-0.0902*
			(0.0540)	(0.0503)
spending_control of corruption			0.0307**	0.0329**
			(0.0137)	(0.0138)
Constant	9.682***	8.637***	9.675***	8.631***
	(0.762)	(0.708)	(0.731)	(0.674)
Observations	159	159	159	159
R-squared	0.990	0.988	0.990	0.989

Robust standard errors in parentheses, clustered at country level
*** p<0.01, ** p<0.05, * p<0.1
Estimated coefficients for country fixed effects are omitted.

Table 3 OLS Estimates using a cross-section of variable means

VARIABLES	(1) Child Mortality Rate	(2) Infant Mortality Rate	(3) Child Mortality Rate	(4) Infant Mortality Rate
income	-0.524***	-0.474***	-0.458***	-0.430***
	(0.0757)	(0.0789)	(0.0668)	(0.0664)
volatility	-0.000577	0.00765	-0.00302	0.00856
	(0.0269)	(0.0256)	(0.0239)	(0.0229)
inequality	0.0312***	0.0276***	0.0277***	0.0261***
	(0.00577)	(0.00597)	(0.00579)	(0.00557)
female illiteracy rate (lag)	0.00917**	0.00812**	0.00946***	0.00787***
	(0.00370)	(0.00336)	(0.00331)	(0.00285)
public spending on health care	-0.204**	-0.128	-0.172**	-0.139**
	(0.0889)	(0.0775)	(0.0769)	(0.0628)
quality of bureaucracy	-0.215**	-0.165		
	(0.102)	(0.108)		
spending_quality of bureaucracy	0.0757***	0.0499*		
	(0.0262)	(0.0258)		
control of corruption			-0.350***	-0.308***
			(0.124)	(0.114)
spending_control of corruption			0.0581***	0.0488***
			(0.0186)	(0.0165)
Constant	6.309***	5.679***	6.486***	5.951***
	(0.813)	(0.774)	(0.770)	(0.747)
Observations	53	53	53	53
R-squared	0.946	0.942	0.946	0.945

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Table 4 IV Estimates using a cross-section of variable means

VARIABLES	(1) Child Mortality Rate	(2) Infant Mortality Rate	(3) Child Mortality Rate	(4) Infant Mortality Rate
income	-0.462**	-0.478***	-0.501***	-0.486***
	(0.213)	(0.168)	(0.109)	(0.105)
volatility	-0.0104	0.00893	0.00721	0.0199
	(0.0453)	(0.0358)	(0.0282)	(0.0281)
inequality	0.0389***	0.0295***	0.0272***	0.0245***
	(0.0137)	(0.00937)	(0.00644)	(0.00653)
female illiteracy rate (lag)	0.00487	0.00771	0.0110***	0.00989**
	(0.00944)	(0.00687)	(0.00414)	(0.00405)
public spending on health care	-0.680	-0.201	-0.0717	0.0194
	(0.861)	(0.643)	(0.259)	(0.254)
spending_quality of bureaucracy	0.198	0.0751		
	(0.198)	(0.144)		
quality of bureaucracy	-0.599	-0.244		
	(0.654)	(0.472)		
spending_control of corruption			0.0558*	0.0343
			(0.0324)	(0.0305)
control of corruption			-0.397***	-0.304***
			(0.126)	(0.118)
Constant	6.986***	5.831***	6.628***	6.012***
	(1.179)	(0.930)	(0.704)	(0.653)
Observations	53	53	53	53
R-squared	0.916	0.940	0.941	0.936

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 First stage results

VARIABLES	(1) public spending on health care	(2) spending_quality of bureaucracy	(3) public spending on health care	(4) spending_control of corruption
income	0.555**	1.557**	0.419	0.941
	(0.261)	(0.722)	(0.249)	(0.844)
volatility	-0.125*	-0.414**	-0.0880	-0.303
	(0.0627)	(0.162)	(0.0609)	(0.210)
inequality	0.00259	-0.0479	0.0149	0.0109
	(0.0168)	(0.0441)	(0.0187)	(0.0589)
female illiteracy rate (lag)	-0.0141	-0.0269	-0.0117	-0.0394
	(0.0101)	(0.0250)	(0.0103)	(0.0306)
quality of bureaucracy	-2.059***	-6.468***		
	(0.562)	(1.734)		
democracy	-0.805*	-4.328***	-0.230	-5.120***
	(0.435)	(1.209)	(0.374)	(1.218)
democracy_quality of bureaucracy	0.468***	2.219***		
	(0.131)	(0.372)		
control of corruption			-0.434	-3.308
			(0.701)	(2.162)
democracy_control of corruption			0.187	1.996***
			(0.117)	(0.388)
Constant	2.914	11.03	-0.418	9.540
	(2.822)	(6.818)	(2.587)	(8.110)
Observations	53	53	53	53
R-squared	0.817	0.932	0.795	0.929

