THE PERFORMANCE OF LOCAL GOVERNMENT IN THE EXECUTION
OF PUBLIC WORKS

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The performance of local government in the execution of public works

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Abstract

This paper aims at analysing the procurement of public works paying attention to the level of government involved. Such an issue has not received so far attention in the literature on fiscal federalism nor in the public works procurement literature. We focus the attention upon the execution stage of public works: indeed, their efficient provision and their capability to deliver the planned benefits are severely affected by the problems arising at the execution stage because of the incompleteness of the underlying contract. The main result is that local governments seem to be less efficient in the management of the execution process, suffering from longer delays than central government. This phenomenon is more severe for small municipalities and when the contract is mainly financed with external resources.

1. INTRODUCTION

The aim of this paper is to analyse the procurement of public works paying attention to the level of government involved. Such an issue has not received so far attention in the literature on fiscal federalism nor in the public works procurement literature.

Indeed, public works represent investments which are relevant for the accumulation of the economic and social capital of local communities.[1] The efficient provision of these goods and their capability to deliver the planned benefits are severely affected by the execution problems, arising because of the incompleteness of the underlying contract. Do these problems and their effects differ according to the level of government ?

In this paper we try to address such a question and to offer a preliminary tentative answer, through an empirical analysis, based on data drawn from a large sample of Italian public works. In section 2 the main findings of the fiscal federalism literature will be recalled and their relevance for the public works procurement will be examined. In section 3, given the empirical nature of our analysis, we will discuss the potential determinants of the efficiency of execution of public works, alongside the different institutional identity of procurers. Section 4 presents the main data and some preliminary statistical analysis. In section 5 an empirical analysis will be carried out, using Italian procurement data, the impact of decentralization on the efficiency in the execution of the contracts for public works will be analysed and some comments on the policy implications of the results will be provided. In section 6 some concluding remarks will be offered.

2. DECENTRALIZATION AND PUBLIC WORKS PROCUREMENT

2.1 Public works have not been specifically addressed as "local output" in the literature on fiscal federalism, though it is widely agreed that infrastructure investment is "location or site-specific" as well as "jurisdiction specific" (Bird, 1995). The "local" dimension may be addressed from different perspectives: the analysis of decentralization can be applied to the allocation process (what infrastructure, for whom)[2] as well as to the implementation process (performance in terms of costs and time of completion). In this paper attention will be concentrated on the implementation phase; as Bird (1995) points out, the provision of infrastructure may vary according with the level of government involved in the design, financing, regulation, operation and maintenance of the infrastructure and, among the other things, the administrative regulatory framework (e.g. rules on contracting, dispute settlement) crucially affects the performance. Elsewhere (Guccio, Pignataro and Rizzo, forthcoming) it has been pointed out that public works rely on long-term incomplete contracts and that such a feature crucially affects their capability to deliver the planned benefits, since it

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[1] A survey of the literature on infrastructure and growth is offered by Estache and Fay (2007), stressing that the relevance of infrastructures varies across countries and over time.
[2] For a survey, see Estache and Fay (2007).

may negatively impact on the time and the costs of execution. Do these problems and their effects differ according to the level of government? This is a sound question, since public works is a field where different governments operate and, therefore, is a good area for "testing" federalism. Within such a perspective in what follows few hints coming from the longstanding literature on fiscal federalism will be recalled in relation with the main theme of this paper[3] to test whether the reasons for decentralization stand as far as the execution of public works is concerned.

As it is well known, in the literature several economic (efficiency) reasons for decentralization have been put forward. Traditionally, it has been claimed that, under certain assumptions, decentralization generates welfare gains in the resource allocation because local governments have better information about local residents preferences (and services costs) and, therefore, local outputs are Pareto superior to an outcome characterized by a centrally determined, uniform level of output across all jurisdictions. Local governments are also likely to be more accountable because of their closeness to citizens and decentralization, therefore, would enhance citizens' participation. Different local outputs are likely to generate competition among local governments if citizens move from one jurisdiction to another. "Competition among jurisdictions forces governments to represent citizen interests and to preserve markets" (Qian and Weingast, 1997, p. 88). Indeed, in a public choice perspective – i.e. with governments not acting in the best interest of the citizens - fiscal decentralization inducing competition it is claimed to constrain public sector tendency to become inefficiently large (Brennan and Buchanan, 1980). Finally, decentralization would favour the experimentation of innovative policies to enhance the efficiency at local level.

More recently, as Oates (2005) outlines, the literature on fiscal federalism moved toward the application of industrial-organization models to the public-sector field. Attention is focused on political processes and the behaviour of political agents, on one hand, and on the effects of the distribution of information among the various agents participating to the collective decision-making process, on the other hand. In such a framework, the objectives of decision-makers derive from the underlying information and incentive structures prevailing in the centralized and decentralized systems; the traditional concepts such as *accountability*, *proximity*, and *yardstick competition* are cast in formal agency models (Tommasi-Weinschelbaum, 2007).

