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ESSAYS IN FIRM-LEVEL COSTS OF CORRUPTION AND THE TRANSMISSION OF MONETARY POLICY SHOCKS TO THE REAL ECONOMY

By

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ABSTRACT
ESSAYS IN FIRM-LEVEL COSTS OF CORRUPTION AND THE TRANSMISSION OF MONETARY POLICY SHOCKS TO THE REAL ECONOMY

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By distorting the rule of law and weakening the institutional foundations on which economic growth depends, corruption has become one of the greatest obstacles to economic and social development. While country level causes and consequences of corruption are relatively well understood, very little is known about corruption related determinants of firm performance. The first essay, **"Bribery and the Nature of Corruption"** studies the impact of bribery on firms. Specifically, the paper explores how the organization of the corruption network influences its costs on firms. Using a relatively new dataset, the study empirically tests the impact of the structure of the corruption network on the incidence and amount of bribes firms face. Findings of the empirical analysis provide evidence that corruption faced by firms varies with the structure of its network. Particularly, the incidence and pervasiveness of corruption is higher where the corruption regime is well organized and uncertainty regarding delivery of the service that is the object of the bribe increases the cost to firms.

Building on the theme of the first essay, my second essay **"Bribery and Firm Borrowing Conditions"** examines the channels through which bribery constrains firms' operations and growth. Since corruption induces uncertainty into the operational environment, it can potentially be a barrier to firms' access to external finance by lowering the projects' expected returns. Using firm-level data from the Business

Environment and Entrepreneur Performance Surveys covering twenty-six transition economies, the study investigates whether a link exists between bribery and firms' borrowing conditions. Empirical results suggest that bribery leads to stringent borrowing conditions. In particular, in environments characterized by pervasive corruption, the probability of firms obtaining bank credit is lower; interest rates on which loans are made are higher; and loan repayment periods are generally shorter.

The last essay, **"The Role of U.S. Banks in the Transmission of Monetary Policy",** examines whether in the U.S. there is a part of monetary policy actions on real economic activity that can be attributed to banks through the bank-lending channel. The effects of monetary contractions can not be fully explained by the well-established interest rate channel, so is it possible that additional effects come from credit markets imperfections? A bank-lending channel is operative if the effect on firm borrowing is a consequence of a decline in loan supply rather than loan demand. Evidence on the existence of this channel has so far proved elusive. Using data from the CALL reports for the period 1991 to 2000, I estimate the impact of bank size and financial soundness, measured by CAMEL-type ratios, on bank lending. The results indicate that banks of different sizes and financial positions are affected differently by monetary policy shocks. Furthermore, unlike existing literature that shows no effect on large banks, I find that depending on their financial attributes, these banks are also affected by policy changes. An additional contribution of this study is the treatment for sample attrition that is a prominent feature of the U.S. banking industry.

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CHAPTER 1. BRIBERY AND THE NATURE OF CORRUPTION

1 Introduction

The growing consensus that corruption is harmful to economies worldwide has meant that the recent past has seen corruption drawing increasing attention from policymakers, politicians and academic scholars. A vast literature has emerged on causes and consequences of corruption, with virtually all empirical work based on cross country data. These works have made important contributions to understanding causes and consequences of corruption. For instance, the studies have found that corruption slows economy-wide growth and total investment (Mauro 1995), reduces foreign direct investment (Wei 1997), drives firms out of the official economy (Kaufmann 1997), and reduces both public sector budgets and the productivity of a county's infrastructure (Tanzi and Davoodi 1997).

Country level studies however, since they only provide aggregate determinants, tell us very little about the relationships between corruption and economic agents. They especially can not explain why individuals or firms facing identical institutional and policy environments, can and do pay different amounts in bribes for the same services. But until very recently, micro-level aspects of corruption had largely been overlooked, yet it is through firms and individuals that economies function. Little attention has been paid to corruption-related determinants of firm performance, yet the extent to which firms' operations are constrained is central to economic outcomes. Neglecting first level operators and then attempting to draw policy implications from macroeconomic studies is, at best, a risky endeavor. Moreover, the severity and institution of corruption is vastly different across

counties[1], therefore we would expect to observe heterogeneities in the impacts of corruption on outcome measures. Hence we believe micro-level empirical research is critical for understanding heterogeneous mechanisms and distributional outcomes of corruption and for better informing policy.

This paper is one of the few in the literature that exploit micro data to study impacts of bribery.[2] It constitutes an empirical investigation of the impact of corruption on firms. Specifically, we explore how the organization of the corruption networks influences its costs on firms. The objective of the study is to improve the understanding of the workings of corruption and their consequences at the micro-level. In particular, using a relatively new dataset, we empirically test the impact of the structure of the corruption network on the incidence and amount of bribery that firms face.

While our line of inquiry is not new having first been proposed by Schleifer and Vishny (1993) in a theoretical framework, as far as we know, our study is the first that empirically investigates the link between the nature of corruption and the cost of bribes at the firm level.[3] This study provides empirical evidence supporting the claim that the cost of

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[1] Some studies suggest that corruption is the same everywhere: that its effects on firms are similar regardless of any national nature (Banfield 1975). Other authors, such as Schleifer and Vishny (1993), suggest that the nature of corruption varies appreciably across countries. In some countries, corruption is hierarchical, organized and predictable; one bribe guarantees access to the desired property or service whereas the opposite is true in other countries.

[2] This fairly new and small strand of empirical literature on broad micro level effects of corruption is beginning to attract scholarly attention. Using the *Business Environment Survey* conducted by the World Bank, Gaviria (2002) examines the effects of corruption on growth of sales, investment and employment at the firm level. Mocan (2005) using micro data from the International Crime Victim Survey on 49 countries investigates the causes of corruption but specifically incorporates individual specific characteristics, such as gender, income, education and marital status to determine the probability that the individual will be exposed to corruption. Hunt and Laszlo (2006) using survey data on households in Peru find that because rich clients are more likely to use public officials, they are targeted by officials for bribes and are more likely to pay bribes. However, they find that the service delivery does not necessarily improve with the payment of bribes. Svensson (2002) based on a survey of Ghanaian firms finds that those firms that deal with officials whose actions directly affect their operations are more likely to make unofficial payments.

[3] There are two empirical papers that also use the organization of the corruption network. Wu (2005) tests the importance of the network of corruption but unlike our approach, this paper focuses on the relationship between bribery and firm accounting practices for corporate Asia. Campos, Lien and Pradhan (year??) use

corruption faced by the firm varies with the network through which corruption is organized. In particular, we find that the incidence and pervasiveness of corruption is higher where the corruption network is well organized. Additionally, the frequency of bribes decreases if firms have effective recourse through government channels or a managerial superior to obtain proper treatment without agreeing to make unofficial payments.

Finally, this paper offers novel results suggesting that the quality of public services, especially the judiciary systems and physical infrastructure, matters significantly for perceptions of corruption. Thus, our results suggest that government policies directed towards improving these services could meaningfully reduce corruption and thereby foster economic growth.

The remainder of the paper is organized as follows. Section 2 highlights the difference between country-based and firm-based assessments of corruption. Section 3 presents the theoretical motivation for the empirical work while Section 4 describes the data and the survey instrument. The primary hypotheses and the estimation procedures are presented and discussed in Section 5. Section 6 presents the estimation results and Section 7 concludes.

2 Micro-Characteristics of Bribery

Groups like *Transparency International* typically measure the 'level' of corruption within a given country through some combination of surveys of business leaders, politicians and academicians. The cardinal rankings that result surely capture a broad picture of the relative level of corruption across countries but may tell us very little about the likely implications of a particular level of corruption or even what it means for one country to be 'more corrupt'

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the same dataset to explore the importance of predictability of corruption in determining its impact on investment.

than another. Moreover, there are good reasons to believe that the effects of corruption can be quite different among countries with the same broadly measured level of corruption. Bhardan (1997) notes in his excellent survey piece that whereas country-level indices measure Indonesia and India as equally corrupt most observers would agree that firms in the two countries have vastly different experiences with corruption. Understanding the particular nature of corruption and the consequent variegated effects is vital to the design of policies and other efforts aimed at reducing corruption, but require more detail than is available through one-dimensional measures.

Recently completed firm-level surveys sponsored by the World Bank have for the first time allowed researchers a valuable examination of the micro-characteristics of corrupt transactions across a broad group of countries and regions. Such information allows for the investigation of heretofore unexamined hypotheses regarding the environment within which corruption takes place. Because corrupt transactions are by their very nature secret, firms have no recourse to a legally enforceable contract if services are not rendered according to the implicit contract of the bribe. Thus, the moral hazard risk surrounding any corrupt transaction is naturally higher than that of an above-board payment for similar services. As a result, corrupt transactions and their aftermath may represent a major source of uncertainty for firms (Kaufmann, et. al. 2000). Moreover, corrupt transactions represent a major challenge to researchers as they are hidden, largely untraceable and highly significant features of the commercial environment in many countries.

Corruption certainly imposes significant direct and indirect costs to firms. Direct costs typically take the form of bribes or kickbacks and are most often monetary payments. Monetary payments to corrupt officials can be expensive but indirect costs often pose even

greater obstacles to firm performance.[4] The more debilitating indirect costs of corruption are: the opportunity costs of the resources it consumes, the cost of delaying transactions, the cost of the resources expended in avoiding common venues for corrupt transactions (e.g. entry into the underground economy), that it deters or eliminates investment through reduced profitability, and that it raises the uncertainty of returns on investments. Schleifer and Vishny (1993) argue that the direct costs of corruption (calculated as a percentage of revenues) are in many ways like taxes in that they are simply another business expense. As such, corruption's direct costs may be high and still allow firms to operate normally. If the analogy to taxes holds, it follows that the uniquely onerous burden of corruption stems from the illegality and uncertainty of engaging in corrupt transactions. Otherwise identical corrupt transactions may be undertaken under markedly different circumstances that are critical determinants of their ultimate effect on a firm.

Kaufmann et al (2000) support the suggestion that the indirect costs of corruption are the more insidious and make the important point that the most important public good that the state can provide is predictability in the institutional and policy environment. Similarly, we assert that the predictability of a corrupt environment largely determines its cost to business. We are not suggesting that perfectly predictable corrupt regimes are not costly or that bribes in such regimes are in fact just like taxes. Rather we emphasize that the perception by firms of the predictability and efficacy of the corrupt regimes is a critical determinant of its full cost to businesses. We investigate how the nature of corrupt regimes affects the corrupt transaction itself. This paper furthers the understanding of how micro-characteristics of firms, including their perceptions of the corrupt transactions they engage in, affect the size and frequency of bribes.

[4] Moreover, most bribes are relatively small especially in comparison with the rents that are often conferred on successful bribers. This finding is known as the 'Tullock Paradox' in the public choice literature.

3 Theoretical Underpinnings

In this section, we provide a brief theoretical motivation for the determinants of the incidence and level of corruption. We identify three groups that are major factors: the corruption regime, the quality of infrastructure and the quality of institutions.

3.1 Organization of the Corruption Network

As stated in the introduction the framework we base our empirical work on was first proposed by Shleifer and Vishny (1993), which characterizes two poles of organizational structures for corruption networks. At one extreme in this framework is the fully disorganized corruption network. Government agents who control access to related and unrelated resources act independently and capriciously in an effort to maximize their own bribe revenue and disregard the effects of their efforts on other officials. The lack of coordination among corrupt agents works to diminish overall economic activity and lower total bribe revenues in the same way that high taxes on final goods lower the derived demand for those goods.. More directly, independent providers of complementary goods (e.g. import and business licenses) set the marginal revenue of a corrupt transaction equal to the marginal cost (e.g. the official tariff rate or cost of a business license). In this type of regime, firms are uncertain whom to pay, what to pay and if payment of bribes will result in property rights over goods they purchased.

The other extreme of the scale is characterized by a well structured regime in which payments expectations are not only predictable but ensure that the services for which firms make unofficial payments will actually be delivered. In the Schleifer and Vishny analogy, under a well-organized regime, bribe collectors act as joint providers and set marginal revenue below marginal costs to account for the cross elasticities of demand for the goods

and thus provide more of the demanded goods in equilibrium. As a result, per unit bribes are lower but total bribe revenue is higher in organized regimes.

One implication of the Shleifer and Vishny paradigm is that organized corruption networks have less adverse effects on firms because government officials internalize some of the negative effects of their corruption on overall economic activity. In disorganized corruption networks however, firms are confronted with substantial uncertainty regarding government-provided rights and services and may often need to bribe multiple agents for the same service. Consequently, firms will reduce their demand for the objects of bribery (i.e. contracts, business licenses, public services, etc.) and lower the total amount of bribes ultimately paid and collected. In hierarchical and organized corruption network, agents' actions are coordinated so as to maximize total bribe revenue. Through some combination of interpersonal and institutional controls, the organized corruption network prevents opportunistic actions by individual agents and thereby prevents the cannibalization of downstream bribes by upstream agents. Firms may frequently pay bribes but the nature of the corrupt transaction is more predictable. A greater degree of certainty surrounds the delivery of rights or services and firms are rarely confronted with unexpected demands for bribes. As a result of the predictable bribe requests and subsequent delivery of services, firms conduct more business and pay more in total bribes.[5]

[5] While Batra, Kaufmann and Stone (2003) argue that unpredictable corruption is more harmful and predictable corruption is more like business as usual, Lambsdorff (2002) makes the observation that predictable corruption causes further corruption as it removes the incentive to seek alternative and legal arrangements.

3.2 The Role of the Operational Environment on the Incidence and Size of Bribes

Physical Infrastructure: The quality of infrastructure such as power supply, transportation facilities, telecommunications and water can play an important role in the pervasiveness and costliness of corruption to firms. While the majority of studies focus on corruption in big infrastructure projects (see Kenny 2006; Leary 2006), we want to propose a different hypothesis that centers on the relationship between existing infrastructure and bribery. In particular, we posit that poor quality infrastructure can actually present opportunities for officials to extort additional payments. For example in most African countries, unreliable supply of electricity is constantly identified as a major impediment to productive activity, (World Bank Investment Climate Surveys). Because this service is so critical to firms' ability to function, we can conceivably see how officials could choose not to provide the service until they were induced with an illicit payment. Thus the impact of infrastructure quality on the cost of corruption is an interesting empirical question that we are now in a position to explore.

Institutional Capacity: While institutions cover a wide spectrum of activities, here we are mainly interested in the aspect of effectiveness of the legal and regulatory frameworks. Sullivan and Shkolnikov (2005) argue that weak legal systems, poor enforcement, complex regulations and excessive discretionary powers provide a fertile base for corruption. The confidence firms place in the ability of the legal system to enforce contracts and property rights, for instance, will have an impact on the pervasiveness of bribery. The quality of the judicial system can affect the likelihood that officials will punish corruption when it is exposed and will affect the probability of firms believing they have recourse to seek assistance from uncorrupt offices when faced with demand for unofficial payments. Bo et al

(2002) point out that honest and effective judiciary systems and courts increase the cost of corrupt deals whereas if the justice system is slow in responding to corruption and in punishing perpetrators, the incentives for corrupt behavior will outweigh the costs. On the part of regulations, unclear and/or excessive regulations make it easy for officials to engage in rent-seeking through extortion. In fact, corruption thrives in environments of complex regulations, especially if they change frequently, and officials have too much discretion (Sullivan et al. 2002; Klitgaard 1998). For instance World Bank (2006) shows that in Cambodia, overlapping regulations and too many administrative measures had created room for excess discretion and rent-seeking. This then suggests that streamlining regulatory procedures and simplifying laws so that there is no room for multiple interpretations or discretion can help reduce corruption.

4. Data Description and Methodology

4.1 The Data

Transparency International, like other well known advocacy groups and NGOs, produces measures of the 'level' of corruption within a given country, but does not collect data on the organizational characteristics of the corruption regime. These regime-level organizational characteristics are reflected in the *Business Environment Surveys* (hereafter BES) conducted by the World Bank in 1999 and 2000, which provides information on the frequency and size of the bribes paid by a varied assortment of firms across a broad sample of countries. The BES followed a smaller survey conducted by the World Bank in 1997 and were designed to capture the perception of managers regarding the main obstacles to

production and growth faced by their firms. Approximately 100 managers[6] in each of 74 countries located in five broadly defined world regions (i.e., Latin America and the Caribbean, Eastern Europe, OECD, Asia, and Africa) were interviewed. The survey spanned a broad set of topics such as infrastructure, regulations, the functioning of the judiciary system, commercial policies and regulations and the prevalence of crime and corruption.

The survey comprises regional questionnaires that were similar in almost all respects but for questions regarding bureaucratic red tape and "unofficial payments" to public officials which were not included in the survey for Africa. In addition, the survey allows for different responses to identical questions (i.e. qualitative versus quantitative) making it necessary to exclude Eastern Europe from the sample in some of the regressions.

The BES contains a set of questions concerning the degree to which corruption constitutes an obstacle to the growth of the firm, and a second group of questions regarding the frequency and size of bribes. The first set of questions comprises: a) whether corruption is a major, moderate, minor or no obstacle for the operation and growth of the business; and b) which factor --financing, infrastructure, taxes an regulations, policy instability or uncertainty, inflation, exchange rate fluctuations, functioning of the judiciary, corruption, street crime, organized crime or mafia, and anti-competitive practices by government or private enterprises-- is the single most important obstacle for the operation and growth of the business. To get an approximate measure of the importance of corruption we create the dichotomous variable *corrup*, which assigns the value of 1 to those firms that answer major or moderate to question (a), and 0 otherwise. As a measure of the importance of corruption

[6] Only in a few cases like Belize, where the country size is small, the number of queried managers is significantly smaller (e.g., 50 firms). Also the observations for estimation is considerably smaller than the surveyed sample would suggest, mainly because of missing data i.e. non-response.

relative to other factors we compute the variable *correl* by assigning the value of 1 to those firms that answer that corruption is the single most important obstacle and 0 otherwise.

Questions regarding the frequency and size of the bribes can be classified in two groups. The first group of questions includes: a) how frequent is it for firms in a line of business to pay some irregular 'additional payments' to get things done (*freq*); b) how many times in the previous year did a government official request that the company pay an extra payment to the electric power company (*electr*), the telephone company (*teleph*), business license authorities (*buslic*), tax agency inspectors (*taxins*), government procurement agents (*govpro*), customs, trade, or licensing officials (*custom*), judges or court officials (*judges*), politicians (*polit*) or other government officials. The first question, (a), in the list above generated a discontinuous variable that ranges from 1 (never) to 6 (always) and spans all the countries in the sample. We transform this multinomial variable in a dichotomous variable that takes the value of 1 if the answer is always or mostly, and 0 otherwise. The second question was also included in all the questionnaires but was worded differently for the Eastern European survey. Given this appreciable difference we elect to estimate the regressions separately for the Eastern European firms and for the sub-sample with firms from all other regions (Asia, Latin America and the Caribbean, and a subset of OECD countries). Questions concerning the frequency of payments are simple count variables ranging from 0 to the maximum reported number of bribes paid.

Questions regarding the size of "unofficial payments" comprise: (a) the average percentage of revenues paid per annum in "unofficial payments" (*bribrev*); and (b) the percentage of the contract offered to the government to secure the former (*bribcon*). We stratify both questions in order to merge all the regions since in some cases the answer is open ended and continuous while in others the answer takes on discontinuous values that

represent interval responses. The percentage of revenues ranges from 1 which corresponds to 0%, to 7 for more than 25%, and the percentage of the contract ranges from 1 for 0% to 6 for more than 20%.

Unlike many other corruption data sets, the World Bank data has the advantage of allowing for the identification of not only the frequency and size of the bribes, but also that of the environment and expectations surrounding their payments. In particular, the survey inquires whether: a) the manager knows in advance the size of the 'additional payment' required to obtain the desired object or treatment (*advance*); b) once the payment is made, the service is delivered as agreed (*serdel*); c) after the firm has made an 'additional payment' to a particular government official the firm will need to pay another official for the same service (*addpay*); d) when a government agent acts against the rules a manager can go to another official or the superior to get the correct treatment without recourse to unofficial payments (*nobrib*). In addition, the surveys provide data on managers' perceptions of the quality of public services such as customs (*qcustom*), judicial services (*qjudge*), policy and armed forces (*qsecur*), and infrastructure (*qinfras*). The answers to these questions take on values ranging from 1 (very bad quality) to 6 (very good quality). This allows us to explore the relationship between the quality of the services provided by the government and the level of corruption.

The *Business Environment Surveys* are representative at the country level but do not correspond to the composition of the country's enterprises by economic sector or location. In particular, the selection of the queried firms was designed to include at least 15% small firms (with 5-50 workers), 60% service enterprises, 15% firms located outside the main

cities, and some enterprises with state or foreign participation.[7] This fact should be kept in mind when comparing summary statistics among different countries.

Table 1-1 and Table 1-2 present summary statistics and correlations for the variables described in the paragraphs above. Several characteristics are noteworthy among the relationships presented. More than half of all firms consider corruption to be a major or moderate obstacle to the operation of the firm but only 1% list corruption as the most important obstacle. Not surprisingly, the percentage of firm revenues paid in bribes per annum (*briberev*) is highly correlated with the percentage of the contract offered as unofficial payment to secure a contract with the government (*bribecon*), as are the number and amount paid in bribes. A more interesting set of positive correlations is that between the regularity of paying bribes (*freq*) and both advance knowledge of the size of bribe necessary to induce the desired treatment (*advance*) and delivery as agreed of the service for which the bribe was paid (*serdel*). Finally, effective recourse to government officials (*nobrib*) is negatively correlated with payments to government agents (*polit, judges, et. al.*), the regularity of paying bribes (freq) and whether corruption is considered a major or moderate obstacle to the operation of the firm. These correlations suggest a reasonable relationship between the frequency of bribe payments and the efficacy of those payments and between various measures of bribery across government agencies. The next section develops and tests hypotheses designed to explain the nature of corruption across countries and its relationship to firms' experiences with bribery.

[7] In order to deal with this problem we include controls for the aforementioned characteristics in the regression analysis.

4.2 Methodological Issues

The potential unreliability of using perception based variables for estimation is not new by any means. The main concern is the extent to which inference based on what is basically subjective data is informative. Although this issue remains largely unresolved, a few studies have shown that results from surveys on corruption/governance perceptions can be informative.[8]

Another potential concern of relying on the direct experiences of managers is an individual manager's perceptual bias. That is, managers' perceptions may be an insufficient basis upon which to base a sound assessment of actual corruption. This concern matters when managers' responses are systematically biased in one direction or when managers prefer to hide or obfuscate their actual experiences for fear of reprisal from authorities. Given the substantial efforts in the instrument design and in the training of the surveyors to assure managers of the anonymity of their responses, systematically biased responses seem unlikely and if anything would tend to understate corruption. Moreover, research on *Business Environment Surveys* by Hellman et al, (2000) found no evidence that such survey data suffered from systematic country bias. Finally, utilizing perceptions of a corrupt regime to make inferences about actual corruption is appropriate in the sense that the perception of corruption matters for planning, investment and the ongoing operation of businesses. Thus, while there are good reasons to believe that the surveys reflect actual conditions, they are also useful for their depiction of the business environment.

Finally in most of our estimations, we use information on the frequency of bribes and the percentages of revenues paid out in additional payments rather than the perception

[8] Kaufmann's (2004) investigation on the quality of governance finds that stakeholders' perceptions matter in the same way as objective data from official statistics with a striking consensus between beliefs of commercial risk rating agencies and those of individuals and firms in most countries. See also Kuncoro (2006) for an interesting experiment on relationships between subjective beliefs and hard data.

of corruption. Even though these variables are indirect measures of corruption they represent close proxies to the ideal objective data. Indeed, it is conceivable that managers have good knowledge regarding the frequency and amount of the bribes paid.

5 Empirical Strategy

The primary objective of the paper is to study the role of the structure of the corruption network in determining the costs of bribes borne by firms. Four variables measure the level of corruption that may directly impact a firms' cost structure: (a) the perception that corruption is a *major* or *moderate* problem to production growth (*corrup*); (b) the perception that corruption is the main single obstacle to the operation of the firm (*correl*); (c) the frequency of payment (*freq*) and pervasiveness of bribes *(brbpay)*; and (d) the size of bribes *(brbsize)*.

For *corrup, correl* and *brbpay*, we estimate a probit model given by:

$$P\left(Y_{ij}\middle|X_{ij},W_{ij},Z_{ij}\right)=G\left(c_j+X_{ij}\alpha+W_{ij}\beta+Z_{ij}\delta+v_{ij}\right) \qquad (1)$$

where i indexes the firm; j indexes a cluster defined as firms that belong to the same country, sector, and size; $G(\bullet)$ is the standard normal cumulative distribution function; Y_{ij} is *corrup*, *correl*, or *freq* for manager i in cluster j; X_{ij} is a matrix containing the variables that reflect the organization of the corruption system; W_{ij} is the perception of the quality of various public services; Z_{ij} contains firm specific characteristics such as age, government and foreign participation; c_j are cluster specific fixed effects; and v_{ij} is the error term.

Both *corrup* and *correl* reflect the perception of the managers regarding corruption, either by itself or relative to other obstacles to growth. Similarly, the measure of infrastructure represents the perception of the manager with respect to physical facilities and services such as roads, mail, telephone, electricity, water and sewage (*qinfras*). Given that managers who have to pay bribes to get these services delivered would most likely not rate them highly, our infrastructure measure could be endogenous. Thus, we use the proportion of firms that report infrastructure to be the single most important obstacle, relative to the firms that report other factor to be the main obstacle to instrument for the perceived quality of infrastructure.

Our estimation strategy combines two procedures, Rivers and Vuong (1989) and IV-probit. Rivers and Vuong henceforth (RV) is essential a two-stage estimation procedure whereby in the first stage we perform an OLS regression of the endogenous variable on the instrument and all the other explanatory variables and obtain the predicted residual. In the second stage, we do a probit regression of the dependent variable on the predicted residual from the first stage regression together with the endogenous and exogenous variables. An appealing attribute of the RV procedure is that the probit *t*-statistics on the predicted residual provides a valid test for the exogeneity of infrastructure. We report the test results in Table 1-3 under the heading *Endogeneity test.* If we find evidence of endogeneity we then proceed to estimate the IV-probit models via maximum likelihood estimation (MLE). Also to quantify the impact of the measures of the corruption regime, as well as other factors of interest on the perception of corruption, we compute and report the average partial effects (APEs) of the variables on the different dependant variables.