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)	(4)
test H0: coef(democracycracy)= coef (democracycracy_quality of bureaucracy)=0	F(2, 45) =10.37 P-value=0.00	F(2, 45) = 21.66 P-value = 0.00		
test H0: coef(democracycracy)= coef (democracycracy_control of control of corruptiontion)=0			F(2, 45) =1.81 P-value=0.17	F(2, 45) =13.26 P-value=0.00

Table 6 OLS Estimates: Using Open Budget Index

VARIABLES	(1) Child Mortality Rate	(2) Infant Mortality Rate
income	-0.101	-0.0754
	(0.178)	(0.143)
volatility	0.0747	0.0663
	(0.0699)	(0.0585)
inequality	0.0309	0.0309
	(0.0248)	(0.0212)
female illiteracy	0.0503**	0.0460**
	(0.0198)	(0.0165)
spending	0.0764	0.162
	(0.474)	(0.389)
open budget index	0.135	0.197
	(0.281)	(0.230)
spending_open budget index	-0.0176	-0.0330
	(0.0668)	(0.0547)
Constant	0.868	0.230
	(2.768)	(2.312)
Observations	18	18
R-squared	0.892	0.907

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7 Pooled OLS: Using Worldwide Governance Indicator

VARIABLES	(1) Child Mortality Rate	(2) Infant Mortality Rate
income	-0.377***	-0.312***
	(0.104)	(0.101)
volatility	0.00276	0.00732
	(0.0208)	(0.0199)
inequality	0.0324***	0.0308***
	(0.00808)	(0.00792)
female illiteracy	0.00979**	0.0101***
	(0.00420)	(0.00366)
spending	-0.0515	-0.0547
	(0.0525)	(0.0530)
governance quality	-0.466***	-0.516***
	(0.159)	(0.165)
spending_governance quality	0.0783***	0.0781***
	(0.0246)	(0.0262)
Constant	4.627***	3.955***
	(1.028)	(0.994)
Observations	78	78
R-squared	0.924	0.926

Robust standard errors in parentheses, clustered at the country level
*** p<0.01, ** p<0.05, * p<0.1

Table 8 Fixed Effect Using Worldwide Governance Indicators

VARIABLES	(1) Child Mortality Rate	(2) Infant Mortality Rate
income	-0.294	-0.303*
	(0.180)	(0.175)
volatility	0.00786	0.0140
	(0.0201)	(0.0214)
inequality	-0.0188	-0.0184
	(0.0126)	(0.0130)
female illiteracy	0.00863	0.00908
	(0.00609)	(0.00661)
spending	-0.0356	-0.0269
	(0.0485)	(0.0468)
governance quality	0.170	0.165
	(0.302)	(0.277)
spending_governance quality	-0.0321	-0.0243
	(0.0460)	(0.0453)
Constant	6.237***	5.970***
	(1.360)	(1.369)
Observations	78	78
R-squared	0.261	0.239
Number of numcod	39	39

Robust standard errors in parentheses, clustered at the country level
*** p<0.01, ** p<0.05, * p<0.1

Appendices

A1. Data on Land Erodibility

Sample

The National Resources Inventory (1997) uses a two-stage, area frame sampling method. In the first stage, the entire US landscape area (corresponding to more than 3100 counties) is divided into non-overlapping 2 mile*6 mile tracts of smaller areas (geographical strata). Based on geographical locations, the strata are constructed using either Public Land Survey System or latitudes and longitudes. Some counties are stratified according to resource conditions, urbanization and conditions that affect the homogeneity. One or more primary sampling units (PSU) are randomly selected within each stratum. Most of these PSU are 0.5mile*0.5mile parcels. In the second stage, specific locations (sampling points) are selected within each PSU. The sampling rate varies across strata, but it is consistent across all primary sampling units of a county. Generally the sampling rate is within the range from 2% to 6%. The likelihood of selection depends upon land use, soil pattern and county size. Therefore the NRI uses unequal probability sampling method. The sample contains 300,000 primary sampling units and 800,000 sample points.

Definition of Erodibility Index

The present study calculates the county level mean and standard deviation of erodibility index of the sample points in the National Resources Inventory (NRI 1997).

The erosion data in NRI cannot be used to compute the erosion that actually occurred during the year 1997, but the data contains information on the factors that help predict long term average annual soil loss due to erosion. The following two models are used to predict land erosion.

(1) Universal Soil Loss Equation (USLE)

$A = RKLSCP$

This equation estimates average annual soil loss due to sheet and rill erosion. A is the estimated soil loss per unit area, R is a rainfall and runoff factor, K is a soil erodibility factor, L is a slope-length factor, S is a slope-steepness factor, C represents cover and management and P is a conservation practice factor.

(2) Wind Erosion Equation (WEQ)

This erosion model predicts long term average annual soil loss from a field with specific characteristics.

