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Digital Government and Corruption

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Gastón Pierri[*]   Mariano Lafuente[†]

Abstract

Digital government and citizen oversight initiatives have increased in number in recent years. Governments have increased the numbers of virtual platforms that display data on public works, and citizens have increased their voluntary participation in low-cost monitoring of these works. However, there is scarce literature on the effectiveness of these initiatives. This study aims to contribute to the limited evidence on the impact of citizen oversight in light of the above-mentioned digital government initiatives. The study uses a regression discontinuity analysis to evaluate the effect of the Citizen Oversight Monitors Program (*Programa de Monitores Ciudadanos de Control* - MCC) of Peru's Office of the Comptroller. Using public sources of administrative information and data from the InfObras platform of the Office of the Comptroller[1] and the Investment Consultation (*Consulta de Inversión*) (Invierte.pe) application of the Ministry of Economy and Finance[2], the study examines the effects of the MCC on the costs and execution times of public works in Peru. The findings suggest that although there is a significant impact in terms of reducing cost overruns for works outsourced to construction firms, there are no significant effects on results in terms of execution times of the works.

JEL Codes: H41, H54, I28, O15

Keywords: Monitoring, citizen, accountability, transparency, digital government, technology, public information.[3]

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[*]**Gastón Pierri** (gpierri@iadb.org) is an Economic Specialist with the Office of Strategic Planning and Development Effectiveness of the Inter-American Development Bank.

[†]**Mariano Lafuente** (mlafuente@iadb.org) is a Modernization of the State Lead Specialist with the Innovation in Citizen Services Division of the Inter-American Development Bank.

[1]For more information, see https://apps.contraloria.gob.pe/ciudadano/.

[2]For more information, see https://ofi5.mef.gob.pe/invierte/consultapublica/consultainversiones.

1   Introduction

Citizen oversight programs have gained popularity in recent years as a low-cost approach to preventing corruption and improving the delivery of public goods and services. The idea underlying such programs is that since members of the community are the beneficiaries of a successful program, they have more incentives to monitor it than do disinterested central government bureaucrats (Stiglitz, 2002). It is therefore relevant to evaluate the impact of those programs on improving the efficiency of the State.

This document presents a preliminary analysis of the impact of the Citizen Oversight Monitors (*Monitores Ciudadanos de Control* - MCC) Program of the Office of the Comptroller of Peru (*Contraloría General de la República del Perú* - CGR) on different findings of interest related to the execution of public works in Peru (cost overruns, delays, and changes in execution periods, among others). The document is based on data obtained from available public sources of administrative information. The MCC intervention only involves works with a budget of less than PEN (Peruvian Soles) 10 million[4], a threshold that allows for a quasi-experimental analysis using a regression discontinuity model. From there one will be able to understand the potential of the program to improve the results related to public works.

This work also aims to contribute to closing the gap in the literature on the impact of citizen oversight (the MCC program) in light of digital technologies for public information (the InfObras platform, and the Invierte.pe application, also known as the Invest Consultation or *Consulta de Inversión*). The most abundant evidence agrees that access to information reduces the costs of collective action for citizens. For example, Olken (2007) shows that corruption declines when citizens have more information on infrastructure expenditures.

Accordingly, the dissemination of information that users clearly perceive as actionable, in coordination with measures that actively foster collective action, has an influence on the incentives of public officials and the providers of State services. In this way, strategies that combine the use of technologies with citizen participation mechanisms are promising, given that they succeed in amplifying the voice of collective action beyond the local setting and, at the same time, strengthen the capacity of the State to respond to citizens' demands (Fox, 2015). The MCC program combines both aspects by making the use of the information available on technology platforms such as InfObras and the Invierte.pe application actionable for citizen oversight through citizen monitoring visits to public works.

The document is divided into seven sections, including this introduction. The second section reviews the literature relevant to citizen oversight of public works and interventions to detect corruption. The third section contextualizes and describes the MCC intervention.

[4]Equivalent to US$3 million based on the exchange rate as of December 31, 2019.

The fourth section describes both the sample and the quasi-experimental methodology used. In the fifth section, an initial descriptive analysis is conducted and the selection of the variables of interest is justified. The sixth section presents the results of the design of the discontinuity regression in order to show the impact of the MCC program on those variables. The seventh and final section puts forth the conclusions from the study.

2 Literature Review

The branch of the empirical literature related to this evaluation analyzes whether citizen oversight of public officials or providers can improve their effectiveness. This body of research goes back to Olken (2007), who provides one of the first experimental estimates of the effects of anti-corruption community-based monitoring (CBM) policies in the context of the construction of roads in villages in Indonesia. The author used a field experiment in which villages were randomly assigned to three treatments:

1. Auditing: The risk of auditing for expenditures on roads increases to 100 percent from a baseline of 4 percent.

2. Invitations: Villagers are invited to "accountability meetings" where the effectiveness of local public expenditure is discussed.

3. Invitations plus anonymous comments: The previous treatment is conducted, but in addition the local population is permitted to make anonymous observations to the national government about local public expenditures.

Olken (2007) observes that the first treatment reduced missing expenses by approximately 30 percent. In contrast, it seems that the second and third treatments were not effective in this context. The author argues that the failure of community monitoring can be partially explained by obstruction by local governments. In villages where invitations were distributed without interference by those governments, the effects were not as reduced as much. In addition, the author shows that community monitoring reduced the proportion of funds assigned to the payment of salaries. This result suggests that the capture of local elites plays an important role in the failure of community monitoring. Policies are only effective when citizens have direct incentives to prevent the bad allocation of public funds. In the present study, in contrast to Olken (2007), it is a State entity that directs and coordinates the citizen participation program, giving more credibility to the monitoring and avoiding its capture by local elites.

In a different context, Bjorkman and Svensson (2009) find that a community-based monitoring program is indeed effective. These authors studied the provision of public health services in rural areas of Uganda and implemented a randomized controlled trial (RCT), which is very similar to the second treatment in Olken (2007). The effects of this treatment on health results and the measures for the use of resources by local public officials were positive. In particular, the mortality rates of children under age 5 declined substantially in the treated areas. Bjorkman and Svensson (2009) maintain that, in contrast to Olken (2007), they were careful to avoid having elites obstruct the policy that was adopted. In addition, the rural inhabitants had direct incentives to prevent the waste of resources that could be used to improve their own health results.

Bjorkman and Svensson (2010) conducted a follow-up to Bjorkman and Svensson (2009) with the aim of understanding why different studies produce contradictory findings on

the effectiveness of community monitoring interventions. They found that in ethnically fractionalized communities, the Bjorkman and Svensson (2009) intervention had not been effective. Therefore, their findings for that year seemed to be driven by the effect of the intervention on homogenous communities. The authors maintain that those findings underline the importance of adapting citizen monitoring interventions to the characteristics of each community. The MCC program evaluated in the present document overcomes the difficulties detected by Bjorkman and Svensson (2010) regarding heterogeneous effects linked to characteristics of communities by systematizing citizen oversight via a technical survey to evaluate the quality of the public works.