With respect to the frequency of bribery by public officials in different sectors, the dependent variable is a count variable, which represents the answer to the question "how

many times in the past year did one of the government officials required bribes?" Therefore, we maintain the same corruption organization (X_{ij}), and firm specific characteristics (Z_{ij}) as covariates, but we specify the model as a Poisson regression of the form

$$P\left(Y_{ij} = h \middle| X_{ij}, Z_{ij}\right) = \exp[-\exp(\mathbf{x\beta})]\exp[(\mathbf{x\beta})]^h / h \qquad h = 0,1,... \tag{2}$$

$$\text{where } \mathbf{x\beta} = c_j + X_{ij}\alpha + Z_{ij}\delta + u_{ij} \tag{3}$$

An intriguing message of the Schleifer and Vishny paradigm is that corruption may be more of a deterrent to commerce and investment where government agents collect less total bribe revenue. The implication is that true costliness of corruption lies as much or more so in the uncertainty it creates for firms than in the financial burden it imposes on them. Bribes paid to organized corruption networks are akin to taxes, costly but predictable, whereas bribes paid in disorganized networks are smaller but nevertheless debilitating in the uncertainty that surrounds them.

If the Schleifer and Vishny characterization is accurate, one would expect larger total bribes payments by a firm to be associated with higher levels of perceived certainty and efficacy surrounding the corruption network and vice versa. We investigate this hypothesized relationship by using as the dependent variable a survey question that asks managers to estimate the percentage of their firm's annual revenues typically paid in bribes or the percentage of a government contract's value paid as a bribe.[9]

Recall that we have transformed the 'bribe size' variables by grouping the data into intervals, so as to make the answers comparable across regions. Therefore, while the

[9] Kaufmann (2000) explains why in this survey instrument firms were asked to estimate bribes as a percent of annual revenues rather than profit; because there is less uniformity across countries regarding what counts as profit, revenues are generally easier to estimate and firms have an incentive to misreport profit estimates.

empirical model uses the same covariates as in equation (1), we estimate an interval regression model whose likelihood function is given by:

$$L = \sum_{i,j} \log\left[\phi\left(\frac{bsize_{ij}^{ub} - c - X\alpha - W\beta - Z\delta}{\sigma}\right) - \phi\left(\frac{bsize_{ij}^{lb} - c - X\alpha - W\beta - Z\delta}{\sigma}\right)\right] \quad (4)$$

Here $bsize_{ij}^{lb}$ and $bsize_{ij}^{ub}$ indicate the lower and upper bounds of bribery paid by the firm, respectively.

6 Estimation Results

6.1 Organized and Disorganized Corruption

Tables 1-5 and 1- 6 report the estimation results of the probit models, where the dependent variables are *corrup* and *correl*, respectively. For ease of comparison, we report the results of the OLS and 2SLS regressions together with the probit models and the APEs in these tables. As mentioned previously, given the large differences between the coding of responses for Eastern Europe and the other regions, we have stratified the sample into two groups, one comprises Eastern Europe and the other all other regions. We estimate the regressions separately for the two sub-samples. With some differences in the importance of individual factors, overall the results hold across the sub-samples. Because of the differences in conducting the surveys, the results will only be considered within a sub-sample and cannot be informative for comparative analysis of the two sub-samples.

Notice first that the *t*-statistic on the residuals in the RV second-stage regression indicates that we cannot reject the null that infrastructure is endogenous (Table 1-3). Also the first stage regression shows that the instrument is highly significant with a t-statistics of

2.99. Therefore, whereas we report the OLS and probit estimates as benchmarks, we focus our discussion on the IV estimations. These results suggest that the organization of the corruption network plays an important role in the perception managers have of corruption as an obstacle to the operation of the firm. In particular, the probability of corruption being reported as an obstacle (*corrup*) increases when the size of the unofficial payment is known in advance and when firms are expected to make multiple payments for the same service. The coefficients for these variables are positive and significant at the 5% level. Also the first stage regression shows that the instrument is highly significant with a t-statistics of 2.99. Therefore, whereas we report the OLS and probit estimates as benchmarks, we focus our discussion on the IV estimations. In line with our expectation, having recourse to another official that can provide the service without a bribe decreases this perception. The parameter estimate is significant at the 5% level with an APE of 0.016. That is, having recourse to an uncorrupt officer results in a 2 percentage point decline in the probability that a firm considers corruption a constraint to performance. Given that the average (median) response ranges from 0.05 (0.02) for OECD countries to 0.48 (0.04) for Eastern Europe, this effect is not negligible.

Similarly for Transition Europe, the structure of the corruption network matters for the perception of corruption being a constraint to firm performance. Advance knowledge of the required payment increases this perception with an APE of -0.052. Note for this particular case the negative effect implies a positive relationship because the responses for *corrupt* start from the lowest rating (corruption is a major constraint) to the highest rating (not an obstacle) whereas the explanatory variables are ordered in the opposite direction. Service delivery and recourse to an uncorrupt government agent also have a positive effect with APEs of 0.030 and 0.067, respectively, and are significant at the 5% level.

The results are much weaker for the belief that corruption is the single most important constraint to firm operations (*correl*), with only the possibility of getting correct treatment having a significant impact.

Consider now the effect of the corruption network on the pervasiveness of bribes (how common is it for firms to be required to make unofficial payment). The results suggest a strong effect of the corruption network, although the coefficients on service delivery and recourse to an uncorrupt official are only significant at the 10% level. Three main conclusions can be drawn from the estimation results presented in Table 1-7. First, the pervasiveness of unofficial payments is higher when the corruption network is organized. The probability that a manager will answer that bribes are common or always paid in her firm's line of business is significantly higher when the size of the payment is known in advance and when the service that is the object of the bribe is usually delivered as agreed after the payment is made. With respect to Eastern Europe, there is also evidence of the importance of the network organization with both advance knowledge of the size of the bribe and the likelihood of having to make multiple payments significant at 5%. The APEs are 0.053 and 0.045 for *advance* and *multpay*, respectively; thus suggesting increases of roughly 5 percentage points in the probability that a manager will respond that bribes are common in her line of business.

Across a wide range of countries and regions, firms seem more willing to pay bribes when the outcome of doing so is more predictable. This result supports numerous qualitative studies that have long suggested that corruption is a regular part of business in many countries and is indeed not unlike taxation. Second, the frequency of the bribes is lower in environments where the correct treatment can be obtained from a superior or another government official without recourse to bribes. This result suggests that investment

into creating effective avenues of recourse and monitoring systems might curtail the incidence of bribery and, indirectly, that bribery is more common where it is accepted and systemic rather than the result of individual opportunism. Third, as one would expect, the propensity of numerous officials demanding unofficial payments for the same service increases the frequency of bribes.

One important offering of the results shown in Table 1-7 is that the frequency of bribes can be large for very different reasons. Regular bribes can result from highly predictable environments or because multiple bribes are required in uncertain environments. Thus, knowing only that bribery is equally frequent in two countries does not allow one to meaningfully regard the two countries as equivalently or even similarly corrupt. However, our results do suggest meaningful differentiation among apparently similar corrupt environments and reveal the conditions that determine the frequency of bribery.

Other interesting tests concern how the frequency of bribes differs according to the service sector. These results are presented in Tables 1-10 to 1-17 and, though not as strong as the results in Table 1-7, the results of these regressions do provide statistical evidence that an organized corruption network is related to higher incidence of corrupt transactions. This relationship is significant for customs and trade officials, business licensing, judges and court, and tax agency inspectors. This finding is in line with those of other studies. In particular, Svensson (2002) using survey data on Ugandan firms finds that those firms that deal with government officials typically paid bribes while those firms that operate in sectors with no contact with the public sectors paid no bribes. Further, these results are generally consistent across both sub-samples. Both the 2SLS regression coefficients and the APEs suggest that economically, advance knowledge of the size of the bribe and the expectation of multiple payments for the same service tend to be more important across sectors than

service delivery and service without bribery (*nobribe*). The two have APEs of 0.05 and 0.03 respectively compared to APEs of around 0.01 for the other two measures of corruption organization.

Tables 1-8 and 1-9 show the effect of the corruption network and the perceived quality of public services on the total size of bribes. In fact, for both Eastern European firms and the other regions, the results show that the percentage of a firm's revenues spent on bribes is indeed higher the more organized the network of corruption into which bribes are paid. That is, firms are willing to commit a larger portion of their revenues to unofficial payments when the size of the payment is known in advance. On the other hand, the opportunity to obtain the service from another government official without recourse to bribes reduces the size of the latter.

Overall, our estimation results provide evidence in support of the hypothesis that organized corruption networks are associated with a higher incidence of corruption, measured in terms of frequency of unofficial payments and the size of bribes (i.e. percentage of the revenues and percentage of the contract). In other words, firms are willing to pay more in total bribes and more frequently pay bribes the higher the certainty regarding the efficiency of and return from participating in the corruption network.

B. Quality of Public Services and their Effect on Corruption

Apart from the relationship between the size of bribes and the nature of corruption networks we consider how some firm and environmental features influence the size and regularity of bribes. This general line of inquiry has been substantially advanced in recent years. Using country-level indices of corruption Ades and DiTella (1999) find that corruption is higher in less open economies and where the supply of bribers is small relative to available rents. Similarly, Treisman (2000) finds that openness to trade lowers measured

corruption as do a host of legal and historical factors: the degree of federal control, tenure as a democracy, the proportion of Protestants. Another, perhaps more intriguing aspect of corruption is its effect on the environment where firms operate. Mauro (1999) finds that corruption skews public investment away from education and health-related investments towards larger infrastructure projects where kickoffs are larger and easier to obtain. Tanzi and Davoodi (1997) find that corruption reduces maintenance and operational expenditures on infrastructure, raises expenditures on new equipment, reduces the productivity of public investments, and crowds out private investment.

It is not so surprising to find that corruption and poorly maintained public infrastructure go hand in hand as it is well known that developing countries often exhibit high levels of corruption (Mauro 1995), strained public sector budgets, and low quality infrastructures. But weak infrastructures also provide opportunities for corrupt officials to extract bribes from firms competing for the timely provision of infrastructure services. Like customs officers, agents who control access to infrastructure services have regular opportunities to impose costs on firms that do not pay bribes. Indeed, Gaviria (2000) finds that bribes related to public infrastructure services (e.g. telephone and power companies) are among the most commonly reported category of bribes in Latin American countries. Thus, it seems reasonable to suggest that corruption both arises from the opportunities created by weak infrastructures and retards efforts to improve them, thereby creating a vicious cycle of corruption and poor quality infrastructure. We consider one half of this circular relationship by analyzing how firm's perceptions of the quality of various public services influence the amount of bribe they pay.

In order to study this relationship we include the perception of the managers regarding the quality of various public services as additional explanatory variables in the

aforementioned empirical model. The results presented in Tables 1-5 to 1-17 allow us to draw some interesting conclusions. First, the results show that the quality of public services matter in a non-negligible way for the perception of corruption as a constraint to firm operations, the proportion of revenue that firms pay to get things done and the perception of corruption as the single most important obstacle. These results suggest that the incidence of corruption could be reduced with investment directed at increasing access to public services, improving the quality of institutions (such as better monitoring, e.g., security) and improving the efficacy of the judiciary system. For example, the results suggest that corrupt officials would request and engage in fewer corrupt transactions if they faced a higher risk of being caught and punished for doing so.

The results presented in Tables 1-5 and 1-6 show that, for regions other than Eastern Europe, all measures of the quality of public services have a significant impact on the probability that corruption will be an obstacle as well as on the likelihood that corruption will be considered as the single most important constraint. The impacts are also economically significant as shown by the APEs that range from 0.031 for the quality of the judiciary systems to 0.364 for the quality of infrastructure. For Eastern Europe only the quality of customs services and judiciary systems matter. Contrarily the results for Eastern Europe are very strong for prevalence of bribery. With the exception of the quality of customs, all other measures of public services have an impact that is significant at 5% with APEs ranging from 0.035 for security to 0.085 for the quality of infrastructure. Only the quality of custom services is significant in the case of all other regions.

The one aspect of this category that is at first puzzling is the impact of physical infrastructure. Our hypothesis is that a higher perception of the quality of facilities would be associated with lower perceptions of corruption. Our results, however, suggest otherwise.

For all other regions, the coefficients on infrastructure are positive, highly significant and economically sizeable with APEs in excess of 0.250 for *corrup* and *correl.* For Eastern Europe, the impact of the quality of infrastructure on the pervasiveness of corruption is also positive but relatively lower at an APE of 0.085 which is still not at all a small impact. The question of interest is whether this positive impact of infrastructure on firms' cost structures leads us to conclude that improvements in the quality of physical infrastructure necessarily increase corruption. This is clearly counter-intuitive. We offer an alternative explanation for the somewhat "perverse" results. The estimations could be picking up some non-linearities we had not accounted for. Consider a situation where the quality of infrastructure is so poor that even the payment of a bribe would not improve access to the service. In a situation like this, it is possible that firms would not be willing to make unofficial payments as the agents would not be able to deliver. However, as the quality of infrastructure improves, ability to deliver also improves, thus making it more worthwhile for service users to grease palms, up to some threshold beyond which impediments to access become so few as to negate the need to bribe. The results for the tests of non-linearities presented in Table 1-18 show evidence of the existence of such non-linearities. For regions other than Eastern Europe, the coefficients on both the linear and the quadratic terms for *corrup* and *correl* are significant at the 5%. In both cases the level term has a positive effect and the quadratic term a negative impact. Noteworthy is the fact that the inclusion of the quadratic term wipes out the impact of the other operational environment indicators. This in essence captures both the strong correlation between the measures of the operational environment and the dominance of infrastructure within this class of indicators. However, jointly the measures are significant at the 5% level. For Eastern European firms, the non-linearity exists for *brbpay* but not for *corrup* with both the level and quadratic terms significant at the 5% level. The possibility of

this relationship suggests that country strategies for growth should necessarily include investment in infrastructure as a way of ultimately doing away with the need to resort to making unofficial payments.

The results in Tables 1-8 and 1-9 indicate that the quality of public services matter for the size of the bribes. In particular higher perceptions of the quality of customs and security reduce the size of the bribes with coefficients that are significant at the 5% level and also economically significant at 0.277 and 0.327, respectively.

C. Corruption and Firm Characteristics

We briefly examine three other relationships between firms and bribes: the influence of national origin, firm size and sectoral affiliation. For many years multinational firms have sought ways to limit their exposure to corrupt practices through the use of internal codes of conduct and participation in anti-corruption campaigns.[10] Whether solely through internal governance or in conjunction with multilateral agencies like the OECD, multinational firms have struggled, often unsuccessfully, to avoid participation in corrupt transactions and their ill effects (Gordon and Miyake 2001). Still, there are good reasons to believe that foreign firms have different experiences with corruption than domestic firms do. Large US multinationals report that their 'zero-tolerance' policies on corruption are costly but work well after a period of just a few years (Gordon and Miyake 2001). Nevertheless, some firms have decidedly opposite experiences with their foreign operations. Presumably because foreign firms are often cash-rich, naïve regarding local customs, or have less recourse to domestic courts, they suffer from a 'liability of foreignness' and are confronted with more corruption than their domestic counterparts (Brewer 1997). Hellman, Jones and Kaufmann

[10] Surely multinational firms have also sought to initiate and profit from corrupt transactions. However, there is ample evidence to suggest that most multinationals believe the costs of corruption to be far greater than any potential benefits.

(2002) find that the prevalence of foreign firms to engage in corruption depends on the type of corruption and the pervasiveness of corruption in host countries. Specifically where kickbacks for procurement are uncommon, foreign firms are more likely to engage in this type of corruption than domestic firms, whereas in countries with significant state capture,[11] the propensity of foreign firms to pay the relevant bribes almost doubles. However, in terms of the level of bribes, both foreign and domestic firms pay similar percentages of their revenues, on average. In the absence of a deterministic model we cannot and do not claim strong support for one relationship or the other but rather empirically test whether the amount that foreign firms' pay is meaningfully different from that paid by domestic firms.

The two remaining hypotheses are straightforward and simple. Compared to small firms, large firms more frequently possess influence with local authorities and are more individually important to the local economy. Consequently, large firms are thought to be less vulnerable to the exploitative demands of corrupt officials.[12] Moreover, to the extent that bribes are rather uniform in size, or that there is an equilibrium bribe rate across all firms, they will constitute a smaller proportion of the revenues of large companies. This reasoning suggests that bribes should rise less than proportionately with firm size. Another possibility is along the finding of Svensson (2003) that the size of the bribe is correlated with firms' ability to pay. Assuming that larger firms have a higher ability to pay then it will be the case that these firms pay more in bribes than smaller firms. Thus, depending on the effect that dominates, the impact could be positive or negative.

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[11] State capture refers to bribes that firms pay to government officials with the specific objective of influencing laws, regulations and policies of the government to their own advantage.

[12] Svensson (2003) finds that existence of outside options increased firms' refusal power but higher ability to pay captured by current and future profitability increased the likelihood of being targeted by officials and the likelihood that they will pay the bribe. Note this depends on an assumption that officials can correctly assess the profitability.

Lastly, there is reason to believe that being either a manufacturing or service firm might have a bearing on how vulnerable the firm is to bribery demands, but a priori it is not clear which sector should be more exposed. Valid arguments can be made for either sector being more susceptible to corruption. For instance, some service industries can be more exposed to corruption through their use of physical infrastructure and also their being subject to inspections. A case in point is the hotel industry and other hospitality services. Availability of telephone, water and electricity services is absolutely critical for firms in this industry to function. Moreover, by their association with the public, it is easy to subject them to numerous inspections, legitimate and otherwise. Anecdotal and statistical evidence suggest that officials prefer to prey on hotels and restaurants and on service firms than manufacturing firms, Kuncoro (2006). On the other hand, Safavian and Graham (2000) postulate that manufacturing firms' production is more visible which increases their vulnerability to regulatory authorities as they have more difficulty hiding their output and sales making it easy for corrupt officials to assess their ability to meet bribe demands. Also, manufacturers' input and outputs more often require the approval of customs officials, their energy and infrastructure demands are higher, and their operations are more easily and expensively interrupted (e.g. specific assets like manufacturing facilities are irreplaceable in the short run).

The results reported in the bottom rows of the tables suggest that firm size matters for the size of bribes (measured as a percentage of revenue), but not for firms' perceptions of corruption as an obstacle. Specifically, being a medium firm increases the size of bribes, possibly reflecting the fact that these firms have a higher ability to pay than small firms rather than their being susceptible to being targeted for bribes. Manufacturing firms pay a lower percentage of their revenues in bribes.

Finally, foreign ownership matters only for the size of the bribe and the perception of corruption as a constraint, which is higher for foreign firms but only at a 10% significance level for regions other than Eastern Europe. The positive impact on perception of corruption can however be the result of different levels of tolerance. Arguments have been made that foreign firms - particularly when they originate from the first world - tend to be less tolerant of corrupt practices than domestic firms and as such could reasonably be expected to have higher perceptions of the incidence and pervasiveness of corruption.

7 Conclusions

We began this paper by asking a question that could not have been addressed just a few years ago: how does the nature of corruption influence its costliness to firms? Country-level indices suggest that corruption imposes a degree of burden on economic activity but, by their very nature they cannot describe the determinants of firms' experience with corruption in a given regime. In the absence of the finer details of corrupt transactions we are unable to characterize differences among countries measured as equally corrupt or even to be precise about what it means to say that one country is more corrupt than another country. The firm-level data employed in this study offers a valuable opportunity to expand our understanding of the variety of corruption regimes and the characteristics that mediate firm's experiences within them.

Our most general finding is straightforward and robust. Across a broad sample of firms in a diverse group of economies we find strong evidence that the nature of corruption does influence its costliness to firms: predictable and effectual corruption regimes increase the frequency of bribery and the total monetary cost of corruption to firms. Specifically, the probability that a manager will report that bribes are frequently paid in his firm's line of business is significantly higher when the size of the payment is known in advance and when

the service that is the object of the bribe is usually delivered as agreed after the payment is made.

Similarly, we find that the monetary costliness of bribes rises with the predictability of the corrupt regime. This is true whether the total monetary cost of bribery is measured as a percentage of firm revenues or as a percentage of the value of a government contract. These results support the general message of Schleifer and Vishny (1993) that organized corruption regimes are able to extract more bribe revenues than disorganized regimes. Moreover, the results suggest that, in and of themselves, high measured levels of bribery may overstate the burden placed upon firms since high levels of bribery go hand in hand with highly predictable and effectual corruption regimes. The lack of a coordinated network of government agents will also increase bribe frequency. We find that bribery is more frequent where multiple officials must be bribed for the receipt of the same service. This result does not imply that total bribes are higher, only that, like predictability, the inefficacy of a single bribe raises bribe frequency. Not surprisingly, we also find that both the frequency and total amount of bribe payments fall when there is effective recourse to the superiors of corrupt government agents. Thus, the monetary costliness of corruption is assailable through effective monitoring.

In addition to examining the influences of the organization structure of corruption, our analysis suggests that inadequate or ineffective government expenditures increase the cost of corruption to firms. Low infrastructure quality raises both the frequency of bribery and the total amount firms spend on bribes. This result implies that investment into infrastructure could decrease the costliness of bribery and, in conjunction with the Tanzi and Davoodi (1997) relationship, that there may be a circular relationship between bribery and

infrastructure quality: corruption leads to lower investment into infrastructure which increases the opportunities for bribery and cost of corruption to firms.

Finally, we find some evidence that, all else equal, foreign firms pay slightly less in total bribes than domestic firms do but seem to more frequently pay bribes to various public service agencies. In addition, manufacturing firms appear to pay less and larger firms more in total bribes (as a percentage of revenue) than non-manufacturers and smaller firms do. With regard to paying bribes to government officials, manufacturers appear to pay bribes more frequently than non-manufacturers do and smaller firms appear to pay bribes less frequently than larger firms do.

With the continued examination of corruption in its many natures we are sure to learn much more about the diversity of corrupt regimes throughout the world and how better to combat them. Our efforts here have provided a step forward in describing firms' experiences with bribery within such variegated environments. More research on ever finer and more detailed data is needed to understand how best to design governmental and firm level policies so as to ease the burden of corruption on firms, peoples and economic development.

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Table 1-1

SELECTED SUMMARY STATISTICS

	Asia	O.E.C.D. (Excl. Mexico)	Transition Europe	Latin America & Caribbean
Magnitude known in advance (*advance*)				
Always or Mostly	28.8	14.5	10.8	18.2
Average response	3.4	2.8	3.6	2.8
Service delivered as agreed (*serdel*)				
Always or Mostly	25.1	39.7	9.4	47.6
Average response	3.2	4	2.6	4.2
Additional payments required				
Always or Mostly	16.6	10	41.1	17.6
Average response	2.9	2.1	4.1	2.7
Can go to another official to get service without paying bribe				
Always or Mostly	36.6	35.9	40.7	23.1
Average response	3.7	3.3	3.9	2.9
Corruption as an obstacle to the operation of the firm				
Always or Mostly	20.7	16.5	45.2	56.4
Average response	2.3	1.6	2.4	2.8
Corruption as the main single obstacle to the operation of the firm				
Average response	1.6	1.9	n.a.	3.9
Common to pay additional payments (*freq*)				
Always or Mostly	20.5	4.8	48	16.6
Average response	3	1.9	4.3	2.6
Percentage of revenues paid in bribes				
10% or more	12.5	1.7	15.1	7.1
Average response	2.6	1.3	3.2	1.9
Percentage of the contract paid				
More than 15%	4	1.2	27.8	2.5
Average response	2.1	1.2	3.4	1.4
Frequency of bribes - Mean				
Power Company	0.2	0.2	n.a.	0.5
Telephone Company	0.2	0.1	5.4	0.5
Business Licensing	0.8	0.2	5.1	0.5
Tax Agency Inspectors	0.6	0.1	5.3	0.7
Government Procurement	0.2	0.1	5.6	0.4
Customs and Trade	1.9	0.1	5.7	1.3
Judges or Court Officials	0.1	0	5.6	0.3
Politicians	0.2	0.2	5.9	0.3

Table 1-2
Selected Correlations

	advance	serdel	addpay	nobrib	corrup	correl	freq	electr	teleph	buslic	taxins
advance	1										
serdel	0.3326	1									
addpay	0.2773	0.1218	1								
nobrib	0.0429	0.2138	0.0849	1							
corrup	0.0851	0.0047	0.1498	-0.137	1						
correl	0.0453	0.0259	0.0223	0.0695	0.1644	1					
freq	0.3701	0.248	0.2875	-0.0182	0.1928	0.0822	1				
electr	0.0741	0.0416	0.1175	-0.0047	0.0801	0.0259	0.1354	1			
teleph	0.0302	0.079	0.0589	0.0623	0.0076	-0.0322	0.1012	0.374	1		
buslic	0.0968	0.0311	0.0979	0.0064	-0.0068	0.0096	0.0901	0.0344	0.0158	1	
taxins	0.0377	0.0746	0.1368	-0.0486	0.084	-0.0164	0.1022	0.124	0.032	0.3566	1
govpro	0.0610	0.0603	0.0903	-0.0031	0.0851	0.0016	0.1366	0.0518	0.1759	0.3184	0.2848
custom	0.1710	0.1531	0.11	-0.0215	0.0513	0.058	0.2257	0.1051	0.069	0.1999	0.1295
judges	0.0482	0.0197	0.0846	0.0006	0.0754	-0.0206	0.0761	0.0324	0.0159	0.0397	0.0212
polit	0.0346	0.0338	0.0793	-0.017	0.043	0.0647	0.0443	0.0299	-0.0014	0.2668	0.4003
bribrev	0.2049	0.1338	0.1948	-0.0554	0.1984	0.0576	0.2595	0.0988	0.0245	0.1525	0.1789
bribcon	0.1658	0.0499	0.1782	-0.0854	0.2098	0.0318	0.2359	0.0478	0.0423	0.0655	0.0495

Table 1-2 continued

Selected Correlations						
	govpro	custom	judges	polit	bribrev	bribcon
govpro	1					
custom	0.1443	1				
judges	0.0742	0.0136	1			
polit	0.2898	0.0947	0.2477	1		
bribrev	0.1923	0.1435	0.1073	0.1664	1	
bribcon	0.1461	0.0942	0.1296	0.0866	0.4034	1

advance: magnitude of payment known in advance
serdel: service delivered as agreed after payment of bribe
addpay: additional payment required after payment of bribe
nobrib: can go to another official to get service without payment of bribe
corrup: corruption as major or moderate obstacle to growth
correl: corruption is the single most important obstacle relative to other obstacles
freq: common to pay bribes in this line of business
electr: bribe required by electricity company
teleph: bribe required by telephone company
buslic: bribe required by business licensing agency
taxins: bribe required by tax inspectors
govpro: bribe required by government procurement agents
custom: bribe required by customs or trade licensing officials
judges: bribe required by judges or courts officials
polit: bribe required by politicians
bribrev: percentage of revenue paid as bribe
bribcon: percentage of contract paid to government to secure the contract

