



European Bank
for Reconstruction and Development

The determinants of performance in building infrastructure in transition economies

Gabriela Dobrescu^{*}, Guido Friebel^{}, Pauline Grosjean^{***}, Katrin Robeck^{****}**

Abstract:

We investigate how contract specificities affect the performance of municipal infrastructure projects in transportation, district heating, water, waste water and solid waste. Using data from projects financed by the European Bank for Reconstruction and Development (EBRD), we look at the effect of involving private parties with different degrees of risk, and involving public parties other than the respective municipality. In particular, central authorities may provide a sovereign guarantee for the funds lent by the Bank. We construct two types of performance measures. First, timeliness of the projects is measured by (i) the total length of delays, (ii) the delays between signing and disbursement of funds and (iii) the occurrence of political disruptions of the projects. Secondly, to measure financial and commercial performance we look at whether (iv) financial covenants and (v) covenants about tariffs for infrastructure use were reached. We find that private participation without commercial risk (for instance, works or turnkey projects) tends to increase project performance. Private participation with commercial risk has no significant effect on project performance. Sovereign guarantees reduce delays but also decrease financial discipline. These effects are robust against potential selection effects, which we control for through instrumental variable regressions.

Keywords: public private, contracts, sovereign guarantee, risk sharing

JEL codes: L33, L90, P35

Address for correspondence: Guido Friebel, Johann Wolfgang Goethe Universität Frankfurt, Campus Bockenheim, Dantestr. 9, D - 60325 Frankfurt, Germany. Email: gfriebel@wiwi.uni-frankfurt.de

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INTRODUCTION

Infrastructure is important for the promotion of economic growth and poverty alleviation. Good infrastructure makes the movement of goods, services, information and people more efficient. Conversely, disruptions in the provision of essential services that build on infrastructure such as water, electricity, heating or transport can cause political frictions that may jeopardize political stability and the progress of economic reforms.

At the outset of transition, infrastructure conditions posed a serious challenge to reform in most economies. The countries were often equipped with vast infrastructure networks but they had gone through a long period of underinvestment. Infrastructure provision suffered from poor quality, outdated technology and widespread waste. A general absence of the user-pays principle undermined efficiency, created soft budget constraints and frequently implied heavy subsidisation. The transition economies had to attract new capital, potentially of private investors, and to change the governance structure in a way to foster commercial discipline and to recover investments. This included the introduction of transparent financing and tariff rules and modern management principles.

On a descriptive level, our paper documents to what extent the transition economies have succeeded in doing this. But beyond this specific interest,¹ we believe that the experience of infrastructure projects in transition economies provides an interesting opportunity to learn more generally about the role of different actors in large investment projects. Infrastructure projects in transition economies often involve multiple public actors, which poses interesting questions about the how public and private actors interact to get things done. Moreover, as transition economies are in need of a rapid and massive overhaul of their infrastructure and have to get the institutional framework right, performance indicators, such as timeliness and commercial and financial discipline are of particular interest. Neither of these indicators has received much attention from the literature, but they seem to be important for a better understanding of the pros and cons of different designs for large investment projects that involve public and private players (Dewatripont and Legros, 2005).

Our data originate from projects financed by the European Bank for Reconstruction and Development (EBRD) in transition economies of central and eastern Europe, south-eastern Europe and the Commonwealth of Independent States. The EBRD is the largest lender for infrastructure projects, which makes our sample rather comprehensive. We look at local infrastructure, such as urban transport, district heating, water, waste water and solid waste. Municipal governments in the region of our study are generally responsible for the provision of these services and they are consequently the sponsor of most projects financed by the EBRD. However, projects differ widely in the extent of private sector participation as well as in the form of such private involvement, which ranges from participation with no private risk-taking, such as turnkey projects, to full privatisation (divestiture), in which the private investor ultimately assumes all commercial risks. For some projects there are sovereign guarantees for the loan that the municipality takes, which involves the presence of additional public actors.

It is notoriously difficult to measure project performance. Many dimensions are involved: the price of the service and cost recovery both determine commercial success but the practicalities of using such measures are obstructed by complicated issues of quality and coverage of the services. Most importantly, the projects have a very long life span, which further complicates

¹ To our knowledge the only other, and less comprehensive, studies on transition economies are Berg et al. (2004) for Ukraine, and EIB (2005a and 2005b) for central eastern Europe.

evaluation. We cannot measure all these important dimensions but the EBRD's project documents make it possible to generate a number of outcome dimensions both for projects that have been concluded and ongoing projects.

More precisely, we construct two types of performance measures. First, timeliness of the projects is measured by (i) the total length of delays, (ii) the delays between signing and disbursement of funds and (iii) the occurrence of political disruptions to the projects. Delays are an important dimension of project performance, not only as a determinant of public satisfaction but also as a source of significant costs. Delays in infrastructure rehabilitation (or, project turnaround) prolong an inefficient situation and as such impose undue burden on the municipal or state budget in the form of continued subsidies. Because of the commitment of funds or up-front fees, they also increase the cost of a project.

Secondly, to measure financial and commercial performance, we look at whether (iv) financial covenants and (v) covenants about tariffs for infrastructure use were reached. Compliance with tariff covenants is an indicator of improved commercialisation of the utility in the context of transition. Similarly, compliance with financial covenants is an indicator of successful rationalisation and commercialisation of the utility, and thus a factor of future profitability and attractiveness of the sector.

We find that private participation without commercial risk, for instance, works or turnkey projects, tends to increase project performance. By contrast, private participation with risk has no significant effect on project performance. Sovereign guarantees reduce delays but also decrease financial discipline. These effects are robust against potential selection effects, which we control for through instrumental variable regressions.

While the number of observations may be too small to claim generality for our results, the regressions seem to indicate that the presence of private parties may be beneficial – even if they do not take commercial risks – because they transfer know-how. Furthermore, our results show that involving public parties other than the principal public sponsor (here, the municipality) may involve a trade-off between faster implementation and weaker financial discipline. Arguably this is the result of a moral hazard problem: the parties involved in the project (municipality, contractors and banks alike) may have dampened incentives to ensure financial performance when a sovereign guarantee fully insures against them against the financial risks of the projects.

We would finally like to make clearer our contribution to a growing literature that has investigated whether the involvement of private partners may lead to better project performance relative to public management.² A large part of the empirical literature focuses on the impact of different forms of ownership on cost or technical efficiency.³ The evidence here is ambiguous and there are no clear-cut results about the superiority of either form of ownership (Estache et al., 2005). Other papers deal with distributional⁴ or fiscal⁵ aspects of private sector participation, which are beyond the scope of this paper. In general, it is fair to

² The theoretical literature includes Hart (2003), Grout (2003) and Tadelis (2002).