For their part, Banerjee, Banerji, Duflo, Glennerster, and Khemani (2010) evaluated an intervention related to community monitoring of public education in rural India. The intervention attempted to improve the local policies responsible for the operation of the schools studied (in this case, Village Education Committees - VECs). To do this, a local nongovernmental organization (NGO) sent representatives to meet with the citizenry and helped them carry out this supervision effectively. They implemented three different treatments and evaluated them through an experiment:

1. Information: Representatives from the NGO organized meetings to disseminate information about the role of the VECs in the manner of the information component of the Bjorkman and Svensson (2009) treatment, though with some additional elements in their participant component.

2. Information and community audits: Identical to the first information treatment, but in this case the villagers also received scorecards on which they could evaluate the quality (perceived) of local education services. They were trained in how to correctly use these scorecards, and the results of the scores were disseminated at the information meetings of the VECs. This treatment was very similar to the intervention by Bjorkman and Svensson (2009).

3. Information, community audits, and self-sufficiency: Identical to the second information and community audit treatment, but here the villagers received one week of basic training to enable them to train others. It was assumed that this had to be done in their village through "field lectures" that they conducted.

Unfortunately, the first two interventions failed in all of the areas and none achieved the intermediate results that measure the intensity of the community monitoring. Finally, there was no significant effect at all on learning results. By contrast, the third intervention did improve educational results. Since the intensity of the community monitoring did not change in response to this intervention, the authors maintain that the intervention's self-sufficiency component must account for all of its impact. In general, in this document, it is suggested that the community monitoring policies that depend on volunteers within the village can do better than those directed by persons from outside the community, in this case the representatives from the NGO. Accordingly, one of the major conclusions of this study resembles that of Olken (2007), who demonstrated that vertical audits –– those conducted by auditors from the government–– do better than community monitoring policies. Another conclusion is that, for this monitoring to work, citizens must be able sanction corrupt and evasive government providers. In Banerjee et al. (2010), parents could not do anything about the poor quality of education except complain. This could explain why the villagers were not interested in participating in the VEC systems, even after the interventions occurred. Along those same lines, the MCC program studied in this

document overcomes the difficulties of community monitoring of Banerjee et al. (2010) by making its findings actionable. In other words, those findings generate consequences, to wit, sanctions against the entities in charge of the public works.

For their part, Berman et al. (2017) evaluate a community monitoring program carried out in Afghanistan that is very similar to the CGR's MCC program analyzed here. The local NGO Integrity Watch Afghanistan (IWA) recruited citizens and assigned them the task of monitoring public works projects. The authors evaluated this program through a field experiment that centered on a sample of only 22 roads that connect a total of 77 villages (the median road connected four villages).Berman et al. (2017) implemented a two-level random design: five roads and the villages connected by them were assigned to a control group and did not receive the IWA program, while the rest were assigned to a treatment group. The IWA program was implemented in approximately 80 percent of the villages connected by the treated roads, while in the rest it was not implemented. The authors contracted an engineering team to measure the quality of the roads, their main outcome of interest. They also surveyed the local population and asked them to evaluate the quality of the roads studied in the sections near their villages. Their intervention was carried out from 2011-2015 and the quality of the roads was measured in 2011, 2013, and 2015.

In general, the authors found that the IWA program had positive effects on the quality of the roads, according to the analysis carried out by the engineers it contracted. The effects of the intervention were scattered among the roads subject to treatment, as much near the treated villages as those not treated, although connected with the former. Berman et al. (2017) provided qualitative evidence that the informal disclosure of auditing reports in the villages played a crucial role in this process (because the findings by the monitors of corruption could set off protests, for example).

One of many recent working papers that analyze interventions similar to those of Olken (2007) and Bjorkman and Svensson (2009) is that of Sexton (2017), although in this case its relevance is even greater, since the intervention was carried out in Peru. In a field experiment, treated villages received training on accountability directed toward community leaders. All of the meetings were conducted by the Peruvian NGO *Grupo Propuesta Ciudadana*. At the meetings, the participants received high-level information about how local governments function. They were also trained in how to form part of pre-existing participation mechanisms. First, they learned about the participatory budgeting process, which consists of meetings between citizens and municipal bureaucrats from the district during which the local population can communicate its priorities regarding municipal expenditures. Second, they learned about the process known as "recall", a mechanism that allows the local population to initiate a referendum to remove mayors prior to the completion of their mandate.

Unlike what was expected, Sexton (2017) found that his intervention reduced citizen participation in the participatory budget meetings while at the same time increasing the prevalence of recalls and informal protests. Because the last two forms of citizen participation are generally considered the most damaging, the author presented those results as undesired and counter-productive. In terms of municipal efficiency, the treatment had a negative effect: it reduced the proportion of municipal budgets that were actually executed. Unfortunately, the fact that the evaluation only studied the short-term effects of his intervention impedes the identification of potential long-term effects. A difference between the MCC program evaluated in the present document and that of Sexton (2017)

is that here the monitoring is coordinated and implemented by a State entity (the CGR), which gives the program more institutionalization and seriousness. In addition, in the MCC the monitoring to assess the quality of the public work is conducted through a technical survey, although a simple one, which is more objective and actionable than oversight through community meetings and subjection valuations.

Another interesting study related to the present one is Lagunes (2019), who investigated the monitoring of public works in urban Peru with a focus on interventions that directly empower NGOs and not individual citizens. The intervention consisted of involving the Peruvian NGO Proética in the monitoring of certain local governments. This intervention was evaluated experimentally at the district level. According to its design, in the control group the CGR sends a message to municipalities in the district reminding them that they must enter information about execution of the projects on the InfObras platform. The treatment group receives the same message as that sent to the control group, but, in addition, Proética investigates the execution of the public works. In addition, during a period of two years the municipalities receive a total of four letters from Proética and from the CGR reminding them that these investigations are in progress and that the CGR will be notified of their main findings.

Lagunes (2019) estimates the effects of the intervention on two elements -the costs and the delays of the infrastructure projects- using data from InfObras that are based on reports by municipalities in the district. The author estimates that the treatment had a very significant effect on project costs, which were substantially reduced. In accordance with the specification, these effects could achieve as much as a 50 reduction. This is the main finding, and it suggests that in general the intervention was extremely effective. A difference between the study by Lagunes (2019) and the MCC program is that the latter directly involves the citizens in social oversight, and they can have more incentives than NGOs to conduct more effective monitoring to the extent that they are the potential beneficiaries of the public works. On the other hand, as discussed earlier, there are some problems with the data used for this evaluation, problems that that MCC evaluation looks to resolve by complementing and improving the data. In addition, the evaluations conducted by the MCCs are more objective, since they consist of collecting technical information and presenting evidence (photos) of the status of the work visited.