$E = f(I, K, C, L, V)$

E is estimated soil loss per unit area, I is a measure of susceptibility to wind erosion, K is a soil ridge roughness factor, C is a climatic factor, L is an equivalent unsheltered distance across the field along the prevailing wind erosion direction and V is an equivalent vegetation cover.

Erodibility index (EI) is defined as the maximum of (R*K*LS)/T from the USLE and (C*I)/T form the WEQ, where LS is the combined effects of slope length and steepness and T is the tolerance factor that equals the maximum rate of annual soil erosion that will permit crop productivity to be sustained. Erodibility index is a numerical measure of the potential for a soil to erode given the physical and chemical

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properties of the soil and the climatic condition of its location. The higher the erodibility index, the greater the investment needed to maintain the sustainability of the soil resource base if the soil is intensively cropped. If erodibility index is greater than 8, then the soil is regarded as highly erodible. (Summary Report NRI 1997)

A2 Measurement of Variables used in Chapter 2

Dependent Variables

Relational Governance

When a transaction between two firms is governed by a relationship that is based on trust or repeated interactions, similar business outcomes could be achieved without costly contracting. The relational governance variable is an index that measures the extent to which the firms rely on such relational governance of the exchange.

This variable is defined according to how contracts are implemented, the importance of self-enforcement of the exchange, and the role of personal relationship and trust in protecting business interests, as perceived by the firms. We also let this variable account for how frequently the firms use informal meetings to prevent or resolve issues with their trade partners.

We first assign a base value of 0 to the relational governance variable. Then we look at the firms' mutually exclusive responses to the question regarding how they implement written contracts. If the respondent reports that important decisions are made by informal mutual agreement during the implementation of written contracts, then we increase the value of the relational governance variable by 0.5. If the firm indicates that each party individually makes important decisions necessary for the

implementation of their written contract, then we increase the value of the variable by 1.

Second, we also take into account the firms' attitude towards personal relationships, trust and the self-enforcement of relational contracts. In the general director's survey, respondents were asked to rate the importance of personal relationships and trust, as well as relying on each other's own incentive, in fulfilling an agreement between a supplier and a customer. If we find the response to any one of the above rating questions to be higher than the sample average, then we increase the value of relational governance variable by 0.5. For example, if a firm's ratings for both personal relationships and trust, and relying on own incentives are above the sample average, we increase the value by 1.

Third, we look at those questions that relate to the actual use of self-enforcement and trust in the representative transaction. We increase the value of the relational governance variable by 0.5 if a positive response is given to any of the following questions:

a) Your enterprise kept some of the property of the partner on your premises.

b) The partner firm kept some of the property of your enterprise on its premises.

c) The partner firm visited your enterprise during the implementation of the agreement.

d) An employee of your enterprise visited the partner during the implementation of the agreement.

e) The supplier delivered in smaller amounts than was optimal because of risks.

f) Blank check was provided by the customer.

Lastly, we consider the role of informal meetings. One of the survey questions asks how frequently the firms use informal meetings to prevent or resolve problems with their customers or suppliers. If a firm's response is higher than the sample average, then we increase the value of the relational governance variable by 0.5.

Legal Governance

Using a method that is similar to the abovementioned, we construct another variable to measure of the extent to which transactions are governed by legal contracting, according to firms' responses to the following survey questions. We assign an initial value of 0 to the legal governance variable. Then depending upon answers to the following questions, we adjust the value of this variable.

a) Were any of the written contracts authenticated? If answer is "yes", we increase the value by 0.5.

b) Is penalty clause for late delivery used? If answer is "yes", we increase the value by 0.5.

c) Is penalty clause for late payment used? If answer is "yes", we increase the value by 0.5.

d) The perceived importance of the legal system for your business, in terms of both frequency of use and effectiveness. If response is higher than the sample average, we increase the value by 0.5.

e) How frequently do you use contracts with clauses that facilitate filing suit in court? If response is higher than the sample average, we increase the value by 0.5.

The idea is to measure the extent to which firms rely on the legal institutions to protect their interests. It is worth noting that the firms may choose to write a legally enforceable contract without having to actually use the contract to protect their interests. Thus we also look at the following questions which are related to the actual use of legal contracts.

f) In the period between when the specific agreement was made and now, how many times did you read part or all of the contracts? If response is higher than the sample average, we increase the value of the legal governance variable by 0.5.

g) In the period between when the specific agreement was made and now, how many times have you cited specific language from the contracts in your discussions with the customer/supplier? If response is higher than the sample average, we increase the value by 0.5.

h) For the person who is responsible for ensuring a smooth relationship with the customer/supplier, how often does she/he discuss the agreement with the legal department or legal advisor? If response is higher than the sample average, we increase the value by 0.5.

Determinants of Governance Form

Variables related to transaction costs

1) Asset specificity

Parties to a transaction often make specific investments that have greater values in the particular transaction than in their next best use to alternative exchange partners. If the transaction involves such an investment that is specific to the exchange relationship, there are risks of opportunistic behavior.