³ See, among others, Estache and Rossi (2002) for the Asia Pacific region, Estache and Kouassi (2002) for Africa, Turolla et al. (2004) for Brazil or Saal and Parker (2001) for England and Wales. For a survey, see Estache (2004).

⁴ See Auriol and Picard (2006), Estache et al. (2000) or Estache and Rossi. (2004). For a survey, see Estache (2004).

⁵ See Estache and Serebrisky (2004).

say that empirical investigation of utilities' performance is hindered by the lack of available data. This is particularly true in the case of municipal utilities, which are the subject of this paper and which, with the exception of water and sewerage, have not been addressed by the literature.

Most importantly, we go beyond looking at the role of private parties and investigate the effect of involving more than one public party in infrastructure projects. Hence our paper contributes to a broader understanding of how project design affects different measures of performance.

In the next section, we provide some background. Section 2 describes the data. Section 3 develops some hypotheses, presents the main regressions and deals with endogeneity issues. Section 4 concludes.

1. MUNICIPAL INFRASTRUCTURE IN TRANSITION ECONOMIES: EBRD INVOLVEMENT

Infrastructure provision in centrally planned economies differed from that in market economies in two ways. First, as part of an extensive growth strategy, services such as electric power were abundantly supplied to the industry with little regard for their costs and environmental impact. Secondly, as part of the central planning approach to income allocation, basic consumer goods and services were supplied at very low prices. This included important infrastructure services, such as electricity, heating, urban transport or water supply, all of which were provided well below cost or for free.

As a result, at the beginning of transition, many economies had vast infrastructure networks that were in serious disrepair and in need of modernisation. Beyond the requirement for new investment there were other major challenges for infrastructure reform: tariffs were very low and the effective tariffs were even lower because of large shares of unpaid bills and low collection rates. In the context of low revenue collection, the operation of infrastructure industries generally lacked commercial discipline, which was exacerbated by cross-subsidisation across services. Consequently, most of the provision of infrastructure was financed by taxes. Municipalities suffered from a lack of financial capacity. The challenge lay in attracting new capital and know-how but getting the private sector involved was difficult because of very low tariff levels.

We look at all EBRD projects in municipal infrastructure.⁶ The exceptions are some “regional” projects that involve several countries and are hence hardly comparable. Our data comprise 90 projects with a total commitment from the EBRD of over €2.2 billion. The smallest commitment is €0.96 million and the largest, the St Petersburg Flood Barrier Project, entails a €249 million loan signed in 2002.

Despite the important differences in the macro-economic environment and development level of the various countries of operations, there is no clear pattern in the regional breakdown of the EBRD’s portfolio. Between 1993 and 2005, 34 projects were signed in central eastern Europe and the Baltic states (CEB)⁷ and in south-eastern Europe (SEE)⁸ alike. In the Commonwealth of Independent States (CIS),⁹ 22 projects were signed. Neither the average signing year nor the average EBRD commitment differs significantly across regions.

A typical project can be described as follows. A municipality needs funds to modernise its infrastructure and may or may not have an idea of how to carry this out. It may ask the EBRD to provide a loan to put in place the infrastructure and to help in designing the process through which infrastructure will be built and operated. The role of the EBRD goes beyond the one of a private bank, as its goal is two-fold: lend money to economically viable projects but select those projects that have a positive impact on the transition process. Hence, the EBRD is not just interested in being paid interest and principal on the loan, but also in the performance of

⁶ Our dataset thus consists of all the projects that have been signed and that are disbursing, as well as those projects that have been completed and repaid.

⁷ CEB consists of the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia.

⁸ SEE consists of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR Macedonia, Montenegro, Romania and Serbia.

⁹ The CIS consists of Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, the Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

the infrastructure itself. The Bank lends under certain conditions, in particular, covenants concerning financial health and the implementation of tariffs that make the provision of infrastructure services economically viable in the long run. Furthermore, the Bank usually pushes for commercialisation, that is, the institutional separation of the units that provide services, say the district heating company and the town's administration.

While this basic structure is quite similar across projects, there are variations in terms of (i) the involvement of private parties and (ii) the involvement of other public organisations. Contract design for municipal infrastructure projects covers a wide range – from sovereign loans over structures in which local authorities bear the risk, to public-private partnerships (PPPs) with different degrees of private risk-taking. The decision about the contract design and hence the allocation of risk relies mainly on the inherent perceived risk of the project. It is therefore related to the degree of decentralisation and to local market conditions and reflects the pace of reform and transition. Sovereign debt, for example, is still the model for investment in countries at the early stages of transition, while more market-oriented lending structures, such as equity participation in a PPP, are by now the rule for more advanced transition countries and the new EU member states.¹⁰

The EBRD's strategic approach, in accordance with its mission to advance transition towards a market economy while respecting the principle of sound banking,¹¹ is to gradually move from sovereign debt financing, combined with substantial grant co-financing, towards providing financing directly to local utilities, combined with commercial co-financing. The evolution of the EBRD's product portfolio reflects this approach. Between 1997 and 2004, the share of the Bank's portfolio represented by sovereign loans or sovereign guaranteed loans decreased to 40 per cent from 80 per cent, while the contribution of investments with local authority risk increased to 36 per cent from 16 per cent and the share of private sector participation increased to almost 30 per cent from 2 per cent.

The above makes clear that the question of how involvement of different parties and contract design affects project performance needs to take into account potential endogeneity. In Section 3 we therefore carry out instrumental variables (IV) regressions.

¹⁰ For example, Tallin Water Company (Estonia) and Sofia Water Company (Bulgaria) are run as a private concession.

¹¹ As well as other principles, such as additionality (the Bank's ability to complement rather than replace private sources of finance) and respect of environmental standards

2. THE DATA

Table A1 in the Appendix presents the summary statistics of all variables used in our regressions. Below we discuss the most important variables.