Another study of the evidence from citizen monitoring programs is Freire, Galdino, and Mignozzetti (2020), who analyze the effect of a cell phone application that enables citizens to monitor school construction projects in Brazilian municipalities. The application asks users to send information about construction sites, facilitates access to this information by independent engineers, and contacts the offices of mayors to report delays in projects. The findings show that the application has no impact on school construction indicators. In addition, it is observed that the politicians do not respond to individual requests. The findings raise doubts about the impact of community monitoring of the performance of public services and suggest that the interventions directed towards other groups or focused on different topics can produce better policy results. One hypothesis derived from those findings is that the absence of sanctions against mayors when they ignore individual requests disincentivizes improvement in the execution of the works. Therefore, it is important that citizen monitoring programs be coordinated and supported by State entities with supervisory power and the power to act.

From the research summarized in this section, it can be deduced that open government policies that promote citizen monitoring and access to public information are two types of

reforms that reduce the costs of collective actions by citizens, something which the studies agree upon. However, there is even more room to generate more rigorous evidence on citizen monitoring and to overcome the difficulties exposed in the evaluations reviewed, which is precisely what is proposed on these pages, First, in contrast to the programs described previously, the MCC initiative is implemented and coordinated by a principal oversight entity of the Peruvian State, the CGR, which provides greater credibility and institutionality. Second, as previously indicated, the findings reported by the MCCs are actionable, since they can result in sanctions against the agencies executing the works in question. Third, the evaluation of the status of the public works by the MCCs is based on a technical questionnaire supported by evidence (photos). In this way, the reports by the MCCs are more objective than those of other citizen monitoring programs, which are usually based on community meetings that are more difficult to evaluate. Fourth, the MCC program has less of a possibility of being captured by local elites, since recruitment is generally done virtually and the volunteers do not usually visit works in their own localities.

Finally, this document contributes to generating evidence about the scarce number of "strategic social oversight interventions" (Fox, 2015), especially in the region. These interventions aim to establish the relevance of the institutional capacity of the State to respond to the voices of the citizenry. In other words, they combine the power of access to information, both to motivate collective action as well as to influence the State, with a State capacity strengthened to respond to that collective action. The combination of these strategies helps to mutually empower the "voice of the people" and the mechanisms for action through a synergy between the State and society.

The MCC program evaluated in this document combines a mixed strategy that takes advantage of the information from the InfObras platform and the Invierte.pe application complemented by monitoring visits to the public works. In this way, the mutually empowering coalitions of actors in support of accountability, both of the State as well as society, can break the vicious circles as needed to achieve effective monitoring (Fox, 2015).

3 Context and Description of the Program

3.1 Context

The CGR is a high-level auditing entity of the Peruvian State, Its mission is to "direct, supervise, and execute the monitoring of public entities to contribute to the effective, efficiency and transparent use of public resources". This oversight includes supervision of all expenditures on public works throughout the country. Traditionally, the CGR's work had consisted of conducting ex post monitoring of the correct use of public resources. But since 2017, as a result of regulatory changes, it has moved towards ensuring greater implementation of monitoring tools to prevent corruption. The office that audits public works is the Office for Management of the Monitoring of Basic Public Services of the CGR. In principle this could audit all public works, but as it has limited resources, the office only audits large projects. For their part, small projects, especially those in the interior of the country, have not been subject to auditing in recent years. The MCC program, led by the CGR's Prevention and Detection Office, was designed to address this gap.

The MCC is a low-cost auditing program carried out by volunteers from the areas of each project. Initially, it was assumed that it should monitor public works corresponding to

the Reconstruction with Changes (*Reconstrucción con Cambios* - RCC) program, which refers to initiatives to rebuild infrastructure that had been destroyed by flooding from the coastal El Niño in 2017. However, given that the RCC suffered long delays, the CGR decided to use the MCC to monitor all of the small public works projects in the country, regardless of their purpose.

This program recruits citizens (monitors) through campaigns in newspapers and on radio and social networks. Most monitors are recruited through social networks, which is why most are university students from large cities. Once a citizen asks to be a MCC volunteer, that person must take a brief training course provided by the CGR. Those who do not pass an exam at the end of the course cannot participate. The CGR also conducts background checks of candidates to exclude those who might enter into the program with malicious intentions

Once recruited, the monitors are grouped into pairs. Each pair of monitors is assigned a public works project and has the task of visiting it once a month. During these visits, it is assumed that the monitors will audit the progress of the project and produce reports for the Office for Management of the Monitoring of Basic Public Services, as well as for one of the 25 regional offices in the country. On the basis of these reports, and with verification of the important information about execution the works provided by public sources such as InfObras and the Invierte.pe application, the offices can decide whether to conduct a large-scale audit of a project, which at the end of the process can lead to the imposition of fines or imprisonment. In this way, the MCC program, together with the inputs provided by public information sources, contributes to the CGR's governmental oversight actions.

The overall objective of the program is to contribute to the improvement of governmental oversight services in order to promote effective and efficient use of resources of the Peruvian State As part of the measures directed toward improving effective and efficient monitoring, the project supported a series of key actions for conducting this study, including (1) an innovative and evidence-based implementation policy strategy, which included the design and creation of the laboratory for government oversight and the innovation of processes; (2) improvements to InfObras to strengthen social monitoring; and (3) improvements to the effectiveness and coverage of the Citizen Oversight Monitors (MCC) program. In addition, the program involved the design of an impact evaluation of the MCC.[5]

3.2   Characterization of the Citizen Oversight Monitors

This subsection presents some of the characteristics of the volunteers (candidates and certified) for the MCC program. They are reached through virtual recruitment campaigns, mainly social networks, which means that most of those attracted to the program are from urban areas and have advanced degrees, as seen in Table 1.

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[5]Notwithstanding that an experimental design had been initially planned, this study decided to exploit the possibility of considering preliminary effects through a regression discontinuity design, as described in the document. Likewise, a knowledge generation strategy has been proposed on issues of digital government and control. For more information on three of the assessment initiatives currently being implemented, see: https://www.iadb.org/Document.cfm?id=EZSHARE-1392852158-75.

Table 1. Descriptive Statistics on Citizen Oversight Monitors, 2019

|	Candidates	Certified Monitors
Number of volunteers	11,706	2,184
Percentage with post-secondary education	94%	96%
Percentage from urban districts	84%	73%
Percentage from provincial capitals	53%	46%
Average age	30.78	28.01
Sex (percentage of men)	65%	48%
Percentage of engineers	29%	22%
Average training score	-	17.97
Visits per monitor	0.11	0.87

Source: Prepared by the authors based on MCC data.

According to data provided by the CGR, relatively few of the works are located in urban areas or provincial capitals, even though that is where most of the volunteers come from. Among the works eligible for the MCC in 2019, 66 percent were located in rural districts and 73 percent outside provincial capitals. Because of this the program has a severe lack of volunteers in rural areas, where most of the works are located.

As can be seen in Diagram 1, a large number of candidates signed up for the MCC program in 2019; however, only a certain number of candidates were certified as monitors.