Table 1-3

First-Stage Rivers and Vuong Regressions

	Coefficient	SE
Instrumental Variable		
Q44b_p	-0.619	0.207**
Exogenous Explanatory Variables		
Advance Knowledge	-0.014	0.022
Service Delivery	0.008	0.021
Multiple Payments	-0.038	0.016**
Recourse to Uncorrupt Officer	0.006	0.015
Quality of Customs Services	0.148	0.027**
Quality of Judiciary Systems	0.045	0.03
Security	0.246	0.028**
Manufacturing	-0.064	0.043
Small	0.133	0.067*
Medium	0.008	0.065
Government Ownership	0.082	0.112
Foreign Ownership	-0.032	0.064
Age	0.002	0.001**
Number of Observations	717	
R-squared	0.35	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-4

Second-Stage Rivers and Vuong Regressions (Test for Exogeneity)

	brbpay		corrup	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.283**	0.055	0.189**	0.040
Service Delivery	0.122**	0.058	-0.018	0.043
Multiple Payments	0.170**	0.051	0.167**	0.054
Recourse to Uncorrupt Officer	-0.131**	0.049	-0.099**	0.033
Public Services				
Quality of Customs Services	-0.261	0.185	-0.274**	0.130
Quality of Judiciary Systems	0.004	0.069	-0.189**	0.054
Quality of Infrastructure	0.924	1.085	2.218**	0.749
Security	-0.197	0.267	-0.623**	0.194
Firm Specific Characteristics				
Manufacturing	0.108	0.144	0.187	0.116
Small	-0.165	0.237	-0.27	0.197
Medium	-0.034	0.161	0.032	0.155
Government Ownership	-0.434	0.402	-0.655**	0.302
Foreign Ownership	-0.092	0.213	0.349**	0.144
Age	-0.006	0.004	-0.003	0.003
Residuals	-1.064	1.087	-2.254**	0.764
Observations	706		700	

Table 1-4 continued

	correl	
	Coefficient	SE
Corruption Regime		
Advance Knowledge	0.115*	0.064
Service Delivery	-0.16**	0.067
Multiple Payments	0.051	0.088
Recourse to Uncorrupt Officer	0.269**	0.061
Public Services		
Quality of Customs Services	-0.569**	0.241
Quality of Judiciary Systems	-0.207**	0.102
Quality of Infrastructure	3.176**	1.367
Security	-0.692*	0.368
Firm Specific Characteristics		
Manufacturing	0.139	0.207
Small	-0.785**	0.286
Medium	-0.509**	0.184
Government Ownership	-0.788**	0.464
Foreign Ownership	-0.199	0.244
Age	0.004	0.005
Residuals	-3.116**	1.365
Observations	573	

Table1-5

Effect of the Organization of the Corruption Network on Firm Costs

Dependent Variable: Corruption as a Constraint to Firm Operations

	All Other Regions								
	OLS		2SLS		Probit		IV-Probit (MLE)		
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	APE
Corruption Regime									
Advance Knowledge	0.048***	0.012	0.058**	0.019	0.141**	0.04	0.110**	0.048	0.032
Service Delivery	-0.001	0.013	-0.008	0.019	0.005	0.041	-0.012	0.035	-0.004
Multiple Payments	0.026**	0.012	0.054**	0.023	0.073*	0.04	0.100**	0.033	0.029
Recourse to Uncorrupt Officer	-0.026**	0.011	-0.028	0.019	-0.076**	0.035	-0.055*	0.032	-0.016
Public Services									
Quality of Customs Services	0.019	0.017	-0.087	0.059	0.047	0.054	-0.156**	0.066	-0.045
Quality of Judiciary Systems	-0.027	0.017	-0.058**	0.029	-0.092*	0.051	-0.108**	0.038	-0.031
Quality of Infrastructure	-0.003	0.023	0.705*	0.365	-0.049	0.08	1.260**	0.244	0.364
Security	-0.022	0.017	-0.197**	0.094	-0.068	0.049	-0.354**	0.061	-0.102
Firm Specific Characteristics									
Manufacturing	0.006	0.033	0.055	0.058	0.034	0.1	0.101	0.079	0.029
Small	0.007	0.057	-0.098	0.092	0.053	0.166	-0.159	0.13	-0.046
Medium	0	0.049	0.001	0.068	-0.046	0.142	0.014	0.114	0.004
Government Ownership	-0.136	0.086	-0.231	0.161	-0.344	0.271	-0.402**	0.196	-0.119
Foreign Ownership	0.077*	0.043	0.111*	0.066	0.169	0.14	0.211*	0.117	0.060
Age	0	0.001	-0.001	0.001	0.002	0.003	-0.001	0.002	-0.0004
Number of Observations	711		711		711		711		
Clusters					81		81		
R-squared	0.22								
Log Likelihood					-434.39		-1061.63		
Likelihood Ratio Test					165.2		388.96		

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table1-5 cont.

Effect of the Organization of the Corruption Network on Firm Costs

Dependent Variable: Corruption as a Constraint to Firm Operations

	Eastern Europe								
	OLS		2SLS		Probit		IV-Probit (MLE)		
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	APE
Corruption Regime									
Advance Knowledge	-0.056	0.034	-0.056**	0.012	0.141**	0.04	0.110**	0.048	-0.052
Service Delivery	0.03	0.025	0.030**	0.013	0.005	0.041	-0.012	0.035	0.030
Multiple Payments	-0.022	0.018	-0.021	0.016	0.073*	0.04	0.100**	0.033	-0.019
Recourse to Uncorrupt Officer	0.071**	0.033	0.072**	0.013	-0.076**	0.035	-0.055*	0.032	0.067
Public Services									
Quality of Customs Services	-0.063**	0.03	-0.062**	0.015	0.047	0.054	-0.156**	0.066	-0.057
Quality of Judiciary Systems	0.052*	0.026	0.049**	0.023	-0.092*	0.051	-0.108**	0.038	0.046
Quality of Infrastructure	0.05	0.04	0.07	0.128	-0.049	0.08	1.260**	0.244	0.085
Security	-0.027	0.047	-0.032	0.036	-0.068	0.049	-0.354**	0.061	-0.035
Firm Specific Characteristics									
Manufacturing	0.001	0.062	-0.002	0.039	0.034	0.1	0.101	0.079	-0.005
Small	0.116	0.141	0.115	0.073	0.053	0.166	-0.159	0.13	0.094
Medium	0.005	0.109	0.004	0.064	-0.046	0.142	0.014	0.114	-0.007
Government Ownership	0.018	0.082	0.017	0.05	-0.344	0.271	-0.402**	0.196	0.007
Foreign Ownership	-0.177*	0.102	-0.177**	0.071	0.169	0.14	0.211*	0.117	-0.170
Age	0.002	0.004	0.002*	0.001	0.002	0.003	-0.001	0.002	0.002
Number of Observations	832		832		832		832		
Clusters					81		81		
R-squared	0.24		0.24						
Log Likelihood					-434.39		-1061.63		
Likelihood Ratio Test					165.2		388.96		

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-7

Relationship Between Firm Cost and the Organization of the Corruption Network

Dependent Variable: How Common are Bribes for Getting Things Done?

	All Other Regions								
	OLS		2SLS		Probit		IV-Probit (MLE)		
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	APE
Corruption Regime									
Advance Knowledge	0.075**	0.015	0.079**	0.013	0.264**	0.053	0.234**	0.08	0.062
Service Delivery	0.034**	0.016	0.032**	0.013	0.123**	0.06	0.101*	0.061	0.027
Multiple Payments	0.034**	0.011	0.044**	0.015	0.131**	0.036	0.141**	0.035	0.037
Recourse to Uncorrupt Officer	-0.029**	0.013	-0.030**	0.013	-0.116**	0.049	-0.109**	0.057	-0.029
Public Services									
Quality of Customs Services	-0.028	0.018	-0.067*	0.041	-0.111*	0.065	-0.216**	0.084	-0.057
Quality of Judiciary Systems	0.01	0.017	-0.002	0.02	0.039	0.058	0.004	0.063	0.001
Quality of Infrastructure	-0.031	0.029	0.229	0.251	-0.135	0.101	0.764	0.606	0.203
Security	0.015	0.018	-0.05	0.065	0.081	0.064	-0.163	0.168	-0.043
Firm Specific Characteristics									
Manufacturing	0.01	0.032	0.029	0.04	0.037	0.124	0.089	0.107	0.024
Small	-0.005	0.05	-0.043	0.062	-0.004	0.184	-0.136	0.178	-0.036
Medium	-0.008	0.042	-0.007	0.046	-0.022	0.16	-0.028	0.145	-0.007
Government Ownership	-0.036	0.081	-0.065	0.108	-0.278	0.385	-0.359	0.365	-0.088
Foreign Ownership	-0.024	0.05	-0.014	0.044	-0.151	0.215	-0.076	0.186	-0.020
Age	-0.001	0.001	-0.001	0.001	-0.004	0.004	-0.005	0.003	-0.001
Number of Observations	717		717		717		717		
Clusters							81		
R-square	0.21		0.06						
Log Likelihood					-333.05		-1021.82		
Wald Chi2					183.41				

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-7 cont.

Relationship Between Firm Cost and the Organization of the Corruption Network

Dependent Variable: How Common are Bribes for Getting Things Done?

	Eastern Europe								
	OLS		2SLS		Probit		IV-Probit (MLE)		
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	APE
Corruption Regime									
Advance Knowledge	0.080**	0.010	0.080**	0.014	0.264**	0.053	0.222**	0.05	0.053
Service Delivery	0.014	0.010	0.012	0.016	0.123**	0.06	0.027	0.037	0.006
Multiple Payments	0.046**	0.011	0.081**	0.018	0.131**	0.036	0.190**	0.044	0.045
Recourse to Uncorrupt Officer	-0.004		-0.001	0.014	-0.116**	0.049	-0.003	0.035	-0.001
Public Services									
Quality of Customs Services	-0.029**	0.010	-0.019	0.018	-0.111*	0.065	-0.095*	0.049	-0.022
Quality of Judiciary Systems	-0.014	0.012	-0.111**	0.028	0.039	0.058	1.325**	0.105	-0.052
Quality of Infrastructure	0.004	0.020	0.676**	0.142	-0.135	0.101	-0.218**	0.048	0.314
Security	0.019	0.012	-0.119**	0.035	0.081	0.064	-0.200**	0.059	-0.047
Firm Specific Characteristics									
Manufacturing	0.071**	0.026	0.010	0.045	0.037	0.124	0.076	0.113	0.018
Small	0.020	0.059	0.012	0.086	-0.004	0.184	0.087	0.204	0.021
Medium	0.012	0.050	0.003	0.076	-0.022	0.16	0.07	0.18	0.017
Government Ownership	0.007	0.039	-0.028	0.060	-0.278	0.385	-0.112	0.137	-0.026
Foreign Ownership	-0.010	0.062	0.026	0.086	-0.151	0.215	0.057	0.189	0.014
Age	-0.001	0.001	0	0.001	-0.004	0.004	0.002	0.003	0.0004
Number of Observations	861		861		861		861		
Clusters					81		81		
R-square	0.27								
Log Likelihood					-333.05		-1021.82		
Wald Chi2					183.41				

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-8

Impact of Corruption Network Organization on Cost to Firms

Dependent Variable: Size of the Bribe (Percentage of Contract Value)

	All Other Regions			
	OLS		Interval	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.048	0.031	0.188	0.127
Service Delivery	0.04	0.025	0.137	0.107
Multiple Payments	0.062	0.041	0.252	0.173
Recourse to Uncorrupt Officer	-0.033	0.035	-0.16	0.149
Public Services				
Quality of Customs Services	-0.118**	0.048	-0.483**	0.204
Quality of Judiciary Systems	-0.082	0.054	-0.357	0.234
Quality of Infrastructure	0.049	0.074	0.152	0.316
Security	-0.072	0.05	-0.307	0.214
Firm Specific Characteristics				
Manufacturing	-0.161	0.105	-0.721	0.439
Small	0.077	0.137	0.37	0.572
Medium	0.148	0.119	0.704	0.499
Government Ownership	-0.292	0.208	-1.602**	0.798
Foreign Ownership	-0.189	0.157	-0.714	0.658
Age	-0.003	0.002	-0.011	0.008
Number of Observations	575		574	
Clusters	80		80	
R-squared	0.18			
Log Likelihood			-1435.49	
Wald Chi2			1303.86	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-8 cont.

Impact of Corruption Network Organization on Cost to Firms

Dependent Variable: Size of the Bribe (Percentage of Contract Value)

	Eastern Europe			
	OLS		Interval	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	-0.055	0.036	-0.272*	0.164
Service Delivery	0.005	0.036	0.061	0.164
Multiple Payments	-0.065*	0.039	-0.215	0.177
Recourse to Uncorrupt Officer	0.089**	0.034	0.453**	0.157
Public Services				
Quality of Customs Services	-0.117**	0.041	-0.509**	0.189
Quality of Judiciary Systems	0.086*	0.046	0.438**	0.209
Quality of Infrastructure	0.056	0.066	0.357	0.302
Security	0.079	0.052	0.374	0.237
Firm Specific Characteristics				
Manufacturing	-0.108	0.099	-0.651	0.453
Small	0.566**	0.194	2.455**	0.892
Medium	0.537**	0.168	2.132**	0.77
Government Ownership	0.04	0.139	0.565	0.64
Foreign Ownership	-0.195	0.185	-0.674	0.847
Age	0.005*	0.003	0.021*	0.012
Number of Observations	533		533	
Clusters	80		80	
R-squared	0.25			
Log Likelihood			-882.771	
Wald Chi2			1303.86	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-9

Impact of Corruption Network Organization on Cost to Firms

Dependent Variable: Size of the Bribe (Percentage of Firm Revenue)

	All Other Regions			
	OLS		Interval	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.086**	0.037	0.263**	0.094
Service Delivery	0.189	0.132	0.132**	0.047
Multiple Payments	0.071	0.044	0.151	0.11
Recourse to Uncorrupt Officer	-0.038	0.041	-0.103	0.113
Public Services				
Quality of Customs Services	-0.139**	0.046	-0.277**	0.130
Quality of Judiciary Systems	-0.006	0.049	-0.080	0.142
Quality of Infrastructure	-0.038	0.071	-0.074	0.210
Security	-0.124**	0.060	-0.327**	0.160
Firm Specific Characteristics				
Manufacturing	-0.144	0.099	-0.661**	0.253
Small	0.125	0.161	0.167	0.404
Medium	0.397**	0.124	0.980**	0.348
Government Ownership	-0.302	0.284	-0.613	0.520
Foreign Ownership	-0.128	0.156	-0.650*	0.395
Age	0	0.003	0	0.007
Number of Observations	625		625	
Clusters	82		82	
R-squared	0.3			
Log Likelihood			-1367.46	
Wald Chi2			2177.51	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-9 cont.

Impact of Corruption Network Organization on Cost to Firms

Dependent Variable: Size of the Bribe (Percentage of Firm Revenue)

	Eastern Europe			
	OLS		Interval	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.086**	0.037	-0.481**	0.110
Service Delivery	0.189	0.132	-0.678**	0.127
Multiple Payments	0.071	0.044	0.345**	0.125
Recourse to Uncorrupt Officer	-0.038	0.041	0.489**	0.112
Public Services				
Quality of Customs Services	-0.139**	0.046	-0.144	0.140
Quality of Judiciary Systems	-0.006	0.049	0.065	0.155
Quality of Infrastructure	-0.038	0.071	-0.261	0.214
Security	-0.124**	0.06	0.988**	0.158
Firm Specific Characteristics				
Manufacturing	-0.144	0.099	-0.163	0.322
Small	0.125	0.161	1.494**	0.655
Medium	0.397**	0.124	0.416	0.578
Government Ownership	-0.302	0.284	0.619	0.473
Foreign Ownership	-0.128	0.156	0.853	0.661
Age	0	0.003	0.001	0.010
Number of Observations	625		625	
Clusters	82		82	
R-squared	0.3			
Log Likelihood			-1367.46	
Wald Chi2			2177.51	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-10

Organization of the Corruption Network

Frequency of Additional Payments: Electric Power Company

	All Other Regions	
	Coefficient	SE
Corruption Regime		
Advance Knowledge	-0.037	0.087
Service Delivery	-0.127	0.081
Multiple Payments	0.158**	0.080
Recourse to Uncorrupt Officer	-0.039	0.071
Public Services		
Quality of Customs Services	-0.171	0.106
Quality of Judiciary Systems	0.095	0.083
Quality of Infrastructure	-0.040	0.136
Security	-0.128	0.145
Firm Specific Characteristics		
Manufacturing	-0.304	0.262
Small	0.040	0.454
Medium	0.547	0.371
Government Ownership	-1.870*	1.125
Foreign Ownership	0.453	0.446
Age	-0.010	0.008
Number of Observations	686	
Clusters	82	
Log Likelihood	-597.59	
Wald Chi2	294.15	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-11

Organization of the Corruption Network

Frequency of Additional Payments: Telephone Personnel

	Other Regions		Eastern Europe	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	-0.039	0.074	0.026	0.017
Service Delivery	0.135	0.168	0.023**	0.011
Multiple Payments	0.002	0.171	0.003	0.010
Recourse to Uncorrupt Officer	0.292	0.181	0.002	0.014
Public Services				
Quality of Customs Services	0.05	0.148	0.041**	0.015
Quality of Judiciary Systems	-0.131	0.124	-0.010	0.017
Quality of Infrastructure	-0.13	0.244	-0.067**	0.014
Security	0.124	0.276	-0.040**	0.018
Firm Specific Characteristics				
Manufacturing	-0.442	0.356	-0.022	0.023
Small	0.92	0.616	-0.002	0.047
Medium	0.587	0.473	0.007	0.039
Government Ownership	0.52	0.822	0.093**	0.034
Foreign Ownership	0.21	0.406	0.054	0.036
Age	-0.012	0.01	0.001	0.001
Number of Observations	688		877	
Clusters	82		61	
Log Likelihood	-725.752		-1640.3	
Wald Chi2	9118.42		2141.69	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-12

Organization of the Corruption Network

Frequency of Additional Payments: Licensing Authorities

	No Transition Europe		Eastern Europe	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.200**	0.058	0.007	0.020
Service Delivery	0.005	0.085	0.029	0.019
Multiple Payments	0.117**	0.059	0.006	0.009
Recourse to Uncorrupt Officer	-0.077	0.073	-0.089**	0.025
Public Services				
Quality of Customs Services	-0.212*	0.118	-0.020**	0.010
Quality of Judiciary Systems	0.210**	0.090	-0.024	0.021
Quality of Infrastructure	-0.285*	0.169	-0.048**	0.018
Security	-0.075	0.098	0.065**	0.028
Firm Specific Characteristics				
Manufacturing	0.116	0.264	-0.065*	0.038
Small	-0.567	0.414	0.086	0.089
Medium	0.095	0.316	0.200**	0.097
Government Ownership	-0.404	0.575	0.136**	0.047
Foreign Ownership	0.450	0.312	0.023	0.049
Age	-0.017**	0.007	-0.001	0.001
Number of Observations	669		877	
Clusters	81		61	
Log Likelihood	-1068.76		-1632.4	
Wald Chi2	4563.36		912.82	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-13

Organization of the Corruption Network

Frequency of Additional Payments: Tax Insp. Agents

	Other Regions		Eastern Europe	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	-0.054	0.089	-0.003	0.016
Service Delivery	0.201**	0.074	0.034*	0.020
Multiple Payments	0.288**	0.098	0.000	0.009
Recourse to Uncorrupt Officer	-0.248**	0.067	-0.080**	0.022
Public Services				
Quality of Customs Services	0.057	0.075	-0.001	0.020
Quality of Judiciary Systems	0.146	0.125	-0.033	0.020
Quality of Infrastructure	-0.275**	0.139	-0.052**	0.018
Security	-0.084	0.141	0.027	0.019
Firm Specific Characteristics				
Manufacturing	0.297*	0.176	-0.015	0.038
Small	-0.353	0.253	-0.046	0.055
Medium	-0.261	0.185	0.060	0.040
Government Ownership	-0.661	1.029	-0.012	0.039
Foreign Ownership	0.241	0.171	-0.010	0.056
Age	-0.013**	0.006	-0.001	0.001
Number of Observations	674		877	
Clusters	82		61	
Log Likelihood	-1238.65		-1622.25	
Wald Chi2	7833.52		945.46	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-14

Organization of the Corruption Network

Frequency of Additional Payments Required: Customs Officials

	No Transition Europe		Eastern Europe	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.186	0.114	0.007	0.014
Service Delivery	0.228**	0.097	0.002	0.013
Multiple Payments	0.105	0.076	0.030**	0.012
Recourse to Uncorrupt Officer	-0.173*	0.102	-0.048**	0.022
Public Services				
Quality of Customs Services	-0.214**	0.106	-0.013	0.014
Quality of Judiciary Systems	0.012	0.103	-0.044	0.028
Quality of Infrastructure	-0.117	0.123	-0.025	0.026
Security	0.099	0.131	0.011	0.018
Firm Specific Characteristics				
Manufacturing	0.15	0.254	-0.024	0.041
Small	-0.785**	0.308	0.116*	0.066
Medium	-0.711**	0.322	0.137**	0.054
Government Ownership	-0.807	0.737	-0.023	0.045
Foreign Ownership	0.587**	0.192	-0.124*	0.070
Age	-0.022**	0.009	0.000	0.001
Number of Observations	651		877	
Clusters	82		61	
Log Likelihood	-2471.142		-1696.07	
Wald Chi2	9805.3		705.01	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-15

Organization of the Corruption Network

Frequency of Additional Payments: Government Procurement

	No Transition Europe		Eastern Europe	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.249*	0.129	0.027**	0.012
Service Delivery	0.137	0.129	0.029**	0.009
Multiple Payments	0.093	0.129	0.016	0.011
Recourse to Uncorrupt Officer	0.071	0.190	-0.066**	0.022
Public Services				
Quality of Customs Services	-0.170	0.142	-0.020	0.013
Quality of Judiciary Systems	-0.071	0.157	-0.001	0.029
Quality of Infrastructure	0.028	0.386	-0.011	0.026
Security	-0.459**	0.149	-0.014	0.025
Firm Specific Characteristics				
Manufacturing	-0.297	0.314	-0.085	0.065
Small	-1.246**	0.564	0.077	0.105
Medium	-0.315	0.376	0.068	0.082
Government Ownership	-0.657	0.830	0.099	0.062
Foreign Ownership	-0.164	0.447	0.004	0.064
Age	-0.014	0.013	-0.006	0.004
Number of Observations	669		877	
Clusters	81		61	
Log Likelihood	-900.63		-1769.53	
Wald Chi2	3927.96		4377.8	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-16

Organization of the Corruption Network

Frequency of Additional Payments Required: Judicial and Courts

	No Transition Europe		Eastern Europe	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.030	0.122	0.005	0.015
Service Delivery	-0.093	0.066	0.010	0.013
Multiple Payments	0.185**	0.091	0.027**	0.008
Recourse to Uncorrupt Officer	0.050	0.115	-0.041**	0.009
Public Services				
Quality of Customs Services	0.100	0.091	-0.060**	0.029
Quality of Judiciary Systems	-0.281**	0.138	-0.026**	0.008
Quality of Infrastructure	0.416*	0.222	0.020	0.037
Security	-0.338**	0.105	0.008	0.027
Firm Specific Characteristics				
Manufacturing	-0.045	0.292	-0.045	0.055
Small	-0.221	0.443	0.141*	0.079
Medium	-0.01	0.395	0.140*	0.079
Government Ownership	-0.896	0.747	0.051	0.039
Foreign Ownership	0.237	0.254	0.042	0.048
Age	-0.012	0.014	0.000	0.001
Number of Observations	669		877	
Clusters	81		61	
Log Likelihood	-549.23		-1676.79	
Wald Chi2	298.81		427.89	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table1-17

Organization of the Corruption Network

Frequency of Additional Payments Required: Politicians

	All Other Regions		Eastern Europe	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	0.139	0.103	0.009	0.006
Service Delivery	0.077	0.135	-0.001	0.010
Multiple Payments	-0.012	0.123	0.007	0.008
Recourse to Uncorrupt Officer	-0.154	0.131	-0.013**	0.005
Public Services				
Quality of Customs Services	-0.228	0.153	0.002	0.006
Quality of Judiciary Systems	-0.055	0.111	-0.007	0.009
Quality of Infrastructure	0.153	0.252	-0.006	0.016
Security	0.100	0.129	0.011	0.012
Firm Specific Characteristics				
Manufacturing	-0.265	0.389	0.003	0.018
Small	0.074	0.415	0.155**	0.049
Medium	-0.128	0.372	0.130**	0.052
Government Ownership	-0.681	0.721	0.028	0.032
Foreign Ownership	0.602*	0.344	-0.012	0.043
Age	-0.01	0.01	-0.001*	0.001
Number of Observations	673		877	
Clusters	82		61	
Log Likelihood	-963.971		-1666.94	
Wald Chi2	642.84		4820.13	

Note. Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

Table 1-18

Test for Non-Linearities in Infrastructure

	All Other Regions					
	corrup		correl		brbpay	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Corruption Regime						
Advance Knowledge	0.144**	0.042	0.035	0.043	0.258**	0.056
Service Delivery	0.001	0.040	-0.068	0.054	0.123**	0.059
Multiple Payments	0.097**	0.037	-0.009	0.04	0.137**	0.035
Recourse to Uncorrupt Officer	-0.063	0.042	0.182**	0.063	-0.115**	0.054
Public Services						
Quality of Customs Services	0.033	0.051	-0.094*	0.051	-0.124**	0.061
Quality of Judiciary Systems	-0.079	0.051	-0.047	0.054	0.044	0.057
Security	-0.108*	0.062	-0.024	0.082	0.021	0.074
Quality of Infrastructure	1.106**	0.519	2.406**	0.288	0.451	0.604
Infrasq	-0.109**	0.051	-0.240**	0.028	-0.047	0.057
Firm Specific Characteristics						
Manufacturing	-0.005	0.109	-0.06	0.093	0.031	0.113
Small	-0.039	0.158	-0.418**	0.127	-0.066	0.178
Medium	0.026	0.141	-0.307**	0.138	-0.036	0.153
Government Ownership	-0.469	0.32	-0.43*	0.238	-0.34	0.376
Foreign Ownership	0.335**	0.138	0.022	0.177	-0.091	0.205
Age	0	0.003	0.001	0.004	-0.004	0.003
Number of Observations	712		696		718	
Clusters	82		79		72	

Table 1-18 continued

Test for Non-Linearities in Infrastructure

	Eastern Europe			
	corrup		brbpay	
	Coefficient	SE	Coefficient	SE
Corruption Regime				
Advance Knowledge	-0.159	0.167	0.026	0.054
Service Delivery	0.09	0.128	0.013	0.052
Multiple Payments	-0.061	0.12	0.023	0.041
Recourse to Uncorrupt Officer	0.197	0.48	-0.042	0.048
Public Services				
Quality of Customs Services	-0.172	0.307	-0.012	0.063
Quality of Judiciary Systems	0.132	0.666	-0.090**	0.039
Security	-0.114	0.476	-0.104**	0.048
Quality of Infrastructure	1.707	35.699	8.130**	0.904
Infrasq	-0.211	5.09	-1.151*	0.148
Firm Specific Characteristics				
Manufacturing	0.011	0.56	0.174**	0.082
Small	0.274	0.795	-0.044	0.176
Medium	0.023	1.247	0.257*	0.145
Government Ownership	0.022	0.394	-0.084	0.122
Foreign Ownership	-0.508	1.022	0.021	0.151
Age	0.006	0.011	0.002	0.003
Number of Observations	832		832	
Clusters	61		61	

Country dummies are included in all the regressions

* significant at 10%

** significant at 5%

SE: Standard Error

CHAPTER 2. BRIBERY AND FIRM BORROWING COSTS: IS THERE A RELATIONSHIP?