In both the customer relations and supplier relations questionnaires, there is a question about asset specific investment: were any elements of the product custom-made for the specific needs of the buyer? If the answer is "yes", then another question is asked: at what cost could the product be modified to sell to alternative buyers? Respondents are given five options: virtually no cost, small cost, moderate cost, high cost and prohibitive cost. As long as the answer indicates a non-zero cost of modification, we assign a value of 1 to the seller specific investment indicator. Otherwise we let the variable take zero value.

Likewise in both the customer relations and supplier relations surveys, there is another question about buyer's specific investment. Both procurement and sales managers are asked whether the buyer has to undertake a substantial amount of special investment to be able to use the product. If the response shows a non-zero amount of special investment, we assign value 1 to the buyer specific investment indicator. Otherwise the variable takes value 0.

2) Product complexity

We construct a numeric measure of product complexity, based on the customer and supplier relationship surveys. The variable measures the complexity of the product in a specific agreement on which the survey is focused. If a firm reports that any potential quality problems would be obvious to anyone who inspected the principal

product, then we assign a zero value to the corresponding complexity variable. Otherwise, we let the complexity variable take a positive value. We assign a value of 0.5 to the variable if it is reported that quality problems are observable to a third party who is knowledgeable in the area of business. If a firm reports that quality problems are not observable to a third party other than the supplier's own specialists, then we assign a value of 1 to the complexity variable. Finally, we assign a value of 1.5 to this variable if the quality problems are not at all observable.

3) Uncertainty

As highlighted by previous theoretical studies (Williamson 1991, 2002), a greater amount of uncertainty in the exchange environment would negatively affect the effectiveness of any form of governance. We define the exogenous uncertainty indicator in the exchange environment using general director's survey. The relevant question asks the director in general to rate the importance of the following unpredictable changes in the industry:

a) weather-induced variation in demand for the good or service sold by firms in the industry

b) weather-induced variation in supply of goods or services that firms in the industry need to buy

c) problems in transportation links that cause changes in the level of demand

d) problems in transportation links that causes changes in necessary supply

Four options are given to each of the above questions: 1=not important, 2= not very important, 3=somewhat important, 4=very important. If the answer to any of the

above questions is 3 or 4, then we assign value 1 to the uncertainty indicator.

Otherwise, the variable takes value zero.

4) Quality of courts

We define a dummy variable to indicate the quality of courts. If the court quality is

better than average in the firm's geographical region, then we define the indicator to

be equal to 1. Otherwise it takes zero value. In order to measure quality of courts, we

look at the legal relations questionnaire which asks legal directors whether filing

claims are problematic. Respondents are asked to give a rating in the following

aspects:

    a) costs of filing a claim

    b) complexity of court procedures

    c) availability and expenses of legal counsel

    d) impartialness of judges

    e) judges' knowledge about market transactions

    f) the time between filing a claim and obtaining a judgement

    g) enforcement of court judgements

    h) protection of business secrets

If the problem rating is higher than average then we assign value zero to the court

quality variable. Otherwise we let the court quality indicator equal 1.

5) Long term partners

We measure the extent to which firms have repeated interaction with their partners

by the proportion of their partners who have been doing business with them for more

than two years.

Variables related to the characteristics of the transition economy

1) Origin of the firms

The directors in general were asked whether the origin of their firms lie in the state in some way, even indirectly. If a response is positive, then we assign value of 1 to the firm origin indicator. Otherwise, the variable takes zero value.

2) Legal knowledge

In our empirical analysis of the choice of governance, we examine three categories of legal knowledge variables: legal knowledge of the sales or purchase manager, legal knowledge of the general director and legal knowledge of the company lawyer or the legal director. Respondents were not allowed to look up related laws and codes when answering the questions. Therefore our measurement of the legal knowledge variable is informative in the sense that it is based on the working knowledge of laws and regulations, rather than book knowledge.

All four survey questionnaires include specific questions about the laws and regulations in Romania that test the legal knowledge possessed by managers, general directors and company lawyers. For example, the procurement manager was asked the following question: in the commercial field, a judge can grant days of grace for the performance of an obligation (choose one of the following): 1. Yes, always; 2. No, never; 3. Yes, if the judge considers the plaintiff's argumentation to be fair. The correct answer to this question is 2. We assign an initial value to the legal knowledge variable. In this case, if the procurement manager's response is correct, then we increase the value of the legal knowledge variable by a certain amount. Otherwise, we

keep the value of the variable. Likewise, we measure the legal knowledge held by the sales managers, general directors and company lawyers accordingly.

It is worth mentioning that the four sets of questions that test legal knowledge vary with the respondents' role. For example, the general director's questions are different from those of the sales or procurement managers' and those of the company lawyer's. While the director's legal knowledge questions are the most general among the four sets of questions, the company lawyer's questions are the most specific about legal rights under various circumstances. The legal knowledge questions for the sales managers are more focused on payment, creditor's rights and security rights in movable property, whereas the procurement managers' questions are more relevant to buyers' obligations.