Diagram 1. Recruitment for MCC in 2019
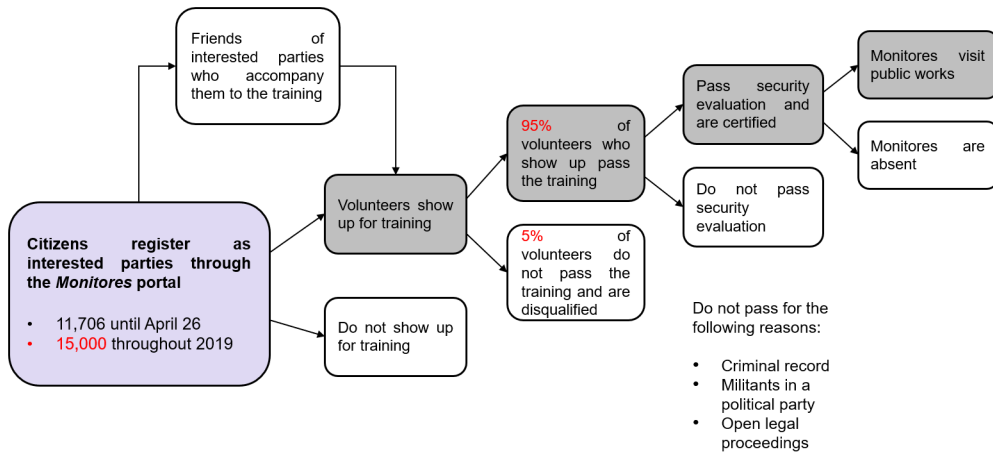
Note: All statistics correspond to **2019**. Statistics in red are approximations validated with the Comptroller's Office in Peru.

Source: Prepared by the authors based on data from the MCC program.

4 Evaluation Methodology and Sample

4.1 Regression Discontinuity Design

This document will evaluate the impact of the MCC program on various quality indicators for public works through the use of regression discontinuity design (RDD). RDD is a rigorous quasi-experimental approach that can be used to estimate the effects of treatment in a non-experimental test environment where that treatment is determined by an observed "assignment" variable that exceeds a designated threshold or cut-off point.

In terms of the design of the MCC program, it is possible to use an RDD to analyze its impact. Specifically, in this design one takes advantage of the program rule that works monitored by the MCC must have a maximum budget that does not exceed PEN (Peruvian Soles) 10 million. In this way, one will be able to analyze the difference in results between works that receive and do not receive MCC visits around the indicated budget threshold. This discontinuity is represented mathematically by the following equation:

$$X_{budget} = \begin{cases} 1 & \text{if } Budget \leq \text{PEN 10 M} \\ 0 & \text{if } Budget \geq \text{PEN 10 M} \end{cases} \tag{1}$$

In this case, the simplest model to apply is the following.

$$Y_{work} = \alpha + \rho X_{budget} + \epsilon \tag{2}$$

Where ρ is the parameter of interest and Y_{work} represents the outcomes of interest at the level of the work, which will be discussed in more detail later.

An important aspect of RDD is that the assignment of treatment is interpreted as random in the neighborhood of the discontinuity. This means that for a segment of the population, it is assumed that being marginally above or below the threshold is something that is beyond the control of the individual and that cannot be manipulated. In the case of the MCC program, it can be assumed that this condition is met, since the works in the sample determine their initial budget prior to the launch of the MCC program. Therefore, the officials responsible could not know that there would be volunteers from the MCC program who conducted visits to their works. In addition, the visits were coordinated by the CGR, without possibility that the responsible officials would have had knowledge of them.

4.2 Description of the Sample

As can be seen in Map 1, the sample and the distribution of the eligible works by district are broad. In any event, the visits conducted depend on the existence of monitors available to do so.

Map 1. Location of Works Eligible for the Citizen Oversight Monitors
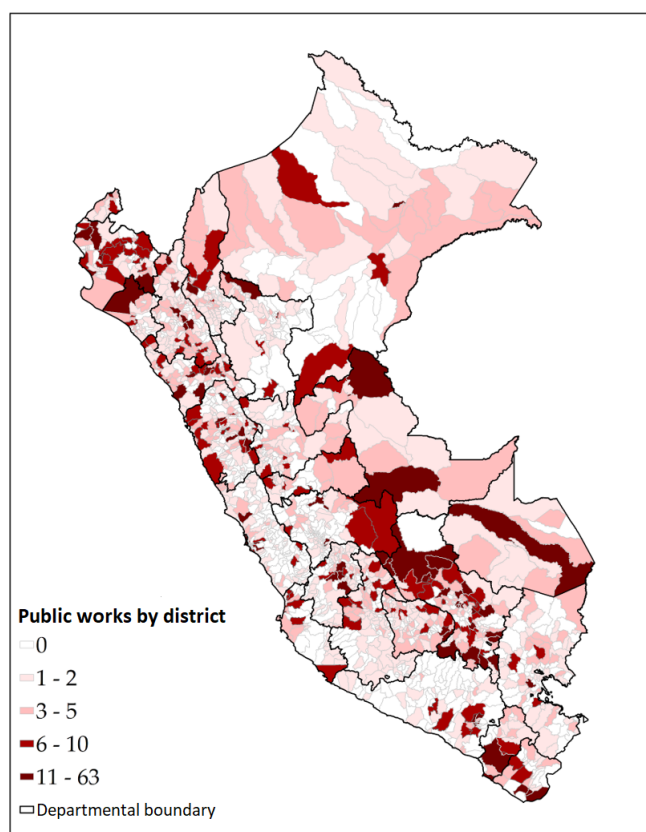
Source: Prepared by the authors based on data from InfObras.

Table 2 describes the sample used in the analysis according to the budget of the work by category (works eligible and not eligible for MCC visits). In total, only 905 works were visited during 2019. Of the works visited, 96.9 percent were eligible for the program as a result of having a budget of less than PEN (Peruvian Soles) 10 million; only 3.1 percent were works with a higher budget that were thus ineligible for the program. Those latter works, because of their very high budget, do not pose a problem for the regression discontinuity design, as they are not considered in the analysis because they are not around the threshold of eligibility.

Table 2. Works of Local Governments in All the Districts of the Country

Budget Intervals for MCC Eligibility	Works Visited by the MCC	Percentage of Works Visited	Total Works
Eligible (Budget less than PEN 10 million)	877	96.9%	324.773
Not Eligible (Budget more than PEN 10 million)	28	3.1%	8.915
Total	905	100%	333.68

Source: Prepared by the authors based on data from the Ministry of the Economy and Finance's Investment Consultation (Invierte.pe) application.

4.3 Data

4.3.1 Description of the Databases Used

The databases of interest for the study were generated by combining different information sources in order to assemble a complete database. The main source of information of the explanatory variable outlines the data on visits to works by the MCC in the first wave of the program in 2019. With respect to the public works, the main source of information has been InfObras. However, given that InfObras did not have specific data important for the analysis, it was decided to incorporate additional information from the public application called "Consulta Inversiones - Invierte.pe" of the Ministry of the Economy and Finance (*Ministerio de Economía y Finanzas* - MEF). Finally, information on complaints contained in the Willay system[6] was also taken into account in order to create a corruption indicator at the district level. All of these databases were combined to obtain a complete panel of information about the works.