1 Introduction

What are the true costs that administrative bribery imposes on firms? How are these transmitted throughout the economy? This paper investigates possible channels through which, the effects of bribery are transmitted throughout the economy and magnified beyond the value of the bribe. In particular, we explore whether bribery imposes indirect costs on firms through its impact on firms' ability to raise external finance.

In the last few decades, corruption has become a highly prominent topic of debate among policy makers, academic scholars and other practitioners in developmental issues and the universal consensus is that it is a public bad that should be eradicated. In almost all countries, especially the developing and transition economies, there are ongoing policy initiatives aimed at addressing the problem. The outcome of this intense interest in the topic has been an extensive research on causes and consequences of corruption. This literature provides valuable insights into its impact on economic activity. For instance, the studies have found that corruption reduces growth and investment throughout the economy (Mauro1995), reduces foreign direct investment (Wei 1997), drives firms out of the official economy (Kaufmann 1997), reduces both public sector budgets and the productivity of a county's infrastructure (Tanzi and Davoodi 1997) and lowers stock values (Lee and Ng 2002).

With this rich literature, do we know enough about the impact of corruption? Specifically, does the current research provide any knowledge about the outcomes of corruption at the micro-level? For instance, do we know enough about the costs that

corruption imposes on firms, how these effects are transmitted or the distributional effects on different agents? The answer here is emphatically negative. The bulk of existing empirical work is based on cross country data, which while it provides valuable insights into understanding economy-wide determinants of corruption, can not inform us of micro level outcomes. Thus, the research agenda is far from complete. Micro-level empirical analysis is critical to complement the existing country level studies for any policy reform agenda to be effective. Yet it was only very recently that research effort is being devoted to micro-level empirical studies. This research has yielded some useful and very informative findings in areas such as firm-level costs of bribery,[13][14] the importance of the organization of the corruption regime[15] and identifying the agents most vulnerable to corruption[16]. However, the very newness of this strand of literature suggests that there is still a lot to uncover on the relationships between corruption and economic agents.

The purpose of this paper is to add to this new but growing research, specifically examining if other channels exist through which bribery could be imposing costs on firms and thereby constraining their performance. Specifically, we investigate the possibility that bribery could negatively impact firms' ability to raise external finance.

Access to credit has long been recognized as key to firm performance and growth. Furthermore, firms with access to external financing generally grow faster than firms that rely on internal funds. At the same time access to finance is a major obstacle to firms' operations, especially small and medium firms, who employ the larger proportion of populations in developing and transition economies. For instance, Beck, Demirguc-Kunt

[13] Svensson (2003) found bribe payments constituted about 8% of firm costs in Nairobi while in Kuncoro (2006) reports payments as high as 10.8% of operating costs in Indonesia.
[14] Indirect costs, i.e. all other costs related to corruption such as the increased amount of time that firms spend dealing with government officials (Henderson and Kuncoro, 2004 find that Indonesian firms spent over 10% of management time with bureaucrats).
[15] See Herrera, Lijane and Rodriguez, 2007 and Wu 2005.
[16] See Mocan 2005 and Svensson 2002.

and Levine (2005) find that financial and legal constraints and, corruption affect firm growth but also find that small firms are the most affected by these obstacles. Beck, Demirguc-Kunt, Laeven and Levine (2007) study the impact of financial development on firm growth and find that under developed financial systems are more detrimental to the growth of small firms.[17] Bank concentration is another factor that increases financing obstacles and decreases the probability of firms receiving bank finance (Beck, Demirguc-Kunt and Maksimovic 2003).[18]

To the best of our knowledge, this study is the first to explore the link between administrative corruption and explicit borrowing outcomes. However, there are a number of articles that explore different aspects of the relationship between corruption and credit. Specifically, Depken, LaFountain and Butters (2006) test the impact of corruption on a country's creditworthiness. They find that creditworthiness measured by sovereign credit ratings is a decreasing function of corruption. Beck, Demirguc-Kunt and Levine (2005) look specifically at the effects of bank corruption on firms' ability to raise external finance, and further assess the effectiveness of different supervision approaches in lowering this obstacle. Finally, Ciocchini, Durbin and Ng (2002) study the relationship between emerging market bond spreads and corruption. They find that governments and firms in countries where corruption is widespread have higher default risks and consequently higher spreads.

By identifying one way firms' operations and their growth opportunities are affected by corruption, the study contributes to an improved understanding of the workings of bribery. We find evidence that pervasive bribery is associated with more stringent borrowing conditions for firms. In particular, in environments characterized by high levels of bribery,

[17] Love (2003) confirms this result through a study that shows financial development improves availability of external and consequently increases firms' investment.
[18] See also Cetorelli and Strahan (2004) who find that increased bank competition increased access to finance.

bank lending activity is low, interest rates on which firms borrow tend to be higher and loan maturities are generally shorter.

Our results also have policy implications that emanate from the complementarities of governance and financial market development. In particular, it suggests that efforts to ease credit constraints for firms without genuine and concerted efforts to reduce corruption could potentially have low probability of success.

The rest of the paper proceeds in this manner. Section 2 is devoted to data, descriptive analysis and theoretical links. We present the empirical strategy in Section 3, results in Section 4 and conclude with Section 5.

2 DATA, SUMMARY STATISTICS AND THEORETICAL LINKS

The primary dataset we use is from the Business Environment and Entrepreneur Performance Surveys, hence forth BEEPS that the World Bank conducts in transition Europe and Turkey. The three wave surveys (1999, 2002, and 2005) cover over 10, 000 firms in 26 countries. In this study we use only the last two surveys, primarily because some of the variables of interest are not included in the 1999 survey.

BEEPS are meant to identify factors that constrain firm performance and growth in the target countries. Thus, the surveys contain a large number of questions on the obstacles to growth and their severity. Questions cover a wide array of issues that pertain to firms' ability to function including different aspects of corruption, financing constraints and public services such as physical infrastructure and institutional frameworks. In addition, the surveys also include questions on firm-specific characteristics such as ownership, origin, size, primary activity and age.

These types of surveys are relatively new but have already provided a platform for carrying out the much needed firm level empirical research. While other surveys e.g. WEBS

2000 have provided a basis for informative analysis, they have tended towards perceptions which still attract controversy on reliability of inference. BEEPS have a very appealing feature in that the questions are more and more moving from perception-kind responses to more objective data. For example, in WEBS 2000, respondents were asked how they rated the quality of different infrastructure services with possible responses ranging from 1 for very poorly, to 6. In BEEPS, the respondents are asked for the number of times they experienced service interruption and the duration of the interruptions. With respect to administrative corruption, the perception-type questions are still used. For instance, a question is how common it is for firms in a particular business to have to pay bribes to get things done with the responses having six possible outcomes. However, some new variables, that nicely proxy for the level of corruption, are now available. For example, in addition to asking firms to state the number of times they made unofficial payments for different public services, firms are asked for the number of times officials from these sectors inspected the firm over the same time frame.

2.1 Bank Lending Conditions

The primary objective of this analysis is to test whether a link exists between corruption and firm borrowing conditions. The kind of effect we envisage emanates mainly from the impact of corruption on firms' cash flows and consequently on their default risk.

In addition to the costs of paying bribes, studies have shown that corruption can reduce legal protection of creditors as well as regulatory oversight (e.g., Garmaise and Liu, 2005). Moreover, delivery of essential services, such as utilities, becomes uncertain in the presence of corruption as government officials may withhold services even for those who pay the bribes, particularly if the corruption regime is unorganized. For instance, Tanzi (1988) presents evidence suggesting that corruption tends to lower efficacy of service deliver.

Deficient service provision interferes with firms' functionality and consequently reduces their revenues. On the other hand, firms that pay bribes might get services that they would otherwise not have access to, which could increase their profits. In general however, payment of bribes increases firms' operation costs, consequently lowering the profitability of projects and raising the default risk, which in turn leads to tighter borrowing conditions. The expected return to banks depends on the probability of loans' repayment and as such projects' expected returns, which directly affect ability to repay are a key criteria used to determine lending conditions.[19] Depending on the assigned default risk, the bank will determine the conditions on which firms borrow and these are generally more stringent the higher the default risk is. There are several means by which banks can impose conditions on borrowing. In this paper we have four different variables that capture the stringency of borrowing conditions faced by firms. We discuss each of these variables below.

2.1.1 Interest Rates

In making loans, banks are concerned about the interest they receive and the riskiness of the loans as these two are key components of their expected returns. The main determinants of this riskiness are the uncertainty of production, projects' profitability as well as the severity of information asymmetries. The riskiness of projects, in turn, determines the monitoring effort banks expend. Monitoring, on the other hand, results in an external finance premium, which Gilchrist and Zakrajsek (1995) show to be highest where the risk of opportunistic behavior is difficult to mitigate. Environments with pervasive corruption therefore, lead to increased risk of making investments and consequently to a higher risk premium that is reflected in high interest rates. Thus, to the extend that pervasive bribery

[19] For a full discussion on project's expected return and lending, see Freixas and Rechet, 1997.

increases default risk by lowering cash flows, we should expect to firms to face higher interest rates.

Two questions in the surveys provide information regarding the prevailing interest rate faced by firms and the possible effect interest rates have on firms' access to credit. First, firms that hold bank loans are asked for the actual interest rate they are charged. Second, firms who have not sought bank lending are asked to indicate whether interest rates were a factor in their not applying for loans. Summary statistics reported in Tables 2-1a and 2-1b show an average interest rate faced by borrowing firms of 17%, with the country-averages varying widely from as low as 7.6% for Slovenia to as high as 34.6% for Belarus. With respect to firms that did not seek bank funding, 22% of firms indicated that high interest rates were a determining factor.

2.1.2 Quantity of Loans

In their seminal paper, Stiglitz and Weiss (1981) show that banks can only increase interest rates up to a certain point beyond which safe borrowers will be driven out of the market leaving only a pool of high risk projects with a low probability of success. There is an interest rate level at which expected returns on loans become negative. In this case, banks may choose to ration credit, instead of increasing interest rates. This situation is very common in developing economies where banks voluntarily hold liquidity in excess of that required statutorily, despite the fact that (by western standards) statutory requirements are already high, imposing an implicit tax on banks. Thus, by contributing to increases in interest rates, bribery then can cause credit rationing.

Firms in the survey were asked for the percentage of their working capital and/or investment that was financed with funds from commercial banks. For firms that do not have a loan, the surveys have asked additional questions on whether the firm had applied and was

turned down or did not seek funding from banks. For instance, firms were asked whether they do not have loans because they were rejected or had not applied. A significant number of firms that did not apply indicated that while they might have needed bank loans, they did not apply because they felt that the conditions were too stringent, e.g. collateral requirements (16% of firms) and interest rates (22% of firms) were too high, while others were intimidated by the complexity of the application procedures (16% of respondents). A small percentage did not apply because they thought their applications would be rejected.

The descriptive statistics reported in Table 2-1a show that about 20% of firms had loans from commercial banks. However, across countries the means vary widely, from as low as 5% for Tajikistan to a high of 35% for Latvia (Table 2-1b).

2.1.3 Collateral Requirements

Covenants meant to reduce banks exposure to risk in case the borrower defaults are an option that can offset the above outcomes. Collateral can help mitigate the problems of information asymmetries. In particular, collateral acts as a signal that induces borrowers to reveal their default risk (Bester, 1985; Besanko and Thakor, 1987) and it provides firms with an incentive to exert effort in the project. However, for collateral to be meaningful, banks must be assured that the legal system is able and/or willing to enforce contracts. By weakening the rule of law and where it permeates the legal systems, corruption can undermine the use of collateral. Strong protection of creditor rights is also essential. De Haas and Peeters, 2006 show however, that the process of seizing and disposing of collateral once the borrower has defaulted tends to be very slow in transition and developing countries. As a result, collateral requirements can be prohibitive as banks seek to compensate for the time lapse.

The average collateral requirement for all countries is 149.65% of the loan amount, and for individual countries, the requirements range from 119% for Turkey to 217% for Georgia (see Tables 2-1a and 2-1b).

2.1.4 Maturity

Finally, with a high level of uncertainty where future policy direction is not clear, banks may confine their decisions to the immediate future by maintaining short planning horizons. The overall mean loan term for all countries is about 27 months (see Table 2-1a) but country-wise comparisons in Table 2-1b show a wide disparity in average loan terms with the lowest repayment period in Turkey at about 15 months while Croatia has the highest at 46 months.

2.2 Corruption Measures

The survey has a number of questions that ask firms to indicate the extent to which corruption is an obstacle to their operation. The severity of corruption is captured by firms' responses to four questions: a) is it common for firms in the line of business to have to make irregular payments to get things done? (*brbpay*); b) Do firms in the line of business know in advance the magnitude of the additional payment? (*advance*); c) How many times do firms have to make the unofficial payments to obtain service in different sectors? (*brbfreq*) and d) How problematic corruption is for firm operation and growth (*corrup*). Answers for the first three questions vary between 1 (never) and 6 (always) while for *corrup* four different outcomes are possible from 1 (no obstacle) to 4 (for major obstacle). In addition firms were asked for the number of times officials from different service sectors inspected their

operations (*num_insps*). Whereas inspections could represent a necessity for the business development, beyond some threshold, they are likely to indicate red tape faced by firms.[20]

2.3 Legal, Judicial and Infrastructure

While our chief interest is in testing whether corruption influences lending outcomes, it is also true that these also depend on the quality of institutional and physical infrastructure. For example, banks may be unwilling to extend loans if the legal framework is such that contract enforcement is problematic while on the part of the physical infrastructure, particularly telecommunications have been shown to mitigate problems of transacting with banks (Kamel, 2005; Honohan et al, 2006). The survey includes a number of variables that proxy for the quality of these services. Firms were asked to evaluate the quality of the courts in terms of their being a) fair, b) honest, c) affordable, d) efficient and e) effective. In addition, firms were asked to indicate their confidence in the legal system. We have used these six individual measures to construct an index of the quality of the legal system.

With regard to physical services, we use firms' use of different information and communications technology services.

2.4 Firm-specific Characteristics and Country-level Variables

Firm-specific traits also have a bearing in the conditions on which firms borrow. For example, literature shows that small firms generally attract punitive conditions because of among others, their inability to prove their credit worthiness.[21] We have therefore, included

[20] Various studies argue that excessive red tape is a deliberate outcome of corrupt officials' efforts to create environments that facilitate opportunistic behavior (for example, see Sullivan and Shkolnikov, 2004; Sherif, 2005). Hence, inspections can be a valid proxy for existence of corruption.

[21] For example, see Beck, Demirguc-Kunt and Levine (2004), Beck, Demirguc-Kunt, Laeven and Levine (2007) and Gilchrist and Zakrajsek (1995).

dummies for firm size and its principal activity. Summary statistics show that 69 percent of firms are small, while 39 percent are manufacturing firms. We also included dummies that cover ownership. Specifically we control for whether a firm is government owned in which case the variable *govern* takes the value of one and zero otherwise and, for foreign ownership the variable foreign takes on the value of one if the firm is foreign owned. Of the surveyed firms, 12% are government owned while foreign entities control 34% of the sample.

Finally, since borrowing conditions, which are our main outcomes, also depend on the general state of the economy, we include some country-level variables, specifically, GDP per capita growth and inflation.

In Table 2-2 we present a set of selected pair-wise correlations and a few of these are of particular interest. Not surprisingly, the perception that corruption is an obstacle to the operation of the firm is negatively correlated with the probability that firms obtain finance from commercial banks. As should be the case, the quality of the legal framework is positively correlated with firms' probability of getting finance while service interruption is negatively correlated but the rate at which firms use information and communication technology is positively correlated. Bribe frequency is negatively correlated to bank lending but more interesting is the positive and relatively large correlation between frequency of bribes and the number of inspections firms are subjected to. Finally, all measures of corruption are positively correlated with the interest rate banks charge individual borrowers and negatively related to the maturity of the loan but also with collateral requirements. Overall, the correlations provide a reasonable basis for testing the stated hypotheses.

3 Estimation Strategy

Our primary objective is to test whether administrative corruption has a role in determining firms' borrowing costs. We have four variables that capture borrowing costs,

namely the quantity of loans, the interest rates that individual firms pay, the collateral required by banks and the maturity of loans. We start with a general model of the form:

$$Y_{it} = \Lambda_{it}\gamma + W_{it}\alpha + Z_{it}\delta + c_i + v_{it} \quad (1)$$

where Λ_{it} is the matrix of variables that measure the level of administrative corruption, W_{it} contains variables that capture the efficiency and effectiveness of the operational environment, Z_{it} is a matrix of firm specific characteristics that could potentially have a bearing on firms' borrowing conditions, c_i are country specific fixed effects, and v_{it} is a random error term.

One aspect of our choice of variables needs to be explained further. In the variables measuring the intensity of administrative corruption, we have chosen to use the number of inspections a firm is subjected to by the various bodies as the main explanatory variable. We believe that this variable is likely to reflect the reality better than variables that entail firms admitting to participating in what are essentially illicit activities. Furthermore, the relationship between firms' borrowing cost and the measure of corruption is likely to be nonlinear. The reasoning for this non-linearity is as follows: inspections are legitimate and essential elements of well functioning systems that ensure adherence rules, regulations and laws and, ensures a level playing field for firm operations. Thus at low levels, they portray a desirable environment in which all parties are comfortable operating. However, the higher the number of inspections, the more likely they are to become harassment through which officials can extort payments and some firms will succumb to the pressure.[22] Thus beyond some threshold, inspections become a symptom of administrative corruption, generating

[22] This is in line with the findings that bureaucrats designed complex regulations with the objective of creating an environment that provided opportunities for rent seeking (Sullivan 2002; Sullivan and Shkolnikov, 2005).

uncertainty and consequently to credit rationing that show up in low quantities of loans or a lower probability of obtaining financing from banks.

Regarding the estimation strategy for quantity of loans, recall that firms were asked for the proportion of the operations financed by bank loans. The variable has a pile up at zero (72% of responding firms did not receive loans) and is roughly continuous to the right. Thus we have used the model using tobit to estimate the probability that a firm will get a loan with a model is given by:

$$\Pr(y_{it} > 0 \mid \Lambda_{it}, W_{it}, Z_{it} c_{i},) = 1 - \Phi(-\frac{\Lambda_{it} + W_{it}\alpha + Z_{it}\delta + c_{i}}{\sigma}) \qquad (2)$$

where Φ is the cumulative standard normal distribution.

To provide additional insight into the probability that a firm will have access to credit we also estimated the probability that a firm is able to obtain financing from banks. We have therefore, transformed the variable into a binary that takes the value of one in any period a firm obtains a loan and zero otherwise. The probability that a firm will have a bank loan is thus given by the following logit model:

$$P(y_{it} = 1) = \Lambda_{it}\gamma + W_{it}\alpha + Z_{it}\delta + c_{i} + v_{it} \qquad (3)$$

To account for country fixed effects, we estimate the model with country dummies.

Interest, loan term and collateral are all continuous thus are estimated using standard panel data methods. A-priori, it is likely that the corruption measure x_{it} is highly correlated with unobserved country-level characteristics (c_{i}), thus rendering the fixed effects model

more appropriate. Yet, to test whether the fixed effects or random effects model are appropriate we use the Hausman's test.[23] Thus the model is given by:

$$y_{it} = \Lambda_{it}\gamma + W_{it}\alpha + Z_{it}\delta + c_i + v_{it} \quad (4)$$

We have also estimated the model including an interaction term between the country dummies and a time period indicator, which allows us to test the importance of time varying country level effects. Unreported results (available upon request) are essentially identical to those obtained for the standard fixed effects model without the interaction term. The only apparent difference is the lack of statistical significance of foreign ownership does not appear to have a significant effect.

4 Empirical Results

(i) What Factors Determine Firms Access to Credit?

Tables 2-4 and 2-5 present the estimation results for the probability that a firm will obtain a loan from the banks. In the first regression, we use number of the inspections faced by each firm as an indicator of the presence of corrupt tendencies. In the second, we use the most direct measure but potentially subject to selective misreporting, frequency of bribes in different sectors. In both we also include other measures of corruption. Although we have run different regressions with and without country dummies we focus our discussion on the former as there is clear evidence of country fixed effects (see Table 2-4).

The estimation results suggest that indeed corruption has a role in the determining firms' access to credit. In particular, the number of inspections and its quadratic term are highly significant and support the existence of the non-linear relationship. In addition, the coefficient on the perception of corruption being a problem to firm's functionality is also

[23] Note that if the fixed effects procedure is appropriate, we could also use first differencing to get rid of the c_i since in a two-period panel the two are equivalent.

significant at the 5% level. The impact turns negative for more than 2.34 inspections while about 19% of responding firms undergo more than the 2.3 inspections. This is a significant population of the firms and suggests that indeed beyond the threshold, the impact is actually negative. The average partial effects range form 0.02 for the perception of corruption to 0.06 for the number of inspections. As for the other measures of bribery, the coefficients are not statistically significant. However, the joint significance test shows that as a group, corruption measures do have an effect on firms' ability to borrow from banks. In terms of the economic significance, it appears most of the impact is explained by country effects.

The specification that uses frequency of bribes (*brbfreq*) supports the view that corruption is a factor in firms' ability to raise external finance. In this case, the main variable, bribe frequency, is not significant but both the perception of corruption and the size of the bribe reduce the firm's likelihood of receiving a loan. The coefficients on these variables are significant at the 5% level. Moreover, we have a positive impact on the possibility of getting service from an uncorrupt official, further reinforcing the importance of corruption in determining firms' access to credit. The APEs are very small with the highest at 0.011 for the perception of corruption. This could imply that even though the coefficients are statistically significant, they may not be as important in economic terms as other country-level characteristics.

In both specifications, the proxy for the quality of physical infrastructure is significant at the 1% level and firm-specific characteristics matter for banks' propensity to lend. Specifically, small firms are associated with lower probabilities of getting a loan from commercial banks. This result is consistent with the literature on borrowing constraints (see for example Beck, Demirguc-kunt and Maksimiv 2002 and Gertler and Gilchrist 1994). Government and foreign firms also have a lower likelihood of obtaining bank loans. With

both, this could be a demand effect in that both are likely to have alternative sources of funding that are a good substitute for bank lending. In particular, foreign firms may be able to borrow from their own countries and thus require less domestic loans. On the supply side, it could be that foreign firms are associated with higher levels of risk as they have less difficulty absconding with loans pending by simply leaving the country. Noteworthy is the fact that unlike the APEs for the corruption measures, the APEs for the firm-specific characteristics are considerably larger with government ownership at 0.127 followed by being a small firm at 0.107. The other APEs ranging from 0.042 for being a foreign firm to 0.164 for being a manufacturing firm are still significantly larger than the APEs for corruption variables.

Other empirical work on firms' access to finance include as explanatory variables, bank concentration and sales, as a proxy for firm size (Beck et al, 2002, 2006). Unfortunately, the BEEPS do not include information on sales; yet, we control for firm size using the number of employees. As for banks concentration, its effect should be captured by the country fixed effect.

(ii) What Factors are Important for the Determination of the Terms Attached to Loans?

Having found some evidence suggesting corruption has a negative impact on firms' access to credit, we now proceed to investigate its impact on the terms of the loans (i.e. interest rate, collateral requirements, and maturity).

Recall first that because the question on the number of inspections only appears in the last survey, we are not ale to use it for the estimations that requires demeaning or differencing. Thus, in what follows, we only use the specification with the frequency of bribes together with the other measures of corruption.

Table 2-7 presents the regression results for the impact of corruption on the interest rate banks charge firms. These results suggest again that corruption in the system has an impact on firms' borrowing conditions. In particular, interest rates are increasing in the commonality of paying bribes to obtain service and the size of the bribe. These coefficients are significant at the 5% level and the coefficients are relatively large at .70 and .33 respectively. Interestingly, the advance knowledge of the bribe and its magnitude reduces the interest rate. With respect to public services, the firms' use of ICT services strongly lowers the interest rate and so does the quality of the legal system. Firm specific characteristics appear to be quite important in the interest rate that a firm faces. With the exception of size, all variables are significant at the 5% level. Firms in the manufacturing sector pay higher interest rates. Foreign firms also pay higher interest rates, which may suggest banks impose a higher rate due to the relative easiness pull up stakes and leave the host country. Finally, the interest rate is decreasing in the age of the firm.

Turning to maturity of loans, there is some indication of the influence of corruption (see Table 2-9). Both the perception of corruption and advance knowledge of the bribe are significant, but at the 10% significance level. Economically the impact is significant at 1.23 and 1.42, respectively. Yet again the quality of public services increases the maturity of the loan, perhaps reflecting the positive impact the effectiveness of these services have on ability and willingness of agents to make long term plans. Firms' specific characteristics do not have such a large impact as they have on the interest rate faced by the firms. Only being in the manufacturing sector and being foreign are significant and both have a negative impact on the loan term.

Finally, with respect to determinants of collateral requirements, it appears that we are perhaps facing an issue of banks preferring credit rationing to asking for high levels of

collateral. Only the perception that uncertainty is a problem to firms' operations is significant. The results are presented in Table 2-8. None of the corruption measures affect the level of collateral.

However, consider a scenario in which corruption has permeated the court system. Hence, a firm with sufficient power can force the enforcing official to drag their feet about seizure of the pledged property. Knowing this, collateral is not useful to lenders and they opt not to make the investments.

5 Conclusion

The primary objective of this study was to test whether corruption in an economy, specifically bribery to government officials in different sectors, affects firms' access to and the cost of external finance through cash flow effects. The key assumption for this proposition is the fact that lending conditions depend largely on assessed default risk, which in turn is a function of profitability of financed projects.

