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Memory in Contracts:

The Experience of the EBRD (1991-2003)

Lionel Artige*- Rosella Nicolini†‡

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Abstract

The objective of this paper is to identify the role of memory as a screening device in repeated contracts with asymmetric information in financial intermediation. We use an original dataset from the European Bank for Reconstruction and Development. We propose a simple empirical method to capture the role of memory using the client's reputation. Our results unambiguously isolate the dominant effect of memory on the bank's lending decisions over market factors in the case of established clients.

Keywords: Financial contract; Empirical contract theory; Reputation; Asymmetric information

JEL Classification: D21, D82, G21, L14, P21

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1 Introduction

The optimal long-term contract in repeated moral hazard generally exhibits memory (Lambert 1983, Rogerson 1985 and Chiappori et al. 1994). With repeated contracts the principal is able to learn from the agent's past history and, hence, to propose a long-term contract that internalizes this information over time. The benefit is that risk sharing is improved. A natural application of long-term contracting is in financial intermediation where asymmetric information is a key problem (Stiglitz and Weiss 1981, 1983). Banks tend to maintain durable relationships with clients of established reputation. It has been proved that, as a result of memory, a long-term credit contract benefits the borrower in the form of lower interest rates and fewer collateral demands (Boot and Thakor 1994). Other models, however, predict that the duration of the bank-borrower relationship in fact increases the borrowing cost because its benefits also create for the borrower switching costs in starting a new relationship with a competitor (Greenbaum et al. 1989 and Sharpe 1990). The advantages of the reduction in asymmetric information, in this specific bilateral relationship through memory, would thus be offset by the market power gained by the bank. These conflicting predictions are reproduced by the empirical literature. Berger and Udell (1995) and Bodenhorn (2003) find a negative relationship between duration of the bank-borrower relationship and borrowing cost or collateral demands. Degryse and Van Cayseele (2000) find, in contrast, that the loan rate increases with the duration of the bank-borrower relationship. Neither result is confirmed by other studies in which no statistically significant correlation is obtained (Blackwell and Winters 1997, Petersen and Rajan 1994, Cole 1998 and Elsas and Krahnen 1998). This inconclusive empirical evidence illustrates that the borrowing cost may not only be a function of duration but also of other factors. Borrowing cost tends to increase with the amount of credit, the riskiness of the project and market power but tends to decrease with competition. In addition, banks use the borrowing cost to screen borrowers and to eliminate the ones with the highest probability of default. Borrowing cost is therefore an instrument that can deal with both adverse selection and moral hazard (Stiglitz and Weiss 1981).

The reputation effect is thus difficult to capture.

We argue that the method used so far by the empirical literature on this subject is flawed as it pools all firms whatever the duration (or frequency or intensity) of the relationship with their bank, and estimates the effect of duration on the borrowing cost. The problem is that the borrowing cost can vary between firms not only because of the duration of the relationship but also as a result of the banks' screening policy. In other words, this method is unable to disentangle the effects of competition and asymmetric information, which in turn prevents us from identifying the effect of memory.

The present paper proposes a different empirical strategy to overcome this problem. First of all, in common with the rest of the literature, we focus on one single bank to control for unobserved heterogeneity in lending policy. We build an original database from data made public by the London-based European Bank for Reconstruction and Development (EBRD) on all its investments in private and public firms during the first years of its life (1991-2003).[1] Second, our dataset allows us to split it into two subsamples: firms that have signed one single contract and firms that have signed more than one contract. In so doing, we control somewhat for the screening effect. In both subsamples, the amount of lending and the type of contract set for each firm's first contract reflect the screening policy of the bank. In the subpopulation of several-contract firms information on the firms' past actions obviously exists. The question is: will the bank use it? We run regressions for each of the two subsamples. If the same results are obtained, this means that the bank does not use the past history of its clients in designing contracts. Our results clearly show that this is not the case. The total project value of the first signed contract (but not of the following ones) is neatly identified as the dominant individual fixed effect in the design of contracts for firms that have signed more than one.

This result could, however, be driven by the effect of competition. The bank could in fact offer better lending conditions to its long-term clients in order to prevent them from going to competitors. The specificity of the EBRD enables us to rule out this possibility. The EBRD was created in 1991

[1] Any local or foreign firm is eligible for EBRD financing.

just after the Soviet Bloc had collapsed. Its purpose was to assist the countries of that region in transforming their centrally-planned economic systems into market economies. When the EBRD started its lending operations in 1991, the business environment of all these countries was characterized by large output fall, complete disorganization of production, macroeconomic and political instability and an inadequate banking sector. This exceptional situation makes the EBRD experience an interesting natural experiment for two reasons. First, the management of risk had to be carried out in a very uncertain environment. The country risk was high owing to the macroeconomic turmoil. Furthermore, all potential borrowers lacked market experience and had no history of creditworthiness. Second, the decisions made by the EBRD were not affected by competition because local banks were insolvent and foreign banks did not enter these risky markets in the early transition period. Moreover, the public shareholders of the EBRD assigned the bank the mission to lead the financial flows to these countries and not to crowd out private investments. The EBRD was therefore in a situation of monopoly.

The monopolistic behavior of the EBRD offers ideal conditions to test memory in long-term credit contracting. Our estimations yield unambiguous results, validating the predictions that reputation is the dominant device in screening clients.

The remainder of the paper is organized as follows. Section 2 focuses on the main theoretical contributions studying the bank-client relationship. Section 3 characterizes the model of the EBRD-client relationship. The data and descriptive statistics are presented in Section 4. Section 5 presents the econometric method and results and section 6 concludes.

2 The choice of contract

The choice of the optimal contract between a lender and a borrower has been widely studied. Asymmetric information is the major source of risk between the two counterparts, and it is very difficult to control for. The lender aims at defining a device that allows her (i) to distinguish the good (solvent)

borrower from the bad one and (ii) to choose the right incentives to force the borrower to put as much effort as possible into the completion of the investment project for which credit is demanded. Therefore, the problem turns out to be the sum of various dimensions of uncertainty and imperfect information.

In a framework accounting for the repeated moral hazard problem between borrowers and lenders, Boot et al. (1991) conclude that, for borrowers with a good reputation, there is a unique equilibrium, in which each borrower is offered an unsecured loan contract. In contrast, borrowers with a bad reputation are offered a secured contract with collateral that is lost only upon default. When private information on borrower type is added, the problem turns out to be of an adverse selection type: agents are required to self-report. If borrower quality and effort are substitutes, low-quality borrowers post collateral in order to commit to higher effort. This action reduces the likelihood of default of low-quality borrowers but it still remains higher than that of the high-borrower quality. As a consequence, there is a deadweight loss associated with collateral. The private information problem accentuates the relationship between collateral requirements and borrower risk (already present in moral hazard problems). In the empirical test that Boot et al. (1991) propose, a key result deserves attention: a decrease in collateral costs or an increase in loan size yields a lower utilization of collateral at equilibrium. Larger loans are more likely to have a lower level of collateral as well as loans with longer maturity. The size of the loan can be interpreted as a signal of borrower quality. Other factors occurring in the client–bank relationship can also be interpreted as signals of the quality of the borrower, such as the structure of the contracts signed by the two counterparts. A bank can usually discriminate between clients by proposing different contracts to them. The contracts can be grouped by type according to their 'nature' but, nevertheless, each of them is often tailored to the client's needs.

Looking at the most widespread class of contracts, Inderst and Mueller (2006) investigate the optimality of debt versus equity contracts. Debt contracts are optimal when the lender is conservative and equity contracts are optimal when aggressive. Debt contracts are suitable for financing profitable projects that are likely to break even on public information alone, while less profitable projects are

financed with equity. In addition, debts are proven to mitigate moral hazard and other problems that arise from asymmetric information. For instance, investments by small firms in tangible assets such as equipment or properties are expected to be financed with debts. Furthermore, these authors analyze the sub-optimality of a lender's decision to propose a contract (to a potential borrower) by choosing it from a menu of contracts after having observed (ex-ante) a public signal. The menu choice always creates a problem because a lender would always choose a contract ex-post optimal for her. Nevertheless, given that the lender optimally restricts herself to a single contract to avoid ex-post self-dealing, it is optimal to offer a single contract that the client accepts or rejects on the basis of the contract's conditions. There is no adjustment of the loan terms after the screening, and this guarantees the optimality of the decision. The authors provide empirical evidence supporting this result. Loans are often granted at standardized terms and borrowers, in particular small firms, are often charged with the same rate of interest (because of an implicit same risk premium).

The screening process is a key tool for discriminating between clients but it is a real burden for the bank (Manove et al., 2001). The process is costly, especially in a perfect competitive setting. Therefore, a bank always has a strong interest in proposing a contract with a high level of collateral and avoiding the screening stage. In this way, it is sure to discard low types. Manove et al. (2001) focus on the screening cost in the case where a bank is a monopolist in the credit market. The result shows that there is a big difference with respect to the standard competitive structure. In the case of a monopolistic bank, the bank's optimal strategy is to offer one unique contract and then to screen all projects. The motivation is straightforward: the structure of the credit market makes the demand quite inelastic and high interest rates do not lower the borrowing volume. The important factor is the market power of the bank, which is efficient under the conditions of asymmetric information. Throughout the screening process, information is generated at a cost to the bank. Therefore, the bank screens the clients, funds the better projects and covers its costs with higher interest rates. As an additional result, the high concentration of the credit market allows the bank to establish a closer long-term relationship with

firms. As for the borrowers, good ones have an incentive to distinguish themselves from the others by posting sufficient collateral. As described in the next section, the framework developed by Manove et al. (2001) perfectly fits the behavior adopted by the EBRD. In this theoretical framework, the reputation effect is crucial to building memory on clients, which, in the long run, turns out to be a discrimination device.

To our knowledge, these theoretical results have not yet been tested empirically. The obvious reason for this is that it is very difficult to identify a bank behaving as a monopolist in the credit market. The case of the EBRD seems to be unique and can be used as a kind of natural experiment to capture the memory effect in relation to contract terms.

3 The EBRD-client relationship

3.1 The EBRD

With a capital of 20 billion euros and being owned by sixty-one countries and two intergovernmental institutions, the European Union and the European Investment Bank, the EBRD is a peculiar investment bank. Its main characteristics are as follows:

- Unlike private investment banks, the EBRD has sovereign shareholders that do not receive dividends.

- Its investments are geographically restricted to the region of the former Soviet Bloc.

- Unlike the World Bank, the EBRD invests mainly in private enterprises. According to our calculations, the share of public clients between 1991 and 2003 did not exceed 12.5% of the total share of cumulated investment of 23%.

- Its investments have to respect environmental standards.