4.3.2 Deployment of Citizen Oversight Monitors

As mentioned earlier, an essential database for the study is that which was created with information on the deployment of monitors, which provides details about the visits by MCCs to works during 2019. The database has information both about the work (variables found in InfObras) as well as the visits: type (initial, periodic, or final), date, national identity document (*Documento Nacional de Identidad* - DNI) of the monitor in charge of the visit, and variables related to the report on situations of noncompliance detected by the monitors. For the RDD analysis, the treatment group is made up of the works eligible for visits by the MCCs (that is, those works with a budget of less than PEN (Peruvian Soles) 10 million). The control group is made up of works ineligible for visits by MCCs (that is, those works with a budget above PEN 10 million). Given the design of the RDD analysis, works with budgets higher or lower than but very near the threshold of PEN 10 million are compared so that this resembles a local experimental design.

4.3.3 Data from InfObras

InfObras is the main source of information on public works in Peru. This analysis uses the InfObras database updated until July 2020. The outcome variables for the study obtained from InfObras are the following:

1. Physical progress of the work: Real/programmed progress of the work in "concrete" terms (percentage).

2. Stoppage of the work: binary variable that indicates if the work has been stopped.

3. Extensions of the work: binary variable that indicates if those responsible for the work requested an extension of the deadline for execution of the work.

4.3.4 Data from the Invierte.pe-Consulta de Inversión Application

As mentioned previously, additional information was also extracted for the open-source application Consulta Inversión-Invierte.pe of the MEF.[7] This complements the InfObras

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[6]Willay is a system by which Reception and Admission Analysts record complaints from citizens electronically.

[7]The National System for Multiannual Planning and Management of Investments, known as Invierte.pe, allows for planning and selecting strategic portfolios of projects based on the needs of the

data in that it provides information about the viability of the work; the viable amount, that is, the budget approved by the MEF (useful for estimating an outcome of interest for the study, such as the cost overruns); the status of the investment; and the specific subcategories of the MEF to identify the typology of the works.

The database is constructed using the stock of all the investment projects initiated in Peru since 2011. This includes 90 percent of the projects in InfObras as well as works that are subject to a viability diagnostic or which already have been deemed as viable but whose execution has not yet started. This information is provided in the public website of the MEF at the district level.

This database indicates the initial budget and the updated cost of each investment project. Comparing these variables allows for obtaining a measure of the cost overruns that is used as an additional outcome of interest to conduct the quasi-experimental analysis. This indicator is computed as a percentage value in the following manner:

$$Cost\ overruns = \frac{Updated\ cost\ -\ Viable\ amount}{Viable\ amount}$$

4.3.5 Willay

Information on complaints provided by the Willay database is also considered as a variable of interest for the descriptive analysis. This information allows for obtaining the number of complaints against the district municipality reported for each district. Citizen complaints are related to administrative deficiencies or acts of corruption by public officials. This variable provides an estimate of the incidence of corruption at the district level and will only be used for the descriptive analysis because, for the moment, this indicator is only available at the departmental level, since the most important information is in a text format.

5 Descriptive analysis

This section will provide a detailed descriptive analysis of the information and the variables of interest for the study. The information comes from different administrative databases, which means that, when combining the observations, information can be lacking because of its absence in some of these databases. On the other hand, this analysis takes into account information about the works executed and approved from 2001 to 2020.

5.1 Description of the Works

Table 3 shows the number of observations for which there is information in InfObras. In addition, the information in InfObras is complemented by additional information contained in Invierte.pe. This study uses observations that have information in both sources: Invierte.pe and InfObras.

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population and for facilitating the development and evaluation of projects. For more information, see
https://idbg.sharepoint.com/:w:/r/teams/EZ-PE-LON/PE-

Table 3. Observations in InfObras

Information in InfObras on the Work?	Number	Percentage
Has information	350,236	80.94
Does not have information	82,490	19.06
Total	432,726	100.00

Source: Prepared by the authors based on InfObras data.

Table 4 shows the distribution of works by execution modality: direct administration or outsourced. **Outsourced** works are those executed by construction firms that win the bids. Works executed by **direct administration** are those executed by the State entity itself (for example, the municipality). Most of the works (61.91 percent) are outsourced and the rest (38.09 percent) are administered directly.

Table 4. Modality of Execution of the Work

Modality	Number	Percentage
Direct administration	31,419	38.09
Outsourced	51,071	61.91
Total	82,490	100.00

Source: Prepared by the authors based on InfObras data.

Regarding the geographic distribution of these works in the period from 2012–2019, Figure 1 shows that 13 of the 24 departments outsourced more than 50 percent of their works. Of those departments, Tumbes had the most, with more than 90 percent of its works outsourced, followed by Ica, with 90 percent, and Ucayali, with more than 80 percent. Of the 12 departments that did not mostly outsource out their works, Moquegua had the fewest with a little more than 10 percent of its works outsourced, followed by Cusco and Puno, both with less than 20 percent.
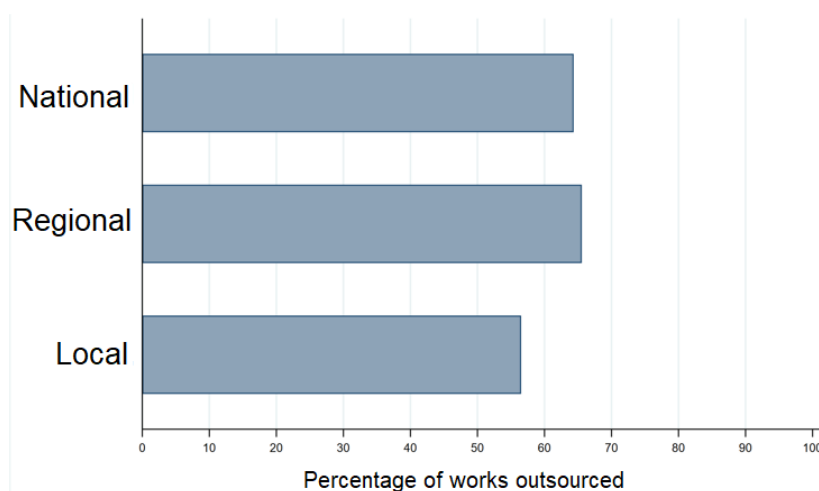
Figure 1. Percentage of Works Outsourced by Department
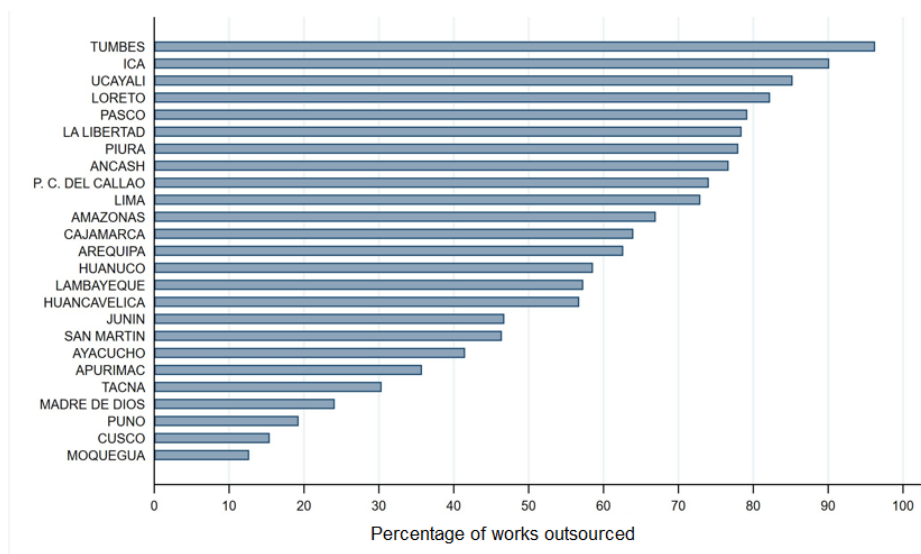
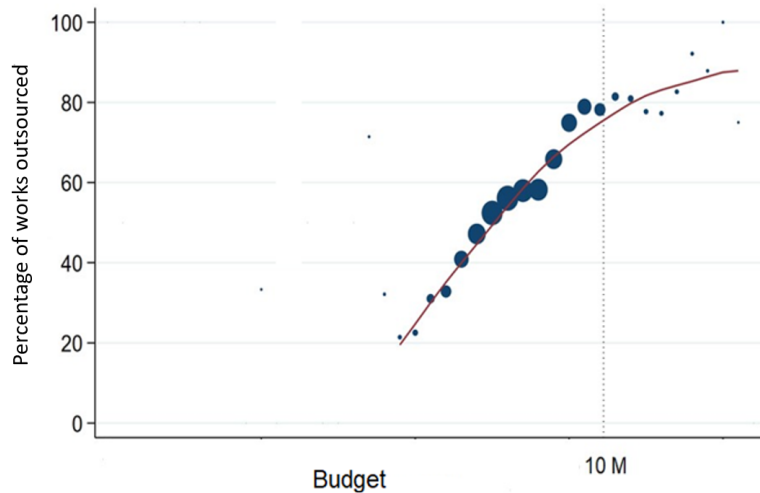Source: Prepared by the authors based on InfObras data.