The empirical analysis has demonstrated that indeed, corruption does influence lending outcomes. The results are particularly strong with firms' ability to access credit in the presence of bribery. This relationship between lending and bribery suggests that corruption has potentially wider implications and adds another level towards understanding the costs of corruption to firm performance and growth. Clearly, there are policy implications but more research is needed to be able to inform the design of policy to deal with this problem. The increasing quantity and quality of firm-level data will go a long way towards making this possible.

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Table 2-1a

Summary Statistics: All Countries

	Mean	N
Lending Outcomes		
bnklns	0.18	13169
interest	17.13	4906
collat	149.65	4168
lnterm	26.89	5066
Corruption Measures		
brbfreq	1.71	10448
corrup	2.18	12651
nobribe	3.00	12473
brbpay	2.51	12333
advance	2.55	11211
brbsize	1.30	11952
inspecs	1.30	7123
Public Infrastructure		
serviceq	7.26	12909
commtech	-0.13	13528
legal	3.00	10525
Firm Characteristics		
manufac	0.39	13528
small	0.69	13528
govern	0.12	13530
foreign	0.34	13530
Age	15.11	13521

Appendix 2-1

Variable Definition

Variable	Definition	Source
bnklns	Probability that a firm can obtain financing from domestic commercial banks	BEEPS
interest	The interest rate that banks charge banks for loans	
collat	The amount of collateral firms have to pledge in order to get credit from banks	
lnterm	The time period over which a loan has to be repaid	
frequency of bribes (*brbfreq*)	Number of times a firm paid a bribe to obtain service	
number of inspections (*num_insps*)	Number of inspections a firm is subjected to by government agents in different sectors	
Pervasiveness of bribery (*brbpay*)	How common is it for firms in a particular line of business to have to pay bribes to get things done?	
corruption perception (*corrup*)	The probability that firms consider corruption an obstacle to their performance and growth	
uncorrupt official (*nobribe*)	The likelihood that a firm faced with a bribe demand can obtain service from another officer without paying the bribe	
advance	Do firms know the magnitude of the unofficial payment in advance	
bribe size (*brbsize*)	The amount firms pay in a given period in bribes measured as a proportion of revenues	
comm. technology	Firms' use of different forms communication and information technology	
legal system	The quality of the legal systems in terms of affordability, fairness, efficiency	
uncertainty	Perception of respondents that uncertainty is a constraint to their operations	
foreign loans	Proportion of operations financed with foreign loans	
development Bank Loans	Share of firm operations financed with loans from development banks	
equity	Percentage of operations financed with equity	
manufacturing	Is the firm's primary activity manufacturing: takes the value of 1 if this is the case and 0 otherwise	
small	Is the firm classified as small: measured by the number of employees?	
government-owned	Takes the value of 1 if the firm is primarily owned by government and 0, otherwise	
foreign-owned	Is the majority shareholding in he hands of foreigners?	

Appendix 1 cont.

age	Number of years since the firm was established	
GDP per Capita Growth		WDI
inflation		WDI

Table 2-2

Selected Correlations

	bnklns	interest	collat	lnterm	brbfreq	inspect	corrup	nobribe	brbpay	advance
bnklns	1.000									
interest	-0.070	1.000								
collat	0.031	0.112	1.000							
lnterm	-0.017	-0.321	-0.065	1.000						
brbfreq	0.008	0.093	0.094	-0.095	1.000					
inspect	-0.004	0.149	0.119	-0.114	0.135	1.000				
corrup	0.025	0.112	0.078	-0.060	0.407	0.098	1.000			
nobribe	-0.032	-0.082	-0.022	0.058	-0.129	-0.045	-0.217	1.000		
brbpay	-0.042	0.168	0.104	-0.141	0.600	0.116	0.394	-0.195	1.000	
advance	-0.030	0.149	0.086	-0.107	0.531	0.038	0.348	-0.135	0.745	1.000
brbsize	0.000	0.090	0.007	-0.024	0.324	0.062	0.272	-0.147	0.405	0.364
legalq	-0.006	-0.066	-0.033	0.073	-0.203	-0.024	-0.325	0.339	-0.240	-0.206
serviceq	-0.012	-0.066	0.108	0.048	0.153	0.142	0.138	0.001	0.114	0.103
commtech	0.012	-0.193	-0.060	0.065	0.038	-0.031	0.047	0.061	0.022	0.023
uncert	0.035	0.159	0.087	-0.060	0.209	0.104	0.472	-0.178	0.200	0.151
percapgr	-0.019	0.543	0.050	-0.240	0.074	0.151	0.011	-0.075	0.144	0.122
infl	0.049	-0.047	-0.131	0.056	-0.052	-0.064	-0.130	-0.024	-0.128	-0.079
small	-0.030	0.024	0.010	0.065	-0.010	-0.252	0.009	-0.097	0.009	0.027
manufac	-0.052	0.063	0.019	-0.102	0.051	0.204	0.067	0.017	0.046	0.009
foreign	-0.007	-0.025	-0.031	-0.063	-0.005	0.052	-0.015	0.075	-0.006	-0.001
govern	-0.065	0.040	0.017	0.005	-0.024	0.059	-0.070	0.096	-0.065	-0.060

Table 2-2 continued

Selected Correlations

	brbsize	legalq	serviceq	commtech	uncert	percapgr	infl	small	manufac	foreign	govern
brbsize	1.000										
legalq	-0.140	1.000									
serviceq	0.104	-0.021	1.000								
commtech	-0.054	0.037	-0.145	1.000							
uncert	0.106	-0.184	0.101	-0.034	1.000						
percapgr	0.042	-0.010	-0.127	0.020	0.112	1.000					
infl	-0.064	0.082	-0.053	0.012	-0.074	0.030	1.000				
small	0.108	-0.081	0.089	-0.257	-0.007	-0.129	-0.014	1.000			
manufac	0.040	-0.014	0.049	0.044	0.061	0.000	0.031	-0.272	1.000		
foreign	0.020	0.035	-0.055	0.113	0.004	0.003	0.062	-0.166	0.080	1.000	
govern	-0.077	0.120	-0.043	0.049	-0.059	0.090	0.011	-0.208	0.009	-0.086	1.000

Table 2-4
Impact of Corruption on Lending Conditions
Dependent Variable: Bank Loans

	Standard Logit		Logit - Country Dummies		
	Coefficient	SE	Coefficient	SE	APEs
number of inspections	0.306**	0.052	0.332**	0.057	0.064
inspsq	-0.080**	0.019	-0.072**	0.020	-0.013
corruption perception	-0.009*	0.005	-0.009*	0.005	-0.002
uncorrupt official	0.003	0.037	0.022	0.039	0.004
advance	-0.014	0.036	0.037	0.038	0.006
bribe size	-0.011	0.023	-0.018	0.024	-0.004
comm. technology	0.262**	0.044	0.232**	0.048	0.043
legal system	-0.024	0.033	-0.010	0.035	-0.003
uncertainty	0.072	0.051	0.059	0.055	0.013
foreign loans	-0.010	0.058	0.031	0.061	0.007
development bank loans	-0.016**	0.006	-0.017**	0.006	-0.003
equity	-0.008**	0.003	-0.008**	0.003	-0.002
manufacturing	0.081	0.109	0.153	0.114	0.026
small	-0.292**	0.126	-0.304**	0.132	-0.091
government-owned	-1.280**	0.241	-1.340**	0.246	-0.163
foreign-owned	-0.226	0.166	-0.306*	0.172	-0.057
age	-0.004	0.003	-0.007**	0.003	-0.002
GDP per Capita Growth	-0.032**	0.012	0.075**	0.037	0.005
inflation	-0.036**	0.013	-0.159**	0.053	-0.020
Number of Observations	2410		2410		
Log Likelihood	-1120.753		-1056.91		
Wald Chi_sq	167.8		295.490		

** Significant at 5%, * significant at 10%
SE: Standard Error

Table 2-5
Impact of Corruption on Lending Conditions
Dependent Variable: Bank Loans - Frequency of Bribes

	Standard Logit		Logit - Country Dummies		
	Coefficient	SE	Coefficient	SE	APEs
brbfreq	0.027	0.020	0.021	0.020	0.004
corrup	-0.010**	0.004	-0.011**	0.004	0.004
brbpay	-0.014	0.046	0.032	0.048	-0.002
nobribe	-0.022	0.030	0.011*	0.006	-0.002
advance	0.015	0.040	0.024	0.041	0.005
brbsize	-0.040**	0.018	-0.043**	0.018	-0.006
commtech	0.250**	0.034	0.223**	0.036	0.034
legalq	-0.014	0.027	0.002	0.028	-0.001
uncert	0.048	0.041	0.016	0.043	0.007
frnlns	0.024	0.046	0.029	0.048	0.005
devlns	-0.010**	0.004	-0.011**	0.004	-0.002
equity	-0.007**	0.002	-0.006**	0.003	-0.001
manufac	0.052	0.087	0.111	0.091	-0.112
small	-0.519**	0.096	-0.538**	0.100	-0.021
govern	-1.302**	0.181	-1.351	0.185	-0.130
foreign	-0.175*	0.092	-0.209**	0.096	-0.039
age	0.002	0.002	0.000	0.003	-0.095
percapgr	-0.016**	0.004	0.007	0.008	0.002
infl	-0.026	0.011	-0.048	0.036	-0.012
Number of Observations			3666		
Log Likelihood			-1687.725		
Wald Chi_sq			387.940		

** significant at 5%
*significant at 10%
SE: Standard Error

Table 2-6

Firms' Access to External Finance

	Percentage Loans in Financing Tobit Estimation			Probability of Obtaining Credit Logit Estimation		
	Coefficient	SE	APE	Coefficient	SE	APE
num_insps	11.107**	1.881	0.064	0.332**	0.057	0.058
inspsq	-2.428**	0.649	-0.013	-0.073**	0.020	-0.012
corrup	-0.395**	0.185	-0.002	-0.010**	0.005	-0.002
nobribe	1.235	1.311	0.004	0.022	0.039	0.006
advance	1.105	1.273	0.006	0.037	0.038	0.004
brbsize	-0.183	0.778	-0.004	-0.018	0.024	-0.001
commuse	6.882**	1.580	0.043	0.232**	0.048	0.034
legalq	-0.648	1.161	-0.003	-0.010	0.035	-0.004
uncert	2.501	1.826	0.013	0.059	0.055	0.014
foreign	0.5128	2.057	0.007	0.031	0.061	0.004
devlns	-0.642**	0.201	-0.003	-0.017**	0.006	-0.003
equity	-0.334**	0.118	-0.002	-0.008**	0.003	-0.002
manufac	2.815	3.806	0.026	0.153	0.114	0.012
small	-9.843**	4.430	-0.091	-0.304**	0.132	-0.073
govern	-44.621**	7.795	-0.163	-1.340**	0.246	-0.066
foreign	-9.918*	5.774	-0.057	-0.305*	0.172	-0.041
age	-0.189*	0.113	-0.002	-0.007**	0.003	-0.001
percapgr	1.963	1.191	0.005	0.075**	0.037	0.001
infl	-4.805**	1.280	-0.020	-0.159**	0.053	-0.018
Number of Observations	2140			2410		
Log Likelihood	3944.369			-1056.91		
Wald Chi_sq	321.4			295.490		

** Significant at 5%

*significant at 10%

SE: Standard Error

Table 2-7
Impact of Corruption on Lending Outcomes
Dependent Variable: Interest Rate

	Pooled OLS		Random Effects		Fixed Effects	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
brbfreq	-0.100	0.119	-0.048	0.109	-0.117	0.117
corrup	0.115	0.271	-0.130	0.256	-0.004	0.273
brbpay	0.740**	0.263	0.346	0.256	0.695**	0.271
nobribe	0.027	0.163	0.092	0.180	0.130	0.193
advance	-0.477**	0.212	-0.463**	0.216	-0.572**	0.230
brbsize	0.307**	0.150	0.149**	0.085	0.325**	0.090
commtech	-1.568**	0.251	-0.847**	0.202	-1.430**	0.208
legalq	-0.218	0.155	-0.287*	0.156	-0.279*	0.165
uncert	0.676**	0.235	0.447*	0.234	0.672**	0.245
frnlns	-0.029**	0.014	-0.033**	0.013	-0.029**	0.014
devlns	-0.008	0.010	-0.012	0.015	-0.007	0.016
equity	-0.007	0.009	0.004	0.014	-0.015	0.014
manufac	1.593**	0.487	1.409**	0.491	1.725**	0.525
small	-0.101	0.575	0.564	0.542	0.281	0.578
govern	4.269**	1.222	4.366**	0.960	4.561**	1.034
foreign	1.957**	0.519	2.739**	0.530	2.068**	0.558
age	-0.032**	0.013	-0.030**	0.015	-0.032**	0.015
gdpcapgr	0.096	0.070	0.371*	0.190	0.005**	0.079
inflation	0.686**	0.044	0.560**	0.040	0.673**	0.024
Number of Observations	1578		1439		1439	
Groups			21		21	
R^2	0.44				0.43	

** Significant at 5%
*significant at 10%
SE: Standard Error

Table 2-8
Impact of Corruption on Lending Conditions
Dependent Variable: Collateral Requirements

	Pooled OLS		Random Effects		Fixed Effects	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
brbfreq	0.656	1.085	-0.111	0.987	0.362	1.028
corrup	-1.331	2.311	-0.156	2.308	-1.038	2.395
brbpay	2.340	2.433	3.139	2.344	2.127	2.407
nobribe	0.957	1.772	3.188**	1.623	1.507**	1.690
advance	1.185	1.956	0.689	1.959	1.507	2.027
brbsize	-0.071	0.845	-0.777	0.770	0.070	0.794
commtech	-2.052	1.802	-0.571	1.837	-1.567	1.809
legalq	-0.918	1.429	-0.934	1.419	-0.756	1.447
uncert	5.623**	2.094	3.356	2.140	4.723**	2.173
frnlns	-0.167*	0.100	-0.125	0.114	-0.178	0.118
devlns	0.018	0.130	-0.078	0.146	-0.070	0.151
equity	-0.143	0.111	0.052	0.129	-0.166	0.127
manufac	4.874	4.634	3.424	4.454	4.400	4.611
small	5.744	4.994	5.136	4.910	5.400	5.083
govern	3.558	9.190	-0.668	8.932	0.901	9.355
foreign	-6.496	4.871	-7.801	4.766	-7.678	4.878
age	-0.028	0.110	-0.142	0.134	-0.019	0.138
gdpcapgr	-0.344	0.667	-1.610	1.685	-0.609	0.712
inflation	-1.606**	0.177	-0.851**	0.362	-1.622	0.211
Number of Observations	1356		1277		1277	
Groups			21		21	
R^2	0.08				0.11	

** Significant at 5%
*significant at 10%
SE: Standard Error

Table 2-9
Impact of Corruption on Lending Outcomes
Dependent Variable: Loan Term

	Pooled OLS		Random Effects		Fixed Effects	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
brbfreq	0.253	0.332	0.229	0.314	0.263	0.324
corrup	1.025	0.760	1.075	0.746	1.425*	0.766
brbpay	-0.393	0.857	-0.004	0.748	-0.531	0.758
nobribe	0.670	0.556	0.675	0.524	0.548	0.539
advance	-1.572**	0.576	-1.192**	0.631	-0.226**	0.648
brbsize	-0.214	0.218	-0.185	0.248	-0.242	0.254
commtech	2.684**	0.526	1.498**	0.588	2.281**	0.580
legalq	1.039**	0.430	0.860**	0.456	1.099**	0.461
uncert	-0.138	0.759	0.605	0.692	0.025	0.695
frnlns	0.113**	0.038	0.041	0.036	0.063*	0.038
devlns	0.078**	0.041	0.055	0.045	0.051	0.047
equity	0.020	0.042	0.029	0.041	0.033	0.039
manufac	-5.626**	1.442	-4.477**	1.436	-5.431**	1.474
small	3.972**	1.656	1.324	1.590	1.855	1.630
govern	0.369	3.522	0.563	2.766	0.242	2.862
foreign	-5.103**	1.488	-6.373**	1.552	-5.762**	1.575
age	-0.004	0.043	-0.070	0.043	-0.037	0.043
gdpcapgr	-0.182	0.317	1.135**	0.531	0.024	0.225
inflation	-0.435**	0.042	0.089	0.111	-0.405**	0.067
Number of Observations	1602		1461		1461	
Groups			21		21	
R^2	0.1				0.12	

** Significant at 5%
*significant at 10%
SE: Standard Error

CHAPTER 3. ARE BANKS IMPORTANT IN TRANSMITTING MONETARY POLICY SHOCKS TO THE REAL ECONOMY?

1 Introduction

How are monetary policy changes transmitted to the real economy? This is an old question in macroeconomics, but one that remains a subject of active debate.[24] Although there is a general consensus that monetary policy does affect economic activity, there has been substantial disagreement about the channels through which this effect is transmitted. There is even more disagreement about the role and importance of the banking sector, (Romer and Romer, 1990; Christiano, Eichenbaum and Evans, 2000; Ramey, 1993; and, Rudebush and Oliner, 1994). Nevertheless, recent literature has provided some evidence that banks do transmit monetary policy shocks to the real sector. But the importance of this mechanism has yet to be established convincingly.

Recent studies have analyzed the issue of transmission mechanisms through the banking sector, stressing the importance of financial frictions in the process.[25] Banks are considered to have some specific characteristics such as size and balance sheet strength that introduce heterogeneity in their ability to raise external finance with which to smooth their lending during periods of monetary contractions. Because of these differences, faced with a policy induced deposit shortfall, some banks will be forced to cut back on their lending volume, thus affecting investment and production activity. Thus exogenous shocks will have different effects on the lending of banks with different characteristics. Empirical studies have appealed to some aspect of bank financial strength and bank size as sources of

[24] See for example, Bernanke and Blinder, 1988, 1992; Gertler and Gilchrist, 1996; Rudebush and Oliner, 1994; Romer and Romer,1990; Stein, 1998; Kashyap, Stein and Wilcox, 1993; Bernanke and Gertler, 1995; Jarayante and Morgan, 2000; Nilsen, 1999; Van den Heuvel, 2001; Opiela and Kishan, 2000; Driscoll, 2003; and Kashyap and Stein, 1993, 2000.

[25] See for example, Kashyap and Stein , 2000; Nilsen; 2002; and Bichsel and Perrez, 2004

heterogeneity and their findings support the existence of differential response to shocks (Kishan and Opiela, 2000).

In this paper, we consider the importance of bank financial soundness in the transmission mechanism of monetary policy shocks. Our work differs from existing studies in that we appeal to a broader measure of bank soundness as opposed to using just one measure of financial strength.[26] Specifically, we use CAMEL-type variables as a measure of overall financial strength and add bank size for a more complete measure of heterogeneity.

The main aim of our paper is to test whether overall financial soundness is an important factor in determining bank-lending response to policy shocks. We appeal to bank heterogeneity to uncover differential response functions for sound and 'unsound' banks, and ultimately to uncover the role of banks in the transmission of monetary policy. Our initial hypothesis is that, given two banks of the same size, a bank with a stronger financial position should have better ability to mitigate the effects of a policy-induced deposit outflow.

Thus, this paper adds to the existing literature by re-examining the bank-lending channel using a panel of quarterly disaggregated data on U.S. commercial banks. To identify loan supply response to monetary policy, we appeal to specific characteristics that differentiate banks, namely bank size and financial soundness of the institutions. The obvious source of heterogeneity appears to be bank size (measured in terms of total assets). Stylized facts suggest that based on size alone, behavior of banks differ significantly and the constraints that banks face also vary according to whether the bank is large or small, see for example Gilchrist and Zakrajsek, 1995. For example, small banks suffer from a disproportionately large share of information asymmetry problems and therefore, typically

[26] There are two specific papers that do this. The first is the Kashyap and Stein which uses liquidity and bank size as sources of heterogeneity and the other is by Kishan and Opiela (2000). This study uses bank capital as a gauge of financial strength. It also uses bank size as an additional source of heterogeneity.

encounter more difficulty when trying to raise external finance. Conversely, large banks are generally presumed to be sound and safe and this feeds into the flight-to-quality phenomenon whereby during downturns, firms and individuals move their financial assets from small to large institutions. Also, because information problems are less severe for large banks, these banks can raise managed liabilities more easily. Because of these differences, Kashyap and Stein (2000), henceforth KS and Kishan and Opiela (2000), henceforth KO, among others have shown that banks of different sizes react differently to shocks since they face different constraints. As a result, if we pooled the sample for all banks, the estimated long-run responses to policy shocks may not be informative with respect to the effect of monetary policy on loan growth. To this end, in testing for the existence of loan supply effects, we first separate banks into different size groups.

We find that overall financial soundness matters in how bank lending responds to policy shocks. In particular, most of the individual ratios also indicate that banks have a non-trivial role in this process. However, most important and more interesting is the finding that even for the largest banks, which have so far been assumed completely insulated from policy shocks, overall financial health plays a role in how lending is affected by policy shocks.

There are two papers that are closely related to ours. The first is by Kashyap and Stein (2000), hereafter KS. This paper has provided the most convincing evidence for the existence of the bank-lending channel by appealing to agent heterogeneity to uncover differential responses to policy shocks. Their intuition is that if the observed decline in bank lending after a monetary policy shock was the result of changes in demand patterns, then all banks should be equally affected. However, if the decline in loans was the result of constrained lending capacity on the part of the banks, then some banks should experience a larger drop in lending activity. Thus using bank level data on U.S. banks covering the period

1976 to 1993, the authors analyze the effects of monetary policy on banks of different sizes (measured in total assets) and liquidity. Liquidity is used as a proxy for the strength of the bank balance sheet. They find that small less liquid banks respond more strongly to monetary policy contractions because of their relative inability to raise funds from uninsured sources.

However, while we recognize that the size of a bank is important in how the bank reacts to policy changes, we believe that using only liquidity to measure balance sheet strength may not be enough. There are several reasons why a bank might hold a large stock of liquid assets. For instance, banks that are subject to severe information asymmetries may choose to hold large stocks of securities as a cushion against any disruptions in deposit flows. Also, as KS point out, banks that lend to firms that are prone to cyclical fluctuations may hold liquid assets that reflect this aspect of their business. Large holdings of liquid assets could also be an outcome of an excessively risk averse institution and this would be reflected in tighter lending practices. Thus, liquidity may not necessarily be an adequate indicator of financial strength. Further, there are other variables that measure financial strength, perhaps better than the liquidity, and leaving them out of the estimation could result in a significant bias.

The other study is by Kishan and Opiela (2000) who use bank capitalization to proxy for bank strength and this is based on the fact that capital can mitigate agency problems in the market for external finance and determines the capacity of banks to issue liabilities. Thus, according to the authors, a high level of capital reflects a healthy balance sheet. However, this is not necessarily the case. On the one hand, a highly capitalized bank has a better ability to absorb losses and hence, has a small probability of becoming insolvent. Holding capital is at the same time costly to banks in terms of foregone high return investments. As a result,

banks will opt to hold the lowest possible level of capital, and observing a bank holding a high level of capital can potentially be an indication of high risk of the underlying assets. Hence, on its own, capital may not be an adequate measure of bank financial soundness and interpretation of results based on capital as it appears on balance sheets is unclear.

Our paper differs from these studies in two fundamental respects. First, to address the shortcomings of using a single indicator of bank financial strength, we use the full set of CAMEL ratings. Secondly, we use estimation techniques that allow us to control for specific features of the data and the structure of the banking market. Specifically, our estimation approach allows us to control for bank specific fixed effects which KS explicitly do not control for because with their approach, they would lose a significant part of their observations. Finally, one feature of the U.S. banking industry that stands out is the declining number of banks. This attrition could be potentially problematic for empirical analysis if it results in the sample changing in a non-random way. In this paper, we explicitly test for effects of sample attrition.

The CAMEL ratings are the most commonly used and accepted measure of financial soundness for banks.[27] The Fed uses a mixture of quantitative and qualitative measures to determine the composite CAMEL rating for each bank. Because we only have information on quantitative measures of soundness, we compute the ratios included in the CAMEL calculation from the banks' balance sheets and income statements. In order to avoid imposing ad-hoc weights on the ratios, we include each of these ratios as a separate explanatory variable in the regressions. High ratios are assumed to indicate overall financial strength while banks with low ratios are considered weak or unsound. Intuitively, investors

[27] CAMEL is an acronym for capitalization, asset quality, management, earnings, liquidity and sensitivity to market risk. These are the six components used for determining bank safety and soundness. In this paper we assume low ratios to imply weakness or a lack of financial soundness. The higher the ratios are the stronger or the more sound the bank is assumed to be.

should care about the examiner's information about a bank when making a decision to lend to a particular bank. Thus CAMEL ratings should play a role in whether the bank can issue external debt. De Young et. al. (2000) find evidence that the bond market is more sensitive to examination information about institutions with low CAMEL ratings as they are perceived as being troubled with a high potential for default, than they are to institutions with a high rating.

One well-established theory is that banks keep liquid assets as a buffer stock, so that whenever they have a shortfall in deposits, they can draw down their stock of securities to continue their lending (Lucas and Macdonald, 1992 and, Alger and Alger, 2000). Thus banks with ample holdings of securities will be in a better position to smooth the effects of monetary contractions. We are, therefore, also interested in the role of liquid assets in this process. Hence, we also investigate the behavior of banks with respect to maintaining a given level of securities.

This paper uses quarterly data from the Call Report on all insured commercial banks in the US from the first quarter of 1991 to the last quarter of 2000. Our results lend support to the existence of a bank-lending channel. The estimation shows that bank loan supply is indeed sensitive to differentiating characteristics, and most importantly the results support the contention that strong and weak banks respond differently to policy changes. Consistent with the findings of Kishan and Opiela (2000) and KS (2000), the effects appear to be strongest for small banks.

The rest of the paper is organized as follows. In section 2, we lay out some theoretical underpinnings for the existence of the bank-lending channel as well as existing evidence. Section 3 presents the data with the details of how the variables of interest were constructed. In section 4 we describe the estimation methodology with a description of

problems that the model addresses. We also discuss the results in this section. We conclude with section 5.

2 The Bank Lending Channel: Theoretical Framework and Evidence

2.1 Theoretical Underpinnings

Two major views of the monetary transmission mechanism are the money view and the credit view. The money view is based on the notion that reductions in outside money cause interest rates thus increase. In the traditional view, bank loans and bonds are assumed to be perfect substitutes. Thus, banks do not have a special role in monetary policy transmission. When policymakers change bank reserves thereby changing the quantity of money, they affect the nominal interest rates, which in turn, causes changes in the real interest rate and consequently affect aggregate demand. This view, however, fails to account for the observed timing or the persistence or the distributional effects of monetary policy shocks. In an attempt to resolve these puzzles, researchers have turned to theories of imperfections in financial markets and their impact on the cost and availability of credit. The effects arising from frictions in the credit markets reinforce the operations of the interest rate channel and amplify the effects.[28] This 'alternative' literature identifies two related ways in which the financial sector can propagate and magnify the effects of monetary policy shocks: the bank-lending channel and the broad credit channel. Both these channels rely on information asymmetries between borrowers and lenders, which, in general, influence the cost of funds to the borrower. Further, these channels are not mutually exclusive; rather each channel reinforces the effects of the other.