- Its mandate stipulates that it must only work in countries that are committed to democratic principles. Nevertheless, some investments have been made in certain countries that are far from being

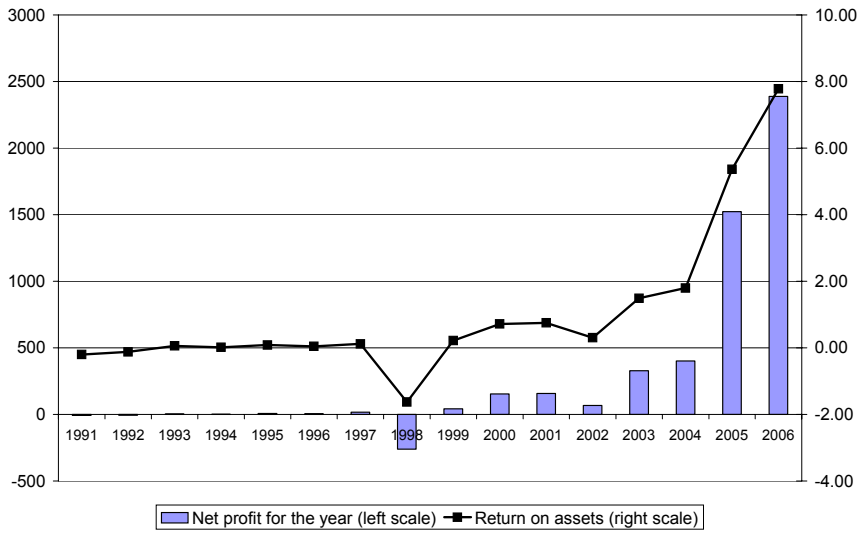

Figure 1: EBRD performance (€ million) (Source: EBRD, Calculus: authors)

fully-fledged democracies.

From a theoretical point of view, we consider the objective function of the EBRD as being identical to that of any investment bank. Its objective is to maximize profits from investment projects and to do so by using all the instruments available on the financial markets to raise funds and to protect its portfolio against risks.[2] Figure 1 describes EBRD performance (net profits) over time.

Its constraints, however, are different. It must invest in a restricted geographic area and this precludes diversification of its portfolio with investments in safer places in the rest of the world. Therefore, in this respect, the EBRD faces a harder constraint than any other investment bank. On the other hand, its sovereign shareholders virtually guarantee protection against bankruptcy, which is far from being the case for any other private investment bank. This feature together with its stable sovereign ownership allows the EBRD to raise funds in the best conditions and, simultaneously, to face the high risks inherent in investing in the region.

[2]In fact, the objectives of the EBRD are not totally identical to those of other investment banks. The EBRD aims at being a catalyst for financial institutions and wants to avoid crowding them out. In other words, the EBRD does not see other financial institutions as competitors. However, in the bank-client relationship, which is our concern in this paper, its objective is to maximize profits from its clients' projects, i.e., in accordance with the EBRD's statement, to apply "sound banking principles" (EBRD, 1999).

3.2 The types of contract granted by the EBRD

When considering a potential client for a lending contract, the bank follows a very standard procedure. First, we consider the case of a contract running for one period. The bank and its client agree to sign the contract; then, the bank finances the firm, which makes the investment and pays back the loan (plus interest) to the bank.[3] Second, we consider a more established bank-client relationship. The bank grants its first contract to a firm. Then, according to the behavior shown by the client, the bank can decide to finance or not a second project whenever the client applies for a second (or further) contract. The problem faced by the bank therefore becomes dynamic. In a repeated contract, two scenarios are possible depending on whether the two stages are independent or not. If the stages are independent, the final result is the sum of the results of two one-stage games. Such a contract is nevertheless an incomplete one. Chiappori et al. (1994) proved that a long-term relationship can outperform a succession of day-by-day agreements if the role of memory is taken into account. To obtain this result, the principal's objective function must be time-separable and the current behavior must affect the probability of the current outcome. Under these assumptions, the bank can write a long-term renegotiation-proof contract by adapting the terms of the contract in the second period with respect to the return of the firm's investment in the first period. The bank, therefore, remembers the return of the firm's first-period investment. The structure of such a contract is optimal: neither the principal (the bank) nor the agent (the firm) has an incentive to deviate. Our empirical exercise aims at identifying whether and to what extent reputation has an impact on the amount of credit granted by the bank to finance its clients' investment projects.

[3] In this section, for the sake of simplicity, we intend 'loan' to mean any kind of credit contract the bank may propose.

4 Data and descriptive statistics

For the purposes of this study, we built an original database from data made public by the EBRD over time. Our database includes 1788 financial contracts signed by the bank with private and public clients from 1991 to 2003. It contains information in each case on the identity and nationality of the clients, the amount of the contract in ECU/Euros, the value of the investment project, the sector of investment, the year the contract was signed, the type of contract (loan, share, equity or guarantee), and other characteristics (old clients, private/public, macro-programs...). In this section we present a brief overview of the content of our database and discuss the most relevant descriptive statistics.

4.1 The contracts

The number of contracts and the amount of annual investments were very low at the beginning of the transition process (see Figures 2 and 3). The EBRD was underusing its capital, and this was a source of criticism among the shareholders and commentators. This underuse was principally due to the severe macroeconomic downturn that affected the entire region. After these initial difficulties,the bank's aim was to strongly increase the volume of the portfolio. The recovery of most of the countries in the region helped the EBRD to sign more contracts and to make sizeable profits from 1999 onwards.

The average EBRD investment was remarkably stable with a slight downward trend in the most recent years (see Figure 4). According to the information available on the EBRD website, the bank designed different kinds of contract. They all represent the financial instruments by which the bank participates in the realization of the investment project proposed by the borrower. These contracts differ not only in the maturity of the credits but also in other characteristics, which we will discuss below. First, in Table 1, we provide a general overview of the different kinds of contract signed by the bank and the frequency of the contracts:

[Table 1 about here]

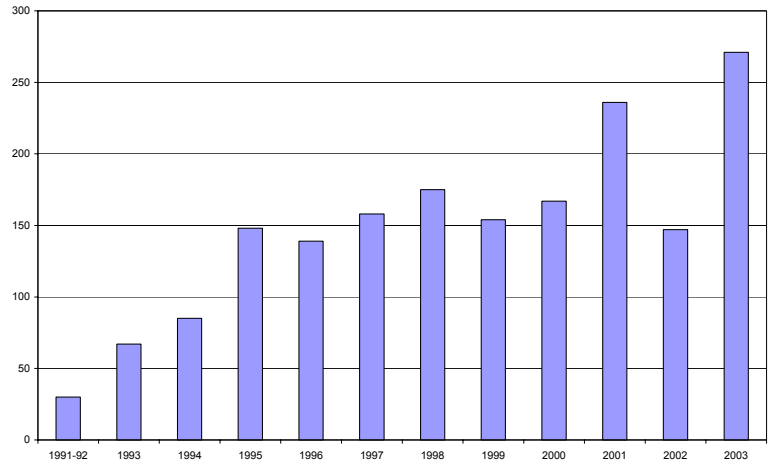

Figure 2: Number of contracts signed by the EBRD between 1991 and 2003.

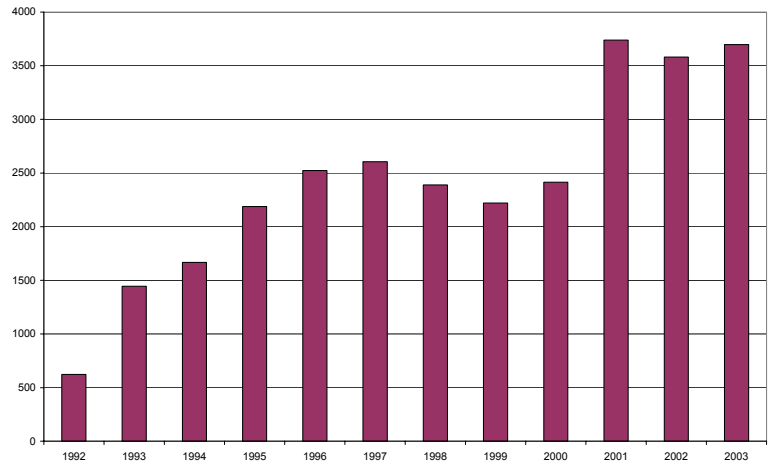

Figure 3: EBRD Investments by year (ECU/€ million)

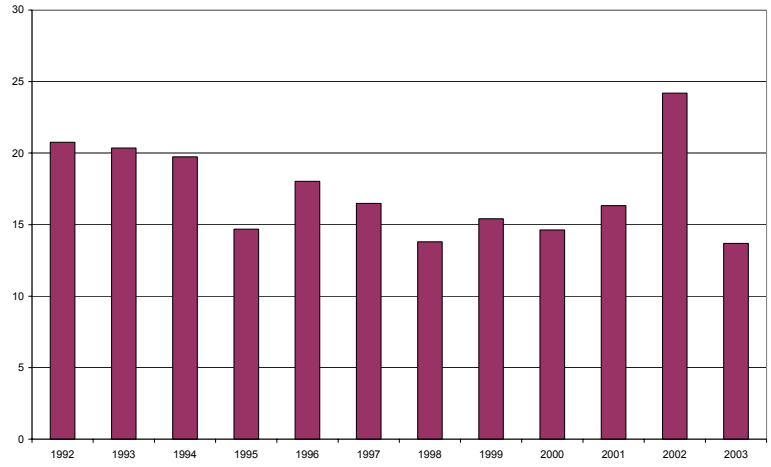

Figure 4: Average EBRD investment by year (ECU/€ million)

Three main categories of credit instrument can be distinguished: loan, guarantee, and share and equity contracts. Loans were the financial contract most frequently used by the EBRD between 1991 and 2003 (Figure 5). A loan is generally considered as a short-term contract, lasting five years on average, and tailored to meet the particular requirements of the project. The credit risk is usually taken by the bank or partially syndicated to the market. A loan may be securitized by a borrower's asset and/or converted into shares or may be equity-linked. The second important category of contract includes share and equity. Share-type contracts were mainly signed at the beginning of the EBRD's activity, while equity contracts represent a broader category of financial contracts including share contracts. An equity investment can be undertaken in various forms, including subscription to ordinary shares. When the EBRD takes an equity stake, it expects an appropriate return on its investment. The bank usually sells its equity investment on a non-recourse basis, has a clear exit strategy and only takes a minority position.[4] The third category of credit instruments refers to guarantee contracts. They were used mainly at the end of our dataset period. Through this type of contract, the bank helps borrowers with gaining access to financial sources through the provision of guarantees (EBRD, 1999).

[4]Equity is considered to be a non-contingent contract.