However, alongside the above mentioned benefits, in the literature several shortcomings of decentralization have been put forward. Welfare gains might be severely reduced by the existence of economies of scale as well as of spillovers effects. At the same time, citizens/taxpayers might lack information and, therefore, might not be able to exert the claimed political control. Local governments might be unable to carry on public policies and local bureaucracy might be less trained than the central one. Moreover, because of the closeness to citizens local governments might be more open to corruption[4] and captured by

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[3] Qian and Weingast (1997) distinguish between a First Generation Theory and a Second Generation Theory. An exhaustive survey has been provided by Oates (2005)

[4] Utilizing cross country data, Fisman and Gatti (2002) found that decentralization is associated with lower levels of corruption.

lobbies and vested interests. Redoano (2003) emphasizes that the link between decentralization and lobbying is ambiguous; Bordignon- Colombo- Galmarini (2003), reach the conclusion that there can be more lobbying and distortion of policy choice under decentralization when firms lobby for the market.[5]

In very general terms, as Oates (2005) points out, there is a trade-off in terms of local "accountability" (sensitivity of outcomes to local preferences) versus central internalization of interjurisidictional interdependencies; " the key insight remains that heterogeneity and spillovers are correctly at the heart of the debate about the gains from centralization" (Besley and Coate, 2003, p. 2628). In the definition of such a trade-off a crucial role is plaid by the intergovernmental fiscal relations and by the ways they are designed. The functioning of a decentralized system heavily depends not only on the assignment of functions but also on the means of financing,[6] on the existence of distributive schemes and of rules to ensure the fiscal discipline. It is widely agreed that the efficiency gains deriving by decentralization are closely linked with hard budget constraints, i.e. with the reliance of local governments on *own* sources of revenues for the finance of their budgets;[7] on the contrary, if the fiscal system provides a "bailout" for local governments, there will be incentives for decentralized governments to expand public programs well beyond efficient levels.[8] Notwithstanding the design of the rules, what is crucial is the credibility of central government commitment to avoid bailouts [9] and its strength to resist the pressure of local governments. Decentralization, in order to be effective, may require a reasonably strong central government (Oates, 2005).

In recent years, interest in fiscal decentralization has been rising in international organizations (such as the International Monetary Fund, the World Bank, the Organisation for Economic, Co-operation and Development and the Inter-American Development Bank), as part of broader strategies for enhancing efficiency of the public sector and for strengthening participatory and democratic decision-making at local government. In such a context, fiscal decentralization remains a controversial issue, the main concerns being that levels of government that are the closest to people often are captured by lobbies and may be corrupted. Moreover, it is also argued that the outcomes of the processes of decentralization in terms of participation are affected by the institutional, economic and cultural

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[5] "Under decentralization lobbying always leads the local politicians to give access to the market to the resident firm only, although a duopoly may be better for social welfare. No matter the degree of politicians' benevolence, in fact, the local firm can always outbid the foreign firm to gain access to the market, because only this firm's profits matter for the local politicians' welfare" (p. 4).

[6] Bordignon – Ambrosanio (2005) offer a survey of the theoretical issues raised by local taxation. Bardhan and Mookherjee (2006), compare the efficiency effects of alternative means of financing reaching the conclusion that user fees ensure that decentralisation generates higher efficiency and equity compared to centralisation and are preferable to coercive local taxes.

[7] The implications of soft budget constraints in intergovernmental relationships, with special reference to Italy, have been investigated by Bordignon (2000).

[8] Starting with Oates (1985), a large empirical literature has analysed the effects of decentralization of fiscal powers on government size and controversial results have been reached (for a survey, see Fiva, 2005).

[9] As Wildasin (2004) points out, the spillover effects of local governments fiscal behaviour are also relevant and, therefore, bailouts are more likely for larger local jurisdictions than smaller ones.

features of each country (Andrews- de Vries 2007). As Bardhan and Mookherjee (2006) point out, many developing countries in Latin America, Asia and Africa are trying to increase the accountability of service providers by providing greater control rights to citizen groups, for instance through the decentralisation of service delivery and community participation[10] but "these trends towards decentralisation are difficult to interpret within the confines of the traditional literature on fiscal federalism, owing to the lack of attention devoted in that literature to problems of accountability in service" (p. 102).

Indeed, more in general, those who support fiscal decentralization argue that, among other benefits, it can increase the efficiency of delivery of government services but no much attention has been devoted to such an issue in the empirical literature.[11] This paper tries to move in this direction looking at the specific case of public works.

2.2   Indeed, the issue of heterogeneity and diversity which is crucial in the fiscal federalism field exhibits different features in the case of infrastructures than in the case of services such as education, social services, culture and so on. The relationship between citizens' demand and supply in the infrastructure case is affected by the instrumental nature of this good. In the latter case, the consumer directly evaluates the quality of the service delivered (for instance, education, water supply), if fees are required can assess its value for money and, eventually, in some cases, if it is not satisfied can look for alternative means of supply. In other words, the production process can be evaluated by the final consumer in line with the above mentioned concepts of *accountability* and *yardstick competition*. When dealing with public works, these concepts do not apply in the same way: the production process of the infrastructure, e.g. the school, cannot be evaluated straightforwardly by the consumer but the infrastructure is relevant as input of the service. Therefore, in the public works case consumers' asymmetrical information is more severe that in the public service case, which is more commonly addressed in the literature on fiscal federalism. However, some features of the public work, depending on the implementation process, can be perceived and appreciated by consumers; for instance whether the completion of the work is on time, affects the production of the expected benefit and, therefore, political pressure is likely to arise. The responsiveness of local governments as far as the implementation of public works is concerned is affected by scope of the autonomous local decision-making as well as the related financial aspects.