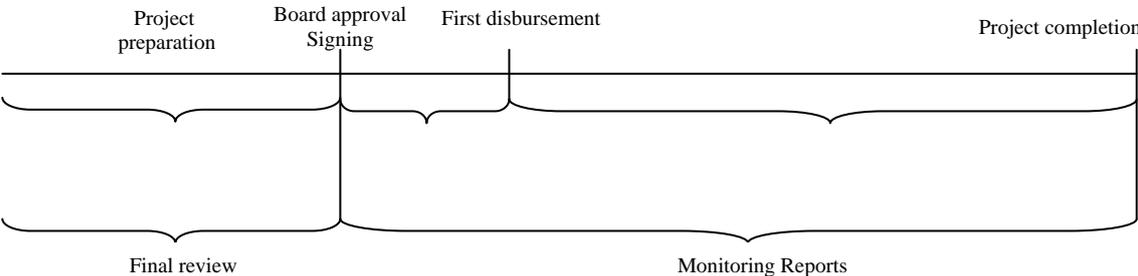
2.1 Outcome variables

Evaluating the performance of infrastructure projects is a formidable task. There are a multitude of performance dimensions, such as financial performance, collection rates and cost efficiency, coverage and quality of service, or timeliness. Data on infrastructure projects in transition economies are scarce, not only because infrastructure projects are rather large and therefore rather rare, but also because they need time to reach maturity. Many of these infrastructure projects are indeed not yet completed.

However, the EBRD’s project documents make it possible to construct a number of interesting performance variables. In particular, we are using the Monitoring Reports (MRs) that provide the basis for the systematic evaluation of progress during implementation of the Bank’s operations. The MRs are used to identify problems in the projects; they list disruptions to the project process, identify their causes and provide the record for review after completion. The operation (banking) teams update the reports twice a year. We generate two types of performance indicators from these MRs. They concern delays and their causes, and financial and commercial discipline.

It is useful to look at the project cycle to understand the origin and nature of these performance variables (see Figure 1). The first variable, *total delay*, consists of the time overrun experienced in project implementation, between signing and completion. This variable is normalised by the length of the project. The second variable is the *time between signing and disbursement of the funds*, which is an indicator of the problems that may occur in coordinating different parties. Unfortunately, there is no information about the time that passes for the preparation of a contract, which would be an interesting additional indicator.

Figure 1: The EBRD project cycle



Besides continuous variables on delay we also look at *political disruptions* as a reason for delays. This binary variable indicates particular dissatisfaction with project implementation and may be sign that there is a high risk of renegotiations. It is also a negative indicator of the commercial independence of utilities in the concerned countries. Other reasons for delays are exogenous – weather or earthquakes, problems related to tendering, procurement or technical reasons in the construction stage. We exclude these from our analysis.

Delays occur in 73 out of our total of 90 projects, with a mean duration of a little below one year, the longest being 42 months. Regarding the reasons for delay, only three projects have delays of an exogenous nature, while 24 have delays of a political nature and 48 have delays in the tendering, procurement and construction stages. All but one project experienced a longer-than-expected time span between project signing and disbursement of funds. The minimum duration of these delays is one month and the maximum is 57 months.

To measure financial and commercial discipline we use the fact that the contracts between the bank and the client specify financial and commercial covenants that must be reached and that are subject to monitoring. Covenants are an important element of contract design as they engage the contracting parties, the municipality, an entity owned by the municipality or the private sector to reach specified milestones. These are to achieve certain financial indicators put down in the contracts, for instance, cost-to-revenue ratios and so on, and to implement tariffs that induce economically viable behaviour of consumers and the agents running the infrastructure. Monitoring reports document any breaches of such covenants that may occur in the period covered. We look at the achievement of financial and tariff covenants: 58 per cent of projects have tariff increases covenanted but 36 per cent actually achieved these increases; all projects have covenants on financial milestones to be reached, but only 65.5 per cent of projects actually reached them.

2.2 Explanatory variables

We distinguish project-related outcome variables and control variables. The main source of project-related right-hand side variables is the Final Review Board Document (FR). The FR is the basis for the project approval process of EBRD management. The FR contains information about the use of proceeds, about the sponsor (the party initiating the project, such as the municipality) or client and other key parties involved (including financial statements). The FR also gives information on the amount of funds required and a description of proposed key loan terms and conditions.

The majority of the projects are in the water and waste-water subsector (accounting for 60 per cent of the total number of projects and 55 per cent of total EBRD commitments), followed by public transport (comprising 20 per cent of projects and 15 per cent of total commitments), district heating (11 per cent of projects and 13 per cent of total commitments) and solid waste (4 per cent of projects and 5 per cent of total commitments).¹² Cost recovery for operations and maintenance is easier in water and waste-water projects than in other sectors. In contrast, in public transport or district heating projects, cost can only be partially recovered.¹³ Waste collection and disposal are generally suitable for full cost recovery approaches, but solid waste treatment is technically more difficult than water projects (EBRD 2004). Solid waste projects are also more difficult from an institutional viewpoint, as they depend critically on developing a political consensus at the central government level to define appropriate environmental laws and regulations, and at the regional or local level, to enforce such regulations.

¹² Other projects entail a toxic waste treatment plant and a flood protection programme in St Petersburg. Some projects deal with several types of municipal infrastructure.

¹³ It is, however, noticeable that farebox recovery ratios, that is the ratio of revenues generated by fares over operating costs in public transport projects in countries in which the EBRD operates, tend to be higher than in western Europe. Transport companies still rely heavily on municipal support in the form of budget allocations, including for non-commercial and social services.

The structure of contracts and the nature of participating parties differ considerably. Arguably the most important distinctions concern which parties are involved beyond the municipality and the EBRD, and what risk these parties bear. We can distinguish four different types of private participation. In descending order of the risk involved for the private party, these are:

- divestiture (privatisation in the strict sense)
- build-operate-transfer (BOT) contracts or concession contracts
- management or service contract
- works or turnkey contract.

The contract with the least private ownership and least risk are works or turnkey projects. Here the private party is an agent who builds the asset and thus bears no commercial risk on the operation of the utility. For management or service contracts, ownership is still in the hands of the municipality, but the private operator operates the utility (either with its own equipment in the case of the service contract, or with municipally owned equipment in the case of the service contract). The BOT or concession contracts are those where ownership is transferred to the private partner over a period of time – typically 15 to 25 years – during which it owns, finances, builds and operates the utility. In divestiture contracts, ownership is fully and permanently transferred to the private sector. The dataset contains 16 projects where either the client or the client sponsor is private (three clients are private domestic with a foreign sponsor, seven clients are foreign, four clients are special purpose entities with a foreign sponsor and two clients are other public domestic entities with a foreign sponsor).

In the bulk of the regressions, we will bundle together all contracts with some dimension of commercial risk for the private party (divestiture, BOT, concession contracts, management and service contracts) and distinguish them from turnkey or work contracts where no such risk is taken by the private contractor. While this does not take into account the important differences in the risk-taking for the private parties that these designs imply, the small number of observations makes regressions that control for each type of contract separately less reliable. In Section 3 we do, however, report the results of these regressions as well. They turn out to deliver quite similar results as the ones in which the risk-taking projects are bunched.