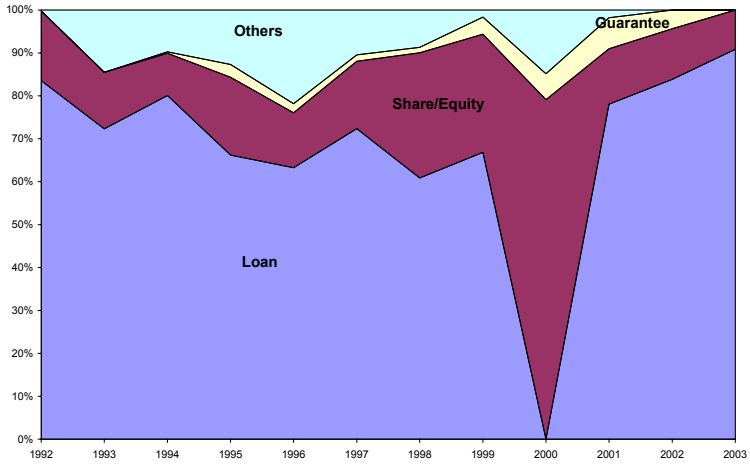

Figure 5: Financial contracts by type in percentage by year

Table 2 and 3 show descriptive statistics on the total values of projects that were selected by the EBRD and the share that it effectively financed. In most accepted projects, the EBRD is not the only lending source.[5] Statistical information is given for the total population and for two periods, one at the outset of transition (1993-1995) and the other at the end of the sample period (2000-2003). The total project value of loans is always higher than that of shares, but both decreased over time. The median bank lending in loan contracts remained unchanged over time, while it declined in share contracts. Figure 6 compares the fraction of the total project value financed by the EBRD for share and loan contracts. This fraction increases proportionally with the total project value but the increase is more pronounced for shares than for loans. As a shareholder, the bank can control the management of the firm, and this implies a reduction in uncertainty associated with imperfect information about the firm's behavior. The bank tends to augment its participation with the size of the project value in share contracts in order to protect itself against the risk. As for loans, the collateral allows for a control of risk.

[5] The contracts issued by the EBRD always require a co-financed part. This may be through cash financing from the firm or, in other cases, from a consortium of commercial banks. However, the involvement of commercial banks in the credit process is strictly subject to EBRD participation. Hence, even in this case, the EBRD plays the role of dominant agent.

[Table 2 about here]

[Table 3 about here]

We also split the population into two subgroups of firms:[6] a first group consisting of firms that had obtained one credit over the sample period (around 1270 firms) and a second group consisting of firms that had signed more than one contract (around 100 firms). Tables 4 and 5 show data for single-contract and several-contract firms respectively. The median bank lending fraction for several-contract firms is always more important than for single-contract firms. These differences may be associated with reputation premia.

[Table 4 about here]

[Table 5 about here]

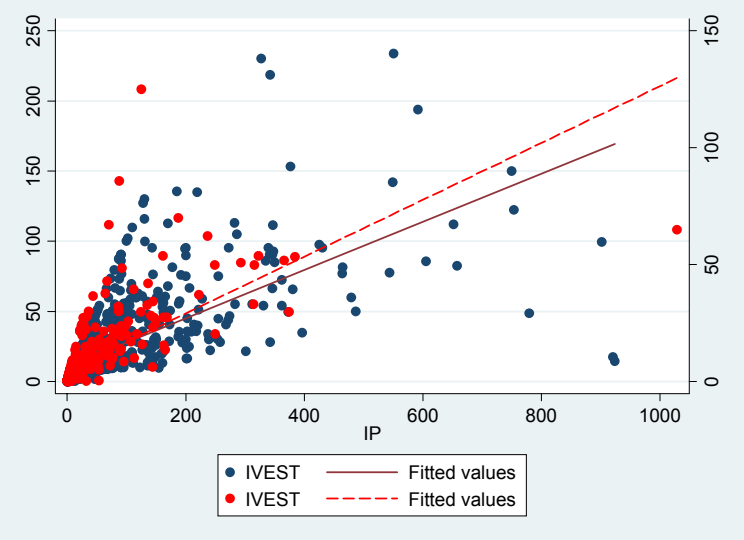

Figure 6: Fraction of EBRD financing in share and loan contracts (red points and dashed line for shares, and blue points and solid line stand for loans)

In order to learn more about the attitude of the EBRD toward risk, we consider the likelihood of a contract type granted by the bank that is chosen against other possible ones conditional on the total

[6] This split in the population will be essential to test the role of memory on bank behavior in the econometric exercise.

investment size and the amount of credit supplied by the bank. In this way, we expect some information on the bank's risk behavior when it finances large projects. To do so, we run a multilogit estimation by regressing the 13 contract types against all available information: the investment size, the size of credit, the London Interbank Offered Rate (LIBOR) and democracy indexes and the country of origin's GDP per capita level. Then, we compute the probabilities for the two most frequently types of signed contract (loans and equity/share) in both subsamples (single-contract subsample and more-than-one-contract subsample). The results are graphically represented in Figures 7 and 8. The probability of signing one contract type (either loan or equity/share) conditional on the investment size is shown in a graph on the left of each figure, and the probability of signing one contract type conditional on the credit size is represented on the right. Let us define $\underline{\mathbf{w}}_i$ as the vector of the characteristics associated with the client (i) that can influence the EBRD's decision to grant her one type of contract $(Y = j)$ rather than another. The model of the EBRD's contract choice can be defined by:

$$\Pr ob(Y_i = j \mid \underline{\mathbf{w}}_i) = \frac{\exp(\underline{\mathbf{w}}_i' \alpha_j)}{\sum_{j=1}^{13} \exp(\underline{\mathbf{w}}_i' \alpha_j)}, \quad j = 1...13.$$

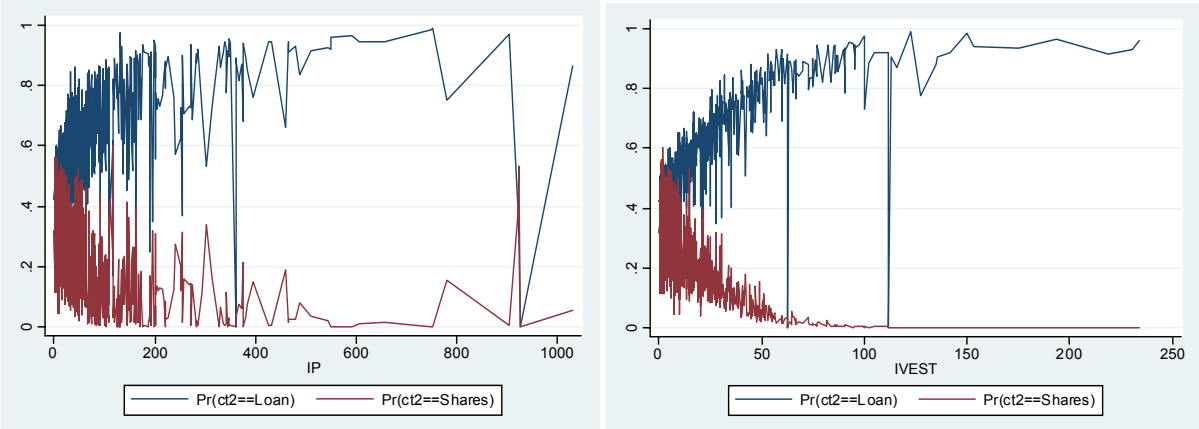

Figure 7: Multilogit probabilities for the subsample of unique contracts

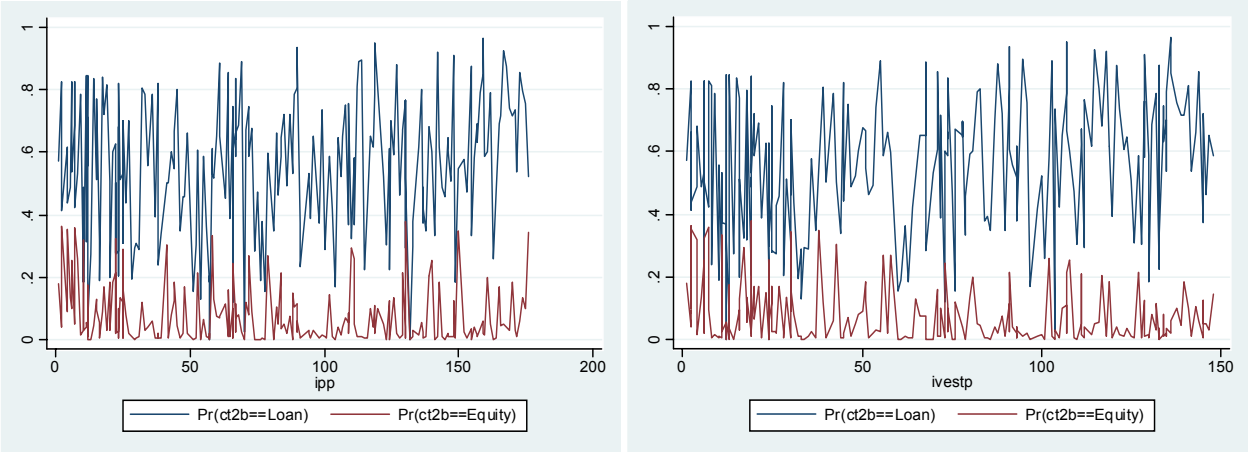

Figure 8: Multilogit probabilities for the subsample of more than one contract

The multilogit predictions show that there is a higher probability of the bank granting a loan rather than a share or equity contract in respect of any size of investment or credit. However, there is a clear difference in the distribution between the two subsamples. In the single-contract subsample, the probability of granting a loan increases with the size of investment or credit, while in the more-than-one-contract subsample, the probabilities follow a random walk instead. This difference in the distribution of probabilities may signal that the EBRD does not behave in the same way for a first contract as for a second (or further) contract. The bank certainly has less client information for a first contract than for a second and, hence, the first contract carries more risk. The bank seems to adjust its lending policy in the face of this higher risk. These results suggest the hypothesis that the EBRD's lending policy does not consist of offering a formatted menu but rather of granting credits tailored on the basis of client information and possibly on the basis of whether it is for a first or further contract.

4.2 Countries and sectors

There are two criteria that can account for the geographical distribution of contracts between 1991 and 2003: market size (population size or income per-capita), and political regime. Figures 9 and 10 show the geographical distribution of EBRD investments in cumulated terms by country and per-capita

by country. Russia received more credits than any other country in the region during the period, followed by the Eastern European countries, and then by the Central Asian countries. The Central Asian countries have not only a poor business climate but also non-democratic institutions. In terms of the cumulated amount of investment per capita, the ranking among the host countries is substantially reversed in the upper half of the distribution. The Central European countries, which are the most developed countries of the population and which led the transition process, received the largest per capita financing (around 300000 euros for Slovenia, Croatia and Estonia), while the Central Asian countries still lag behind significantly. According to this second criterion, Russia moves down to the lower half of the distribution.