Regarding the modality of execution of the works by level of government during the 2012–2019 period, Figure 2 shows that outsourced works tend to dominate all levels, with more than 50 percent of the works of local and regional governments and the national government using this modality. Although 40 percent of the works have been executed through direct administration, these only account for 20 to 30 percent of expenditures on public works, since these works tend to be on a scale smaller (in terms of both budget and population) than outsourced works, as can be seen in Figure 3.

Figure 2. Percentage of Works Outsourced by Level of Government

Source: Prepared by the authors based on InfObras data.

Figure 3. Percentage of Works Outsourced by Budget


Note: The circles are proportional to the number of works in each interval. The dotted line shows the threshold for the MCC.

Source: Prepared by the authors based on InfObras data.

Information contained in the CGR's Willay system allows for accessing information on complaints by citizens. This variable is useful to obtain outcomes of interest for the analysis. Figure 4 shows the number of complaints recorded by department. As would be expected, the largest departments have the most complaints.

Figure 4. Complaints by department, 2018-19
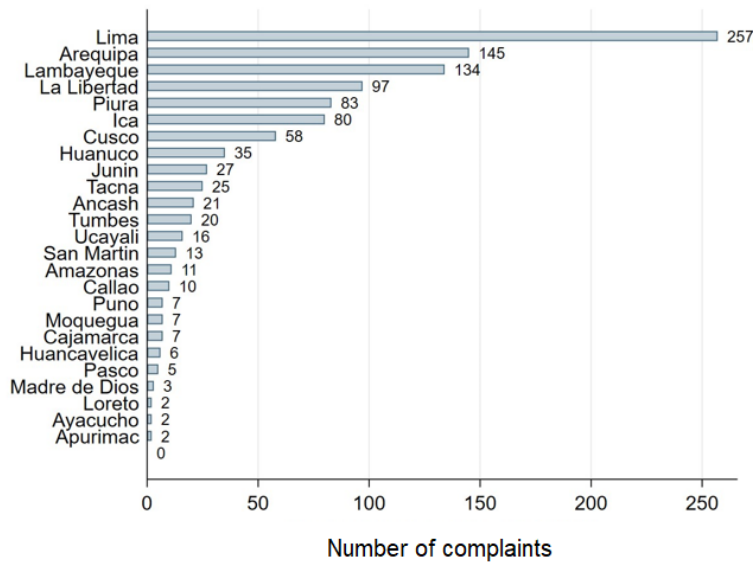
Source: Prepared by the authors based on Willay data.

Although numerous complaints are filed, not all of them are accepted and generate alarms. Figure 5 shows the number of complaints that generated alarms by department. It can be observed that the departments with the most alarms were Lambayeque and La Libertad, which were also the departments that had the largest number of complaints, behind Lima and Arequipa. And even though Lima and Arequipa had the largest number of complaints, the proportion of alarms in those departments is lower than in the other departments.

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Figure 5. Alarms Deriving from Complaints, by Department, 2018–2019
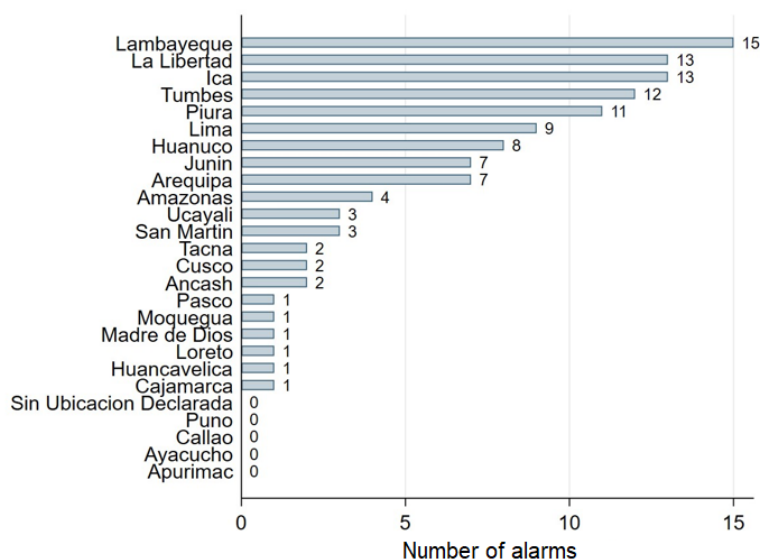
Source: Prepared by the authors based on Willay data.

6 Results

This section describes the effects of the MCC program on the outcomes of interest mentioned previously in relation to public works. Those effects have internal validity, specifically within the budget threshold of PEN (Peruvian Soles) 10 million, and therefore must be considered to be "local".

## 6.1 Validity of the Analysis

One of the most important assumptions in using the regression discontinuity design is that there was no strategic change in the behavior of the works around the threshold. This means the assignment of treatment (in this case, visits by the MCC) is interpreted as random in the neighborhood of the discontinuity. For a segment of the population, it is assumed that being marginally above or below the threshold is something that is out of its control.