[28] This is well articulated in Bernanke and Blinder (1988) which extends the conventional IS-LM model to show that contractions in the monetary base shift the supply of credit thereby imposing a greater restraint on real activity than that implied by the conventional money view alone.

The first of these theories, the bank lending channel, argues that monetary policy shocks affect real spending through availability of credit. Thus, the essential feature of this channel is that by altering the quantity of base money, monetary policy actions should have a direct impact on the supply of loans. Furthermore, for banks to be effective in policy transmission there must be some borrowers who depend on banks for their external finance.[29] This bank-dependency can emanate from borrowers facing different costs of external finance because of information problems and thus, having to rely on intermediated finance to reduce agency costs. Hence the importance of bank credit depends on the severity of information costs with the role for financial intermediaries being more pronounced when high information costs create a significant gap between the cost of internal and external finance. As a result, any shift in the ability or willingness of banks to supply credit will affect these borrowers directly, generating bank loan supply effects. In these situations, banks are better placed to provide credit because they specialize in creating covenants on loan contracts as well as establishing special relationships with their clients. These characteristics of financial contracting make bank credit an imperfect substitute for non-bank credit. Consequently, this imperfect substitution between bank and non-bank credit contributes to the bank-lending channel of monetary policy transmission.

The second theory is the broad credit channel. This channel focuses on the nature of relationships between borrowers and lenders, and consequently on borrowing terms. Specifically, information asymmetries between contracting parties create a wedge between the cost of internal and external finance. Without information asymmetries, the interest rate charged on a loan should reflect the cost of funds and the risk characteristics of the

[29] This dependence can be justified on the basis of there being fixed costs to direct participation in financial markets. Because of their ability to monitor borrowers at least cost, banks are better placed to economize on these fixed costs making them the natural lenders to borrowers that might have characteristics, e.g. size, that prohibits them from issuing securities directly to the market.

borrower. However, information and incentive problems will affect this cost. Borrowers' net worth is also an important component of this channel since it can mitigate the agency costs emanating from these imperfections. In particular, the external finance premium -the gap between the cost of internal and external finance- varies inversely with net worth (See among others Kiyotaki and Moore, 1997; Bester, 1995; Bernanke, Gertler and Gilchrist, 1996). When borrowers' net worth is low, borrowers have less collateral with which to back their loans. Furthermore, low net worth increases moral hazard problems since the borrowers have a smaller stake and would have more incentive to engage in risky projects. Since low levels of net worth imply a higher probability of loan default, it will lead to a reduction in lending and hence in real spending. An adverse shock that affects the borrowers' net worth increases the cost of external finance and restricts borrowers' access to finance. Thus the effects are more intense during monetary contractions since the resulting high interest rates increase debt service and reduce the value of collateralizable net worth and consequently the marginal cost of external finance increases.

2.2 Empirical Studies

In addition to these theoretical underpinnings, there is a substantial volume of empirical work seeking to demonstrate the relevance of the financial system with some studies devoted exclusively to the importance of financial intermediaries.

Earlier studies (Bernanke and Blinder, 1992; Ramey, 1993; Oliner and Rudebush, 1994) utilized aggregate data on variables such as total bank loans, the mix between commercial paper and bank loans, output, interest rate spreads and other economy-wide variables. These studies, e.g. Bernanke and Blinder, have shown that bank loans declined after monetary tightening and have argued that this provided evidence for bank-lending effects. Because monetary policy shocks affect loan demand as well as loan supply,

identification requires adequate separation of shifts in loan supply from movements that originate on the demand side. Identification has, therefore, been a major problem with these attempts because aggregate data does not adequately control for loan demand effects, and as such, makes it difficult to identify effects emanating from credit availability. Hence, even though the results of these studies provide evidence consistent with the existence of loan supply effects, the interest rate channel could also yield similar results. Thus, evidence from these efforts has been mostly inconclusive. Kashyap, Stein and Wilcox (1993), hereafter KSW, tackle this identification difficulty by investigating movements between bank loans and non-bank financing for which they use commercial paper as a proxy. Using a simple model of firms' capital structure choices to highlight conditions under which distinctions between loans and securities are irrelevant, they explicitly test for two conditions: 1) whether on the asset side of the banks' balance sheets, loans and securities are considered imperfect substitutes which is necessary for monetary policy to affect loan supply; and 2) whether for firms' financing there is an imperfect substitutability of loans and alternative finance so that reduced loan supply can generate real effects. Their intuition is that shifts in substitutes for bank financing should reveal information about the demand for loans. If there are loan supply effects, then there should be a negative co-movement between loans and commercial paper. The study finds evidence for the existence of an active bank-lending channel. Following a policy shock, firms' issuance of commercial paper increases and loans decline, albeit at a slower rate. The slow response of loans is attributed to prior commitments that banks are obliged to fulfill.

The existence of the bank-lending channel relies on lending responses emanating from loan supply effects. In addition, these effects should be disproportionately large for less creditworthy borrowers, which should have difficulty substituting lost deposits with external

forms of finance. In order to identify differential responses to shocks, current research appeals to heterogeneity of agents through the use of microeconomic data. Gertler and Gilchrist (1994) use firm level data on U.S. manufacturing firms to test whether the response of small firms to monetary policy shocks differs from that of large firms. Their intuition is that because small firms are more likely to rely on banks for their external finance, loan supply effects from policy tightening should show up in small firms having to reduce their borrowing more sharply. The study finds that indeed, the impact of policy is larger for smaller firms.

Along the same line of thinking, Kashyap and Stein, 1995 and 2000, focus on cross-sectional differences in financing and lending decisions of banks of different sizes and balance sheet positions. In this study, the authors are interested in how banks of different sizes and different liquid asset holdings react to policy changes. They argue first that less liquid banks will reduce their loans if they are not able to replenish lost insured deposits with other forms of finance and they specifically expect to see $\partial^2 L_{it} / \partial B_{it}\, \partial M_{it} < 0$ for less liquid banks. Here B stands for liquidity, M is the monetary policy indicator and L stands for lending while i and t are indexes for bank and time, respectively. They test this hypothesis by focusing on how small and large banks differ in their ability to issue managed liabilities. They find that, indeed, the effect of monetary policy is strongest for the smallest banks and that large banks are not sensitive to contractionary policy shocks because they have access to the market for uninsured funds.

Based on alternative theoretical bases for the existence of capital market imperfections, other studies following the same line of inquiry have used capitalization to measure balance sheet strength and hence banks' access to other forms of finance. Theory

suggests that bank leverage contributes to the existence and severity of capital market imperfections. Furthermore, a bank's capital determines the ability to issue liabilities and also determines the amount of loans and securities it can hold. Equity can mitigate information asymmetry problems in the market for managed liabilities. For instance, the assets of an undercapitalized bank will be considered riskier than identical assets of a well-capitalized bank because the latter has more ability to absorb futures losses, should any result. Further, capital constraints limit the bank's ability to finance profitable projects. Thus several studies have attempted to uncover loan supply effects using bank capital as a discriminating characteristic. Scholars have argued that information problems are more severe for small banks, thus their ability to raise funds in the capital market will be more constrained relative to large banks. Following on this line of thought and the capitalization argument, Kishan and Opiela (2000) sought to establish loan supply shifts in response to monetary policy by dividing banks according to size (based on total assets) and their capital ratio.[30] This study emphasizes the importance of bank capitalization in explaining the effect of policy shocks on loan growth. In particular, the authors aim to show that small-undercapitalized banks are unable to raise alternative funds to continue their lending activity during a monetary contraction. Their findings support the existence of loan supply effects. Lending of undercapitalized banks is more sensitive to monetary policy. Further, this finding appears to be more relevant for small banks.

Van den Heuvel (2001) also focuses on bank capital as a source of differential response but looks more at the regulatory framework. He emphasizes the role of banks' capital structure in influencing the response to policy-induced changes in interest rates and other relevant variables. His view is that bank equity can affect the bank-lending channel by

[30] For another interesting study on the relationship between bank capitalization and credit market imperfections, see Jarayatne and Morgan, 2000.

its relationship with adverse selection and moral hazard problems. Effectively, a bank that has low equity suffers more from information asymmetry problems than a well-capitalized bank. Thus the level of capital can have a mitigating effect on these problems. He further shows that there is more risk attached to liabilities of under-capitalized banks. Thus for these banks, it is optimal to issue less debt and reduce lending following a policy shock. Consequently, he sees the interaction between capital adequacy requirements and monetary policy as an important cause of loan supply shifts.

2.3 Changing Structure of the Banking Industry and the Bank-Lending Channel

During the past two decades, financial markets have undergone a major transformation driven mainly by rapid growth and diffusion of new technology that has resulted in lower transaction costs and reduced information asymmetries. There has been a pronounced trend towards market-based financing with a tremendous growth of capital market activity that is evident from the decline in bank assets as a share of total financial assets, D'Astria (2000).

These developments have led to intensified competition in financial markets that have resulted in narrowed margins for traditional banking activities. Access to market finance has become easier and asset substitutability among financial markets has improved. Banks have, therefore, had to reposition themselves in order to remain profitable by greatly expanding the scope of their activities. An important strategic development in this regard has been the move by banks into new areas of off-balance sheet activities such as derivatives and securitization of loans[31]. The process of securitization presents several advantages to the

[31] Securitization is a process by which pools of similar assets are sold in the form of tradable securities.

securitizing banks. By facilitating unbundling and trading of risks, securitization has improved efficiency and profitability of banks' operations (Mishkin & Strahan, 1999). Securitization also provides banks with additional funding since banks can originate loans and securitize them immediately, thus obviating the need to fund them on an on-going basis. Thus banks are able to originate more loans than they would if they could not sell some of these loans. Phillips (1996) argues that many of the loans that banks securitize would not have been originated if banks had been required to keep them on their balance sheets. Also the ability to engage in off-balance sheet activities is shown to permit banks to invest in loans with positive net present values that they would pass up if restricted to deposit financing. Finally by removing some assets from their balance sheets, banks are able to lower the burden of capital requirements.

What are the implications of these developments for monetary policy transmission, in particular for the bank-lending channel? We have argued that the existence of the bank-lending channel is based on credit market imperfections that are caused by asymmetric information. Additional requirements for the existence of this channel are that there should be imperfect substitutability between retail deposits and wholesale deposits so that a fall in retail deposits induced by monetary contraction is followed by a decline in loans rather than an increase in wholesale deposits. Further, some borrowers should be bank dependent in the sense that they cannot easily switch to alternative forms of external finance. Thus, at a glance it would appear that the developments in the financial sector negate the very basis of the bank-lending channel as they brought about a reduction in information asymmetries, improved funding so that the dependence on insured deposits is reduced and an improvement in the substitutability of assets and liabilities. In fact, Estrella (2000) hypothesizes that by reducing credit market imperfections these developments must have

weakened the credit channel and the bank-lending channel. We argue differently and instead see these developments, particularly the loan sale process, as additional sources of the bank-lending channel. Existing studies seek to establish the existence of the bank lending channel by showing that different classes of agents are affected differently by monetary policy. In particular, it has been shown that small banks, especially when they are not adequately capitalized or liquid are affected more by shocks (Kishan and Opiela). In this paper, we hypothesize that the soundness of a bank will affect the way a bank reacts to monetary contractions. Thus to see whether securitization affects the bank lending channel, we need to know what type of banks securitize. If all banks can securitize their assets, then deposit shortfalls induced by policy shocks would be offset by funds raised through loan sales. Therefore, banks would not have to reduce their lending. Hence, these changes would significantly reduce the potency of the bank-lending channel of monetary policy only if they are distributed equally among banks. However, not all banks securitize. When banks sell loans, they are mostly selling their reputations. Specifically, it is likely that large banks are the main participants in these activities. Existing studies, e.g. Garrido (2000), show that even though all banks have the possibility of originating assets for securitization, small banks lack the necessary resources to be effective participants. These banks can only securitize if they combine their resources to deliver large pools of assets, which could be sold. Also with securitizing, the risk exposure is a main consideration because even though investors consider securitized assets safer, buyers are not able to assess the quality of the underlying credits. Hence it is conceivable that buyers of these assets will tend to prefer the credits from large banks because of perception of size being equivalent to good quality. Thus, our contention that instead of reducing the potency of the bank-lending channel, these changes add additional sources through which this channel manifests.

2.4 Some Stylized Facts

The analysis in this paper relies on banks' ability to shield their loan supply from the effects of a contractionary policy change. We want to test whether actions of the Federal Reserve do affect the loan supply as suggested by KS, BB, KSW and others. If this is the case, a positive policy innovation should lead to a decline in deposits, reducing the banks' lending capacity. To counteract the effects of this decline, banks will issue external debt or sell their securities so that they can maintain their portfolios rather than reduce their lending activities. However, it has been shown that banks (De Young et. al, 2000) do not have equal access to markets for debt instruments, some classes of borrowers encounter difficulties issuing debt. This is because, unlike retail deposits, the liabilities in external markets are not covered by federal deposit insurance. They are therefore, subject to considerations of information asymmetries whereby lenders are concerned with the perceived creditworthiness of the borrowers and also with the knowledge that borrowers have private information about the quality of their assets. Thus some banks will obtain funds from these sources while other banks might not be able to, even at a higher cost of borrowing. These facts form the basis of market frictions, which are the root of the existence of the bank-lending channel.

The presence of frictions in the external market for funds imposes costs on banks. In addition to the marginal cost of borrowing there is also an external finance premium, which reflects the severity of the constraints that each bank faces and consequently the lenders' assessment of the default risk. The effects of frictions will tend to intensify during periods of tight money. The rise in interest rates that accompanies a policy tightening affects the profitability of funded projects. As a result, the likelihood of default increases, adversely affecting the asset quality for banks and possibly making moral hazard more pervasive. Thus, information asymmetries are likely to worsen and we can therefore infer that the external

finance premium is higher during these periods as well. Hence, a larger proportion of banks will not be able to borrow from the external market for funds.

KSW, 1993; Nilsen, 1999; and, Bernanke and Gertler, 1995, show that different classes of borrowers are subject to differing degrees of information asymmetries. In particular, small borrowers tend to be associated with more severe information problems, making it harder for them to obtain alternative funding to maintain their lending activity. Thus, we do the analysis controlling for size.

Banks keep stocks of securities as a buffer against periods of low levels of deposits and unpredictable withdrawals. Banks also need to guard against other factors that can affect the flow of deposits in and out of the bank, particularly changes in monetary policy that would induce reductions in deposits. In this respect, banks are assumed to invest in securities mainly for precautionary motives. Thus if this were the only motive for holding securities, for all banks, investment in liquid assets would be proportional to the level of deposits. This would be the outcome if there were no constraints to obtaining alternative funding and banks had equal access to non-deposit finance. However, the amount of liquid assets held depends on the ability of banks to issue managed liabilities when they experience a shortage of liquidity. A bank that can easily obtain funds from alternative sources will tend to hold less liquid assets than a bank with limited access to these funds. As stated earlier, some classes of borrowers have limited access to capital market financing. In particular large banks have access to uninsured debt instruments and thus they tend to hold relatively low levels of liquid assets whereas small banks seem to encounter some difficulties and will therefore tend to hold a larger proportion of their assets in liquid form. Furthermore, it has been shown that banks with different characteristics, size and, balance sheet and financial strength, exhibit different behavior with respect to the amount of liquid assets they hold. Table 1b

supports this view as the ratio of assets held in the form of liquid assets declines with the size of the bank. In particular, the level of liquid assets held by small banks is strongly influenced by the relative strength of their balance sheets, such that small banks with strong financial positions hold a larger stock of securities relative to their weaker counterparts (See Lucas and MacDonald, 1992).

The existence of imperfections makes investment in liquid assets a function of factors other than the level of deposits and expectations of withdrawals. These include factors such as the ability of a bank to quickly issue non-deposit debt instruments. Kashyap and Stein (1993, 2000), Worms (1999), Stein (1995), Alger and Alger (1998), Kashyap, Rajan and Stein (2001), among others, have shown that because large banks have relatively easier access to non-deposit instruments they tend to keep a low level of liquid assets, relative to their deposit base. This is because large banks, like large firms face less severe information problems and therefore their borrowing from external markets attracts low agency costs. Small banks, on the other hand, seem to encounter some difficulties obtaining funding on the financial or inter-bank markets. This implies that in general small banks will hold a higher proportion of liquid assets, but there is a further distinction that needs to be made. Investing in liquid assets represents a cost to banks because they pay a low rate of return. Therefore, although prudence requires banks to hold liquid assets as a buffer against deposit shortfalls, for banks with weak balance sheets, the opportunity cost of investing in these assets may be too high. This follows from the fact that in general, weak banks only have a positive net present value if they get the highest return possible on a unit of investment. Consequently, these banks tend to hold a much lower level of securities. Thus depending on the financial conditions of banks, there should be a difference in the level of securities held. In addition, small banks are associated with more severe information problems and if they

are perceived to have private information about the quality of their assets, their ability to raise external finance will be affected. This is because, unlike deposits, external finance is not insured and as such is sensitive to information about the asset quality of a bank. This is in direct contrast to the argument by Romer and Romer (1990) that all banks can costlessly issue large denomination CDs to counter low levels of deposits induced by contractionary monetary policy.[32]

The intuition for this expectation is that weak banks need a high return for each unit of investment they make. This can only be realized by investing in illiquid loans because they offer the highest return. Strong banks can afford to hold some level of low yielding securities with the intention of drawing on them when there is a policy change that reduces their deposit base. As a result, we should also see a different response in lending activities within the same class of banks when there is a monetary policy induced reduction in deposits. Weak banks should, thus, reduce their lending activity more sharply.

From the above framework, we can empirically test the following hypotheses for the existence of the lending channel:

Hypothesis 1: Given a level of deposits, within the same size group, financially sound banks should hold higher levels of securities relative to banks with a weak financial performance. Therefore, when there is a monetary policy induced deposit shortfall, banks with a weak financial condition will experience sharper declines in lending activity than sound banks. Further, given that large banks face fewer constraints, the effect should be more pronounced for small banks.

[32] Bernanke and Gertler (1995) found that interest rates on CDs increased significantly more than T-bill rates during periods of monetary contraction, providing further evidence against the Romer and Romer's argument that demand for managed liabilities was perfectly elastic.

Hypothesis 2: Given a level of financial health, sound banks should be able to raise larger amounts of external funding during periods of tight money. Furthermore, large banks should be able to solve their funding problem by securitizing some of their loans. Thus, sound banks should not have to reduce their lending drastically.

Hypothesis 3: When faced with a reduction in insured deposits, banks that are able to will partially offset the effects of low deposits by liquidating their securities. Thus we should observe a reduction of securities during periods of tight money.

3 DATA

The empirical work in this paper uses quarterly data from the Call Report of Income and Condition that provides bank level data on all insured commercial banks. This data set is made available by the Federal Reserve Bank of Chicago and covers the period 1976 to 2000. Over this period the number of banks declined from over 15,000 in 1976 to just over 9,000 by the end of 2000. There are several reasons for this decline with the main ones being consolidations and failures. Each of these factors has potentially interesting implications and their importance to the analysis depends on whether these disappearances are systematic. This attrition, as well as generally missing data, has presented some challenges in how to handle the estimation. We test of the importance of this sample attrition. The data set provides information on several components of bank balance sheets. Because of changing reporting standards over the years, the way the variables of interest are reported has changed considerably. Hence, we have had to rely on the notes provided by Kashyap and Stein to form consistent time series.

Following on the influential paper by Bernanke and Blinder (1988), we use the federal funds rate (FFR) as an indicator of the stance of monetary policy. The data are

provided on a monthly basis and since our main dataset is quarterly, we use the last month of each quarter. In this paper, we have argued that the lending channel operates through changes in the level of insured deposits as a result of contractionary policy. Thus, to test the appropriateness of the FFR as a measure of policy stance, we have conducted a simple test that shows a statistically significant negative correlation of 0.39 between the federal funds rate and deposits. Because we have also argued that banks rely mostly on insured deposits for their lending activities since these are not sensitive to information asymmetries, we need to find a reasonable measure of insured deposits. We have adopted the method used by Ashcraft (1999) and use core deposits for a measure of insured deposits. This variable is constructed as the difference between total deposits and large time deposits.

3.1 Measures of Financial Soundness

The main thrust of this paper is that overall financial soundness of a bank, and not only size, may be important for the bank's ability to shield its loan supply from disruptions induced by policy innovations. As a proxy for financial soundness, we use a measure based on the CAMEL ratings. These ratings, which focus on six components of bank safety and soundness, namely, capitalization, asset quality, management, earning capability, liquidity and sensitivity to market risk, are a universally accepted measure of bank financial health and should therefore, be appropriate for our analysis. Although the ratings are normally used as an index giving a score between 1 and 5, in this work, we compute the relevant ratios using data on both the balance sheets and the income statements and enter them separately in the regression equations. Banks with low ratios are considered unsound or weak.

Table 1b presents a summary of the ratios for each size category. From this summary certain characteristics are evident. The data show small banks to be better capitalized than large banks, as the mean is highest for the smallest banks and lowest for the largest banks.

For the capital ratio (equity), we have a mean of .097 for banks in the smallest size category and this ratio declines to .078 for the largest banks. This picture is not surprising since capitalization of a bank reflects its ability to absorb losses and large banks generally remove some of the risky assets from their balance sheets through loan sales which effectively reduces the capital they have to maintain.

The liquidity component of the CAMEL measures the bank's ability to fund loan commitments or withdrawal demands at a reasonable cost. Therefore, a higher ratio indicates a greater ability to meet unexpected liquidity needs. However, banks' ability to meet funding needs also depends on their reliance on non-core funding. Large banks can easily raise non-core funding and thus do not have to maintain a large stock of liquid assets. The data supports this view in that the ratio gets smaller as the size category gets larger. For the banks in the 75th percentile, the ratio is .347 and banks above the 95th percentile have a ratio of .166.

The earnings capability is measured as the ratio of net income to total assets (ROA). We are interested in this ratio because earnings are an important source of capital for banks and as such provide an additional cushion for withstanding negative shocks. Thus a bank is better off the higher this ratio is. Like the capital ratio, for banks in the small size group, this ratio is substantially higher at .036 than it is for the three larger categories, for which the ratio is about .007.

Authors seem to use different measures for asset quality. Some authors use the ratio of loan loss reserve to non-performing loans, which is *Quality1* in the table, (e.g. Shen et al., 1999) whereas others use the ratio of non-performing loans to total loans, *Quality2* (e.g. Siems, 2002). We have used both ratios because we believe both to be important as they provide complimentary information, and separately they may not give a complete picture of

the bank's performance in the criteria. The ratio of loan loss reserves to non-performing loans provides an indication of a bank's ability to absorb losses from bad loans. While this is important in its own right, it does not tell us anything about the extent to which banks' portfolios are impaired and we get this information from *Quality2*. We have also included a third measure, which we call *Quality3*. This is constructed as the ratio of non-performing loans to total assets. This ratio gives an indication of balance sheet impairment instead of restricting the measure to loan portfolios. All ratios increase with size, which may not be surprising since large banks can limit their exposure to bad loans through securitization. At the same time, large banks may also have more financial resources enabling them to provide adequately for non-performing loans.

The data suggest that management quality is higher at the larger banks. To measure management capability we use the banks' relative productive efficiency, calculated as the ratio of non-interest expense to total assets as a proxy. This suggests that the banks with a better ability to control their expenses will generally fair better than the others. A bank is more efficient when this ratio is low and from the summary we see that the ratio is higher for banks in the smallest size group indicating that management capability improves with size.

3.2 Other Descriptive Statistics

Table 1a presents some key statistics on the structure of the U.S. banking sector. From this table, it is evident that an overwhelming majority of banks (over 70%) are considered small with median assets of $44,000. On the other extreme, the largest banks, those whose size is above the 95th percentile of total assets, compose about 7% of the total number of banks. However, even though they are few of them, on average, these banks control around 80% of the total assets.

This trend is also evident in the lending aspect. Despite their comparatively small number, on average, these banks account for about 85% of total lending while the banks in the smallest size group account for only 6% of the total loans despite their multitude. Also, small banks are the most soundly capitalized but have the lowest growth rate of either total loans or commercial and industrial loans while the largest banks have the highest loan growth rate.

On the liability side, the figures also support the stylized facts; mainly large banks are net borrowers in the federal funds market. The statistics show that the amount of federal funds issued increase with bank size with the smallest banks issuing only 1% of their total liabilities while the largest banks have an average of 9%. The banks in the smallest size groups on average have the highest level of insured deposits with the ratio smallest for the largest banks while for large deposits we have the largest banks holding the highest level of these liabilities.

3.3 Potential Problems

3.3.1 Sample Attrition: Tests and Correction

The structure of the U.S. banking system has undergone some major changes over the last three decades. Most notable of these changes is the decline in the number of banks through bank failures and consolidations. For the sample period we are using, the number of banks declined from 13,418 in 1991 to 9,261 by the end of 2000. This reduction represents a significant amount of sample attrition and is thus potentially problematic for inference about parameters of interest.[33]

[33] In our case the attrition is an absorbing state, i.e. once a bank drops out of the sample it stays out permanently.

The main concern with the attrition is selection bias, which would result if attrition were non-random. Thus, we are concerned with whether the banks that are in the sample for the entire period differ in any significant manner from those that attrite. If they do, then we have a selection on observables and/or selection on unobservables, which may generate a selection bias and consequently a distortion of the estimation. Suppose we are interested in estimating a linear unobserved effects model of the following form:

$$y_{it} = x_{it}\beta + c_i + u_{it}$$

Because of selection issues we have to assume that (x_{it}, y_{it}) is observed for all i at $t = 1$ and if s_{it} is the selection indicator for each time period, then $s_{it} = 1$ if (x_{it}, y_{it}) are observed and $s_{it} = 0$ if (x_{it}, y_{it}) are not observed. We first difference the model to remove the fixed effects and the equation reduces to

$$\Delta y_{it} = \Delta x_{it}\beta + \Delta u_{it} \quad t = 2,....T$$

The presence of attrition implies that this equation can only be estimated for banks that are in the sample in period t, or only when $s_{it} = 1$ and y_{it} is observed.