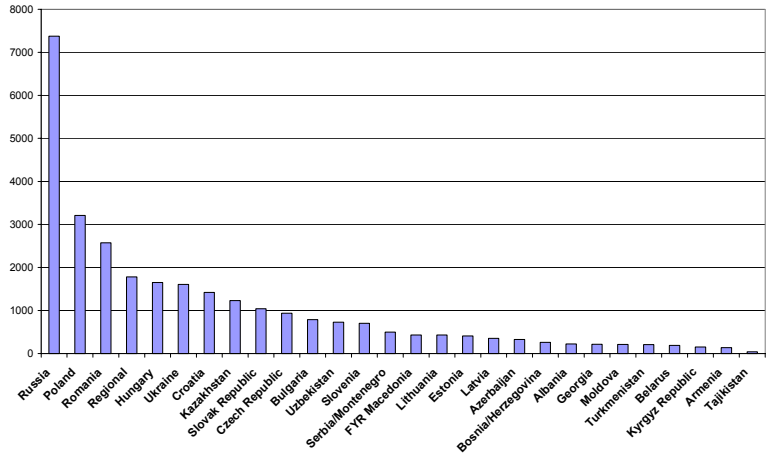

Figure 7:

Figure 9: Cumulated EBRD investment by country (€ million)

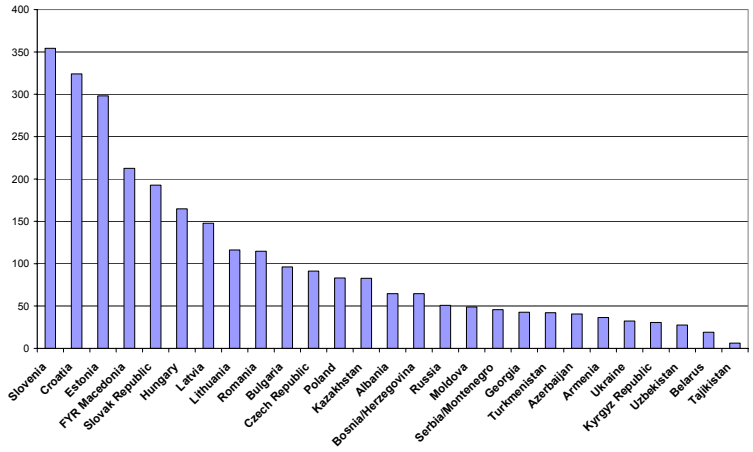

Figure 8:

Figure 10: Cumulated EBRD investments per capita by country (€ thousands)

[Table 6 about here]

We split the distribution into three sub-periods (1991-1995, 1996-1999 and 2000-2003). Table 6 shows that at the beginning of the transition process, almost half of the investments went to the early starters, Central Europe and the Baltic states. Their share later reduced to roughly one-third of the total. During the transition process, Russia received an increasing proportion of EBRD investment and its share remained stable. South-Eastern Europe saw a progressive increase in its share of EBRD investment during the period. The relative share of Eastern Europe and the Caucasus decreased. Finally, the Central Asian countries reached a noticeable share between 1996 and 1999 which fell by half in the final period.

[Table 7 about here]

As for the distribution by sector (Table 7) [7] at the beginning of the transition, most of EBRD investment went to Finance, Telecom, Oil/Gas/Natural Resources and Other sectors. The objective was

[7] A complete list of all the sectors is included in Appendix A.

to finance infrastructure and the restructuring of the banking and the manufacturing sectors. Thereafter, the focus of the bank switched to the financing of the creation of small and medium enterprises (SMEs).

5 Empirical strategy

The EBRD selects one of the thirteen different available contracts (Table 1) when deciding to finance the investment project of a firm. The one selected should be the contract that reduces as much as possible the asymmetric information between the principal and the agent. The objective of the econometric analysis is to identify the screening device that enables the bank to discriminate between the firms and to select the contract that will incite them to behave well. In particular, we want to verify whether the bank modifies its behavior when it signs several contracts with the same firm over time. If it does, as proved by Lambert (1983), Rogerson (1985) and Chiappori et al. (1994), this means that the bank uses the historical information (memory) about the firm to adjust the financing conditions in order to maximize its profits. In order to test this, after considering the full sample, we proceed first by splitting the whole population into two subpopulations: one-contract firms and several-contract firms. Historical information is available on the firms in the subpopulation of several-contract firms, and we want to check whether the bank uses this information. In this way, we can both control for imperfect information and identify the role of memory (reputation). We apply the same econometric specification to both subpopulations but allow for different specifications of the same fixed effects.

According to the level of significance of the fixed effects, we are able to check (i) the degree of heterogeneity that they account for and (ii) the importance of the reputation effect captured by an ad-hoc fixed effect in the case of established clients.

5.1 Econometric specification

In order to run our econometric exercise, we match data referring to a few characteristics of the contracts signed by the bank with other data referring to the environment in which the investment project has been run. In this way, we can capture the degree of the investment risk (country and credit risks). According to the general theoretical framework discussed in Section 2, the amount of the credit contract is supposed to be the result of a combination of the market conditions and the expected return of the investment.

The variables referring to the environment are: the measure of income level in the host market (GDP per capita), an indicator for political institutions (degree of democracy, DEM), time dummies and, finally, a dummy for public clients. In fact, a public client is more likely to be considered as a solvent client. Concerning the contract, in addition to the value of the credit (IV) granted by the EBRD to the firm, we consider the type of contract, the year it was signed and the return of the investment of that firm that can be approximated, for a solvent firm, by the value of its productive investment (IP, available in the database). This investment value is the minimum level of return of any successful productive investment by the firm, which corresponds to its capacity for repayment.

The maturity of a credit is different for each category of contract and the type of contract is an approximate indicator of the credit maturity, as mentioned in Subsection 4.1. Finally, we know that the interest rate charged by the EBRD is equal to the LIBOR (London Interbank Offered Rate) plus a risk premium. The value of the LIBOR allows us to capture the current conditions of the financial markets. From the firm's point of view, the LIBOR is an approximated measure of the effort required to establish its reputation as being solvent. Fom the bank's point of view, any changes in the LIBOR will affect the credit supply to the firm. In addition, for the specific case of loan contracts, the LIBOR can approximate the rate of return of the bank's investment.

As for the risk premium, the data from the EBRD are not available. However, this does not represent an obstacle for the issue we are studying. As argued in Section 2, the borrowing cost cannot

be an unambiguous indicator of the type of borrowers. In our exercise, we overcome this problem by introducing individual fixed effects, which control for the omitted variable bias. A description of the variables is given in Box 1.

[Box 1 about here]

We formulate the empirical model as follows. Let us define the dependent variable (value of the credit) as Y (IV) and $\underline{X}$ =$(IP, Public, DEM, Libor, GDP)$ as the vector of the independent variables. Each entry of the dependent variable, the size of the credit for financing an investment project (IP), is defined as $y_{itjs,}$ with $i = firm$, $t = year$, $j = host\ country$, s =$sector$. We also include an interaction term $(Dem_{jt} * year_t)$ between the democracy index and the time dummies. This term is meant to track the possible changes of the variable democracy over time in each country. Therefore, the equation we consider can be defined as:

$$\begin{aligned} IV_{itjs} &= \alpha_0 + \beta_1 IP_{itjs} + \beta_2 Public_i + \beta_3 Dem_{jt} + \beta_4 Libor_t + \beta_5 GDP_{jt} + \\ &\quad \beta_6 (Dem_{jt} * year_t) + \varepsilon_{itjs}. \end{aligned} \tag{1}$$

Our database is not a true panel, but rather a pooling of independent cross sections over time. Hence, we need to control for heterogeneity problems As argued in Wooldridge (2006), this pooled structure implies that the dependent variable may have different distributions in different time periods and, to control for this, we need to introduce some time-fixed effects (μ_t). The same reasoning applies to the sector dimension, for which we include some sector-fixed effects (μ_s). In addition, as shown, for instance, in Baltagi (2008), we also need to include the unobservable time-invariant individual-specific effect (μ_i) to control for the heterogeneity problem as much as possible. Controlling for all these effects allows to decompose the error term (ε_{itjs}) in the following way:

$$\varepsilon_{itjs} = \mu_i + \mu_t + \mu_s + \nu_{itjs}, \tag{2}$$

where μ_i is the unobservable time-invariant individual-specific effect and ν_{itjs} denotes the remaining disturbances, which are now expected to be $IID(0, \sigma_\nu^2)$. By inserting the error decomposition into the previous equation, we obtain the following equation:

$$\begin{aligned} IV_{itjs} \quad = \quad & \alpha_0 + \beta_1 IP_{itjs} \ + \beta_2 Public_i \ + \beta_3 Dem_{jt} \ + \beta_4 Libor_t \ + \beta_5 GDP_{jt} \ + \\ & \beta_6 (Dem_{jt} \ * year_t) + \gamma_1 \mu_i + \gamma_2 \mu_t + \gamma_3 \mu_s + \nu_{itjs}. \end{aligned} \tag{3}$$

The choice of the variable μ_i turns out to be crucial for obtaining independence between the residuals and the dependent variable. In a standard panel effect, the variable μ_i would be simply identified with firm-fixed effects. Due to the structure of the panel, this option is not possible here. It is therefore necessary to look for other potential candidates, which do not introduce endogeneity distortions. We start by considering the sectors of activity of the investing firms ($Sector$).The theoretical framework indicates the contract type as one of the possible ways to identify the individual-firm effects. The contract type is in fact time-invariant according to the EBRD statements. In our exercises, the firm-fixed effects (FE) will be alternatively identified by the following exogenous variables: the contract type granted at time t ($C13$), and, for established clients obtaining more than one contract, the contract type signed by a firm at $t = 1 (C13FIRST)$ or the value of the investment of the same firm financed at $t = 1$ ($IPFIRST$). Therefore, the specification used for the estimation can be written as:

$$IV_{itjs} = \alpha_0 + \beta_1 IP_{itjs} + \beta_2 DI_j + \beta_3 Dem_{jt} + \beta_4 (Libor_t) + \beta_5 GDP_{jt} \quad (4)$$
$$+\beta_6 (Dem_{jt} * year_t) + \gamma_1 FE_i + \gamma_2 Year_t + \gamma_3 Sector_s + \nu_{itjs}$$

[Table 8 about here]

Table 8 gives descriptive statistics for some of these variables for the overall period and for two specific years: 1993 and 2003. The dependent variable is the financing amount (IV) granted by the EBRD. This is one of the variables in the bank's profit function, which depends negatively on the riskiness of the project.[8] It reflects both the screening process and the incentive mechanism that take place between clients. The measure of political institutions is taken from the Polity IV project (2007). This is an index varying between zero (for an absolute autocracy) and ten (for a fully-fledged democracy).[9] In our population this index declines over time because the EBRD financed democracies of Central and Eastern Europe at the beginning of the transition and later started to finance autocratic countries from Central Asia. The variation of the LIBOR corresponds to the historical values of the credit market during the period.