2.3   In Italy, the procurement system is national, it is based on a detailed and complex set of centrally determined   rules and local governments (Regions) have

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[10]   The programmes include a wide range of infrastructure services (water, sanitation, electricity, telecommunications, roads) and social services (education, health and welfare programmes).
[11]   Barankay-Lockwood (2006) analyse the relationship between expenditure decentralization and the productive efficiency of government using a data-set of Swiss cantons and provide evidence that more decentralization is associated with higher educational attainment.

only limited autonomy for marginal changes of the national legislation.[12] Italian procurement rules are quite strict in specifying how decisions should be taken (for instance, "award to the lowest bidder,") or what process has to be followed in making a decision (for instance, "do not accept late proposals", "evaluate proposals only based on the evaluation criteria in the solicitation"). The law tries to reduce bureaucratic discretion as much as possible. On these grounds, preference is given to competition[13]: procurements should be widely advertised and evaluated strictly on the criteria announced in advance. Sealed bids are used to prevent collusion among the participants and to ensure transparency. As far as the specification of the contract is concerned, cost plus contract are not allowed to prevent opportunistic behaviour of private contractors.

Elsewhere (Guccio, Pignataro and Rizzo,2008), it has been argued that the «philosophy» underlying the above mentioned procurement rules does not always seem in line with the economic reality of procurement: purchasing with anonymous sellers or the impossibility of promising future contracts in presence of good performance make difficult to establish any relationship between the purchaser and the seller and does not necessarily ensure the quality of the outcome. Indeed, in such a regulated environment, there is a very limited scope for discretion and, therefore, the potentialities of decentralization in terms of efficiency gains and of experimentation of innovative solutions are somehow restricted.

On the other hand, in such a scenario other factors come into play. It has been previously pointed out that there is a risk for the local decision-maker of being captured by firms lobbying for the market. Political reasons might also be used to support the view that local decision makers are likely to «buy local».[14] Local policy-makers are under constant pressure from local interest groups to protect their specific interests and procurement can be a powerful tool to achieve political objectives such as, the protection of local industry, the supporting of small business and the development of high-unemployment areas, the social group most directly affected by the opening-up of the public markets being the work force of these markets. In such a case, therefore, the local decision-maker might be oriented to gain political consensus adopting a wide "public interest" objective which does not necessarily coincide with the selection of the most efficient firm.

In the execution stage the capability and experience of bureaucratic structures are crucial. Are there relevant differences in the bureaucratic organizations at central and local levels? At local level, bureaucratic performance is likely to vary according with the size and the economic condition of the local governments as well as with the incentives they face. From this latter point of view a crucial issue refers to the financing side. In Italy, in the public works field the role of own local resources is limited, public investment being mainly financed out of central

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[12] Being Italy a member State of the European Union, its legislation on procurement needs to be designed according with the principles set up in the EU Directive. For more details of public works Italian legislation see Guccio, Pignataro and Rizzo,2008.

[13] Open and restricted procedures are the rule and negotiated procedures can be adopted only in well defined circumstances.

[14] Similar arguments have been applied by Rizzo (2000) in the analysis of UE procurement rules to explain the limited opening up of the EU procurement market. .

government transfers.[15] This implies that local governments might find convenient to try to "ride the common" in order to maximize the amount of national resources and enlarge their infrastructure endowment. However, such a tendency of the political decision makers is not necessarily backed by adequate bureaucratic structures able to carry on the planning and design activities as well as the monitoring at the execution stage. The likely effects might be the need for the revision of the project in the execution phase with the likely consequence that works are interrupted and delays are generated. Nor the sponsor – the central government – exerts any effective control on the use of funds so that no sanctions or penalties are implied for delays or even for uncompleted works.[16]

3. SEARCHING FOR THE DETERMINANTS OF THE EFFICIENT EXECUTION OF PUBLIC WORKS

3.1 Following the discussion in the previous section, we make an attempt to check whether the efficiency in the execution of public works contracts varies according to the level of government involved. The analysis carried out in this paper is of an empirical nature, and refers to data drawn from a large sample of Italian public works. The obvious problems to be faced in this analysis are basically related to the identification of: *i)* a suitable indicator for execution problems and *ii)* the different levels of government.

As for the first problem, the execution of a public work can be characterized by different events (revision of the initial project, renegotiation, etc.) that can alter the initial project and affect the governments' performance in the realization of public works and, therefore, the efficiency and effectiveness of public spending. One obvious indicator of governments' performance in the execution of a public work is represented by adaptation costs, i.e. the additional costs above the value of the winning bid, incurred by contracting works authorities. Another indicator is given by the time of completion of works: Bajari and Lewis (2008) underline its relevance for social welfare and, referring to highways construction, suggest that slow completion times may generate "significant negative externalities for commuters through increased gridlock and commuting times" (Bajari and Lewis, 2008, p. 1). In other words, while completion time may generate costs overrun for public finance (even if it is not necessarily so), it is the source of negative effects on social welfare at large. We, then, choose to consider this variable for the empirical investigation of the differences in performance across the different levels of government, because it may also be regarded as a significant indicator of the impact of their differential closeness to citizens' preferences. In general terms, we can define the variable as the difference between actual completion time and

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[15] Central government financing usually takes two forms: specific grants to local government or the payment of the mortgage to the bank which has financed the investment.