The following is a list of all relevant questions for testing the legal knowledge held by sales and procurement managers, directors in general and legal directors.

Questions for the general director

a) Your enterprise wants to sue in the Tribunal a supplier from a different judet who has violated the terms of a commercial contract to supply you with goods. The contract stated that the goods must be delivered by the supplier to the premises of your enterprise. Which of the following best states your options on where you file suit? 1. Your enterprise must file suit in the supplier's judet; 2. Your enterprise must file suit in your enterprise's judet; 3. Your enterprise can choose whether it files suit in your own judet or the supplier's judet. 4. The supplier can choose whether you must file suit in your judet or the supplier's judet.

The correct answer to the above question is "3". We assign an initial value of -4.6666 to the director's legal knowledge variable. If the director's response to this question is correct, we increase the value of the director's legal knowledge variable by 1.3333 if the response is correct.

b) Can a commercial sale contract be used by a commercial company to sell land to another commercial company?

The correct answer is "No". We increase the director's legal knowledge variable value by 2 if the response is correct.

c) In the commercial field, an obligation undertaken by several debtors is (choose one of the following): 1. always a joint obligation; 2. always an obligation that is divided equally among the debtors; 3. a joint obligation, unless the contract stipulates how to divide the obligation among the debtors; 4.divided equally among the debtors, unless the contract stipulates that it is a joint obligation. The correct answer is 3. We add 1.3333 to the variable value if the response is correct.

d) To be valid, do the following have to be authenticated?

1. constitutive document for a commercial company; YES/NO (add 2 if yes)

2. agreement secured by rights in movable property; YES/NO (add 2 if no)

3. commercial contract for sales of goods; YES/NO (add 2 if no)

Now we rescale the director's legal knowledge variable and divide the index by 6 so that the value of the variable is between -1 and 1, with a higher value indicating a better legal knowledge.

Questions for the sales manager

a) Your enterprise's product is necessary for the operations of an enterprise that

   has been declared bankrupt. That company's agreement to purchase your

   product states that payment will be made 30 days after delivery. If the

   bankrupt company ceased activities before it paid the debt to you, would the

   debt have higher priority than the following debts of the bankrupt company?

   We assign an initial value of -4.0 to the sales manager's legal knowledge

   variable.

   1. debts secured by rights in movable property before the date of bankruptcy

       (add 2 to the value of the variable if "yes")

   2. debts to the state incurred before bankruptcy

       (add 2 to the value of the variable if "yes")

   3. debts to workers incurred in the last six months before the date of

   bankruptcy

       (add 2 to the value of the variable if "yes")

b) According to the law, which statement is correct? Choose one of the

   following:

   1. Commercial contracts must be written to be valid.

   2. Some types of commercial contract must be written to be valid, but not all.

   3. All forms of commercial contract are valid even if unwritten.

   The correct answer is 2. We increase the variable value by 1.5 if correct.

c) Which of the following is correct for a security contract in movable property?

   Choose one of the following:

1. It must be authenticated.

2. It may be entered either as authentic deed or under private signature;

3. It is valid without any formality.

We add 1.5 to the variable value if 2 is chosen.

Then we divide the value by 5 so that the sales manager's legal knowledge variable takes a value between -1 and 1.

Questions for the procurement manager

Likewise, we assign an initial value of -3.8333 to the procurement manager's legal knowledge variable and adjust the value based upon responses to the following questions:

a) You are considering signing a commercial contract to buy goods from an important supplier. The Tribunal is the court of competence if disputes arise concerning this contract. Can any of the following contractual choices affect which judet's Tribunal will have competence if a suit is filed against your enterprise by the supplier? Answer YES/NO for each option

1. whether the supplier agrees to deliver the goods to you or whether you agree to pick up the goods from the supplier; (add 2 if "yes")

2. whether your payment is to be made before or after delivery of the goods; (add 2 if "no")

3. whether the contract is signed on your premises or on the supplier's premises; (add 2 if "yes")

b) When a customer falls behind in the payments due to a supplier as a result of a commercial contract, which does not mention penalties or interest, legal interest is due from: (choose one)

   1. the date when the supplier asks the customer to pay.

   2. the due date of the payment.

   3. the date of bringing an action in Court.

   4. the date of notification by the supplier.

   (add 1.3333 if 2 is chosen)

c) In the commercial field, a judge can grant days of grace for the performance of an obligation: (choose one)

   1. Yes, always

   2. No, never

   3. Yes, if the judge considers the plaintiff's argumentation to be fair.

   (add 1.5 if 2 is chosen)

We now divide the value of procurement manager's legal knowledge variable by 5 so that it is between -1 and 1.