According to the theoretical results discussed in Section 2, we expect that all independent variables in equation (4), except the LIBOR, will have a positive sign. An increase in the LIBOR implies a decrease in the amount of credit. In order to test the level of individual heterogeneity, we apply the technique of pooled OLS versus fixed effects.[10] In all the contracts signed by the EBRD, the type of contract is an individual time invariant characteristic. We will treat it as an individual fixed effect. We will identify it by applying the three different measures: $C13$, $C13FIRST$, $IPFIRST$. By running a regression with $C13$ as an individual fixed effect, we do not include any historical information for the

[8] See Stiglitz and Weiss (1981) on credit rationing.
[9] See the Polity IV website for details on how the scores are computed: www.systemicpeace.org/polity/polity4.htm.
[10] The econometric estimations were computed with the Stata 9.0 package.

firms. When we introduce historical information on individual firms (using the $FIRST$ variable), it is possible to observe whether the past performance of firms affects the conditions of the contract proposed by the bank. If it does, we can conclude that the bank memorizes the past information and uses it to adjust the conditions of the future contracts for each individual firm.

5.2 Results

Our database contains all contracts signed by the bank during the period 1991-2003. First, we concentrate on the full sample and, then, we split it into two groups: one-contract firms and several-contract firms. In order to test the reputation effect, we run regressions separately for each group of firms. We proceed first by assessing whether the fixed effect model should be preferred to the pooled OLS (with the F-test) and to the random effect model (with the Hausman test). In all the regressions we control for heteroskedasticity by applying either the White or the cluster correction. Then, we test the different measures of individual fixed effects.

5.2.1 The full sample

We first consider all contracts as though they are totally independent. Then, we identify the main factors that can influence the size of the credits granted by the EBRD. In Table 9a, we show the output of the OLS estimations for the pool of observations when considering dummies by year, by sector and an interaction term (dem*years), which takes into account the transition of the political regime in the host countries towards democracy. In order to control for heteroskedasticity problems, we correct the residuals with either the White or the cluster method. The cluster method is appropriate since it allows us to take into consideration the fact that one firm can apply for more than one contract.

The results we obtain are robust overall. The proxy of the repayment capacity (IP) and the GDP per capita of the host country have a positive impact on the size of credit. Being a public borrower also has a positive impact on the size of credit, which can be interpreted as a guarantee for being a

solvent client. In contrast, the LIBOR and the democracy index display negative signs. As for the LIBOR, the result simply confirms that the size of the credit is inversely related to the interest rate level. The negative sign associated with the democracy index indicates that the EBRD invests increasingly over time in the less democratic countries (see Subsection 4.2). This can be explained by the fact that at the beginning of the transition the EBRD granted few credits but mostly in more democratic countries then increased its supply of credits to all types of regimes, and, finally, kept investing a great deal in less democratic countries because the more democratic ones started to be financed by the private investment banks. Finally, the statistical tests run for the time and sector dummies state that those variables are not always statistically significant. Thus, time, sector or transition dynamics are not discriminating factors influencing the size of credit granted by the bank.

We repeat the same exercise by including a type of fixed effect at firm level: the type of contract. As we discuss comprehensively in the first part of the study, most of the contracts offered by the bank are standardized. Therefore, it is likely that the type of the contract signed by the client is somewhat the result of the bank's screening process, and it is automatically defined by the contractual condition a firm is required to fulfill. The estimations run by using these fixed effects (Table 10a) confirm the previous results. The regressors (when statistically significant) improve their degree of significance. According to the F-test, the fixed effect estimation has to be preferred to the pooled OLS when including the interaction term. Again, the size of the investment, the identity of the client and the level of the GDP per capita in the host market have a positive impact on the size of credit. Finally, we establish that the fixed effects cover almost three-quarters of the variance. This result suggests that there really is a device to discriminate between clients and helps to explain the differences in the amount of credit granted by the bank.

In addition, we perform a robustness check. Another characteristic that may be very important for the bank's lending decisions is the fraction of the borrower's capital owned by an international firm. An international firm is defined as one from the United States, Canada, Western Europe, Japan or other

Asian developed country or city-state, Australia or New Zealand. As a shareholder, the international firm is assumed to have some control over the management of the local firm, and to bring management experience, international contacts, access to capital markets and international clients, and expectations of high returns. These international firms are usually considered as well established clients and may contribute to reducing the investment project's risk evaluation by the EBRD when they own a fraction of the local borrower's capital. We wanted to check whether this international factor affects the bank's behavior. To do so, we built an ad-hoc dummy (dummy MNE) distinguishing the 617 projects with at least one international partner from those with none. We add this variable to the regressors and we run again the previous estimations whose results are shown in Tables 9b and 10b. The specification performs well but the new dummy is never statistically significant.[11] The presence of an international partner does not seem to play any role in the bank's lending behavior towards the borrowers that obtained a credit.[12]

Having considered the full sample, we now want to go further by splitting the sample into two subsamples in order to verify the results' robustness. The first subsample includes all firms having signed only one contract while the second one is composed of the firms that had signed more than one contract. The specific split of the sample is the method we propose to use to identify the role of memory in the bank's lending decisions.

[Table 9a and 9b about here]

[Table 10a and 10b about here]

5.2.2 One-contract firms

This subpopulation includes 1269 contracts. Since, each contract corresponds to a particular firm, we do not have historical information on the firms. Therefore we can only test one measure of individual

[11] We ran other regressions to check for robustness using the one-contract subsample. Results are available upon request.

[12] The presence of an international partner could possibly affect the bank's decision to grant or not a credit to an applicant but the EBRD does not provide information on rejected projects in order for us to be able to test this.

fixed effects ($C13$). This is a qualitative variable that identifies each type of the thirteen contracts.

[Table 11 about here]

[Table 12 about here]

The results of the F-test and the Hausman test show that the fixed effect model should be preferred to the pooled and random effects models (Tables 11 and 12). In addition, the fraction of the variance due to fixed effects (ρ) is particularly high (0.70). The estimate of ρ suggests that almost three-quarters of the variation in the amount of financing is related to the different types of contract (Baltagi, 2008 and Baum, 2006). In the fixed effect estimations, the coefficients of all the explanatory variables (when they are statistically significant) display the expected sign. The firm's repayment capacity is always highly significant. All dummy variables are always statistically significant. The public identity of a client turns out to be important because a public client may be considered by the bank as less risky than a private one. The significance of the interaction term between democracy (DEM) and the time dummy means that the more democratic a country is over time, the larger the size of the financing offered by the bank. This result either tends to confirm the official claim that the EBRD promotes democratic institutions in transition countries or means that a country moving to democracy (over time) offers more profitable investment opportunities.

For an additional robustness check of the obtained results, we also ran regressions using the same specification for a particular sector, banking and finance, in which the EBRD had been very active in all transition countries over the sample period. The results obtained are very similar to those of the full sample (Table 13).

[Table 13 about here]

To sum up, for the one-contract firms the individual fixed effects by type of contract turn out to be a good measure for identifying individual heterogeneity. Each contract signed by the bank is granted

according to the individual characteristics of the client. This captures the optimal behavior of the bank in the face of both adverse selection and moral hazard when it signs a first contract with a firm that it has selected.

5.2.3 Several-contract firms

This subpopulation includes 346 contracts and includes all firms that obtained more than one contract. Therefore, we have historical information on each individual firm and we can control for it. Given this characteristic, we would like to check whether the individual heterogeneity we identified in the previous subpopulation holds in the present one. If it does, this means that the bank deals with firms of both subsamples in the same way, hence ignoring historical information in the subpopulation of several-contract firms. Thus, we repeat the previous exercise in its entirety for this subsample. In order to control for heteroskedasticity, we alternatively apply the White and the cluster corrections. The cluster correction is important for controlling the autocorrelation in the residuals because each firm appears more than once in the subsample.

[Table 14 about here]

[Table 15 about here]

The previous exercise for this subsample yields a first important result: fixed effects by type of contract do not capture the individual heterogeneity, as happened previously (Tables 14 and 15). First, the F-test is weakly significant or insignificant, while the Hausman test strongly rejects the random effect model. As a result, we conclude that the model with contract-type ($C13$) fixed effects is not a quite robust estimation technique for this subpopulation, even though these estimations should be preferred to the pooled and random effects estimations. This conclusion is reinforced by the low level of $\rho(0.07–0.12)$ of these estimations.

We, therefore, need to look for other measures of fixed effects for controlling individual heterogeneity. One reasonable factor that can have an important impact on discrimination between clients is the client's reputation. As discussed by Boot and Thakor (1994), an established client may enjoy better conditions when signing various contracts with the same bank. We are able to identify the potential reputation of a client by isolating the first type of contract and the value of the first investment (namely, the repayment capacity) for the firm that appears more than once in our database. Then, we match these values to the other (later) contracts signed by the same firm. In order to avoid endogeneity problems, we extract from this sub-sample of several-contract firms the entries that correspond to the first contract for all firms as well as the firms with more than one contract signed the same year (as first entry). We are not able to determine the chronological order of these contracts.

In this way, we are able to use the historical information included in this subsample by testing two measures of individual fixed effects defined previously: C13FIRST and IPFIRST. Each of these measures contains this historical information because it takes into account the information associated with the first contract signed by each firm (FIRST). The variable IPFIRST represents the project value of the first contract; the variable C13FIRST is the type of the first signed contract. The present exercise yields the second important result of the paper: the fixed effects associated with the project value of the first contract are a good measure to account for individual heterogeneity in this subsample.

[Table 16 about here]

[Table 17 about here]

[Table 18 about here]

Whenever the project *value* of the first contract (*IPFIRST*) is included in the individual fixed effects, the value of ρ increases strongly [Tables 17 and 18]. When we only consider the *type* of contract (*C13*), the level of ρ is low (first column in Table 14). Then, when we consider a measure of reputation for established clients (second and third column in Table 14), the value of ρ is high, above all when we

consider the size of the first investment (*IPFIRST*). This result is evidence of the presence of memory. The project value of the first contract is historical information for the bank since it reflects what the firm paid back, while the type of the first contract contains no history. In addition, the project value (IP) is always statistically significant and has the expected sign. Concerning the other variables, they lose part of their statistical significance when compared with the previous exercise but keep the expected sign. The only difference is for the identity (*PUBLIC*) of the client. Being a public partner no longer has strategic importance. It even displays a negative sign in one estimation out of four. In the previous sample, the absence of historical information obliged the bank to rely on the other available variables, for instance, public ownership. Once the bank is dealing with established clients, the previous public-status effect is replaced by a more specific client-reputation effect. Another way to interpret this result (and, especially, the negative sign of the coefficient) is simply to argue that the bank changed its strategy of operating in the market. It may be more oriented toward financing projects not involving public partners.