Projects may not only involve private parties, they may also involve additional public institutions at the regional or central level. These institutions may offer project support in the form of a guarantee or project support agreement. The most important type of guarantee is the sovereign guarantee in which a central government guarantees that the lender will be paid back. There are also guarantees on the municipal level. Financial covenants and covenants for tariff change affect profitability of the utility company, an important condition for further privatisation and commercialisation of the utilities sector.

The FRs also provide us with information about the region and in addition, we include variables relating to country characteristics and the progress in institutional reform. First, we use country-specific EBRD transition indicators for infrastructure reform. These indicators range from 1 to 4+, with 1 representing little or no change from a planned economy (with a minimum degree of decentralisation and commercialisation and a large political interference in management) and 4+ representing the standards of an industrial market economy, characterised by independent regulation and full decentralisation and commercialisation of utilities. We also use country-specific indicators of the business environment from the World Bank/EBRD Business Environment and Enterprise Performance Survey (BEEPS). We use an average index of this survey data on unofficial payments to public officials in general, more specifically in order to obtain public contracts, and to influence law and regulation.

3. EMPIRICAL ANALYSIS

We investigate to what extent the explanatory variables affect our various measures of performance. We first present some hypotheses about the potential effects of sovereign guarantees and private sector involvement on different dimensions of project performance.

3.1 Hypotheses

Consider the relationship between a municipality that wants to build or modernise its infrastructure and a bank that would provide a loan. If there are neither sovereign guarantees nor private parties involved, then the bank assumes a large part of the risk associated with the investment. It consequently has strong incentives to monitor the viability of the project beforehand and to monitor the fulfilment of the contract. Covenants play a crucial role here; they facilitate to verify performance both during the investment process and afterwards. In particular, they represent a measure for the efforts the municipality undertakes to create the conditions necessary for commercial viability.

The bank may, however, consider that there is excessive risk for a project and ask for a sovereign guarantee. It is unclear whether this has positive or negative net effects on project performance. When a sovereign guarantee is granted, the risks that the municipality and the lender bear decrease. According to the standard trade-off present in moral hazard situations, the insurance provided by the sovereign guarantee may reduce the efforts of the municipality to take good care of the project. For instance, it may not undertake necessary but painful restructuring measures and may not engage in the institutional transformations necessary to run the infrastructure properly. The sovereign guarantee may also affect the bank's incentive to monitor the efforts of the municipality.

On the other hand, the central government may itself have a stronger incentive to put effort into the project. This may consist of monitoring the municipality, for instance to reduce leakage of funds. Potentially the government may be able to monitor more efficiently than the banks would be able to do so, particularly in countries where property rights are not or only weakly enforced, and banks are therefore in a difficult situation. The sovereign guarantee may also make the central government more interested in the success of the local infrastructure project. It may therefore remove obstacles, for instance red tape, to make the project work more smoothly.

Given these countervailing incentive effects on the different parties, the total effect of a sovereign guarantee on the fulfilment of financial and tariff covenants could go either way: it may distort the efforts that the bank and the municipality put into the project, but may increase those of the government, which in turn affect the efforts of the municipality. Whether the positive effect on effort is present and its strength will depend on the interest of the central government. There could be situations in which a sovereign guarantee makes things not only worse, because the bank and the municipality have poorer incentives, but also because a "bad" central government receives more power. This is why we hypothesise that a good government would have a positive or neutral effect on covenants, while a bad one would reduce the probability of achieving covenants. Similarly, involvement of a good government would result in fewer political disruptions and faster disbursement. The delay between signing and disbursement would be shortened (this is what we call "positive") if the central government is good; while otherwise anything may happen (even a bad government may have an incentive to move quickly). We have no hypothesis to present on total delays because a good government

may have an incentive to delay a project if there are problems at hand, while a bad government may do the same for totally different reasons. Finally, we of course cannot observe the type of government present in reality and will hence only be able to measure net effects.

The presence of private parties in a project can have two effects. First, private parties may have managerial skills that public parties do not possess. They may be better at managing the assets or better at planning construction, and they may have skills to operate human resources or assets in a more efficient way than the public institutions in charge. Secondly, private parties may play a monitoring role. If they take some commercial risk, as for instance in BOT or concession contracts, they have an interest in monitoring closely the actions of the municipalities. But private party participation also involves a political risk. Experience shows that private participation in infrastructure projects is not always very popular (see Estache 2005 and Bonnet et al. 2006). The electorate may consider that private parties are cream-skimming or are more prone to engage in corruption, whether this is actually true or not.

Table 1 summarises the hypotheses one may build for the involvement of sovereign guarantees and private parties.

Table 1: Summary of hypotheses

	Total Delay	Political disruption	Delay between signing and disbursement	Tariff covenants respected	Financial covenants respected
Sov guarantee:					
* bad central gvt		Negative	Positive, negative or neutral	Negative	Negative
* good central gvt		Positive	Positive	Positive or neutral	Positive or neutral
Private parties, with commercial risk	Negative	Negative		Positive	Positive
Private parties, without commercial risk		Negative		Neutral	Positive

Note: Blank cells correspond to situations without *a priori* hypotheses.

3.2. Selection effects

Financial performance and timely realisation of an infrastructure project are likely to depend on a number of different factors. First, the sector and the environment in which the project takes place are likely to play an important role. We therefore include sectoral dummies, as well as regional dummies, indices of progress in transition and business environment indicators in order to capture these effects. Secondly, the characteristics and scope of the investment project itself are likely to matter not only for a project’s performance, but also for the design of the contract as discussed in Section 2. Indeed, the EBRD is more likely to impose a sovereign guarantee in early transition countries, where the performance of projects is also likely to be worse, because of poor income levels, poor institutional environment and low commitment of authorities to reform. Similarly, private enterprises are likely to cherry-pick their projects so that the involvement of a private agent is more likely in good projects and in countries where the institutional and business environment is better.

In order to control for endogeneity of project design features, we carry out instrumental variable estimations for the two variables that significantly influence project performance: sovereign guarantees and municipal guarantees.¹⁴

Sovereign guarantees are linked to the advancement of the country on the reform path and to the quality of the business environment. The number of years in transition at the time of signing of the project, the project age and the BEEPS indicator of the quality of the business environment thus constitute good potential instruments for the presence of a sovereign guarantee. Planned private sector involvement at the design stage is another instrument for sovereign guarantee, as it represents a more advanced institutional environment and because private sector participation mitigates the lender's risk and thus relaxes incentives to seek a sovereign guarantee. Lastly, as the presence of a sovereign guarantee also depends on the respective degree of involvement of the different public actors in the project, the scope of central government's financial participation in the project is used as another instrument of sovereign guarantee.