Questions for the legal director/company lawyer

Again we assign an initial value of -2.6666 to the lawyer's legal knowledge variable. Then we adjust the value according to responses to the following questions.

a) In case of non-performance of a commercial obligation that is assessable in money, if penalties and interest are not mentioned in the contract, what can the court order? We add 1.5 to the variable value if option 2 is chosen.

   1. The Court can order the payment of legal penalties, but not legal interests

2. The Court can order the payment of legal interests, but not legal penalties

3. The Court can order the payment of both legal interests and legal penalties

b) The Civil Procedure Code was amended in 2000. According to these amendments, at what time would the Tribunal, rather than the Judecatorie, become the court of competence for commercial lawsuits below 10 million lei?

We add 1.3333 if option 2 is chosen among the following:

1. at the beginning of 2001

2. after April 2001

3. after August 2001

4. after the end of 2001

c) Withdrawal (retract litigios) from a lawsuit is:

1. possible only in the civil field;

2. possible only in the commercial field;

3. possible in both civil and commercial fields;

4. not possible.

We increase the value by 1.3333 if 1 is chosen.

d) A security right in movable property is: (choose one)

1. valid only when publicity is done at either the Court Pledge Registries or the Electronic Archive of Security Rights in Movable Property

2. valid without publicity.

3. valid only when publicity is done at the Electronic Archive of Security Rights in Movable Property.

4. valid only when publicity is done at the Court Pledge Registries.

We increase the value by 2 if either option 2 or 3 is chosen.

e) Which of the following is correct for a security contract in immovable property? Choose one of the following:

1. It must be authenticated.

2. It may be entered either as authentic deed or under private signature;

3. It is valid without any formality.

We increase the value by 1.5 if option 1 is chosen. Then we divide the value by 5 so that it is between -1 and 1.

A3. Data Appendix for Chapter 3

Globalization-Health Nexus Database (GHND)

The GHND dataset provides comprehensive statistical information required for the analysis of the relationships among country characteristics, globalization and health. It provides information on variables that measure health status, social and economic factors that may affect health outcomes as well as country characteristics that may be associated with health status. The GHND dataset covers 136 countries, which are representative of various geographical regions around the world. The time span covered by the original GHND data consists of five-year periods from 1960 to 2005. The five years data are computed by taking the five year arithmetic mean of the variable centered around the mid- or end-decade years. Details on the calculation method are described in the documentation for the GHND dataset.

Due to data limitations, our main analysis is based on a subset of this dataset, including observations on 53 countries that cover the period from 1990 to 2000. Among these countries, 32.1% are high-income countries, 37.7% are middle-income countries, 22.6% are low-income countries, the rest 7.6% are transition countries. This subsample contains full information on the following variables, which are relevant for our cross-country study of the empirical determinants of health outcomes.

Under-five Mortality Rate (per thousand live births). The under-five mortality rate is measured by the number of children who die before the age five per thousand children. The data on this variable is provided by UNICEF (2006) and the coverage is complete for 1980, 1990, 1995, 2000 and 2005. Note that missing values for year

1985 is interpolated by computing the mean between the values of the preceding period (1980) and the following period (1990).

Infant Mortality Rate (per thousand live births). Infant mortality rate is the number of infants dying before reaching one year of age, per thousand live births in a given year. The data, which is provided by UNICEF (2006), contains complete information for all years considered.

Normalized Gini Coefficient. The original data on income inequality which are based on different income, consumption or earnings concepts are normalized to "Gini coefficient of gross income per capita" (Cornia et al 2008).

GDP Per Capita. GDP per capita is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included on the value of the products. It is calculated without deducting depreciation of fabricated assets for depletion and degradation of natural resources. Data on GDP per capita is from the World Development Indicators (World Bank 2006).

Volatility of Economic Growth. The volatility of economic growth is measured by the five-year inter-temporal mobile standard deviation of the annual growth rate of GDP per capita at constant international prices. Details on the calculation are available in the documentation for the GHND database.

Public Expenditure on Health. This variable is measured by the amount of public expenditure on health as a share of GDP. Information on public expenditure on health is obtained from various data sources including the OECD Health Database for OECD countries, TransMonee database 2006 for Central and Eastern European countries, World Development Indicators 2006 for remaining countries.

Female Illiteracy. Female education status is measured by the percentage of illiterate

female aged 25 and above (Barro and Lee 2000).