Once more, for a robustness check, in the regressions carried out for the banking and finance sector alone, the results for the more-than-one-contract subsample are similar to those of all sectors involved. The memory effect applies especially for native banks, i.e. local borrowing banks that do not have an international partner (Tables 19 and 20).

[Table 19 about here]

[Table 20 about here]

To conclude, the memory of the first contract overrides all the other potential effects. It turns out that the coefficient is always statistically significant. Memory thus allows the bank to discriminate between firms according to their individual historical characteristics and to offer tailored contracts in order to control risk better. As an indicator, it can be observed that the number of groups inside this subsample increases from eight to between ninety and ninety-four as a result of the memory effect.

6 Conclusions

Contract theory has proved that the optimal contract generally exhibits memory in repeated contracts with moral hazard. It has turned out to be difficult to identify this clearly in the empirical literature on long-term contracting in financial intermediation. Considering that the method used so far in this literature is flawed, we have proposed in this paper an alternative empirical method based on the separation of observations between firms having signed one contract and firms having signed more than one contract. We argue that this procedure is required to control for the effect of asymmetric information in the bank's lending policy. Nevertheless, this is not sufficient. The effect of memory on moral hazard can be influenced by the competition effect in the banking industry, making it hard to isolate. The dataset we built from the European Bank for Reconstruction and Development allows us to achieve this. The EBRD was in a situation of monopoly in many transition countries, especially at the outset of the transition process. Moreover, the EBRD's shareholders are sovereign and assigned to the bank its mission to foster and not to crowd out financial flows towards the private sector in these countries. Our results yield two conclusions. First, they unambiguously identify the role of memory in the bank's lending decisions when the firms have signed more than one contract. Second, they confirm the relevance of the empirical method we propose to control for the adverse selection effect, which, in our opinion, explains the inconclusive results that is generally observed in the empirical literature. The common background of our empirical tests has been the identification of the mechanisms adopted by the bank to discriminate between clients and to offer them profitable contracts suitable for their type. According to our results, the EBRD's lending policy was a combination of its specific objectives in the former Soviet bloc and the constraints associated with the information on clients. The need to cope with high credit risk unambiguously forced the bank to adopt measures of protection by using a client-screening scheme. As discussed in the economic literature, there is no unique scheme available to be implemented. In our sample, a screening device as general as the type of contract turned out to

be an efficient tool, especially when considering sectoral subsamples of data. The importance of the cluster correction in the absence of memory effects may indicate that the EBRD probably designed various types of contract, each one tailored to the market conditions of a specific sector. Then, the bank offered these to clients who wanted to invest in a particular sector and country. Therefore, the sectoral characteristics become the device rendering the contract itself the most suitable screening tool. Our econometric specification led to robust results, but we think that these would be hard to replicate with data on private banks, whose lending policies are affected by competition.

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LIST OF TABLES

Table 1: EBRD contracts and their frequency (1991-2003)
(Source: EBRD, Calculus: authors)

Contract	**Freq.**	%
Debt	1	0.06
Equity	141	7.92
Guarantee	100	5.62
Line of Credit	7	0.39
Loan	949	53.31
Loan/Line of credit	1	0.06
Loan/Shares	96	5.39
Loan/Guarantee	1	0.06
Senior debt	72	4.04
Shares	404	22.70
Shares/Loan	2	0.11
Shares/Loan/Share	1	0.06
Share/Loan/Guarantee	1	0.06
Subordinated debt	4	0.22
TOTAL	**1780**	**100**

Table 2: Descriptive statistics on loans (value € mill.)
(Source: EBRD, Calculus: authors)

	Variable	**Obs**	**Mean**	**Std. Dev**	**Median**	**Min**	**Max**
Total sample[1]							
	Bank financing	945	21.25	27.76	12.7	0.1	233.76
	Tot. project value	936	60.81	109.94	29.25	0.1	923.9
Up to 1995							
	Bank financing	219	19.98	23.53	10.90	0.2	142
	Tot. project value	220	68.24	115.81	31.85	0.5	923.9
From 2000 onwards							
	Bank financing	438	21.19	31.36	10.00	0.1	233.76
	Tot. project value	427	50.60	94.94	15.00	0.1	750

[1] The difference between the number of observation in bank financing and total project value is due to lack of data for one of the two variables.

Table 3: Descriptive statistics on shares (value € mill.)
(Source: EBRD, Calculus: authors)

	Variable	Obs	Mean	Std. Dev	Median	Min	Max
Total sample							
	Bank financing	402	9.05	13.93	3.2	0.1	125
	Tot. project value	402	34.57	76.98	8.2	0.1	1028.9
Up to 1995							
	Bank financing	84	10.14	11.82	5.9	0.1	53.4
	Tot. project value	84	35.92	59.96	18.6	0.7	384.1
From 2000 onwards							
	Bank financing	100	7.45	11.95	3.1	0.3	53.7
	Tot. project value	99	26.87	63.57	4.8	0.5	365.8

Table 4: Descriptive statistics on single contracts (value € mill.)
(Source: EBRD, Calculus: authors)

	Variable	Obs	Mean	Std. Dev	Median	Min	Max
Total sample							
	Bank financing	1369	17.73	25.53	8.8	0.1	233.8
	Value project	1353	55.02	106.34	17.1	0.1	1028.9
Up to 1995							
	Bank financing	279	17.86	22.18	9.1	0.1	142
	Value project	279	68.95	122.65	27.5	0.5	924.8
From 2000 onwards							
	Bank financing	596	18.08	29.05	7.9	0.1	233.8
	Value project	596	44.8	87.60	10.09	0.1	750

Table 5: Descriptive statistics on several-contract firms (value € mill.)
(Source: EBRD, Calculus: authors)

	Variable	Obs	Mean	Std. Dev	Median	Min	Max
Total sample							
	Bank financing	405	11.97	17.75	6.6	0.5	130
	Tot. project value	395	28.7	56.3	8.7	0.5	651.3
Up to 1995							
	Bank financing	59	16.47	20.83	8.8	0.5	109.8
	Tot. project value	59	36.25	53.61	20.8	1.3	329.6
From 2000 onwards							
	Bank financing	219	11.78	18.87	5.6	0.1	130
	Tot. project value	202	28.63	65.32	7.9	0.1	651.3

Table 6: Descriptive statistics: Cumulated investment by region (%)
(Source: EBRD, Calculus: authors)

Regions	1991-1995	1996-1999	2000-2003
Russia	19.9	29.1	28.8
Central Europe and Baltic States	45.9	32.9	36.0
Eastern Europe and the Caucasus	11.8	11.9	7.5
South-Eastern Europe	16.8	13.5	20.5
Central Asia	5.6	12.6	7.2

Table 7: Descriptive statistics: Cumulated investment by sector (%)
(Source: EBRD, Calculus: authors)

Sector	**1991-1995**	**1996-1999**	**2000-2003**
Finance	19.6	27.0	30.2
Environment	..	4.1	..
Food	2.6	8.1	9.0
Telecom	14.5	6.8	4.9
Energy	9.5	9.7	8.9
Oil/Gas/Nat.Res.	10.8	10.3	8.4
Transport	8.8	3.4	16.1
Others	34.3	30.6	22.4

BOX 1: **LIST OF VARIABLES**

C13	Type of contract signed by the EBRD (13 possible contracts)
DEM	Index of democratic level in the country hosting the investment (Polity IV, 2007)
PUBLIC	Dummy variable for presence of a public client or other interests of the bank in the project
DSY	Dummy for investments financed by the EBRD for the same firm in the same year
GDP	Gross domestic product per-capita of the host country (IMF statistics, 2007)
IP	Total value of the investment project
IPDSY	Value of projects for firms obtaining more than one credit in the same year
IV	Value of the investment financed by the EBRD
Libor	Average annual value of LIBOR interest rate at 12 months.
FIRST	Dummy for the first contract signed by the EBRD with firms obtaining more than one credit
Sector	Dummy by sector
Year	Time dummy
C13FIRST	Interaction term between C13 and FIRST
C13IPFIRST	Interaction term among C13, IP and FIRST
IPFIRST	Interaction term between IP and FIRST
Dummy MNE	Dummy for contract involving a multinational firm as a partner

Table 8: Descriptive statistics

	Variable	Obs	Mean	Std. Dev	Min	Max
Sample						
	Libor	1788	4.23	1.45	2.17	9.91
	GDP per-capita ($)	1706	2706.5	2143.6	151.48	13937.4
	Polity IV index (DEM)	1662	6.5	2.85	0	10
	EBRD Credit Value (€ mill.)	1766	16.5	24.2	0	233.7
	Total project value (€ mill.)	1750	49.23	97.87	0	1028.9
	Financing share	1728	0.6	0.33	0.009	1
1993						
	Libor	71	7.24	0	7.24	7.24
	GDP per-capita ($)	68	2167	1519.7	225.8	6801.8
	Polity IV index (DEM)	68	7.32	2.45	0	10
	EBRD Credit Value (€ mill.)	71	20.36	23.9	0.1	100.12
	Total project value (€ mill.)	71	69.98	96.95	1.3	464.7
	Financing share	71	0.43	0.28	0.04	1
2003						
	Libor	272	2.17	0	2.17	2.17
	GDP per-capita ($)	260	3292.8	2539.6	248.2	13937.4
	Polity IV index (DEM)	254	6.61	3.04	0	10
	EBRD Credit Value (€ mill.)	270	13.69	23.7	0.1	230.2
	Total project value(€ mill.)	271	33.26	77.4	0.1	750
	Financing share	270	0.69	0.34	0.01	1