In the context of this study, one of the advantages of the program is its implementation ex post to the design and approval of the monitored projects and, consequently, the availability of its budget. As a result of this, those responsible for the works have not been able to know prior to determination of the budget about the potential involvement of the MCC program, or that, depending on the budget, their works would or would not have been subject to monitoring visits. Under those circumstances, it is not feasible to manipulate the budget of the works in order to avoid monitoring by the MCCs.

To rigorously prove that there indeed was no manipulation of the analysis, the density test of (McCrary, 2008) is used to test the density of the assignment variable before and after implementation of the program in order to demonstrate that there are no variations attributable to it. Here, the results show that there is no variation in the assignment variable before and after the start of the MCC program. The proportions of units below and above the threshold are maintained during the years prior to and after the program.

The results are shown in Figure 6.

Figure 6. McCrary Density Test
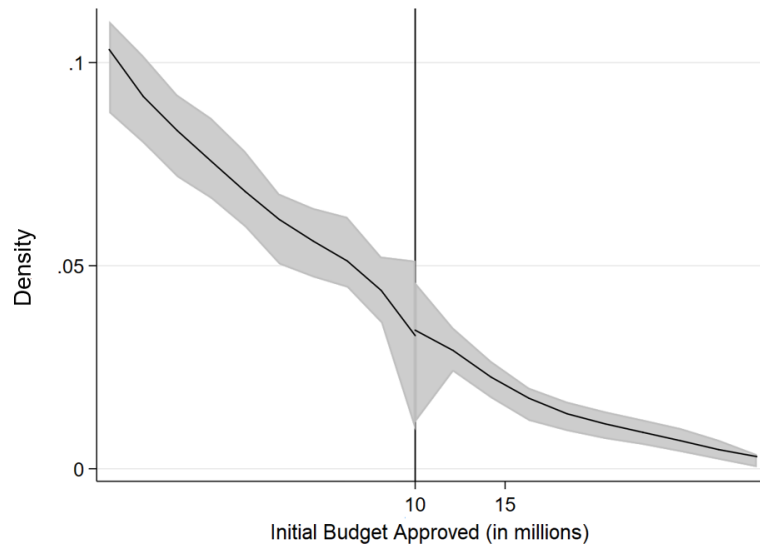
Source: Prepared by the authors based on InfObras data and Invierte.pe.

6.2 Polynomial Regression with Visits

Figure 7 shows the adjusted values of the regression of MCC visits over the threshold variable (budget = PEN 10 million) and the budget of the works of local governments in districts visited by the MCC (the x axis is on a logarithmic scale). This first figure uses as a sample all of the works in the database. It can be seen that the PEN 10 million threshold rule is complied with.
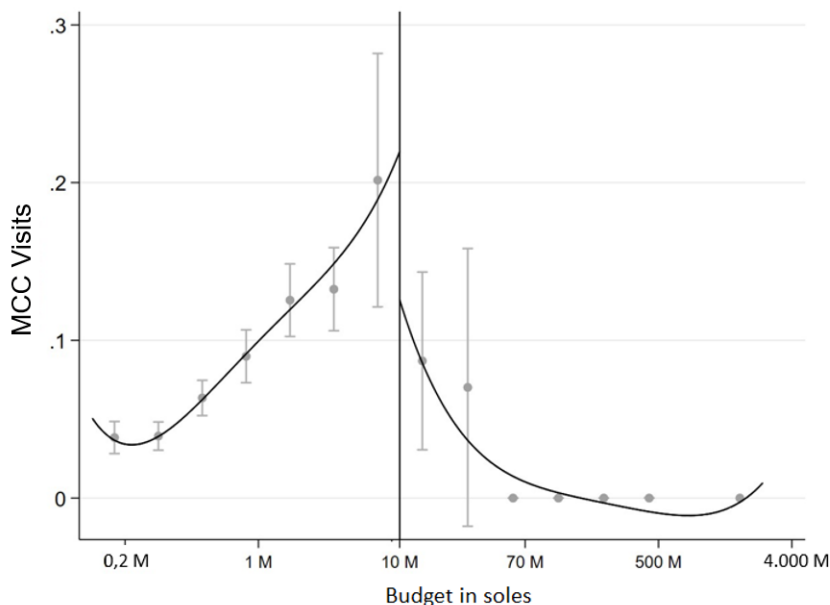
Figure 7. MCC Visits, All Works
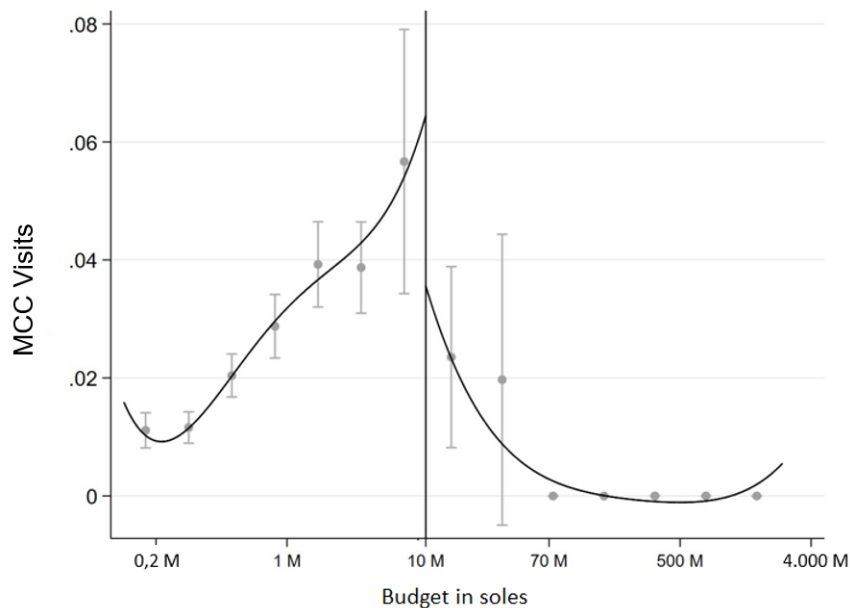
Note: The figure shows each work in universe x, according to its original recorded budget. The works to the left of the threshold line of PEN 10 million are those eligible for the MCC program. The figure shows that the works with a budget of less than PEN 10 million have received monitoring visits, which is why the line to the left of the threshold line is higher than the curve to the right of that line.

The figure shows the discontinuity in the PEN 10 million threshold, which is used for the analysis because it maintains the relationship with the visits variable, which is the variable that the discontinuity aims to identify.

Figure 8 uses the same variables as Figure 7 but filters the sample by reducing it to works executed by local governments and located in districts where MCC visits were conducted. Going forward, this reduced and more exact sample will be used to estimate the effects of the MCC program with the RDD model.

**Figure 8. MCC Visits, with Works Filtered**

Note: The figure shows each work in districts with MCC visits in universe x, according to its original recorded budget. The works to the left of the threshold line of PEN 10 million are those eligible for the MCC program. The figure shows that the works with a budget of less than PEN 10 million have received monitoring visits, which is why the line at the left of the threshold line is higher than the line at the right of that line.