[16] As it has been recently pointed out (Commissione tecnica della finanza pubblica, 2008) the monitoring system is rather weak: at central level bureaucrats are evaluated only on financial indicators – e.g. the share of allocation which is transferred to lower governments – rather than on the outcome obtained by the recipients.

expected completion time, as indicated at the moment of signing the contract with the firm, which was awarded the public work. This variable, which we will call delay (**DEL**), can take on positive values, in case of an actual delay in the completion of the work, negative values if the work is completed earlier than expected, and a zero value if it is completed perfectly on time. Alternatively, it could be possible to consider as delayed those works that are completed after the date agreed on in the contract, while all the other works, including those finished earlier, are not delayed. We can, therefore use another variable, which we will call **C_DEL**, having a zero value for all the works completed within the contractual deadline and positive values for those delayed.

A different empirical strategy for the evaluation of the impact of different factors on the delay is to consider the "event" of delay. In this case, the natural way is to use a binary variable taking on values of zero, when the work is completed on time, or even earlier, and 1 if completion is delayed with respect to the expected time (**P_DEL**). The advantage of this approach is to distinguish for the two events allowing also to estimate the relative probabilities. The limit of this approach is that it does not discriminate against the different extent of delays.

As for the second problem, the identification of the different levels of government, we group procurers according to an institutional differentiation, which is relevant for Italy: Central Government (basically, State administrations - **C_GOV**), Local Governments (regions, provinces, municipalities – **L_GOV**), Institutions (Public institutions with budget autonomy, such as Local Health Authorities and Public Hospitals, etc.- **INST**), Public enterprises (*ANAS, FS, Poste s.p.a.* – **P_ENT**) and Private Companies (e.g. Concessionaires – **PRIV_COM**).

3.2 The objective of our empirical analysis is to test whether delay, as measured by the variables defined in 2.1, systematically depends on the "identity" of public procurers, using different estimation models. To carry out such a test, we need to control for several variables that may affect the delay in the execution of public works, across the different institutions.

Before considering which control variables will be used in the empirical analysis, two further variables referring to the identity of procurers deserve to be taken into account. They aim at characterizing one of the layers of government, as defined in section 2.1, namely local governments. First of all, these institutions may be rather heterogeneous, in terms of efficient execution behaviour, with respect to their size. Indeed, the existence of several municipalities of very small dimensions may imply that these tendering authorities might not be able to exploit the economies of scale and might exhibit lower administrative capacities in monitoring the implementation of the contract. To take into account such a problem we use a dummy variable, with value 1 when the contracting authority is a local government with less than 5,000 inhabitants (**S_COUN**). The other variable, which captures one further potential source of heterogeneity across local governments, is   representative of their role in financing the public work. On the grounds of the considerations developed in section 1, it is reasonable to assume that the incentives toward the efficient performance of the tendering authority are

stronger the greater is its financial effort, i.e. the share of its own resources in the financing of the public work. To take into account these incentives we use a dummy variable with value 1 when the public work is mainly financed out of the contracting authority own resources (***O_FIN***).

As for the control variables, first of all, we consider *the nature of the procurement procedure*. In a previous paper (Guccio, Pignataro, Rizzo, 2008), we tested the differential impact of procurement procedures on renegotiation of the initial contract and on its costs, and showed that competitive procurement procedures, such as auctions, are associated to higher adaptation costs, in the implementation stage, than negotiated procedures. We will, therefore, check whether the procurement procedure used to award the contract for the realisation of the public work has also an impact on the time of completion, using a dummy variable (***OPEN***), taking on value 1 when the procedure is an auction, and 0 otherwise.

Other factors, which can affect the delay in the completion of the work and, therefore, cause a difference with respect to the original expected time of completion are: the *complexity of the work*, the *execution mode*, the *market characteristics* and other *environmental factors*.

As far as the *complexity of works* is concerned, our hypothesis is that contracts execution becomes more uncertain the higher the degree of complexity of the work, and, therefore, the completion time is more likely to be higher than the expected time of completion. As proxies for complexity we use the estimated total value of the work by the contracting authority (***ETV***), and an index measuring the "composition" of the work (calculated on the different sub-categories involved in the work, weighed for their relative amount - ***WCI***) [17]. We also differentiate between "new" works and repair/restructuring ones, using the dummy variable ***T_W*** (it takes on a value equal to 1 for the new works). We expect that the degree of complexity, and the likelihood of delays, is increasing with new works.

As for the *execution mode*, the factors which may affect the time of completion are: the presence of subcontractors in the execution of the work (***SUB***); the existence of legal disputes between the firm and the contracting authority (***DIS***); whether the contractual obligation of the firm includes the completion of the design of the project, what is known in Italy as executive project (***PROJ***). Our hypothesis is that the variables ***SUB*** and ***DIS*** tend to increase the completion time, and make more likely a delay in completion. The effects of the variable ***PROJ*** need some further comments because they are not unambiguous: on one hand, the lack of an executive project when the contracting authority bids for its procurement and, therefore, the possibility for the firm to intervene on the project, could allow for the adoption of technical solutions consistent with its productive capacities and know-how and could reduce the pressure on renegotiation and on changes of the original projects, thus reducing the chance of delays in the execution. On the other hand, however, the separation of the activities of project

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[17] Public works are articulated in sub-categories, i.e. the different components of the overall work, which contribute, according with their relative relevance for the specific work, to the estimated total value. It is plausible to assume that the more complex is a public work the higher is the number of sub-categories involved in its implementation.

and execution may introduce a "conflict of interests" between the engineer/architect and the firm executing the work, with more constraints on the firm and, therefore, less room for its opportunistic behaviour (La Pecorella – Rizzo 2002), with potential positive effects on the time of completion. In principle, there is no reason to state in advance the direction of the compensation between the two effects, and we leave it to the results of the empirical analysis.