Table 9a: Econometric results: Full sample

Method of estimation: Pooled OLS, Value in brackets: Std Error,

Dependent variable: IV

	OLS	**OLS**	**OLS**	**OLS**
C	13.17 (5.77)**	7.68(5.89)	13.61(5.11)**	8.08(2.26)**
IP	0.16 (0.019)***	0.16(0.02)***	0.16 (0.008)***	0.16(0.008)***
PUBLIC	7.55(2.34)***	7.40(2.37)***	7.55(2.04)***	7.48(1.90)***
Dem	-0.25(0.14)*	-1.65(0.79)**	-0.25(0.02)***	-0.14(0.18)
Libor	-1.72 (0.69)**	0.26(0.82)	-1.72 (0.16)***	-1.67(0.25)***
GDP	0.0006(0.0002)**	0.0005(0.0003)**	0.0006(0.0002)***	0.0005(0.0002)**
Dummy years	yes	yes	yes	yes
Dummy sectors	yes	yes	yes	yes
DEM*years	no	yes	no	yes
Tests:				
D. Years=0	2.93***	0.50	26647***	234.71***
D. Sectors=0	4.97***	4.14***	1.4 10^5***	1.4 10^5***
DEM*year=0		1.22*		1747.38***
DEM*year=D. Years		1.14		1499.96***
Robustness errors	Heterosk.	Heterosk	Clusters	Clusters
Adj. R-Square	0.51	0.51	0.51	0.52
OBS	1620	1620	1614	1614

*** 1% significance level; ** 5%; * 10%

Table 9b: Econometric results: Full sample

Method of estimation: Pooled OLS, Value in brackets: Std Error,

Dependent variable: IV

	OLS	**OLS**	**OLS**	**OLS**
C	10.83 (2.81)***	5.04(3.16)	10.90(2.74)***	5.13(1.28)***
IP	0.16 (0.019)***	0.16(0.02)***	0.16 (0.008)***	0.16(0.008)***
PUBLIC	7.22(2.36)***	6.90(2.40)***	7.24(2.36)***	6.91(2.32)**
Dem	-0.24(0.14)*	-1.71(0.77)**	-0.23(0.03)***	-1.71(0.29)***
Libor	-1.76 (0.67)**	0.36(0.82)	-1.72 (0.14)***	0.35(0.67)
GDP	0.0006(0.0002)**	0.0005(0.0003)**	0.0006(0.0002)***	0.0005(0.0002)**
Dummy MNE	-0.83 (0.90)	-1.2 (0.91)	-0.79 (0.88)	-1.16 (1.16)
Dummy years	yes	yes	yes	yes
Dummy sectors	yes	yes	yes	yes
DEM*years	no	yes	no	yes
Tests:				
D. Years=0	3.01***	0.49	1.5 10^5***	260.86***
D. Sectors=0	5.02***	4.23***	40210***	3.4 10^5***
DEM*year=0		1.39		1747.38***
DEM*year=D. Years		1.26		1.1 10^5***
Robustness errors	Heterosk.	Heterosk	Clusters	Clusters
Adj. R-Square	0.51	0.51	0.51	0.52
OBS	1620	1620	1614	1614

*** 1% significance level; ** 5%; * 10%

Table 10a
Econometric results: full sample
Method of estimation: Fixed effects, Value in brackets: Std Error,

Dependent variable: IV

	Fixed effects	**Fixed effects**	**Fixed effects**	**Fixed effects**
C	12.7 (6.10)**	5.15 (6.37)	12.72 (3.82)***	5.15 (2.19)**
IP	0.16 (0.005)***	0.16(0.005)***	0.16 (0.007)***	0.16(0.007)***
PUBLIC	6.88 (1.76)***	6.81 (1.77)***	6.88 (1.49)***	6.81 (1.38)***
Dem	-0.18 (0.17)	-0.79 (1.02)	-0.18 (0.06)***	-0.79 (0.48)
Libor	-1.92(0.70)	0.77 (1.13)	-1.92(0.21)***	0.77 (0.46)
GDP	0.0006(0.0002)	0.0005 (0.0002)**	0.0006(0.0002***)	0.0005 (0.0002)**
Dummy years	yes	yes	yes	yes
Dummy sectors	yes	yes	yes	yes
DEM*years	no	yes	no	yes
Fixed effects	C13	C13	C13	C13
Tests:				
Hausman Test (χ^2)	39.64	17.18***		
F-test: fixed vs pooled	4.52***	4.65***		
D. Years=0	3.84***	3.84***	1.8 10^6***	1.4 10^5***
D. Sectors=0	2.87***	2.87***	2.1 10^5***	1582***
DEM*year=0		0.28		1.4 10^5***
$\boldsymbol{\sigma_u}$	27.55	28.05	27.55	28.05
$\boldsymbol{\rho}$	0.72	0.73	0.72	0.73
Robustness errors	Heterosk.	Heterosk	Clusters	Clusters
R-Square (within)	0.50	0.49	0.49	0.50
OBS	1614	1265	1614	1614
Groups	13	13	13	13

*** 1% significance level; ** 5%; * 10%

Table 10b
Econometric results: full sample
Method of estimation: Fixed effects, Value in brackets: Std Error,

Dependent variable: IV

	Fixed effects	**Fixed effects**	**Fixed effects**	**Fixed effects**
C	10.49 (4.59)**	2.94 (4.84)	10.49 (1.62)***	2.94 (1.83)
IP	0.16 (0.005)***	0.16(0.005)***	0.16 (0.007)***	0.16(0.007)***
PUBLIC	6.72 (1.81)***	6.46 (1.82)***	6.72 (1.87)***	6.46 (1.88)***
Dem	-0.17 (0.17)	-0.82 (1.02)	-0.18 (0.04)***	-0.82 (0.51)
Libor	-1.94(1.57)	0.83 (1.13)	-1.94(0.17)***	0.83 (0.54)
GDP	0.0006(0.0002)	0.0006 (0.0002)**	0.0006(0.0002***)	0.0006 (0.0002)**
Dummy MNE	-0.41(1.02)	-0.81 (1.03)	-0.41(1.03)	-0.81 (1.32)
Dummy years	yes	yes	yes	yes
Dummy sectors	yes	yes	yes	yes
DEM*years	no	yes	no	yes
Fixed effects	C13	C13	C13	C13
Tests:				
Hausman Test (χ^2)	20.88	83.29***		
F-test: fixed vs pooled	4.50***	4.62***		
D. Years=0	3.87***	0.28	1.7 10^5***	1.7 10^5***
D. Sectors=0	3.18***	3.11***	1.8 10^5***	2.6 10^5***
DEM*year=0		1.14		268***
$\boldsymbol{\sigma_u}$	27.50	28.03	27.50	28.03
$\boldsymbol{\rho}$	0.72	0.73	0.72	0.73
Robustness errors	Heterosk.	Heterosk	Clusters	Clusters
R-Square (within)	0.49	0.50	0.49	0.50
OBS	1614	1614	1614	1614
Groups	13	13	13	13

*** 1% significance level; ** 5%; * 10%

Table 11
Econometric results: One-contract firms
Method of estimation: Pooled OLS, Value in brackets: Std Error,
Dependent variable: IV

	OLS	**OLS**
C	14.75 (6.9)**	8.38(7.56)
IP	0.15 (0.02)***	0.15(0.02)***
PUBLIC	8.12(2.71)***	8.00(2.75)***
Dem	-0.21(0.19)	dropped
Libor	-1.78 (0.73)**	0.32(0.92)
GDP	0.0004(0.0003)	0.0004(0.0003)
Dummy years	yes	yes
Dummy sectors	yes	yes
DEM*years	no	yes
Tests:		
D. Years=0	2.61***	0.89
D. Sectors=0	4.47***	3.20***
DEM*year=0		1.55*
DEM*year=D. Years		
Robustness errors	Heterosk.	Heterosk
Adj. R-Square	0.51	0.51
OBS	1269	1269

*** 1% significance level; ** 5%; * 10%

Table 12
Econometric results: One-contract firms
Method of estimation: Fixed effects, Value in brackets: Std Error,
Dependent variable: IV

	Fixed effects	**Fixed effects**
C	14.7 (6.77)**	-8.78 (-0.57)
IP	0.16 (0.02)***	0.15(0.006)***
PUBLIC	7.19 (2.72)***	7.12 (2.04)***
Dem	-0.14 (0.19)	dropped
Libor	-2.03(0.70)***	3.94 (2.82)
GDP	0.0005(0.0003)	0.0004 (0.0003)
Dummy years	yes	yes
Dummy sectors	yes	yes
DEM*years	no	yes
Fixed effects	C13	C13
Tests:		
Hausman Test (χ^2)	11.20**	17.18***
F-test: fixed vs pooled	4.33***	4.57***
D. Years=0	3.03***	0.98
D. Sectors=0	2.02***	1.73**
DEM*year=0		1.82**
$\boldsymbol{\sigma_u}$	27.75	28.63
$\boldsymbol{\rho}$	0.70	0.71
Robustness errors	Heterosk.	Heterosk
R-Square (within)	0.48	0.49
OBS	1265	1265
Groups	13	13

*** 1% significance level; ** 5%; * 10%

Table 13
Econometric results: One-contract firms
Sector: Banking and Finance
Method of estimation: Fixed effects, Value in brackets: Std Error,

Dependent variable: IV

	Pooled	**Pooled**	**Fixed effects**	**Fixed effects**
C	5.97 (1.66)***	5.98 (0.48)***	3.83(5.08)	3.83 (1.60)**
IP	0.36 (0.06)***	0.35(0.04)***	0.35 (0.01)***	0.35 (0.04)***
PUBLIC	1.16 (3.08)	1.53 (2.00)	1.65 (4.91)	1.65 (2.38)
Dem	dropped	dropped	dropped	dropped
Libor	-1.95 (0.45)***	-1.93 (0.23)***	-1.51 (1.53)	-1.51 (0.42)***
GDP	0.001 (0.0004)**	0.001(0.0003)**	0.001 (0.0002)***	0.001 (0.0003)**
Dummy years	yes	yes	yes	yes
DEM*years	yes	yes	yes	yes
Fixed effects			C13	C13
Tests:				
F-test: fixed vs pooled			3.10**	
D. Years=0	3.71***	36971.4***	0.89	23106.5***
DEM*year=0	1.35	1144.3***	1.30	4928.97***
σ_u			5.74	5.74
ρ			0.22	0.22
Robustness errors	Heterosk.	Cluster	Heterosk	Cluster
R-Square (within)	0.57	0.57	0.58	0.58
OBS	582	582	578	578
Groups			8	8

*** 1% significance level; ** 5%; * 10%

Table 14
Econometric results: Several-contract firms
Method of estimation: Pooled OLS (with error correction), Value in brackets: Std Error,