Descriptive Statistics

Variable	Number of observations	Mean	Std. Dev.	Min	Max
Child mortality rate	159	51.2	57.9	4.0	230.0
Infant mortality rate	159	35.1	34.0	3.0	131.0
GDP per capita (in 2000 USD terms)	159	10946.9	9568.4	731.1	34094.2
Standard deviation of growth rate	159	3.6	2.4	.7	11.4
Gini coefficient	159	45.5	9.8	27.0	70.9
Female illiteracy rate	159	25.7	26.2	0	92.0
Public spending on health care as a percentage of GDP	159	3.5	2.1	.5	8.1

Sample: 53 countries; Years 1990, 1995 and 2000

Source: the Globalization and Health Nexus Database (Cornia et al 2008)

International Country Risk Guide (ICRG) Variables

The International Country Risk Guide (ICRG) rating is based upon three categories of risk: political, financial and economic. A separate index is constructed for each of the three categories. For purposes of our analysis, we focus on the first risk group, political risks. In the construction of the political risk rating, 12 variables covering both political and social characteristics are measured. We use four of these variables, namely, government stability, corruption, democratic accountability and bureaucracy quality in our empirical analysis of the impact of governance and public spending on social outcomes.

 Government Stability. The highest possible rating on government stability is 12 points. This is a measure of the ability of a government to carry out its declared programs and its ability to stay in office. The risk rating is the sum of three subcomponent scores, each with a maximum score of 4 points and a minimum score of 0 points. A higher score represents lower risks. The three subcomponents for the rating of government stability are government unity, legislative strength and popular support.

Corruption. The corruption variable could take a value that ranges from 0 to 6, with 6 representing the best control of corruption and 0 standing for the worst rating. This variable is a measure of corruption within the political system. The ICRG measure of corruption takes into account not only financial corruption in the form of special payments and bribes related to trade licenses, exchange controls, tax assessment, police protection or loans, but more focused on the type of corruption in the form of excessive patronage, nepotism, job reservations, secret party funding and suspiciously

close ties between politics and business. A higher score for this variable stands for lower risks and better control of corruption in the political system.

Democratic Accountability. The possible value of this variable ranges from 0 to 6 with 6 indicating the best democratic accountability and the most responsive the government is to its people. This variable measures the extent to which the government responds to its citizens, based on the assumption that the less responsive it is, the more likely for the government to fail. The scores are assigned on the basis of the type of governance adopted by the country. The types of governance that are used to define this variable include alternating democracy, dominated democracy, de-facto one-party state and de jure one-party state and autarchy.

Bureaucracy Quality. The range of this variable is from 0 to 4. A higher value of this variable is assigned to countries where the bureaucracy has better capabilities to govern without abrupt changes in policy or interruption in government services. The institutional strength and quality of the bureaucracy is an important determinant of risks and may minimize revisions of policy when governments change. Higher bureaucracy quality is likely to be associated with more efficient management and allocation of resources and more effective delivery of public services.

Worldwide Governance Indicators

The Worldwide Governance Indicators measure six dimensions of governance: voice and accountability, political stability and absence of violence or terrorism, government effectiveness, regulatory quality, rule of law and corruption. Covering 212 countries and territories for 1996, 1998 and 2000, and annually from 2002 through 2008, the indicators are based on several hundred individual variables

measuring perceptions of governance, drawn from different data sources from around the world. These individual measures are assigned to categories that capture the six dimensions of governance and are used to construct six aggregate governance indicators with an unobserved components model.

The WGI are based on subjective or perception-based data on governance reflecting the views of various informed stakeholders. Kaufmann et al (2009) show that there are several reasons for using subjective data to measure governance. First, perceptions are important because agents base their decisions on their perceptions and views. Second, in many areas of governance, there are few alternatives available to measure governance. When objective or fact-based data are available, they often capture a de jure notion of laws that differs from the de facto reality. The authors further argue that almost all measures of governance and the investment climate rely on judgment in some measure so that the distinction between subjective and objective data may not be a valid dichotomy.

Governance is defined broadly as the traditions and institutions by which authority in a country is exercised (Kaufman et al 2009). The six corresponding dimensions of governance are:

Voice and accountability: perceptions of the extent to which citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association and free media.

Political stability and absence of violence: perceptions of the likelihood that the government will be destabilized or overthrown by violent means.

Government effectiveness: perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies.

Regulator quality: perceptions of the ability of the government to formulate and implement sound policies and regulations that permits and promotes private sector development.

Rule of law: perceptions of the extent to which agents have confidence in and abide by the rules of society and the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence.

Control of corruption: perceptions of the extent to which public power is exercised for private gain.

The World Governance Indicators are constructed using 35 different sources, which consist of surveys of individuals or domestic firms, expert assessments and commercial business information providers. These data sources are provided by 33 organizations, including international organizations such as African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development and private business information providers such as Political Risk Services and the Economist Intelligence Unit.

As for the method of aggregation, individual data sources are combined to construct the six aggregate governance indicators. The underlying statistical approach assumes that each of the individual data sources provides an imperfect signal of some underlying perception of governance that is difficult to observe directly. Thus our

objective is to extract the informative signal about governance from each individual data source and to optimally combine different data sources to derive the best measurement of governance in a country. Kaufmann, Kraay and Mastruzzi (2004 and 2009) adopt an unobserved components approach and argue that the advantage of this method is that the aggregate indicators are more informative about the unobserved governance than any individual data source. The identifying assumption in the unobserved components approach is that any observed correlation between two measures of a governance variable is due to their common but unobserved signal of that governance variable. By this assumption, data sources that are more correlated with each other are more informative about the underlying governance variable. The authors rescale the individual indicators from each data source so that they are comparable across sources and then construct a weighted average of each rescaled data sources to build an aggregate indicator of governance.