The *market characteristics* may play a role in connection with the relevance of reputation for the firm. Reputation is likely to increase the effort of firms to complete works on time. *Ceteris paribus*, the relevance of such a variable depends on the *market competition level* and on the *market share* of the firm. To measure market competition we employ the number of potential bidders (i.e. the number of firms qualified for the public work category -e.g. roads, railways, etc.- and value at national level – *P_BID*). The expected sign of this variable is positive: the higher the competition, the lower the probability of being awarded a contract in the future and, therefore, the lower the future value of reputation and the weaker the incentive for the firm to make efforts for completing on time. It is also important, however, to evaluate the position of the winning bidder within the market. We have, therefore, estimated the market leadership as the number of contracts awarded to each firm by the contracting authorities, included in the data set in the period under consideration (*LEAD*). In a market in which tendering is effective in selecting the best bidder and assuming that quality is homogeneous across firms for the works of the same category and size, the market leadership could be considered as cost leadership. In this case, the greater the market leadership, the higher the probability of being awarded contracts in the future and, therefore, the greater the value of reputation and the stronger the effort to complete on time. Finally, we consider as a proxy for the value of the long-term relationship between the firm and the specific contracting authority, the number of contracts awarded to each firm by the same authority (*INT*) . The expected sign for this variable is negative, since the interaction is likely to prevent inefficient behaviour of the firm and, therefore, the lower is the chance of delays in the completion of the work.

Finally, we take into consideration *environmental factors* that may characterise the political and socio-economic context in which public works are decided and executed. We focus on one of them, namely the incidence of corruption and, more generally, the "illegal" distortion of the public decision-making and implementation process, since it may be distributed unevenly along the different levels of government, thus potentially distorting the results of our main test. We are able to capture this factor, using, as a proxy, the incidence of the so called "association" crimes for 100,000 inhabitants at provincial level (*CORR*).

We also believe that the values of the dependent variable *DEL* may be idiosyncratically distributed across the different units, since the expected time of completion is a matter of "subjective" estimate by each of them. In other words, the delay can increase or decrease, simply as the result of underestimation or overestimation of the expected time of completion. Therefore, we also control for this variable (*ED*).

Finally we control for the year of award of the public work. The list of the

variables we will use is summarised in table 1.

Table 1 – List of variables

NAME	VARIABLE
Dependent variable	
DEL	Delay
C_DEL	Contractual delay
P_DEL	Dummy for delay
Independent variables	
C_GOV	Central Government
L_GOV	Sub-Central Governments
INST	Institutions
P_ENT	Public Enterprises
PRIV_COM	Private Companies
S_COUN	Dummy for municipalities with a population less that 5,000 inhabitants
O_FIN	Dummy for the financial source of the work – 1 when the prevailing source is the budget of the contracting authority
OPEN	Dummy for open tendering procedures
SUB	Dummy for subcontracting
PROJ	Dummy for the completion of the project by the firm
DIS	Dummy for legal dispute
ED	Estimated time of completion (in days)
ETV	Estimated total value
WCI	Weighted public work composition index
INT	Past relationships between firm and contracting authority
LEAD	Number of contracts awarded by winning bidder in the market
P_BID	Number of firms qualified for the work category and value
T_W	Type of work (new/repair)
CORR	Associative crime incidence for 100.000 inhabitants at provincial level

4. DATA EMPLOYED AND STATISTICAL ANALYSIS

4.1.   The data used in this analysis refer to a sample of Italian public works carried out between 2000 and 2004. The data are collected by *Osservatorio per i lavori pubblici* of the "Autorità di Vigilanza sui contratti pubblici di lavori, servizi e forniture". The observation unit is given by the single public work and very detailed information are available on the various steps of the procedure – project, selection of the contractor, realization and conclusion of the work. The sample refers to 9,885 public works, whose costs range from 150,000 euros to 5 million euros, awarded in the period 2000-2004 and completed by 2005.[18] Our sample refers to public works, distributed along 16 different categories.[19] Since the

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[18] The sample was selected on the basis of completeness of the records included in the data base. To limit heterogeneity, the public works costing over 5 millions euros were not included in the sample because of the longer time lag required to complete complex works. Moreover, public works with a final cost lower than the contract cost were not taken into account because of the lack of adequate information.

[19] These categories cover all the fields of public works, ranging for instance from   roads and highways to schools or environmental protection infrastructures.

number of observations for each category is not the same, we work with an unbalanced panel data. Table 2 provides summary statistics for the number of contracts awarded per year, the total amount, the mean value of contracts, as distributed for the different groups of contracting authorities.