Dependent variable: IV

	OLS	**OLS**	**OLS**
C	14.57 (10.14)	0.44(3.65)	14.57 (7.34)**
IP	0.21 (0.03)***	0.21(0.03)***	0.22 (0.032)***
PUBLIC	1.96 (4.11)	1.97 (4.06)	1.96 (0.62)
Dem	dropped	-0.19(0.19)	dropped
Libor	-5.58 (4.42)	0.67 (1.18)	-5.58 (3.04)*
GDP	0.0007 (0.0004)*	0.0007 (0.0004)**	0.0007 (0.0004)*
IPDSY	0.34 (0.12)***	0.32 (0.11)***	0.34 (0.12)***
Dummy years	yes	yes	yes
Dummy sectors	yes	yes	yes
DEM*years	yes	no	yes
Tests:			
D. Years= 0	1.81*	0.69	2.07**
D. Sectors=0	3.30***	4.20***	2.99***
DEM*year=0	1.62*		2.16**
DEM*year=D. Years	1.85*		3.06***
Robustness errors	Heterosk	Heterosk	Cluster
Adj. R-Square	0.65	0.64	0.65
OBS	346	346	346

*** 1% significance level; ** 5%; * 10%

Table 15
Econometric results: Several-contract firms
Method of estimation: Fixed effects (with error correction), Value in brackets: Std Error,
Dependent variable: IV

	Fixed effects	**Fixed effects**	**Fixed effects**
C	1.43 (10.39)	-2.84 (4.95)	13.43 (7.60)*
IP	0.21 (0.03)***	0.21 (0.03)***	0.21 (0.03)***
PUBLIC	1.14 (4.57)	1.37 (4.50)	1.14(4.36)
Dem	dropped	-0.11(0.21)	dropped
Libor	-5.34(4.43)	0.85 (1.22)	-5.34 (3.04)*
GDP	0.0009(0.0004)**	0.001 (0.0004)**	0.0009(0.0004*)
IPDSY	0.34 (0.12)***	0.32 (0.11)***	0.34 (0.11)***
Dummy years	yes	yes	yes
Dummy sectors	yes	yes	yes
DEM*years	yes	no	yes
Fixed effects	ct13	ct13	ct13
Tests:			
Hausman Test (χ^2)	18.32***		
F-test: fixed vs pooled	1.85*	1.65	
D. Years= 0	1.7*	0.51	2.05**
D. Sectors=0	3.15***	4.42***	3.22***
DEM*year=0	1.68*		2.42***
DEM*year=D. Years	1.49		2.81***
$\boldsymbol{\sigma_u}$	4.21	3.20	4.21
$\boldsymbol{\rho}$	0.12	0.07	0.12
Robustness errors	Heterosk.	Heterosk	Cluster
R-Square (within)	0.48	0.64	0.65
OBS	344	344	344
Groups	8	8	8

*** 1% significance level; ** 5%; * 10%

Table 16
Econometric results: Several-contract firms
Method of estimation: Fixed effects (with error correction), Value in brackets: Std Error,
Dependent varibale: IV

	Fixed effects	**Fixed effects**
C	22.51 (9.04)**	22.51 (7.00)**
IP	0.21 (0.03)***	0.21 (0.03)***
PUBLIC	1.11(4.03)	1.11(3.87)
Dem	dropped	dropped
Libor	-6.40 (3.68)*	-6.40 (2.65)**
GDP	0.0008(0.0004)*	0.0008(0.0004)*
IPDSY	0.38 (0.12)***	0.38 (0.12)***
Dummy years	yes	yes
Dummy sectors	yes	yes
DEM*years	yes	yes
Fixed effects	C13FIRST	C13FIRST
Tests:		
Hausman Test (χ^2)	na[2]	
F-test: fixed vs pooled	2.73*	
D. Years$=0$	2.27**	2.73***
D. Sectors=0	3.09***	2.80***
DEM*year=0	1.93**	3.02***
DEM*year=D. Years	2.11**	4.30***
$\boldsymbol{\sigma_u}$	5.51	5.51
$\boldsymbol{\rho}$	0.19	0.19
Robustness errors	Heterosk	Cluster
Adj. R-Square	0.66	0.66
OBS	346	346
Groups	8	8

*** 1% significance level; ** 5%; * 10%

[2] We experienced problems in running this test with this fixed effect either in the current and the reduced form. The variable (CT2PPRR) contain a big mass of zero values and, hence, the fitted model fails to meet the asympothic assumption of the Hausman test.

Table 17
Econometric results: Second and further contracts
Method of estimation: Pooled OLS, Value in brackets: Std Error,

Dependent variable: IV

	OLS	**OLS**	**OLS**	**OLS**
C	-3.14 (4.40)	-5.06(2.47)*	-1.85(7.96)	3.36 (7.57)
IP	0.20(0.03)***	0.19 (0.28)***	0.194 (0.03)***	0.19 (0.03)***
PUBLIC	-1.92(5.85)	-2.00 (8.85)	-3.45 (6.48)	-3.25 (9.05)
Dem	-0.59 (0.25)**	-0.60 (0.42)	dropped	dropped
Libor	2.26 (0.59)***	2.26 (0.56)**	1.93 (2.48)	1.93 (0.79)***
GDP	0.001 (0.0006)**	0.001(0.0002)***	0.001 (0.0007)*	0.001 (0.0001)***
Dummy years	yes	yes	yes	yes
Dummy sectors	yes	yes	yes	yes
DEM*years	no	no	yes	yes
Tests:				
D. Years=0	6.21***	6.70**	2.98***	18.71***
D. Sectors=0	4.78***	2.74	2.20***	14.09***
DEM*year=0			2.82***	12.49***
DEM*year=D. Years			5.45***	22.06***
Robustness errors	Heterosk.	Cluster	Heterosk.	Cluster
Adj. R-Square	0.58	0.58	0.59	0.59
OBS	191	191	191	191

*** 1% significance level; ** 5%; * 10%

Table 18
Econometric results: Second and further contracts
Method of estimation: Fixed effects, Value in brackets: Std Error,

Dependent variable: IV

	Fixed effects	**Fixed effects**	**Fixed effects**
C	-3.65 (17.63)	2.99 (11.94)	98.91(26.82)***
IP	0.19 (0.017)***	0.19(0.02)***	0.63(0.20)***
PUBLIC	-5.99 (6.98)	-4.07 (6.56)	-20.50 (6.84)***
Dem	dropped	dropped	dropped
Libor	1.90 (2.42)	1.42 (2.33)	-2.45 (1.41)*
GDP	0.002 (0.0006)**	0.001 (0.0006)**	-0.003 (0.002)
Dummy years	yes	yes	yes
Dummy sectors	yes	yes	yes
DEM*years	yes	yes	yes
Fixed effects	C13	C13FIRST	IPFIRST
Tests:			
F-test: fixed vs pooled	0.94	3.27***	4.42***
D. Years=0	0.84	2.23**	2.56**
D. Sectors=0	0.64	1.79**	7.35***
DEM*year=0	0.86	2.11**	11.11***
DEM*year=D. Years	0.72	2.86**	9.80***
σ_u	3.32	15.49	76.23
ρ	0.07	0.64	0.99
Robustness errors	Heterosk.	Heterosk	Heterosk
R-Square (within)	0.59	0.60	0.81
OBS	190	190	179
Groups	6	7	91

*** 1% significance level; ** 5%; * 10%

Table 19

Econometric results: Second and further contracts in the Banking and Finance sector

Method of estimation: Fixed effects, Value in brackets: Std Error,

Dependent variable: IV

	Fixed effects	**Fixed effects**	**Fixed effects**
C	-2.58(6.87)	-0.52(6.40)	5.25(8.04)
IP	0.33 (0.034)***	0.32(0.03)***	0.73(0.06)***
PUBLIC	dropped	dropped	dropped
Dem	dropped	dropped	dropped
Libor	1.67 (2.31)	1.03 (2.18)	-1.71 (2.55)
GDP	0.001 (0.0006)*	0.001 (0.0006)*	-0.002 (0.001)*
Dummy years	yes	yes	yes
DEM*years	yes	yes	yes
Fixed effects	C13	C13FIRST	IPFIRST
Tests:			
F-test: fixed vs pooled	0.81	3.76***	5.41***
D. Years=0	0.55	0.76	1.62
DEM*year=0	0.55	0.61	2.44**
σ_u	5.27	13.72	26.71
ρ	0.17	0.61	0.94
Robustness errors	Heterosk.	Heterosk	Heterosk
R-Square (within)	0.55	0.60	0.81
OBS	141	138	129
Groups	6	7	58

*** 1% significance level; ** 5%; * 10%

Table 20
Econometric results: Second and further contracts in the Banking and Finance sector
Subsample: Native firms
Method of estimation: Fixed effects, Value in brackets: Std Error,

Dependent variable: IV

	Fixed effects	**Fixed effects**	**Fixed effects**	**Fixed effects**	**Fixed effects**	**Fixed effects**
C	-2.58(6.87)	-1.68(4.54)	13.62 (9.30)	0.52 (2.70)	-1.68 (1.97)	13.62 (10.04)
IP	0.80 (0.046)***	0.77(0.05)***	0.58(0.06)***	0.80 (0.15)***	0.77 (0.17)***	0.58 (0.23)**
PUBLIC	dropped	dropped	dropped	dropped	dropped	dropped
Dem	dropped	dropped	dropped	dropped	dropped	dropped
Libor	0.32 (1.60)	0.08 (1.59)	-2.67 (2.61)	0.32 (0.74)	0.08 (1.09)	-2.67 (1.30)**
GDP	0.005 (0.0006)	0.007 (0.0006)	-0.003 (0.001)**	0.005 (0.006)	0.0007 (0.0004)	-0.003 (0.001)**
Dummy years	yes	yes	yes	yes	yes	yes
DEM*years	yes	yes	yes	yes	yes	yes
Fixed effects	C13	C13FIRST	IPFIRST	C13	C13FIRST	IPFIRST
Tests:						
F-test: fixed vs pooled	0.12	1.06	1.93**			
D. Years=0	3.92***	17.51***	1.32	7.08 E07***	380.37***	14.99***
DEM*year=0	16.36***	12.43***	1.86*	1.4 E07***	18.63***	301.80***
$\boldsymbol{\sigma}_u$	74.9	7.17	19.87	74.99	7.17	19.87
$\boldsymbol{\rho}$	0.99	0.48	0.91	0.98	0.48	0.91
Robustness errors	Heterosk.	Heterosk	Heterosk	Cluster	Cluster	Cluster
R-Square (within)	0.83	0.82	0.75	0.83	0.82	0.75
OBS	115	112	111	115	112	111
Groups	6	7	53	6	7	53

*** 1% significance level; ** 5%; * 10%

A Appendix: List of sectors

The following table shows all the sectors that firms asking for a finance belong to:

Banking, Finance and holding	Local services (water, waste...)
Chemical (including Pharmaceutical)	Media
Education and other public services	Manufacturing
Electronic and Hi-Tech	Metal
Energy	Natural resources
Environment	Oil and gas
Food and beverage (incl. agriculture)	Real estate
Health and personal care	Telecommunication
Hotels and tourism	Trade and retail
Infrastructure (transport)	Vehicles

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