To instrument for *municipal guarantee* for a project, we look at, for similar reasons as in the sovereign guarantee case, whether private sector participation was planned at the design stage and the respective shares of central and municipal governments' investments in the project.

The quality of our instruments is tested using over-identification tests, that is, we verify that our instruments are valid, i.e. uncorrelated with the error term of our performance regressions. We also use a Wald test to verify that these instruments are valid instruments, i.e. that the error terms in the structural equation of our performance indicators and the reduced-form equation for the endogenous variable are not correlated.

3.3. Results

Table 2 looks at the various measures for timeliness, and Table 3 at financial and commercial discipline. In Table 3 we report the results of a probit estimation in which the dependent variables are whether or not (1 or 0) the financial and tariff (commercial) covenants agreed in the contract were reached. The first and third columns present the baseline regression results, while columns 2 and 4 report the ones for the IV estimates that control for potential endogeneity of sovereign guarantees.

Let us first consider our results related to delays in project implementation. A first striking result is that the presence of a sovereign guarantee reduces total delays (by one to two months). The cause of this effect may be that a central authority that has given a sovereign guarantee is more interested in the project taking off, as it takes on the financial risk associated with any delays. Similarly, the delays between signing and disbursement are cut when there exists a sovereign guarantee. This effect is robust when controlling for endogeneity of sovereign guarantee.¹⁵ Here the effect is much larger – having a sovereign

¹⁴ Although participation of the private sector is likely to be endogenous, we do not instrument for it. The rationale is that if private sector participation was endogenous, the bias on our performance measures would likely be upward, the private sector being likely to pick the “best” projects. However, private sector participation is never found significant. For robustness, we instrument private sector participation, and our insignificance result carries through.

¹⁵ Results of the first stage regression results of the instrumentation of sovereign guarantee are reported in Table A2.

guarantee reduces the delay between signing and disbursement by approximately a year. The presence of a municipal guarantee has a similar effect on total delays, as under a guarantee the town government internalises the costs of delay, but it has no significant effect on the delay between signing and disbursement.

Table 2 entails two other interesting results. First, when the municipality rather than a commercialised municipal company is the client, the delay from signing to disbursement increases (by about 10 months), which points to the benefits of having managers rather than politicians running municipal infrastructure. Secondly, when the numbers of investors increases, it becomes harder to move from signing a contract into disbursement of funds (each additional investor increases the delay by approximately three to four months). This reflects that coordination costs increase in the number of participating parties. The BEEPS index is significant only for the delay since signing and disbursement and again has the right sign; less corrupt countries are realising projects faster than more corrupt countries. Thirdly, as one may expect, CEB countries do better.

For completeness, we also report the first stage regression results for those regressions where we instrumented for sovereign guarantees in Table A3. Finally, we have also instrumented for municipal guarantees as this has shown up as statistically significant in one regression and maybe endogenous in a similar way as sovereign guarantees. The discussed result turns out to be robust.

The results concerning financial and commercial discipline are presented in Table 3. In terms of financial covenants, a clear picture emerges. Sovereign guarantees, through which a central government institution insures all parties against their risk and in turn gains some influence on the project, reduce financial discipline. This effect is robust as the IV estimates show. For the average project, having a sovereign guarantee lowers the probability of achieving financial covenants by about 60 percentage points, a seemingly large effect. The presence of a sovereign guarantee does indeed distort the incentives of the parties involved to carry out the necessary efforts to make a project financially healthy, just as discussed above. We cannot, unfortunately, identify the relative incentive effect on different parties, but only the composite effect on municipalities, the EBRD and other private parties alike.

Private participation with risk transfer such as BOT, concessions or service contracts does not have any impact on the probability of reaching a project's financial milestones, but private participation without risk (works or turnkeys) does (it increases the probability of achieving financial covenants by approximately 30 percentage points for the average project). Importantly, the same result holds, even when one differentiates among the different classes of risk of private sector participation, namely management, service contract, concessions or divestiture. At first glance this is surprising because one should expect more effort and hence better financial discipline when private parties take risk. However, this result is consistent with other evaluation studies of private sector participation in central eastern Europe (Brenck et al. 2005), which point to an unfavourable institutional environment, suboptimal project design and unrealistic demand projections as the main causes of the mitigated success of such private sector participation. The authors, however, argue that institutional conditions for successful private sector participation have much improved recently. Another tentative explanation along this line is that some of the earlier projects in which private parties took risks were particularly problematic, and that the result may therefore reflect the learning process over time; in the early stages there was less experience in designing contracts such that all parties would have appropriate incentives to carry out the political and managerial

efforts to make the project succeed. There was also some wide-spread enthusiasm about the participation of the private sector among private actors, but in later stages more careful attitudes prevailed.

We have therefore tried to test for such learning or institutional improvements effects by interacting project age with private sector participation with risk. It turned out that the coefficient on this interaction term is also not significant, which gives no support for the learning or the institutional improvement hypothesis.

Another explanation, for which our small dataset does not allow to test but that is supported by anecdotal evidence, is that our population of private sector participation with commercial risk is too heterogeneously distributed between successful (for example, Tallin concession project) and unsuccessful projects (for example, Sofia concession project) to display clear trends. As noted by Brenck et al. (2005), the water sector, in contrast to telecoms or toll road projects, has proven to be difficult for private sector participation, mainly due to the limited commercial nature of projects. The same argument is all the more valid for the other sectors of municipal infrastructure studied here. Estache and Serebrisky (2004) also note the higher tendency for renegotiations of private sector participation in the water sector, often after macroeconomic shocks or political turnover (as in the case of the Sofia water concession).

The size of projects plays no statistically significant role; neither do other contract characteristics such as number of investors, the existence of a project support agreement or a municipal guarantee. Nor is there a robust effect when the client of the debt contract is the municipality. The share of EBRD finance in the total project volume does, however, play a role, and the effect is negative. Increasing the EBRD share by 1 per cent lowers the probability of achieving financial the promised financial indicators by about 1 per cent. One interpretation of this result is that other parties involved in the project reduce their efforts when the EBRD plays a major role, which is consistent with the idea that parties involved in a project may free-ride on each other. Sectors of activity play no role, as does the region in which the project is situated (CIS, CEB, with the omitted category SEE). The BEEPS index, a measure of the obstructive effect of corruption in infrastructure projects, has a negative effect on the probability of reaching a milestone, which may indicate the presence of collusion (Martimort and Straub 2006), and its efficiency-decreasing role.