Table 2 - Composition of the sample by contracting authorities – public works above 150,000 euros   (value at current prices)

Contracting authorities	Number of observations	Mean	St. Dev.	Maximum amount	Minimum amount
Central government	545.00	364,155.80	429,263.96	4,441,529.00	150,135.00
Local government	6,978.00	376,051.35	359,003.55	4,777,537.00	150,000.00
Institutions	1,212.00	505,286.26	564,026.44	4,815,961.00	150,000.00
Public enterprises	606.00	321,276.46	285,910.94	3,436,940.00	150,082.00
Private concessionaires	529.00	609,038.29	636,414.99	4,965,733.00	150,024.00
Total	**9,870.00**	**400,388.34**	**414,186.12**	**4,965,733.00**	**150,000.00**

Source: our elaboration on data provided by Autorità di vigilanza sui contratti pubblici di lavori, servizi e forniture

Given the interest of the paper for the distribution of the delays in time of completion across different levels of government, table 3 shows some summary statistics on the values of the delay variable ***DEL***.

Table 3 – Distribution of delay by contracting authorities – public works above 150,000 euros

Contracting authorities	Number of obs.	DEL (no. of days)		Delay (no. of public works)		
		Mean	St. Dev.	On time	Delayed	% delayed
Central government	545.00	57.40	132.95	244.00	301.00	55.23
Local government	6,978.00	127.64	161.66	1,739.00	5,239.00	75.08
Institutions	1,212.00	115.84	161.10	315.00	897.00	74.01
Public enterprises	606.00	31.26	77.83	266.00	340.00	56.11
Private concessionaires	529.00	79.11	156.66	191.00	338.00	63.89
Total	**9,870.00**	**113.79**	**158.47**	**2,755.00**	**7,115.00**	**72.09**

Source: our elaboration on data provided by Autorità di vigilanza sui contratti pubblici di lavori, servizi e forniture

The distributions of the values of the two variables, ***DEL*** and ***C_DEL*** are represented in figures 1 and 2.

Figure 1 – Distribution of values of DEL

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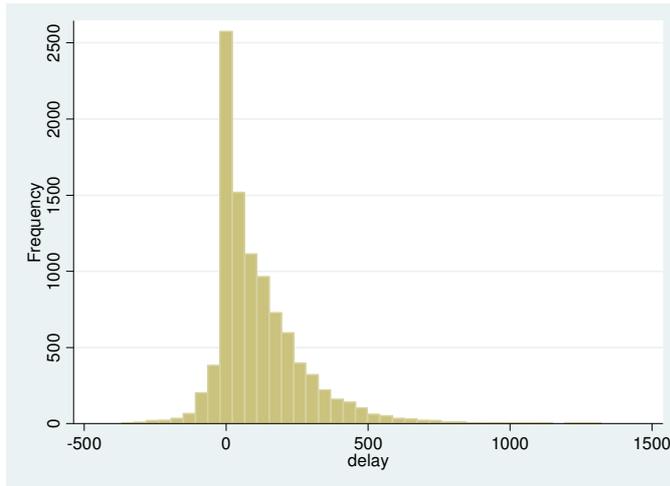
Figure 2 – Distribution of values of C_DEL
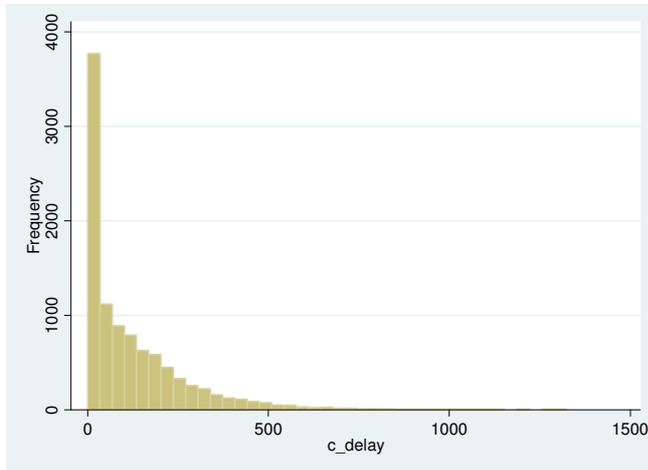
The data show that, in our sample, less than 25% of the works are completed on time (or even earlier than expected) and, therefore, the delay issue is a very relevant one. Delay is, on average, of about four months. The percentage of works delayed is not uniformly distributed according to the different institutions: local governments show the highest percentage of delayed works, as well as the highest delay on average. Finally, some summary statistics related to the variables presented in section 2.2, and summarized in table 1, are presented in the following table 4.

Table 4 – Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
DEL	9870	113.79	158.47	-338.00	1,323.00
C_DEL	9870	120.50	150.76	0.00	1323.00
P_DEL	9870	0.72	0.45	0.00	1.00
C_GOV	9870	0.06	0.23	0.00	1.00
L_GOV	9870	0.71	0.46	0.00	1.00
INST	9870	0.12	0.33	0.00	1.00
P_ENT	9870	0.06	0.24	0.00	1.00
PRIV_COM	9870	0.05	0.23	0.00	1.00
S_COUN	9870	0.11	0.32	0.00	1.00
O_FIN	9870	0.43	0.49	0.00	1.00
OPEN	9870	0.81	0.39	0.00	1.00
SUB	9870	0.78	0.42	0.00	1.00
PROJ	9870	0.80	0.40	0.00	1.00
DIS	9870	0.02	0.14	0.00	1.00
ED	9870	212.27	137.83	3.00	1,327.00
ETV	9870	400,388.30	414,186.10	150,000.00	4,965,733.00
WCI	9870	1.20	0.34	1.00	4.00
INT	9870	2.42	3.37	1.00	60.00
LEAD	9870	17.87	37.92	1.00	436.00
P_BID	9870	2,250.01	1,397.18	1.00	5,707.00
T_W	9870	0.30	0.46	0.00	1.00
CORR	9870	5.75	2.97	1.27	18.35