From this model, suppose we are interested in the conditional density of $f(y_t \mid x_t)$ but we observe $g(y_t \mid x_t, s_{it} = 1)$. We need some restrictions or additional information that will allow us to use the data we observe so that we can infer $f(*)$ from $g(*)$. Fitzgerald et al (1998) suggest obtaining these restrictions from the probability function of attrition, $p_{it}(s_{it} = 1 \mid y_{it}, x_{it}, z_{it})$, where x_{it} is the matrix of our main regressors and z_{it} is the matrix of variables that are important in predicting selection

and are not included in x_{it}. This could include lags of both the dependent and independent variables.

We can state the attrition as follows to determine if the selection we have is potentially problematic:

$$s_{it}^{*} = \alpha_0 + \alpha_1 x_{it} + \alpha_2 z_{it} + v_{it}$$

$$s_{it} = 1 \text{ if } s_{it}^{*} \leq 0$$

$$s_{it} = 0 \text{ if } s_{it}^{*} > 0$$

Here s_{it}^{*} is a latent index and attrition occurs if this variable equals zero and v_{it} is a zero-mean random influence on the probability of attrition. Our first question is whether the attrition exhibits selection on observables and/or on unobservables.

We have selection on observables if $p_{it}(s_{it} = 1 \mid y_{it}, x_{it}, z_{it}) = p_{it}(s_{it} = 1 \mid z_{it})$, $t = 1, \ldots T$. Thus conditional on y_{it} and z_{it}, the attrition probability is independent of y_{it} and of the unobserved factors in the error term of our primary model of estimation. Selection on unobservables exists if $p_{it}(s_{it} = 1 \mid y_{it}, x_{it}, z_{it}) \neq p_{it}(s_{it} = 1 \mid z_{it})$. In the parametric model, selection on unobservables occurs if v_{it} is not independent of the error term conditional on x. If there is selection, then our next concern is the ignorability property. If selection is ignorable, the estimation of our parametric linear model leads to unbiased estimates of β_t. Selection would be ignorable if y_{it} and z_{it} were independent conditional on x_{it} and $s_{it} = 1$ and we can reduce the probability function to $p_{it}(s_{it} = 1 \mid x_{it}, z_{it}) = pr(s_{it} = 1 \mid x_{it})$ that is the probability of attrition is independent

of z_{it}. If these conditions are met, then the estimation of the linear equation yields consistent estimates of the coefficients. However, if these conditions do not hold, then selection is non-ignorable and we need to account for the attrition in the analysis.

To identify a model with selection on unobservables, the usual approach is to use some exclusion restrictions, which requires the use of some variable, q that could predict attrition but was independent of $u_t \mid x_t$, as well as being included in x_{it}. The consensus appears to be that it is extremely difficult to find such a variable, because there are few variables that can both predict non-response and be convincingly excluded from the main equation for y. However, while selection on unobservables might remain a problem, correcting for selection on observables by using all the available information will reduce the amount of residuals and unexplained variation due to non-response. Thus controlling for selection on observables will also reduce biases due to selection on unobservables.[34]

With respect to selection on observables, as an initial analysis, we have tested the means of our important variables for the attritors (those banks that drop out of the sample at some time) and those banks that stay in the sample throughout the entire period, which we refer to as the stayers. We find that for most variables the means are significantly different indicating that we might have selection on observables (see table 3-2)[35]. The issue is whether the attrition will yield a significant selection bias of the coefficients, i.e. would the attrition yield a significant selection bias in estimates?

With respect to selection on observables, as an initial analysis, we have tested the means of our important variables for the attritors (those banks that drop out of the sample

[34] See Alderman, Behrman, Kohler, Maluccio and Watkins (2001).

[35] The difference in means could also be attributable to a host of other factors that are not related to attrition, e.g. changes in operation procedures over the intervening period could result in means of the variables being significantly different.

at some time) and those banks that stay in the sample throughout the entire period, which we refer to as the stayers. We find that for most variables the means are significantly different indicating that we might have selection on observables (see table 3-2)[36]. The issue is whether the attrition will significantly bias the coefficient estimates.

There are a number of tests that are commonly used to determine the importance of attrition. None of these are perfect tests but two approaches appear to be more suitable for our purposes given the structure of our dataset. One is the test that entails comparison of the weighted and 2SLS regressions. Similarity of the estimates suggests that attrition may not impose a significant bias on the estimate. The other test we use is suggested by Wooldridge (2001) and involves including a lead of the selection indicator in a simple 2SLS regression. If the coefficient on this variable is not significant, then we can still obtain reasonable inference from the estimates. Thus estimation of our structural equation based on the observed data for non-attritors will yield consistent coefficients of the β. The results of these tests are presented in table 3-4 to 3-6 and suggest that attrition will not largely bias our estimates. With the caveat that the tests are not error-proof, the results suggest that it is valid to use the usual estimation procedures with either an unbalanced panel or a balanced sub-panel for estimation.

3.3.2 Endogeneity

Most of the right-hand-side variables of interest, especially the ratios that measure bank financial soundness are derived from the banks' balance sheets and the income statements. Generally, these variables are not determined outside the model and as such we have to deal with the potential estimation problems presented by endogeneity.

[36] The difference in means could also be attributable to a host of other factors that are not related to attrition, e.g. changes in operation procedures over the intervening period could result in means of the variables being significantly different.

Liquidity: The decision of banks to hold a certain level of liquid assets is a function of a number of factors including market frictions. The stock of securities banks hold is a function of information asymmetries and whether the core borrowers of a bank are prone to cyclical fluctuations may also influence the choice of liquid assets that a bank holds. Finally, we cannot exclude the possibility that holding large stocks of liquid assets may be a reflection of a relatively intense risk aversion on the part of the bank. If this is the case, then the banks in questions are likely to have more stringent lending conditions. Otherwise, the possibility that there were differences in loan demand between risky and less risky firms in response to a monetary policy shock would make liquidity a poor measure for identifying loan supply effects.

Large deposits could also be endogenous. Suppose that lenders are sensitive to the financial health of the banks they deposit their funds with. One possible outcome of tight monetary policy is that the soundness of some banks may be compromised. Holders of uninsured deposits may want to withdraw their funds from these banks. At the same time, because contractionary policy reduces core deposits, banks' demand for large deposits will be increasing. Consequently, banks may try to induce inflow of these deposits by offering higher interest rates. Thus we have a possible joint determination with respect to large deposits.

Return-on-Assets: Banks' ability to lend is influenced by its ability to generate income but the lending a bank does also determines how much income the bank is able to generate. Thus the ROA is also potentially endogenous.

Asset quality (measured as the ratio of loan loss reserve to non-performing loans) is another suspect variable in that it could be a reflection of a bank with a solid balance sheet

and an ability to absorb problem loans. However, a high ratio could also hide the fact that the bank had a risky portfolio and was anticipating a relatively large incidence of default.

Equity: High capitalization is usually associated with banks being less prone to asymmetric information problems vis-à-vis their lenders. Thus a high capital ratio should entail a lower external finance premium relative to that of poorly capitalized banks. However, bank capitalization may reflect the riskiness of its loan portfolio if banks held high levels of capital because they were more risky.

3.3.3 Correlation between fixed effects and explanatory variables

A related problem arises when we have bank specific fixed effects that are correlated with some or all of the RHS variables.

A bank's attitude towards risk determines the portfolio choice of that bank. Thus there is a correlation between this fixed effect and the liquidity ratio. Other than portfolio choice, this effect will also influence the banks' actions with respect to other operational aspects such as providing for loan losses and earning capacity.

Geographical location is another time invariant effect that is correlated with some explanatory variables. For example, most banks, especially small ones, tend to limit their operations to the states or cities where they are located. Banks with geographically concentrated activities are potentially vulnerable to local economic conditions because of an inherent concentration of loan and deposit customers.

4 Estimation and Results

4.1 Estimation

The strategy for the empirical analysis is to test for a differential response of bank lending to changes in monetary policy across banks, depending on their financial position. For analysis, we use panel data techniques to estimate an equation of the form:

$$\left[\begin{array}{l} y_{it} = \alpha y_{it-1} + \sum_{j=-1}^{4} \beta_j ffr_{t-j} + \gamma' x_{it} + \phi' Z_{it} \\ + \sum_{j=-1}^{4} \theta_j ffr_{t-j} Z_{it} + \varphi g_t + \eta_i + u_{it} \end{array}\right] \quad (1)$$

where y_{it} represents real loans, X_{it} is a matrix of bank specific variables that capture determinants of loan supply shifts that are not caused by monetary policy changes; Z_{it} is a matrix of the components of the CAMEL ratios, which are allowed to vary across banks and time; η_i represents a bank's unobserved time-invariant characteristics and u_{it} is the idiosyncratic error term. With the exception of the interest rates, we have deflated all variables by the CPI. The variable g_t (real GDP) is a proxy for the overall health of the economy. We estimate this equation with real loans as the dependent variable. We want to determine whether policy changes affect lending activities for banks.

We use first differencing to remove the fixed effects, thus we are effectively estimating an equation of the following form:

$$\left[\begin{array}{l} \Delta y_{it} = \alpha \Delta y_{it-j} + \sum_{j=-1}^{4} \beta_j \Delta ffr_{t-j} + \gamma' \Delta x_{it} + \phi' \Delta Z_{it} \\ + \sum_{j=-1}^{4} \theta_j ffr_{t-j} Z_{it} + \varphi \Delta g_t + \Delta u_{it} \end{array}\right] \quad (2)$$

Since banks of different sizes appear to react differently to shocks, our estimation also takes size effects into consideration. To do this we have divided banks into four size groups based

on total assets. We have banks with assets below the 75th percentile, the 90th percentile, the 95th percentile and above the 95th percentile. We estimate the regression equation separately for each size group. Our monetary policy indicator is the federal funds rate, thus we test the hypothesis that $\beta_j < 0$ as well as $\sum \theta_j < 0$. Since we are also concerned with whether financial strength affects the way banks respond to policy changes we are also interested in $\sum \theta_j$ for each ratio as well as the overall significance.

4.2 Estimation Methodology

We estimate the equation using the Generalized Methods of Moments (GMM) for dynamic panel data models; specifically we use the Arellano-Bond (1991) approach. This approach is appropriate for several reasons. It is possible that the choice of current period loans is influenced by past values. Thus we would want to allow for the dynamic nature of the model by including lags of the dependent variable and for this purpose, most standard GMM estimators would suffice. We also want to control for possible simultaneity and reverse causality of the explanatory variables and the dependent variable. This we can achieve by relaxing the assumption of strict exogeneity of the explanatory variables and instead assuming weak exogeneity (where the error term can be correlated with the leads but not the lags) and then using instrumental variables. This approach would also provide consistent estimators for endogenous independent variables. Because we do not have outside instruments, we estimate the model using lagged independent variables as instruments and we show the conditions under which these are valid instruments.

However, we still need to account for the existence of unobserved individual effects resulting from substantial differences across banks. Estimating the equation using the standard GMM alone would not be adequate because the unobserved heterogeneity would

lead to inconsistent coefficient estimates. We first difference the equation to eliminate the fixed effects. However, because we have a relatively short panel, this technique may not work very well and would still yield inconsistent estimators.

Consider our model in this simplified form:

$$y_{it} = \alpha y_{it-j} + \beta_j \sum_{j=-1}^{4} ffr_{t-j} + \gamma' x_{it} + \eta_i + u_{it} \quad (3)$$

where

$$E(u_{it} \mid x_{i0}, \ldots x_{iT}, \eta_i) = 0$$

After first differencing the equation, we get

$$\Delta y_{it} = \alpha \Delta y_{it-j} + \beta_j \sum_{j=-1}^{4} \Delta ffr_{t-j} + \gamma' \Delta x_{it} + \Delta u_{it} \quad (4)$$

The differencing also induces a new source of correlation between the differenced error term and the differenced lagged dependent variable because by construction, Δy_{it-1} is correlated with Δu_{it}. These correlations require the use of valid instruments for consistency. Under the assumption that u_{it} is not serially correlated and that the explanatory variables are weakly exogenous, we get the following moment conditions for the explanatory variables:

$$E(y_{it-s} \Delta u_{it}) = 0 \quad (5)$$

$$E(x_{it-s} \Delta u_{it}) = 0 \quad (6)$$

When these moment conditions apply then

$(y_{it-2}, y_{it-3}, \ldots y_1)$ and $(x_{it-2}, x_{it-3}, \ldots x_1)$ are valid instruments. Arellano and Bond (1991) have shown that the estimator from the above model would be consistent and efficient. We use the Sargan test for over-identifying restrictions to check the validity of the

instruments used, and the presence of second-order serial correlation of the error term. The second test is necessary because the consistency of the estimators relies on the condition that $E[\Delta u_{it} \Delta u_{it-2}] = 0$, i.e. we should not have second order serial correlation in the errors. Violation of this condition invalidates the instruments as they would be correlated with the error term.

4.3 Empirical Results

Our goal is to test the hypothesis that the response of bank loan supply to monetary policy shocks is a function of banks' financial strength and that it could also depend on the size of the bank. For this purpose, we need to use a specification that relies on interactions between monetary policy shocks and measures of bank strength. The stratification of the sample by asset levels takes care of the size effect. However, direct relationships that might exist between bank strength, size and lending activity should provide useful initial insights into the importance of these characterizations of banks for the transmission of monetary policy. We start with these and discuss their importance briefly without much detail besides whether or not they matter for lending.

a) Bank lending sensitivity to bank financial strength

In tables 3-4 to 3-9 we report the results of the regressions for the impact of monetary policy shocks given bank strength separately for each of the four size groups These results for all panels are considerably different indicating that the changing structure of the banking industry may have some important implications for banks' response to shocks.

For the variable of interest, the federal funds rate, we included one lead and four lags and we are interested in the cumulative effect. Because a lot of decisions concerning future

lending are made well in advance of changes in monetary policy, loans react to policy shocks with a considerable lag, (Bernanke & Blinder, 1992). However, since 1994 the Fed has been announcing the target level for the federal funds rate. Rationally, banks should react to the announcement and start adjusting their portfolios appropriately. Thus, we need to allow for some announcement effect, hence the inclusion of the lead in the regression.

Looking only at the federal funds rate, it appears that size is the only factor that matters in how monetary contractions affect bank lending. The cumulative effect is negative and significant for the banks in the 75^{th} and the 90^{th} percentile only. For the two larger size categories, none of the coefficients are statistically significant.

We have, however, made a case for the possibility that the overall financial strength of banks might play a role in mitigating the effects of monetary contractions on their lending and we have appealed to components of CAMEL ratings for heterogeneity or differences in financial strength. Thus for a basic understanding of how these variables could potentially help banks withstand policy-induced deposit falls, we should analyze their impact on bank lending. These are presented in Table 3-7. In addition we have looked at how monetary policy changes affect some of these ratios, especially the liquidity to determine whether indeed some banks fall back on their security holdings to maintain the levels of their lending. The results of the impact of shocks on net liquid assets show a coefficient estimate that is negative and strongly significant for all banks except those in the largest size group. This result implies that in periods of tight monetary policy, lending activity will be more restrictive for less liquid banks. Banks with adequate liquidity will offset, at least partially, the effects of policy-induced deposit shortfalls by selling their liquid assets. Thus we should observe a reduction in liquid assets when there is a monetary tightening. The lack of a significant response on the part of the largest banks supports the hypothesis that because of access to

alternative sources of funding, these banks do not need to maintain a high liquidity base to meet funding needs. Thus while liquid assets are important in helping banks in lower asset groups to smooth their lending they are not so important in the highest asset group.

For the influence of ratios on lending in the level estimations, it appears that the importance of individual ratios to bank lending activity varies by size. However, most ratios are significant for all size groups except the largest banks.

The estimates for the ROA ratio indicate that this measure of financial strength is an important determinant of lending activities for banks in the smallest and largest size groups. For the small banks the coefficient is positive and significant. If monetary policy affects bank loan supply and if this ratio is important to the banks' ability to maintain its lending, then this ratio being positive would support the prediction that lending at strong banks would decline by a lesser proportion. However, for the largest banks the coefficient estimate is negative and significant. There might be a simple explanation for this outcome. The negative coefficient could be capturing the fact that large banks do not rely that much on traditional loan activities for income generation. They have access to an extensive base of non-lending activities and fee-based operations, which have become very important sources of income for large banks. Thus, during periods of tight money when firms would not be very profitable, large banks may choose to substitute out of the traditional loan market into other income generating activities that do not entail as much risk.

Our first measure of asset quality is the ratio of loan loss provision to non-performing loans. This ratio can be interpreted in two ways. First, the high ratio can be thought to indicate prudent behavior on the part of banks, which could then be taken to imply some positive correlation with financial strength. If this view holds, a high level of provisions relative to bad loans should be reflected in a high level of lending or a smaller

decline during periods of tight money. Thus the estimates should be positive to show banks' ability to weather effects of restrictive policy actions. Shen (1999) argues that in fact an increase in the ratio or a high level of provisions could actually indicate that the bank was expecting a higher proportion of loans to default. If there is an expectation of an increase in non-performing loans, then we should observe larger declines in lending activity. Our results would seem to support this latter argument, as the coefficient estimates are negative for all but the largest banks.

The second measure of asset quality is the ratio of non-performing loans to total loans, which measures the extent of portfolio impairment. One of our hypotheses is that during periods of tight money, sound banks have a better ability of shielding their loan supply through their ability to raise external finance. It is reasonable to expect that the markets will consider the banks' asset quality as an indicator of default possibility. If this is true, then banks with better loan portfolios should not have to drastically reduce their lending following a monetary contraction and it is also likely that those banks with poor loan portfolios may encounter more difficulties when attempting to borrow from external markets. Our findings appear to support this argument in that in all cases, the coefficients are significant and positive indicating that asset quality is important in how banks react to shocks. Further, these results indicate that banks with high asset quality portfolios are able to smooth out the effects of policy shocks. The coefficients are significant and positive in all cases.

In the next stage, we introduce interaction terms to the specification described above. We still want to address the question of whether the behavior of bank lending is influenced by differences in banks' financial positions. Interacting the monetary policy indicator with the measures of financial strength should provide some additional information

on how individual characteristics of banks influence their response to policy shocks. Specifically, we have interacted each CAMEL ratio with the lead and four lags of the federal funds rate and we estimate the regressions separately for each size group. Our discussion of the results is based on the cumulative effects of all the lags.

For statistical significance of the explanatory variables, we use the joint significance tests presented at the bottom of table 3-8. Note however, that because of the substantial difference in the number of observations across the different bank sizes, we cannot make valid comparisons on the statistical importance of the right hand side variables. Thus we restrict analysis of statistical significance within each size group. In addition to statistical significance, economic importance measured by the size of the effect is also important. For this purpose, we use standardized coefficients and since for each size group we are effectively moving the variable over the same distance regardless of the sample size, we can determine the relative importance of variables across different size groups.

Once again we see a vast difference in the importance of financial soundness for banks in different size groups. The results are suggestive of financial ratios playing a role in how bank lending reacts to monetary contractions. The results show that all variables are jointly significant for all bank sizes expect for those in the 95th percentile group. However, the cumulative impact of the individual measures of bank strength varies significantly across the different size categories. It appears that banks in different size groups respond differently to different ratios, i.e. a ratio that is significant to a bank in the 90th percentile may not be significant for banks in the 95th percentile and vice versa. This would suggest that perhaps factors that determine financial strength for large banks are different from those factors that determine financial health for small banks, possibly because of different approaches to generating income.

Again there is variability in how banks in different size groups react to policy shocks and in the importance of individual variables process. The liquidity term has a cumulative effect that is significant for all size groups However, for the large banks, this effect is only significant at the 10% level. Perhaps more interesting is the economic importance of these effects. The magnitude of the impacts clearly reflects the importance of bank size, especially that of large banks, for economic activity. The results show that an increase of one standard deviation in net liquid assets reduces lending activity by 0.8 percentage points and 2 percentage points for banks in the 75^{th} and 90^{th} percentile groups while the impact is over 20 percentage points for the large banks with the largest banks having more than twice as large an impact.

Also, the effect is positive for the largest banks indicating that these banks actually increase the volume of lending following a monetary policy contraction. This could be in support of the flight-to-quality argument whereby financial assets gravitate towards large institutions during periods of economic downturns.

Notably, the interaction term for capital is not significant for any of the groups. Does this imply that bank capitalization is not important in determining bank financial soundness? Obviously not since capital requirements are one of the major ratios that central banks consider when examining bank soundness. The results we obtain could be reflecting the use of total book-value capital that is not risk-weighted. Unfortunately, data on risk-adjusted capital, which would, perhaps, be more informative on how markets respond to bank capitalization, are not available. Notwithstanding the size of the cumulative effects gives reason to pause and reconsider the importance of the implied influence. The impact of a unit increase in the standard deviation of equity reduces lending for all but the largest banks -- by from 1 percentage point for the smallest banks to 28 percentage points for banks

in the 95th percentile group. This more than likely, reflects the fact that when banks increase their capital holdings, for whatever reason, they are effectively reducing their base for alternative investments. However, for banks in the largest size category, the impact is positive and relative to the other sizes, very large. The positive impact could be a reflection of the ability of these banks to resell loans thus reducing the need for the capital base from their balance sheets.

The return on assets measure is statistically significant only for the largest banks again with a large disparity in the economic significance across the sizes. For example, increasing the variable by one standard deviation increases lending of the two smallest groups by about $0.02 compared to $0.36 increase in the lending of the largest banks.

The other variables that are important for banks' ability to maintain their lending activity following a shock are efficiency, which matters only for the smallest and largest banks, the ability of banks to absorb losses from bad loans (*quality1*), which is important for banks of all sizes and the measure of the impairment of portfolios (*quality2*), which is significant for that smallest and largest banks.

Again the impact is suggestive of bank size determined implications for economic activity. In particular, the magnitudes of the cumulative effects show that for efficiency, a unit increase in the standard deviation, increases lending by roughly $1.50 for the banks in the two smallest size groups relative to about $5.00 for banks in the upper percentile categories.

The importance of asset quality across all groups suggests firstly that markets are sensitive not only to banks' ability to absorb losses from bad loans and therefore remain solvent. Second, relative to the amount of total loans, the impact of improving asset quality

is larger for small banks which could reflect the possibility that they are associated with higher perceived default risk compared to large banks,.

b) Does bank's financial position matter for its ability to raise external finance?

We have argued in the main body of the paper that part of the reason why banks have different abilities to smooth out the effects of contractionary shocks emanates from having differential access to markets for external finance depending on their individual characteristics. We have hypothesized that financially sound banks should be able to obtain larger amounts of external funding. We test this hypothesis using the same estimation technique as we did for loan response and the same ratios but with the federal funds purchased as a dependent variable.

Since smaller banks are net suppliers of federal funds and we are interested in ability to borrow from the market, we limit the estimations to large banks. The results show that only the return on assets (ROA) has a statistically significant coefficient. The second measure of asset quality and the liquidity ratios are both marginally significant at the 10% level.[37] Jointly, all the measures of soundness are significant at the 5% level. Thus, the results somewhat support the hypothesis that bank financial strength improves the ability of banks to issue federal funds. However, most of this process could be driven by size since the data show that large banks are the only effective borrowers in this market.

5 Conclusion

[37] These results have to be interpreted with caution, as the model is potentially misspecified. Ideally, this regression should be run using a tobit model since our dependent variable has a significant pile-up at zero (26%) and a continuous distribution to the right. However, most of our variables of interest are potentially endogenous. We do not have outside instruments and ivtobit cannot be run with lags. Thus we have had to sacrifice specification for consistency.

In this paper we have investigated the importance of banks' financial position in their ability to smooth the effects of monetary contractions on their lending activity. We specifically analyzed ways in which imperfections in financial markets can help propagate and magnify the effects of shocks.

Using data on commercial banks in the U.S. we have tested for the importance of banks' financial position in mitigating the adverse effects of policy tightening. Because of the existence of financial frictions that make it difficult for some firms and banks to obtain alternative funding, this is an appropriate way of testing for differential responses to monetary policy. We have found that, indeed banks' financial positions matter in how banks respond to policy actions, although we find that the response is not uniform among banks of different sizes. Furthermore, unlike the existing literature that finds no loan supply effects for large banks, we find that some measures of bank strength are important in banks' reaction to monetary contractions. We also find that banks may rely to some extent on their liquid assets to partially offset reduction of their lending activity. The financial frictions and their asymmetric nature can potentially introduce uncertainty into the size and timing of the response of the economy to monetary policy innovations. Thus, it is important that policy makers understand these and should incorporate the assumption of credit constraints in policy design.

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Table 3-1
Summary Statistics

All Banks					
	All	75th	90th	95th	>95th
Variable	Mean	Mean	Mean	Mean	Mean
assets	474888	52979	234026	615487	7.39E+06
loans	250459	29605.3	138774	373213	4.73E+06
Loans ratio	0.553	0.539	0.595	0.610	0.613
Commercial	0.173	0.168	0.178	0.187	0.228
Real estate	0.557	0.539	0.640	0.622	0.513
household	0.170	0.171	0.155	0.170	0.207
agriculture	0.105	0.130	0.026	0.013	0.008
cashrat	0.062	0.062	0.051	0.062	0.081
liabilities	438920.0	47891.1	213929.8	569269.9	6.87E+06
deposits	302484.8	46076.6	196526.9	494406.0	5.37E+06
core	0.419	0.424	0.408	0.388	0.400
large	0.112	0.109	0.117	0.124	0.136
loan growth	0.879	0.650	5.011	14.158	18.105
Median Assets	83779	44249	216281	575412	2.58E+06
1991q1					
	ALL	75th	90th	95th	>95th
Variable	Mean	Mean	Mean	Mean	Mean
assets	316610	47492.1	232290	615162	5.43E+06
loans	171562	25081.1	137201	383071	3.64E+06
Loans ratio	0.527	0.509	0.592	0.625	0.624
Commercial	0.196	0.190	0.212	0.219	0.264
Real estate	0.506	0.496	0.576	0.569	0.468
household	0.195	0.195	0.191	0.186	0.205
agriculture	0.108	0.129	0.019	0.008	0.006
cashrat	0.069	0.070	0.053	0.074	0.098
liabilities	297611.5	43440.4	215659.3	573938.7	5.1E+06
deposits	220029.3	42092.4	201192.9	506455.8	4.3E+06
core	0.379	0.383	0.357	0.357	0.375
large	0.116	0.112	0.125	0.142	0.155
loan growth		37890.5	211554.0	575328.0	2.7E+06

Table 3-1 Continued
2000q4

	ALL	75th	90th	95th	>95th
Variable	Mean	Mean	Mean	Mean	Mean
assets	817061	60185.7	234974	609434	1.16E+07
loans	444513	37410.4	151471	388332	7.24E+06
Loans ratio	0.611	0.597	0.645	0.642	0.626
Commercial	0.171	0.168	0.169	0.175	0.212
Real estate	0.607	0.579	0.688	0.670	0.572
household	0.135	0.141	0.112	0.123	0.166
agriculture	0.085	0.113	0.029	0.018	0.009
cashrat	0.055	0.058	0.045	0.051	0.055
liabilities	747308.6	53812.7	212902.6	555956.3	1.07E+07
deposits	494934.6	50954.6	193110.1	473954.2	7.78E+06
core	0.410	0.433	0.395	0.310	0.276
large	0.156	0.153	0.156	0.163	0.188
loan growth		53146	218726	574229	3.E+06

Table 3-2

Summary Statistics for Ratios Percentiles of total asset distribution				
Ratio	75th	90th	95th	>95th
Liquidity	0.356	0.310	0.282	0.213
Net Liquid	0.347	0.285	0.235	0.167
Equity	0.097	0.092	0.090	0.078
ROA	0.036	0.007	0.007	0.007
Quality1	11.473	13.387	14.147	15.094
Quality2	0.015	0.014	0.017	0.019
Quality3	0.008	0.008	0.009	0.012
Efficiency	0.036	0.021	0.021	0.017

Appendix 3-1—Definition of Ratios

Net Liquid: The ratio of net liquid assets to total assets. Net liquid assets are constructed as Securities + Federal Funds Sold – Federal Funds Issued.