The authors emphasize the limitations of these measures of governance, which are shared by "all efforts to measure governance across countries and over time". The margins of error are present in "any effort to measure governance" and are due to the difficulty in measuring such a complicated variable as governance. This paper also shows that more than half of all cross-country comparisons result in highly significant differences in one of the six dimensions of governance. It is shown that the likelihood of a comparison between any given pair of countries being characterized by a significant difference in governance is about 75%. In addition, the authors show that about one third of countries have had significant changes in at least one dimension of governance between 1998 and 2008.

The Open Budget Index (OBI)

Developed by the International Budget Partnership (IBP), the Open Budget Initiative (OBI) dataset provides measurements of public availability of budget information and other transparent and accountable budgeting practices in 85 countries. The survey has 123 questions, of which 91 questions evaluate public access to budge information. The responses to these questions are averaged to form the open budge index. The remaining 32 questions are related to opportunities for public participation in the budget process and the ability of key oversight institutions of government to hold the executive accountable.

Most questions ask about what occurs in practice, not requirements that exist in law. The OBI index is based on the 91 questions related to public availability of information on the Open Budge Questionnaire. The score reflects the quantity of publicly available information in the eight key budget documents, namely, pre-budget statement, executive's budget proposal, enacted budget, citizens' budget, in-year reports, mid-year review, year-end report and audit report. The public availability and comprehensiveness of the Executive's Budge Proposal is a key determinant of a country's OBI score, as 58 out of the 91 questions concern the executive's budge proposal.

Publicly available information about the budget documents is defined as the information that can be obtained by any and all members of the public through a request to the public authority issuing the documents. Thus it includes two types of information, one of which is available through a well-defined procedure that ensures simultaneous release of public documents to all interested parties. The other type of

information is available only on request. The implicit assumption underlying this definition is that the performance on OBI of a given country is not affected by which method a government chooses to disseminate documents

Letter grade "a" or "b" is used to describe good practice regarding the subject matter of the question. "c" or "d" corresponds to poor practices. An "a" response indicates that a standard is fully met. In order to aggregate the responses, a numeric score of 100 percent is awarded for "a", 67 percent for "b", 33 percent for "c" and 0 for "d". If the response is "e" not applicable, then the question is not counted as part of the aggregate. If only three options are given by the question, then "a" is assigned 100 percent, "b" is graded as 0. "c" causes the question to be excluded in the aggregation.

A score of 81 to 100 percent indicates that the government provides extensive information to citizens on the budget process. 61 to 80 percent indicates that the government "provides significant information to citizens", country scores of 41 to 60 indicate that the government "provides some information to citizens" and scores of 21 to 40 percent indicate that the government "provides minimal information to citizens". Scores below 20 percent indicate that the government "provides scant or no information to citizens."

According the creators of the OBI, there is a worldwide transparency gap in the public financial management practices. Only five countries make extensive information publicly available. On average countries surveyed provide minimal information on their central government's budget and financial activities. In most of the countries surveyed, legislatures have very limited capabilities to review the

executive's budget proposal and monitor the implementation of the budgeting process. Likewise, the supreme audit institutions do not have sufficient independence or ability to monitor the government expenditure.

Less transparent countries share similar characteristics such as geographic locations, income level, dependency on foreign aids and weak democratic institutions. In addition the survey finds that the lack of transparency undermines accountability and prevents participation by citizens.

The Open Budget Questionnaire is intended to offer an independent, non governmental view of the state of budget transparency. All researchers are non-governmental organizations and share a common interest in promoting access to information during the budget process, strengthening the power of the legislature, and in the performance of Supreme Audit Institution. The IBP staff conduct an analysis after the questionnaires are completed and make an effort to ensure that the questions have been answered in a consistent manner. The feedbacks are also cross-checked with public information. Following this analysis and review the questionnaire is submitted to two anonymous peer reviewers who are required to be independent of both the government and the research organization. Peer reviewer feedbacks are examined by the IBP staff so that the comments are consistent with the study's methodology and help ensure the consistency of assumptions across countries in selecting answers.

Descriptive Statistics: governance indicators

Variable	Number of observations	Mean	Std. Dev.	Min	Max
Quality of bureaucracy	159	2.6	1.1	0	4.0
Control of corruption	159	3.6	1.3	.3	6.0
Democracy	159	4.2	1.4	0	6.0
Government effectiveness	78	.7	.9	-.9	2.6
Open budget index	44	4.6	2.3	.2	8.9

Source: The Political Risk Group, Inc. (2009), The International Budget Partners (2006)

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