5.   MODELS ESTIMATION AND DISCUSSION OF RESULTS

5.1   The two estimated models, as related to the two dependent variables, are represented below:

$$DEL_{ij} = \beta_0 + EF\ \beta + \varepsilon_{ij} \qquad\qquad \textbf{[1.a]}\ ;$$

$$C\_DEL_{ij} = \beta_0 + EF\ \beta + \varepsilon_{ij} \qquad\qquad \textbf{[1.b]}$$

where DEL_{ij} stands for delay in public work i in category j; C_DEL_{ij} stands for contractual delay in public work i in category j; EF is a matrix of the control variables described in section 2.2 and ε are disturbance terms. As we pointed out earlier, our sample refers to   public works distributed along 16 different categories. To take into account the different characteristics of each category, we employ a GLS panel model with random effects. Also to control for

heteroskedasticity we used robust standard error. The estimate results for each model as well as standard errors and elasticities are shown in table 5. The coefficients for the institutional dummies are computed with respect to central government.

Table 5 – Estimation results (entire sample)

Variable	DEL			C_DEL		
	β	se	elasticities	β	Se	elasticities
Constant	-35.406***	(-10.954)		-15.682	(-10.045)	
L_GOV	41.783***	(-6.253)	0,260	34.826***	(-5.624)	0,204
INST	38.891***	(-7.363)	0,042	30.767***	(-6.759)	0,031
P_ENT	-41.847***	(-6.885)	-0,023	-45.021***	(-6.182)	-0,023
PRIV_COM	4.455	(-8.898)	0,002	5.837	(-8.030)	0,003
S_COUN	60.840***	(-5.805)	0,061	58.270***	(-5.674)	0,055
O_FIN	-14.936***	(-3.261)	-0,056	-14.500***	(-3.118)	-0,051
OPEN	3.122	(-4.032)	0,022	3.112	(-3.880)	0,021
SUB	6.962*	(-3.826)	0,048	6.760*	(-3.661)	0,044
PROJ	15.642***	(-3.752)	0,110	15.191***	(-3.515)	0,101
DIS	58.885***	(-13.580)	0,010	56.809***	(-13.223)	0,009
ED	-0.136***	(0.013)	-0,254	-0.088***	(0.012)	-0,154
ETV	0.000***	(0.000)	0,178	0.000***	(0.000)	0,147
WCI	11.210**	(-4.713)	0,118	7.503*	(-4.513)	0,075
INT	-2.199***	(0.425)	-0,047	-1.733***	(0.392)	-0,035
LEAD	0.003**	(0.001)	0,057	0.003**	(0.001)	0,048
P_BID	-0.094**	(0.040)	-0,015	-0.090**	(0.038)	-0,013
T_W	19.226***	(-3.449)	0,051	17.382***	(-3.328)	0,044
CORR	2.234***	(0.540)	0,113	2.166***	(0.518)	0,103
d_2000	99.395***	(-6.213)	0,207	88.499***	(-5.592)	0,174
d_2001	76.701***	(-5.703)	0,212	66.887***	(-5.032)	0,175
d_2002	71.457***	(-5.775)	0,160	61.879***	(-5.103)	0,131
d_2003	42.218***	(-5.836)	0,056	34.102***	(-5.131)	0,042
Observations	9,870			9,870		
categories	16			16		

Notes: Robust standard errors are reported in parentheses.
***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively.

The impact of the other variables, when significant, has the expected sign. The nature of the procurement procedure does not seem to play a role in delayed completion of the works. As for the execution mode, the significant variables are *DIS*, that is the existence of legal disputes between the firm and the contracting authority, which exerts a positive impact on the completion time, and *PROJ*, that is whether the firm is in charge of designing the executive project of the work, which has also a positive sign. The latter result implies that in such a case the firm has more room for opportunistic behaviour, being in charge of the project as well as of the implementation of the work, and the prevalence of this incentive can delay the completion of the work. The complexity of the work is positively correlated to delay, and significantly in all the three dimensions we chose. The factors that can be representative of some form of reputation and that can increase the chance of being awarded future contracts (*INT* and *LEAD*) are highly

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significant and negatively correlated to delay. Time of completion is also increased by an environment characterised by higher rates of crime. As expected, the dependent variable is affected by the estimation of the time of completion: the higher the latter the lower the delay.

5.2 The main result, that is the longer delays characterising local government, is confirmed when considering sub-samples, defined according to homogenous types of work. We tried with roads: this is a kind of work, which has a limited differentiation with respect to other categories of works. The results are shown in table 6, and are substantially identical to the ones obtained for the entire sample[20].