Liquidity: This ratio is constructed as (securities + federal funds sold)/total assets. Note that this measure does not account for borrowing. *ROA*: Return on Assets calculated as the ratio of net income to total assets.

Equity: Bank capitalization calculated as the ratio of total book-value capital to total assets.

Efficiency: Proxy for bank management constructed as

Quality1: The measure of asset quality is calculated as the ratio of loan loss allowance to non-performing loans.

Quality2: The second measure of asset quality based on the ratio of non-performing loans to total loans.

Table 3-3

Descriptive Statistics by Attrition

	Original Sample	Attritioned Sample	(1)-(2)
	-1	-2	p-value
assets	272266.6	430126	
	20331.76	55275.5	0.002
Loans	1146.92	1341.41	
	105.46	205.94	0.362
Fed Funds	153.99	233.77	
	13.31	36.37	0.020
Large Deposits	230.12	360.95	
	15.107	42.542	0.001
Core Deposits.	72.55	33.1	
	9.144	9.144	0
Total Deposits	16.54	63.5	
	9.3188	15.7502	0
Liquidity	0.3644	0.3181	
	0.0013	0.0013	0
Net Liquid Assets	0.3542	0.0014	
	0.0014	0.0014	0
Equity	0.0894	0.0807	
	0.0006	0.0280	0.710
ROA	0.0015	0.0068	
	0.0003	0.0006	0
efficiency	0.0090	0.0343	
	0.0001	0.0009	0
Quality1	7.7941	9.2638	
	0.2695	0.6551	0.021
Quality2	0.0205	0.0222	
	0.0003	0.0002	0
Quality3	0.0110	0.0128	
	0.0001	0.0001	0

Table 3-4

Test with Selection Lead
Dependent Variable: Loans

	Coefficient	z-stat
Loans_1	0.11	0.83
Loans_2	0.043	0.25
Large Deposits	5.389	1.82*
Netliquid	-0.012	2.02**
Equity	69.531	0.8
ROA	27.685	0.93
Efficiency	-98.064	1.01
Quality1	55.062	0.97
Quality2	-53.582	0.42
Quality3	-56.6	0.72
ffr	-60.536	0.18
ffr_1	-18.221	1.98**
ffr_2	2.938	0.04
ffr_3	-2.807	0.78
ffr_4	23.624	0.78
Core Deposits	0.311	2.04**
RGDP	4.522	1.02
Real Assets	0.408	2.26**
Spread	-11.492	0.82
Selection Indicator	-20.947	0.07

Table 3-5: Attrition Probability

Dep. Var.	Stay1	stay2	stay3	stay4	stay5	stay6	stay7	stay8
rloans	-0.00002	-0.00001	-0.00002	-0.00001	-0.00001	-0.00001	-0.00001	-0.00001
	(2.091)**	-0.927	(5.817)***	(5.682)***	(3.208)***	(2.023)**	(3.598)***	(4.194)***
rloans_1	0.00001	-0.00001	0	0	0	0	0	0
	(3.957)***	(2.638)***	-0.459	-0.644	(3.008)***	-1.25	-0.759	-0.557
rloans_2	0	0.00001	0	0	0	0	0	0
	(2.237)**	(3.022)***	-0.734	-0.45	(1.910)*	-0.611	-1.056	-0.64
rtmlrg	0.00007	0.00005	0.00005	0.00003	0.00001	-0.00001	-0.00001	-0.00004
	(9.140)***	(6.164)***	(8.363)***	(6.350)***	(1.692)*	-1.05	-1.633	(4.382)***
netliq	0	0	0	0	0	0	0	0
	(6.459)***	(4.950)***	(7.541)***	(5.945)***	(2.097)**	-0.097	-0.18	-0.297
equity	-8.07851	-5.16633	-5.48144	-6.31121	-8.43036	-4.3142	-2.77947	-4.10776
	(24.517)***	(19.695)***	(27.132)***	(23.364)***	(32.422)***	(22.147)***	(16.618)***	(19.894)***
roa	-37.05928	-15.68012	-1.39809	-1.04365	-31.82255	-5.34229	5.80264	9.82821
	(10.743)***	(16.166)***	(5.303)***	-1.245	(11.084)***	(7.368)***	(48.036)***	(45.383)***
effy	-114.863	-15.87712	5.30476	15.20125	-122.942	-15.75562	5.62726	17.42228
	(72.892)***	(45.634)***	(10.910)***	(25.542)***	(96.097)***	(48.628)***	(8.947)***	(37.631)***

Table 3-5 continued								
quality1	-0.00243	-0.00247	-0.00297	-0.0028	-0.00233	-0.00119	-0.00064	-0.00086
	(5.660)***	(5.971)***	(9.390)***	(6.885)***	(7.567)***	(5.986)***	(4.303)***	(2.725)***
quality2	0.47342	0.37657	0.37577	0.337	0.53978	0.36151	0.26127	0.27681
	(6.183)***	(5.054)***	(5.245)***	(3.441)***	(4.616)***	(3.942)***	(3.893)***	(2.935)***
quality3	9.38341	6.44763	7.32434	2.99361	10.65708	7.29532	6.11637	1.03832
	(11.543)***	(14.258)***	(19.532)***	(7.461)***	(14.138)***	(16.846)***	(17.413)***	(2.604)***
rassets	0	0	0	0	0	0	0	0
	-0.812	-0.809	(2.560)**	(4.031)***	(2.123)**	(2.035)**	(2.739)***	(3.885)***
rcore	0.00002	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001
	(4.569)***	(3.783)***	(6.474)***	(5.564)***	(4.209)***	(4.885)***	(4.199)***	(6.159)***
Observations	305853	305853	305853	305853	305853	305853	305853	305853

Table 3-5 continued							
	stay9	stay10	stay11	stay12	stay13	stay14	stay15
rloans	-0.00001	0.00001	0	0	0	0.00001	0
	(2.189)**	(2.739)***	-0.083	-1.509	-0.867	(1.898)*	-1.195
rloans_1	-0.00001	-0.00001	0	0	0	-0.00001	0
	(3.845)***	(3.109)***	-0.522	-0.239	-1.152	(4.298)***	-0.15
rloans_2	0	0	0	0	0	0	-0.00001
	-0.043	-0.676	-1.191	-0.879	-0.654	-0.559	(1.794)*
rtmlrg	-0.00008	-0.00019	-0.00014	-0.00006	-0.00014	-0.00017	-0.00012
	(4.334)***	(7.721)***	(7.636)***	(5.878)***	(5.425)***	(6.143)***	(7.381)***
netliq	0	0	0	0	0	0	0
	-0.922	(3.884)***	(4.659)***	(2.128)**	-0.169	-0.763	-0.668
equity	-4.56059	-1.44643	-0.866	-2.09965	-2.24473	-0.4959	-0.36281
	(21.288)***	(8.363)***	(5.779)***	(8.786)***	(11.308)***	(3.082)***	(2.498)**
roa	-27.89559	-1.58588	7.70383	13.67756	-43.09666	-12.90409	4.39091
	(12.836)***	(1.927)*	(53.935)***	(47.004)***	(13.181)***	(19.140)***	(40.525)***
effy	-110.99917	-13.56463	4.86397	17.198	-111.42299	-12.5321	4.92928
	(96.802)***	(38.919)***	(7.899)***	(37.568)***	(96.240)***	(39.996)***	(7.841)***
quality1	-0.00075	-0.00023	-0.00029	-0.00046	-0.00009	0.00003	0.00002
	(4.463)***	(2.220)**	(2.442)**	(2.129)**	-0.714	-0.919	-1.117
quality2	0.34125	0.21305	0.12427	0.07715	0.2044	0.08449	-0.04623
	(3.435)***	(2.527)**	(2.311)**	-0.546	(2.404)**	-1.585	-0.397

Table 3-5 continued							
quality3	5.58313	4.56436	3.08703	-3.00058	-0.1249	-2.69535	-3.54337
	(9.883)***	(11.438)***	(8.475)***	(4.988)***	-0.188	(5.405)***	(6.401)***
rassets	0	0	0	0	0	0	0
	(2.423)**	-1.544	-0.564	(2.014)**	(2.097)**	-1.038	(2.113)**
rcore	0.00002	0.00002	0.00002	0.00001	0.00002	0.00002	0.00001
	(6.377)***	(9.007)***	(7.830)***	(6.676)***	(6.946)***	(9.309)***	(7.727)***
Observations	305853	305853	305853	305853	305853	305853	305853

Table 3-5 continued

	stay16	stay17	stay18	stay19	stay21	stay22	stay23	stay24
rloans	0	0	0	0	0	0	0	0
	-1.036	(1.648)*	-0.884	-0.232	-1.301	(2.083)**	-1.109	-0.34
rloans_1	0	0	0	0	0	0	0	0
	-1.335	-1.061	-0.218	-0.18	-0.318	(2.696)***	-0.18	-0.381
rloans_2	0	-0.00001	0	0	0	0	0	0
	-1.204	(3.851)***	(3.284)***	(1.893)*	-0.932	-0.428	(2.182)**	-1.248
rtmlrg	-0.00005	-0.00007	-0.00005	-0.00003	-0.00002	-0.00001	-0.00001	-0.00001
	(5.959)***	(4.989)***	(4.831)***	(5.112)***	(2.827)***	(2.475)**	(1.918)*	-1.257
netliq	0	0	0	0	0	0	0	0
	(2.497)**	-0.979	-1.201	-1.572	-0.206	(2.120)**	-0.708	(2.045)**
equity	-1.89867	-0.25344	1.51699	1.39128	0.0228	1.03499	1.4495	0.72913
	(8.985)***	-1.288	(11.170)***	(11.195)***	-0.118	(7.124)***	(11.881)***	(3.893)***
roa	11.57344	-44.86067	-14.64095	5.93503	-40.067	-5.29045	7.28703	14.12326
	(46.219)***	(13.611)***	(22.968)***	(53.703)***	(13.029)***	(6.260)***	(63.022)***	(57.293)***
effy	16.87344	-104.3838	-12.23917	4.35969	-126.6855	-18.74884	3.24279	11.56634
	(31.994)***	(89.622)***	(38.951)***	(7.668)***	(84.483)***	(44.240)***	(7.420)***	(18.175)***
quality1	-0.00004	0	0.00002	0.00005	-0.00015	0.00001	0.00003	-0.00035
	-0.447	-0.02	-0.826	(2.244)**	-1.078	-0.23	-1.225	(2.296)**
quality2	-0.25841	-7.81641	-2.75609	-1.50237	0.11339	0.0537	-2.21121	-3.56692
	-0.662	(7.137)***	-1.597	(1.939)*	-1.592	-0.47	(2.487)**	(3.797)***

Table 3-5 continued								
quality3	-9.89732	7.39095	-1.29045	-2.82136	-3.63741	-2.86784	-0.32948	-3.82538
	(10.495)***	(3.869)***	-0.457	(2.088)**	(5.005)***	(5.074)***	-0.224	(2.266)**
rassets	0	0	0	0	0	0	0	0
	(5.483)***	(1.798)*	-1.435	(2.514)**	-0.065	-0.626	-0.369	-0.439
rcore	0.00001	0.00001	0.00001	0	0	0	0	0
	(6.039)***	(4.984)***	(4.406)***	(3.855)***	(2.277)**	-1.109	-1.299	-1.189
Observations	305853	305853	305853	305853	305853	305853	305853	305853

Table 3-5 continued

	stay33	stay34	stay35	stay36	stay37	stay38	stay39	stay40
rloans	0	0.00002	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001
	(2.040)**	(2.979)***	(3.205)***	(4.277)***	(3.729)***	(4.393)***	(4.472)***	(4.173)***
rloans_1	0	0	0	0	0	0	0	0
	(2.029)**	-1.23	-0.371	-0.524	-0.619	-1.335	-1.152	-1.424
rloans_2	0	0	0	0	0	0	0	0
	(2.195)**	-0.112	-0.402	(2.634)***	(1.911)*	-0.697	-1.027	-0.638
rtmlrg	0.00002	0.00002	0.00002	0.00002	0.00004	0.00004	0.00004	0.00003
	(5.536)***	(3.765)***	(7.072)***	(7.443)***	(8.434)***	(9.892)***	(10.147)***	(9.884)***
netliq	0	0	0	0	0	0	0	0
	(1.651)*	(2.668)***	(4.097)***	(2.398)**	(3.342)***	(2.948)***	-1.47	(2.567)**
equity	1.81038	1.75539	1.87652	0.04608	0.18768	1.25657	1.84653	1.35182
	(8.563)***	(11.221)***	(13.295)***	-0.251	-0.811	(7.208)***	(13.157)***	(8.437)***
roa	-46.4338	-13.55417	2.28448	10.96541	-44.00705	-13.00394	3.80045	10.22138
	(13.087)***	(15.997)***	(2.809)***	(66.650)***	(12.833)***	(12.697)***	(42.603)***	(58.235)***
effy	-134.26036	-19.44206	2.69578	8.58639	-134.35489	-20.14479	2.28601	7.69829
	(80.427)***	(46.824)***	(5.965)***	(15.890)***	(79.408)***	(44.458)***	(5.704)***	(15.171)***
quality1	-0.00001	-0.00001	-0.00001	-0.00011	0.00007	0.00004	0.00003	-0.0002
	-0.077	-0.184	-0.31	-1.073	-1.079	(1.669)*	-1.148	-1.578
quality2	-23.90791	-29.11118	-37.1097	-30.10806	-44.3138	-60.06502	-56.2289	-48.44356
	(15.902)***	(20.619)***	(24.055)***	(17.605)***	(21.392)***	(31.069)***	(32.706)***	(25.106)***
quality3	30.79977	36.1725	45.07516	27.32175	55.83391	75.38815	70.69045	58.1788
	(13.365)***	(18.026)***	(20.613)***	(10.417)***	(18.804)***	(29.556)***	(30.699)***	(21.927)***
rassets	0	-0.00001	-0.00001	-0.00001	-0.00001	-0.00001	0	-0.00001
	-1.364	(2.667)***	(3.109)***	(3.265)***	(2.935)***	(3.081)***	(3.288)***	(3.910)***
rcore	-0.00001	-0.00001	-0.00001	-0.00001	-0.00002	-0.00002	-0.00002	-0.00001
	(3.684)***	(4.304)***	(5.377)***	(5.459)***	(6.461)***	(7.101)***	(7.028)***	(5.372)***

Table 3-6
Correction for Attrition
Dependent Variable: Real Loans

	Weighted 2SLS	Instrumental Variable
Loans_1	0.901	-0.394
	(2.075)**	(4.826)**
Loans_2	0	0
	(.)	(.)
Large Deposits	8.369	7.032
	(3.963)**	(17.074)**
Liquidity	-0.055	-0.007
	(2.533)**	(5.452)**
Equity	2375.785	-15185.313
	-0.057	-0.714
ROA	-74646.461	35605.798
	-0.184	-0.390
Efficiency	31567.059	-22131.475
	-0.245	-0.587
Quality1	-13.358	-11.522
	-0.584	-1.102
Quality2	-20266.748	-56046.266
	-0.327	-1.255
Quality3	16526.100	45349.763
	-0.064	-0.394
ffr	-140.036	-44.815
	-0.645	-0.589
ffr_1	52.806	21.584
	-0.878	-1.179
ffr_2	35.512	0.803
	-0.688	-0.042
ffr_3	16.053	8.742
	-0.423	-0.575
ffr_4	-0.542	-6.417
	-0.019	-0.541
Core Deposits	-0.011	-0.008
	-0.331	-0.485
rgdp	-0.576	0.612
	-0.363	-0.748
Assets	0.002	0.002
	-0.288	-0.447
Spread	106.603	36.080
	-0.562	-0.560
Observations	119097	119097

Table 3-7
Loan Response to Policy Change - Levels
Dependent Variable: Real Loans

	Percentile			
	75th	90th	95th	>95th
Loans_1	0.583	0.333	0.466	0.137
	(8.590)**	(3.713)**	(4.158)**	-1.292
Loans_2	0.027	0.078	0.037	0.188
	-1.171	(2.912)**	(1.647)*	(1.693)*
Loans_3	0.110	0.098	0.044	0.547
	(5.478)**	(3.063)**	(2.513)**	(5.403)**
netliquid	0.428	-0.002	11.673	0.002
	(2.217)**	(6.626)**	(2.842)**	-0.496
equity	5.746	6.544	-0.001	-8604.010
	-0.185	-0.571	-0.663	(2.210)**
ROA	0.000	-12.919	35.004	-55880.477
	-0.117	-0.205	-1.415	(1.986)**
efficiency	-0.002	-17.783	0.024	4.563
	-0.713	-1.046	-0.080	(1.702)*
Quality1	2.756	-0.001	-164.543	286.828
	(14.730)**	-0.934	-0.387	-0.221
Quality2	6.581	-13.034	122.515	-3398.442
	(2.159)**	-0.926	-0.447	(1.742)*
cffr	1.323	8.585	25.979	1619.882
	(4.694)**	(3.741)**	(2.205)**	(2.165)**
cffr_1	-0.793	-5.049	-7.187	-1115.531
	(1.749)*	(1.925)*	-0.569	-1.209
cffr_2	3.663	9.345	16.797	972.248
	(10.188)**	(3.915)**	-1.297	-1.429
cffr_3	0.674	5.738	-11.080	1576.207
	-1.501	(2.244)**	-0.776	-0.975
cffr_4	-2.860	-11.364	-15.982	-1810.052
	(10.078)**	(5.589)**	(1.752)*	(2.497)**
crcore	0.211	0.196	0.244	1.648
	(11.518)**	(7.423)**	(5.477)**	(4.285)**
cspread	-0.945	-4.165	2.540	-1163.240
	(2.830)**	(1.947)*	-0.232	-0.829
crgdp	0.007	0.135	0.221	19.825
	(2.025)**	(5.440)**	(2.127)**	-1.256
Observations	37991	10348	2873	3118
Number of entity	5595	2065	642	551

Robust z statistics in parentheses
* significant at 10%; ** significant at 5%

Table 8

Loan Response to Monetary Contraction – Regressions with Interactions

Dependent Variable: Real Loans

	Percentiles			
	75th	90th	95th	>95th
Loans_1	0.649	0.283	0.471	0.139
	(8.119)**	(2.238)**	(5.922)**	-1.394
Loans_2	-0.003	0.072	0.016	0.147
	-0.118	(2.268)**	-0.539	-1.140
Loans_3	0.104	0.120	0.055	0.542
	(4.965)**	(2.746)**	(2.268)**	(5.189)**
LeadLiq	64.848	-15.909	491.231	24.018
	(2.252)**	-1.150	-0.818	-0.812
Intnetliq	-13.779	69.251	-0.166	-11478.199
	-0.064	-1.517	-0.144	-0.840
Intnetliq1	0.004	-26.342	-58.378	7.467
	(4.289)**	(1.960)**	(2.773)**	-0.131
Intnetliq2	12.317	-16.873	1507.141	140525.944
	(1.944)*	(1.978)**	-0.027	(1.786)*
Intnetliq3	-8.827	-13.730	-543.878	-27724.594
	-0.065	-0.648	-0.652	-1.205
Intnetliq4	11.779	339.714	140.280	9586.346
	(2.737)**	(2.905)**	-1.320	-0.743
LeadEquity	-28.969	-8.014	-594.878	-158242.000
	-1.158	-0.230	-0.913	-0.093
Intequity	39.068	-24.084	-45.971	-22156.397
	-0.212	-0.487	-1.101	(2.163)**
Intequity1	-0.011	26.957	51.300	3934.247
	-1.188	-0.566	-0.127	-0.250
Intequity2	-1.643	98.717	134.771	7.014
	(1.813)*	(2.560)**	-0.666	(2.445)**
Intequity3	-0.496	-51.833	384.050	-352533.000
	-1.399	-1.615	(1.662)*	-0.237
Intequity4	-10.719	123.643	69.722	7.519
	-1.375	-0.586	(1.891)*	(3.208)**
LeadEffy	18.410	-262.868	-871.247	33437.769
	(2.515)**	-1.252	-0.270	(1.957)*
IntEffy	12.708	155.137	-32.331	-2963.531
	-0.974	-0.728	-0.660	-1.572
IntEffy1	-4.929	-1.364	-150.724	-73839.827
	(2.909)**	-0.005	-1.458	(1.972)**
IntEffy2	-4.135	-145.435	254.713	13099.041
	-0.808	-0.731	-0.288	(2.078)**
IntEffy3	0.000	117.007	-1109.591	-5.752
	-0.786	-0.548	-0.140	-0.647
IntEffy4	-2.358	-15.331	854.062	-415290.550
	-0.479	-0.069	(2.867)**	(1.932)*

Table 8 continued

LeadROA	13.601	-158.040	-0.030	202542.082
	-0.774	-1.335	(2.769)**	(1.982)**
IntROA	-61.225	403.844	790.810	-4240.855
	-1.334	(2.867)**	-1.372	(1.895)*
IntROA1	0.002	61.333	80.557	-495.115
	-0.598	-0.541	-0.914	-1.331
IntROA2	-6.288	63.383	0.084	233857.110
	-0.113	-0.542	-1.121	(1.871)*
IntROA3	0.001	-196.028	50.922	15222.014
	(3.926)**	(1.984)**	-0.536	(1.668)*
IntROA4	0.000	49.995	33.672	8180.833
	(3.207)**	(1.841)*	-1.159	(2.045)**
LeadQuality1	-13.659	-0.007	-1.399	-34619.967
	-1.440	-0.445	-0.206	-1.359
IntQuality1	-7.767	0.023	326.879	255066.668
	-0.721	-0.864	-0.941	-1.179
IntQuality1_1	-1.400	-0.046	253.390	-849.379
	-0.276	(1.913)*	-0.698	(1.983)**
IntQuality1_2	23.033	0.024	-180.448	-85342.591
	-0.548	(2.100)**	-1.157	-0.080
IntQuality1_3	40.494	0.002	470.166	3969.323
	(2.233)**	(1.966)**	-0.248	-1.347
IntQuality1_4	-10.719	123.643	69.722	7.519
	-1.375	-0.586	(1.891)*	(3.208)**
LeadQuality2	-41.067	-67.546	106.241	72375.328
	(2.463)**	-1.277	-0.582	-1.483
IntQuality2	-15.126	-59.774	-0.023	-17.824
	(3.863)**	-1.026	-0.914	-0.306
IntQuality2_1	12.419	-59.621	791.031	5933.934
	-0.180	-1.155	-1.173	(1.752)*
IntQuality2_2	4.286	-54.256	0.070	-7536.938
	(1.802)*	(1.965)**	-0.917	-0.600
IntQuality2_3	81.259	69.901	-60.280	-1387.982
	(1.775)*	(1.957)*	-0.950	(2.002)**
IntQuality2_4	-12.018	-27.430	28.097	-9.693
	(2.725)**	-0.607	-1.231	(2.032)**
cffr	4.835	21.097	296.344	2976.018
	(9.238)**	(5.456)**	-0.721	(1.920)*
cffr_1	-3.148	-11.214	333.137	-1909.088
	(5.357)**	(3.764)**	-0.319	(1.656)*
cffr_2	3.808	9.833	936.937	2118.603
	(7.783)**	(3.498)**	-1.040	(2.929)**
cffr_3	-3.029	-10.578	-500.699	-1523.900
	(6.508)**	(3.706)**	-0.873	-0.709
cffrlead	-3.753	-11.458	-278.214	-1777.282
	(8.702)**	(3.869)**	-0.676	(1.648)*

Table 8 continued

crcore	0.085	0.124	0.178	1.759
	(5.076)**	(5.153)**	(4.479)**	(4.398)**
cspread	1.976	6.088	14.058	-333.408
	(4.346)**	(2.157)**	-1.000	-0.172
crgdp	0.004	0.122	0.227	18.240
	-1.073	(4.259)**	(2.009)**	-1.077
Observations	39284	10024	2737	3024
Number of entity	5632	2020	619	531
Test For Joint Significance of the Lags				
F-Stat (All Variables)	4.000	3.970	2.460	3.490
P-value	0.0454**	0.0463**	0.117	0.0617*
F-Stat (Liquidity)	6.280	5.860	0.710	2.930
P-value	0.0122**	0.0155**	0.0582*	0.0881*
F-Stat (Equity)	1.740	1.500	2.650	2.350
P-value	0.679	0.220	0.104	0.125
F-Stat (ROA)	1.650	0.630	1.040	2.710
P-value	0.199	0.426	0.308	0.0996*
F-Stat (Efficiency)	2.760	1.830	0.690	4.010
P-value	0.0965*	0.176	0.407	0.0454**
F-Stat (Quality1)	5.900	3.320	1.160	3.730
P-value	0.0151**	0.0687*	0.282	0.0533*
F-Stat (Quality2)	2.910	2.650	1.650	2.710
P-value	0.0879*	0.104	0.197	.1000*
F-Stat (FFR)	6.610	4.470	0.250	1.230
	0.0102**	0.0432**	0.615	0.267

Table 9

Ability to Issue External Debt

Dependent Variable: Federal Funds Purchased

	Coefficient	z-stat
Funds_1	0.116	-0.745
Liquid Ratio	-386.221	(1.776)*
Equity	1636.881	-1.114
ROA	8912.664	(2.013)**
Efficiency	-303.177	-0.188
Quality1	0.741	(1.824)*
Quality2	208.507	-0.867
Quality3	-2531.828	-1.35
cffr	48.128	-0.401
cffr_1	-38.720	-1.154
cffr_2	-19.223	-0.583
cffr_3	-1.197	-0.044
cffr_4	-4.871	-0.23
crcore	-0.019	-0.681
cspread	-233.007	(2.519)**
crgdp	1.541	-0.55
Observations	7123	
Entities	1251	