Comparing these results to the ones on commercial covenants, it becomes clear that the latter regressions explain less of the variance. A borderline statistically significant effect concerns the presence of private parties without risks, whose technical and operational know-how makes it easier for municipal clients or the firms operating infrastructure to reach commercial targets. The only statistically significant effect concerns the sectors: water being the sector in which it seems easier to implement commercial discipline via tariffs, in effect expected given the technological complications to charge for solid waste or heating. Table 5 summarises the results that survive our IV for endogeneity.

Table 2: “dprobit” and IV regressions, delays, instrumentation for sovereign guarantee

	-1	-2	-3	-4	-5	-6
	Total delay	Total delay	Delay sign. to disb.	Delay sign. to disb.	Political delays	Political delays
	(OLS)	(IV reg)	(OLS)	(IV reg)	(dprobit)	(IV probit)
Sovereign guarantee	-1.184** [0.515]	-1.715*** [0.598]	-8.320** [3.627]	-11.974** [5.583]	0.344* [0.211]	0.64 [0.837]
Private part. with risk	-0.192 [0.553]	-0.098 [0.473]	-4.708 [4.062]	-4.617 [3.557]	-0.059 [0.143]	-0.095 [0.593]
Works or turnkey realised	-0.293 [0.445]	-0.402 [0.382]	2.577 [3.213]	2.633 [2.784]	-0.310* [0.181]	-0.797* [0.465]
Total investment	0 [0.002]	0 [0.001]	-0.007 [0.012]	-0.006 [0.011]	-0.001 [0.001]	-0.002 [0.002]
EBRD share	-0.013 [0.010]	-0.014 [0.008]	-0.025 [0.071]	-0.034 [0.063]	-0.002 [0.003]	-0.002 [0.012]
Number of investors	0.027 [0.272]	-0.058 [0.242]	3.780* [1.968]	3.466* [1.789]	0.118 [0.081]	0.431 [0.305]
Municipal client	0.474 [0.461]	0.439 [0.398]	10.613*** [3.273]	10.782*** [2.853]	0.333** [0.158]	0.826* [0.498]
Project support agreement	-0.489 [0.483]	-0.656 [0.434]	5.583 [3.518]	5.017 [3.206]	-0.076 [0.143]	-0.411 [0.491]
Municipal guarantee	-1.389** [0.535]	-1.653*** [0.501]	-2.519 [3.759]	-3.658 [3.686]	-0.052 [0.149]	-0.366 [0.660]
District heating	0.636 [0.752]	0.555 [0.654]	7.558 [5.588]	7.45 [4.934]	-0.205** [0.082]	-0.68 [0.770]
Waste water	0.178 [0.475]	0.216 [0.407]	3.297 [3.449]	3.34 [3.028]	0.132 [0.128]	0.843* [0.499]
Solid waste	-0.203 [1.010]	-0.13 [0.808]	-12.792* [6.971]	-13.501** [5.836]		
CIS	0.518 [0.483]	0.633 [0.416]	0.79 [3.742]	0.798 [3.205]	0.03 [0.159]	-0.15 [0.508]
CEB	-0.842* [0.489]	-0.971** [0.432]	-4.992 [3.634]	-5.889* [3.350]	-0.264** [0.125]	-0.962 [0.673]
BEEPS index	0.599 [1.390]	1.024 [1.171]	-17.294* [10.137]	-17.104** [8.629]	0.26 [0.436]	1.712 [1.507]
EBRD transition indicator	-1.116*** [0.328]	-1.199*** [0.285]	-3.168 [2.473]	-3.372 [2.190]	0.004 [0.115]	-0.202 [0.387]
Project age	-0.254* [0.135]	-0.207*** [0.080]	1.376 [1.028]	1.283** [0.592]	0.037 [0.047]	-2.789 [2.038]
Years in transition	-0.047 [0.115]		0.16 [0.866]		-0.008 [0.039]	0.101 [0.097]
Observations	69	69	82	82	78	81
R-squared	0.368		0.4		0.35	
Anderson LR statistic (P-val)		0.00		0.00		
Sargan statistic (P-val)		0.40		0.47		
Wald test of exogeneity (P-val)						0.62
Amemiya-Lee-Newey chi-sq stat (P-val)						0.52

Notes:

The omitted categories are south-eastern Europe, urban transport. Reported regressions control for the presence of a constant.

Columns 1 and 3 report OLS regression results of the length of total delay and of the delay between signing and disbursement. Columns 2 and 5 report the instrumented regression results for the same dependent variables. Column 5 reports the marginal effects for the probability of occurrence of political delays, while column 6 reports the coefficients of the instrumented probit estimation of this probability.

Number of years in transition for the country where the project is signed (*years in transition*), share of central government's participation to the project and whether private participation was planned at the design stage of the project are used for instruments of sovereign guarantee in all above instrumented regressions.

Solid waste is excluded from the regression on political delays as it is perfectly correlated with the occurrence of such delays.

***, **, and * denote statistical significance at the 1 per cent, 5 per cent and 10 per cent levels.

Instrumental variable probit estimations are obtained using Newey's minimum chi-squared estimator.

The Amemiya-Lee-Newey test results for over-identification of instruments were generated using Baum, Schaffer, Stillman and Wiggins' (2006) `overid.ado` programme for Stata.