Table 6 -   Estimation results (roads)

Variable	DEL
Constant	-93.637***
	(33.747)
L_GOV	57.467*
	(29.677)
INST	50.291
	(33.170)
P_ENT	-26.808
	(29.763)
PRIV_COM	4.502
	(31.274)
S_COUN	61.023***
	(9.646)
O_FIN	-2.511
	(5.324)
OPEN	-2.917
	(6.720)
SUB	20.101***
	(5.645)
PROJ	7.477
	(6.661)
DIS	42.750**
	(20.277)
ED	-0.154***
	(0.023)
ETV	0.000***
	(0.000)
WCI	36.147***
	(11.889)
INT	-1.548***
	(0.547)
LEAD	0.003
	(0.002)
P_BID	-0.198***
	(0.059)
T_W	26.640***
	(5.737)
CORR	3.167***
	(0.851)
d_2000	90.235***
	(9.921)
d_2001	63.226***
	(8.936)
d_2002	54.897***
	(8.884)
d_2003	32.588***
	(9.042)
Observations	3,218
Categories	1
R²	0.13

Notes: Robust standard errors are reported in parentheses.
***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively.

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[20] Since the model is estimated just for one category of works, the estimation is transformed in a standard OLS, and the model, for each category *j*, is $DEL_i = = \beta_0 + EF\ \beta + \varepsilon_i$. The R^2 is rather low, which probably requires some further exploration on the appropriateness of the linearity assumption.

5.3 A different approach to estimate the impact of the different factors on the delay is to consider the "event" of delay. The natural approach is to use a binary variable taking on values of zero, when the work is completed on time, or even earlier, and 1 if completion is delayed with respect to the expected time. In this estimate we employ a logit model with random effects. In terms of latent variable the estimated model can be expressed as:

$$P\_DEL^*_{ij} = \beta_0 + EF\,\beta + \varepsilon_{ij} \qquad [4.2]$$

where $P\_DEL_{ij}=1$ if $P\_DEL^*_{ij} > 0$ and $P\_DEL_{ij} = 0$ if $P\_DEL^*_{ij} >= 0$

EF is a matrix of the control variables described in the previous section and ε are error terms with logistic distribution. The estimation results are shown in table 7 and tend to confirm previous results.

Overall, then, what clearly and robustly emerges from the empirical analysis carried out on the data used in this paper, is that local governments are less efficient, than other contracting authorities, especially at the central government level, in ensuring a timely completion of public works. In the next section we provide some preliminary comments with the indication of potential further developments.

Table 7 – Estimation results with logit model

Variable	P_DEL	
	β	se
Constant	-0.886***	(0.198)
L_GOV	0.732***	(0.110)
INST	0.800***	(0.133)
P_ENT	-0.020	(0.137)
PRIV_COM	0.357**	(0.144)
S_COUN	0.502***	(0.088)
O_FIN	-0.148***	(0.052)
OPEN	0.268***	(0.063)
SUB	0.081	(0.058)
PROJ	0.377***	(0.059)
DIS	0.500**	(0.208)
ED	-0.004***	(0.000)
ETV	0.000***	(0.000)
WCI	0.323***	(0.082)
INT	-0.038***	(0.007)
LEAD	0.000***	(0.000)
P_BID	-0.000	(0.001)
T_W	0.269***	(0.055)
CORR	0.013	(0.008)
d_2000	0.841***	(0.117)
d_2001	0.662***	(0.113)
d_2002	0.686***	(0.114)
d_2003	0.441***	(0.120)
Observations	*9,870*	
Categories	*16*	

Notes: Bootstrap standard errors are reported in parentheses.
***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively

6. CONCLUDING REMARKS

What is of interest here is to try to give an interpretation of the result of the empirical analysis carried out in this paper, in the light of the discussion in section 1. This is relevant to understand whether decentralisation matters in the execution of public works and for discussing the policy implications, in terms of organisation of the public works sector.

Notwithstanding the fact that efficiency in the execution of public works is generally crucial to achieve the benefits expected from given choices of allocation of resources, decentralisation does not seem to provide a pressure on local governments and its bureaucracies to act efficiently, which should arise from their proximity to the beneficiaries of the works.

One explanation of the result is that the organisation of the bureaucracy managing the execution of public works at the local level is not efficient. There are different potential justifications for this inefficiency. The small dimension of

several municipalities in Italy obstacles the achievement of an efficient dimension of the offices in charge of monitoring the execution of public works and the possibility of having all the proper professional competences needed for this task. The result obtained checking for the dimension supports such an explanation. A further way to check for this effect requires to estimate the variability of delay along the different population sizes of local governments. The dimension effect could also be reconnected, *ceteris paribus*, to the quantity and nature of public works carried out, which could be tested considering the number and the amount (total and per work) of public works carried out by each local government. It could also be interesting to check whether works supervision is attributed to internal or external personnel, and the average number of works supervised per unit of personnel.

Another explanation for the relative inefficiency of decentralized public works relies refers to the financing system operating for local governments public works. When the role of own local resources is not crucial and public investment are mainly financed out of central government transfers local governments might find convenient to maximize the amount of national resources and enlarge their infrastructure endowment, regardless the adequacy of their planning, design and monitoring capabilities. Nor the sponsor – the central government –   exert any effective control on the use of funds so that no sanctions or penalties are implied for delays or even for uncompleted works. The result obtained checking for the financial effort of the contracting authority supports such an explanation

The main policy implications arising from empirical evidence of organisational inefficiency is, first, to move to centralised forms of management of public works, capable to exploit the economies of scale and to employ adequate bureaucratic and managerial competences. This does not seem a naïve suggestion, since the Italian law already provides for delegation of works to provincial units, by local municipalities, whenever the money value of works is considerable, though this provision is very rarely implemented. Moreover, a further implication is to move to change the financing system of the local investment moving from specific grants to block matching grant enhancing the responsibility and the accountability of the local decision maker.

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