Table 3: “dprobit” and IV regressions, financial and commercial performance

	-1	-3	-2	-4
	Fin. cov. achieved	Fin. cov. achieved	Tariff cov. achieved	Tariff cov. achieved
	(dprobit)	(IV probit)	(dprobit)	(IV probit)
Sovereign guarantee	-0.639***	-3.755***	-0.390***	0.038
	[0.171]	[1.370]	[0.094]	[0.936]
Private participation with risk	-0.052	0.06	0.319	1.04
	[0.214]	[0.745]	[0.244]	[0.652]
Works or turnkey realised	0.345*	1.276**	0.318***	0.84
	[0.198]	[0.651]	[0.118]	[0.526]
Total investment	0	0.003	0.001	0.001
	[0.001]	[0.004]	[0.001]	[0.002]
EBRD share	-0.010***	-0.037**	-0.007*	-0.014
	[0.004]	[0.015]	[0.004]	[0.012]
Number of investors	0.011	-0.031	-0.16	-0.458
	[0.095]	[0.357]	[0.100]	[0.315]
Municipal client	-0.287	-0.808	0.121	0.083
	[0.185]	[0.623]	[0.173]	[0.511]
Project support agreement	-0.172	-0.998	0.219	0.59
	[0.159]	[0.692]	[0.160]	[0.547]
Municipal guarantee	-0.054	-0.616	-0.223	-0.379
	[0.206]	[0.752]	[0.145]	[0.678]
District heating	-0.246	-0.753	0.145	0.2
	[0.279]	[0.855]	[0.318]	[0.885]
Waste water	-0.179	-0.592	0.304**	1.098*
	[0.165]	[0.658]	[0.153]	[0.597]
Solid waste	-0.241	-0.858	-0.112	0.57
	[0.437]	[1.245]	[0.269]	[0.991]
CIS	-0.04	-0.108	-0.311**	-0.783
	[0.199]	[0.689]	[0.133]	[0.634]
CEB	0.116	-0.167	-0.329**	-0.523
	[0.205]	[0.849]	[0.146]	[0.609]
BEEPS index	-1.454**	-4.882**	-0.246	0.021
	[0.644]	[2.145]	[0.476]	[1.449]
EBRD_TI	0.113	0.344	-0.047	-0.131
	[0.126]	[0.464]	[0.122]	[0.388]
Years in transition	0.052		-0.088**	
	[0.048]		[0.041]	
Project age	0.06		-0.052	
	[0.060]		[0.053]	
Observations	85	85	85	85
R2	0.55		0.38	
Wald test of exogeneity (P-val)		0.11		0.12
Amemiya-Lee-Newey minimum chi-sq statistic (P-val)		0.64		0.22

Notes:

The omitted categories are south-eastern Europe, urban transport. Reported regressions control for the presence of a constant.

Columns 1 and 3 report marginal effects for the probability of not breaching financial and tariff covenants. Columns 2 and 4 report the coefficients of the instrumented probit estimation of the probability of not breaching financial and tariff covenants.

Number of years in transition for the country where the project is signed (*years in transition*), time elapsed since the project was signed (*project age*), share of central government's participation to the project and whether private participation was planned at the design stage of the project are used for instruments of sovereign guarantee in all above instrumented regressions.

***, **, and * denote statistical significance at the 1 per cent, 5 per cent and 10 per cent levels of the marginal effects of the probit estimation and the coefficients of the instrumented probit estimation.

Instrumental variable probit estimations are obtained using Newey's minimum chi-squared estimator.

The Amemiya-Lee-Newey test results for over-identification of instruments were generated using Baum, Schaffer, Stillman and Wiggins' (2006) `overid.ado` programme for Stata.

4. CONCLUSIONS

We have carried out an analysis of municipal infrastructure projects in transition economies. A number of hypotheses about the potential effects of different contract designs have been brought forward. The hypotheses were investigated with a unique dataset stemming from the project documentation of the largest lender for PPPs in transition economies.

The following Table summarizes what we find. We have argued in Section 3 that whether or not sovereign guarantees affect project performance positively or negatively would depend on the type, or quality, of the central government (reform-minded or not). As the type of government is not observable, we can only look at the net effect from the regressions. Notice that *ns* means that no statistically significant effect was identified in our empirical results.

Table 4: Summary of the results

	Total delay	Political disruption	Delay between signing and disbursement	Tariff covenants respected	Financial covenants respected
Sovereign guarantee	Negative	<i>ns</i>	<i>ns</i>	<i>ns</i>	Negative
Private parties, with commercial risk	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>
Private parties, without commercial risk	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	Positive

Our results show that the effects are quite subtle because they depend on what dimension of performance being looked at: the presence of a sovereign guarantee decreases financial discipline, but reduces the delays between signing and disbursement. This is in line with the view that too much insurance distorts the incentives of the parties involved in a project, but also with a view that a central institution that is involved in the project can help to push (or abstain from obstructing) the project.

The second and third lessons are that it is not necessarily the presence of private parties taking risks that improves the performance of a project. In our study, risk-sharing private parties have no impact on measures of project performance. However, private parties that are transferring know-how, for instance through their involvement in building infrastructure, increase financial discipline. As we have a rather small sample that covers a rather long period of time and many project specificities, this does not constitute strong empirical evidence against risk transfer between public and private parties. However, it seems to indicate that knowledge transfer is an important channel through which private parties can contribute to project performance. To get a more complete view on the intricate interactions between private and public parties in their partnerships, both projects with and without private risk-taking should hence be scrutinised.

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APPENDIX

Table A1: Descriptive statistics

Variable	Description	Mean	Std. Dev.	Min	Max
Fin. cov. achieved	0 if financial covenants have been breached; 1 if not	0.66	0.48	0	1
Tariff cov. achieved	0 if tariffs covenants have been breached; 1 if not	0.37	0.48	0	1
Political delays	1 if some occurrence of political delays	0.28	0.45	0	1
Total delay	Total length of project delay, normalised by project age	0.68	1.45	0	11
Sign to disbursement	Delay from signing to disbursement (months)	16.05	12.68	0	57
Private part. with risk	1 if private involvement in management, service contracts, concession or divestiture	0.22	0.42	0	1
Sovereign guarantee	1 if presence of a sovereign guarantee on the project	0.21	0.41	0	1
District heating	1 if project in district heating	0.11	0.32	0	1
Waste water	1 if project in water or waste water	0.61	0.49	0	1
Solid waste	1 if project in solid waste	0.04	0.21	0	1
CIS	1 if project in Commonwealth of Independent States	0.24	0.43	0	1
CEB	1 if project in central eastern Europe and the Baltic states	0.38	0.49	0	1
SEE	1 if project in south-eastern Europe	0.38	0.49	0	1
Total investment	Size of total investment, in millions of euros	74.30	127.62	4	1128.51
EBRD share	Share of EBRD involvement in total investment	41.21	21.48	8.87	100
Municipal client	1 if client is a municipality or a 100 per cent municipally owned company	0.37	0.48	0	1
PSA	1 if presence of a project support agreement with municipality	0.56	0.50	0	1
Municipal guarantee	1 if presence of a municipal guarantee on the project	0.20	0.40	0	1
Number of investors	Number of investors	2.27	0.86	1	5
Works or turnkey realised	1 if private sector involvement in works and turnkey contracts	0.69	0.47	0	1
Central part.	1 if central government is a co-investor	0.40	0.49	0	1
Private part. with risk planned	1 if private involvement in management, service contracts, concession or divestiture had been planned	0.80	0.40	0	1
Years since transition	Number of years since the beginning of transition in the country	10.56	3.12	3	16
EBRD transition indicator	EBRD transition indicator score of the country	2.63	0.66	1	3.67
BEEPS index	BEEPS business score of the country	0.97	0.16	0.74	1.79
Project age	Time elapsed between reporting time and signing of project (in years)	4.43	2.19	0.5	11.42

Table A2: Results of the first stage least square, instrumentation of sovereign guarantee for delay outcomes

	Financial and tariff covenant achieved	Total delay	Delay signing to disbursement	Political delay
	First SLS estimates			
	Sovereign guarantee			
	(IV probit)	(IV reg)	(IV reg)	(IV probit)
Central participation	0.330*** [0.093]	0.490*** [0.099]	0.357*** [0.099]	0.349*** [0.090]
Private-sector participation planned	-0.2335** [0.116]	-0.172 [0.116]	-0.235** [0.117]	-0.285** [0.111]
Years in transition	-0.053** [0.026]	-0.069*** [0.025]	-0.05* [0.027]	-0.069** [0.026]
Project age	-0.037 [0.031]	-0.050 [0.030]	-0.039 [0.032]	-0.055* [0.032]
Private participation with risk	0.037 [0.123]	0.028 [0.123]	0.051 [0.128]	0.001 [0.117]
Works or turnkey realised	0.064 [0.106]	-0.035 [0.106]	0.059 [0.108]	0.147 [0.103]
Total investment	0 [0.001]	0 [0.001]	0 [0.001]	0 [0.001]
EBRD share	0 [0.001]	-0.001 [0.002]	-0.001 [0.002]	0 [0.001]
Number of investors	-0.028 [0.060]	-0.027 [0.061]	-0.020 [0.062]	0.020 [0.059]
Municipal client	0.065 [0.097]	0.011 [0.102]	0.051 [0.102]	0.011 [0.093]
Project support agreement	-0.186* [0.100]	-0.283** [0.106]	-0.214* [0.111]	-0.239** [0.097]
Municipal guarantee	-0.289** [0.111]	-0.422*** [0.112]	-0.294** [0.113]	-0.271** [0.105]
District heating	-0.042 [0.153]	-0.131 [0.168]	-0.004 [0.175]	0.003 [0.145]
Waste water	0.007 [0.106]	-0.087 [0.106]	0.011 [0.108]	-0.006 [0.097]
Solid waste	-0.312 [0.208]	-0.534 [0.220]	-0.294 [0.215]	
CIS	0.043 [0.119]	0.112 [0.111]	0.052 [0.122]	0.004 [0.114]
CEB	-0.112 [0.113]	-0.074 [0.115]	-0.090 [0.119]	-0.066 [0.107]
BEEPS index	0.082 [0.314]	0.178 [0.311]	0.102 [0.320]	0.181 [0.29]
EBRD transition indicator	0.049 [0.077]	0.027 [0.076]	0.102 [0.080]	0.042 [0.0736]
Observations	85	69	82	81
R-squared (uncentered)	0.48	0.75	0.61	0.53

Notes:

The omitted categories are south-eastern Europe, urban transport. Reported regressions control for the presence of a constant.

Column 1 reports the first stage least square of the instrumentation of sovereign guarantee in the instrumented probit estimation of the probability of not breaching financial and tariff covenants. Excluded instruments are: number of years in transition for the country where the project is signed (*years in transition*), time elapsed since the project was signed (*project age*), share of central government's participation to the project and whether private participation was planned at the design stage of the project are used for instruments of sovereign guarantee.

Columns 2, 3 and 4 report the first stage least square of the instrumentation of sovereign guarantee in the instrumented estimation of, respectively: total delays, delays between signing and disbursement and the probability of occurrence of political delays. Excluded instruments are: number of years in transition for the country where the project is signed (*years in transition*), share of central government's participation to the project and whether private participation was planned at the design stage of the project are used for instruments of sovereign guarantee.

***, **, and * denote statistical significance at the 1 per cent, 5 per cent and 10 per cent levels.

Table A3: IV estimation of total delay first and second stage least square, instrumentation for municipal guarantee

	Total delay	Municipal guarantee
	Second SLS	First SLS
Municipal guarantee	-3.739** [1.482]	
Sovereign guarantee	-1.989*** [0.701]	-0.537** [0.145]
Private participation with risk	0.3 [0.625]	0.190 [0.144]
Works or turnkey realised	-0.623 [0.486]	-0.161 [0.119]
Total investment	0 [0.002]	0 [0.001]
EBRD share	-0.021* [0.011]	-0.003 [0.002]
Number of investors	-0.33 [0.344]	-0.105 [0.084]
Municipal client	0.315 [0.471]	-0.057 [0.119]
Project support agreement	-0.477 [0.485]	-0.090 [0.128]
District heating	-0.243 [0.914]	-0.386** [0.184]
Waste water	-0.16 [0.516]	-0.168 [0.118]
Solid waste	-0.979 [1.111]	-0.466* [0.255]
CIS	0.369 [0.493]	-0.135 [0.129]
CEB	-1.625** [0.672]	-0.179 [0.141]
BEEPS index	1.336 [1.459]	0.336 [0.356]
EBRD transition indicator	-1.639*** [0.450]	-0.168** [0.083]
Project age	-0.251* [0.136]	-0.006 [0.351]
Years in transition	-0.055 [0.115]	-0.016 [0.031]
Municipal participation		-0.0259 [0.137]
Central participation		0.355** [0.139]
Private participation planned		-0.034 [0.135]
Observations	69	69
Uncentered R2	0.28	0.62
Anderson LR statistic (P-val)		0.02
Sargan test of over-identifying restriction (P-val)		0.71
Partial R2 of excluded instruments		0.13
Anderson Rubin test of joint significance of instruments (P-val)		0.02

Notes:

The omitted categories are south-eastern Europe, urban transport. Reported regressions control for the presence of a constant.

Column 1 reports the second stage of the instrumented regression results for total delays. Column 2 reports the first stage of the instrumentation of the presence of a municipal guarantee.

The share of the municipal or the central government's participations to the project and whether private participation was planned at the design stage of the project are used for instruments of municipal guarantee. Excluded instruments are indicated in bold.

Solid waste is excluded from the regression on political delays as it is perfectly correlated with the occurrence of such delays.

***, **, and * denote statistical significance at the 1 per cent, 5 per cent and 10 per cent levels.