6.3   Polynomial Regression with Cost Overruns

Figure 9 presents the adjusted values of the regression of the MCC visits over the cost overruns variable and the budget of the works of local governments in districts visited by the MCC (the x axis is on a logarithmic scale). As mentioned previously, the figure filters the sample to reduce it to those works executed by local governments and located in districts where MCC visits were conducted. The figure shows that the works with MCC visits have less cost overruns than the others around the PEN 10 million threshold.

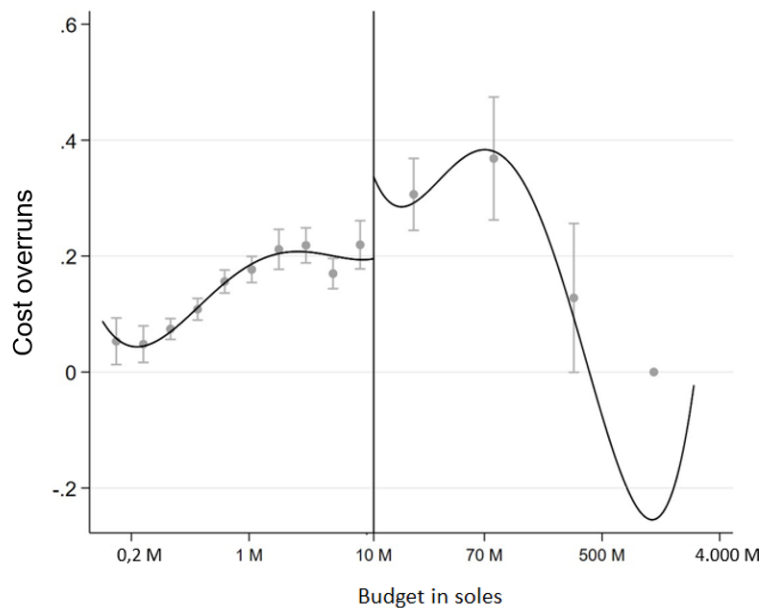**Figure 9. Cost Overruns, with Works Filtered**
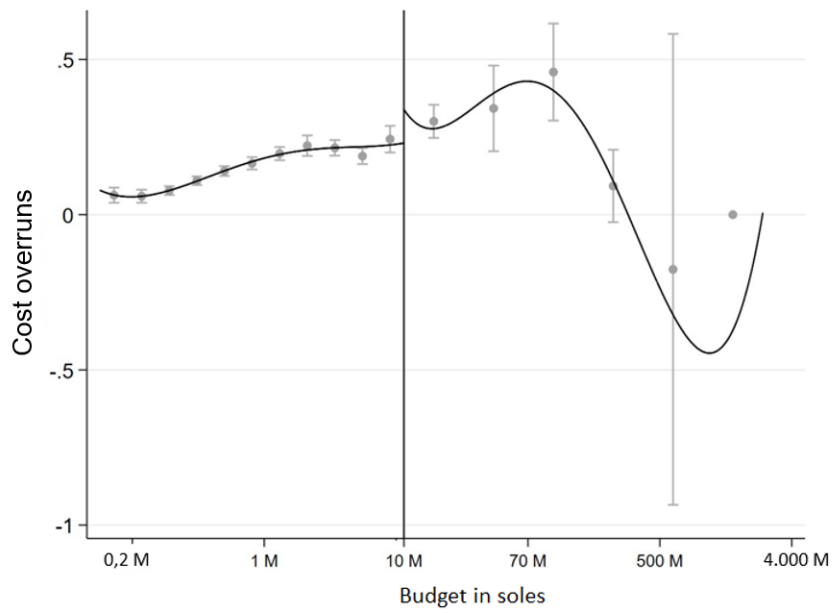
Source: Prepared by the authors based on InfObras data and Invierte.pe.
Note: The figure shows that the works to the left of the PEN 10 million budget threshold have less cost overruns that the works with a budget above PEN 10 million.

Along these lines, it is also interesting to analyze cost overruns in accordance with the work's execution modality (direct administration versus outsourced). Figure 10 shows the cost overruns in outsourced works in the filtered samples. In this case, clearer and more interesting results can be seen between the works with and without MCC visits. This result could indicate that the MCC program is more effective for works that are outsourced.

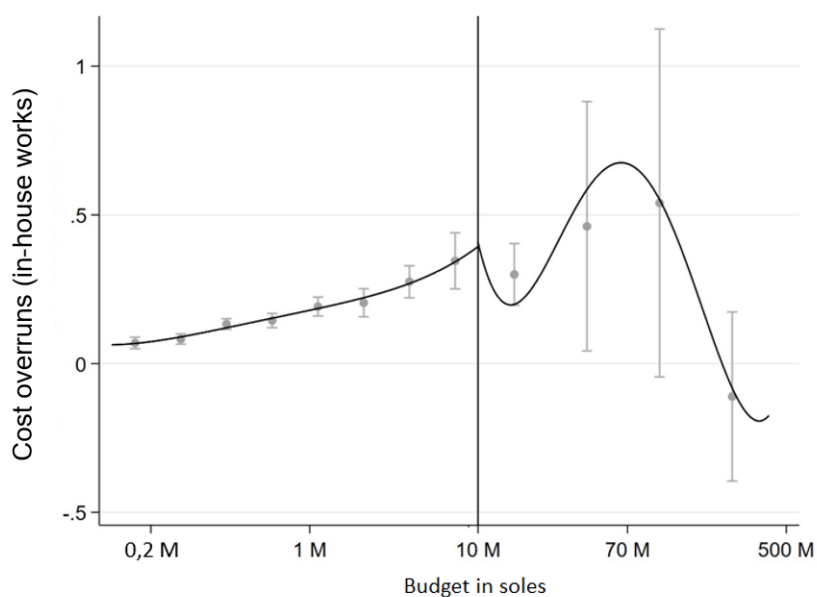**Figure 10. Cost Overruns in Outsourced Works, with Works Filtered**

Source: Prepared by the authors based on InfObras data and Invierte.pe.

Note: The figure shows that the outsourced works to the left of the budget threshold of PEN 10 million (eligible for the MCC) have less cost overruns than outsourced works that have a budget above PEN 10 million.

Figure 11 shows the cost overruns in works under direct administration in the sample with filters. In this case, one observes that there are no significant differences in cost overruns between works directly administered and with MCC visits and works directly administered but with no MCC visits.

Figure 11. Cost Overruns in Directly Administered Works

Source: Prepared by the authors based on Invierte.pe data.

6.4   Regressions on Cost Overruns

By virtue of the discrepancies between the results of the samples of outsourced and directly administered works observed in the figures analyzed in the previous section, it was decided to more robustly evaluate the treatment estimated by the RDD in the sample of works executed under the outsourcing modality, since it seems that the MCC program had a larger effect on those works. In total, 11,297 observations were considered, given that the RDD only takes into account observations around the eligibility threshold (budget of PEN 10 million); 1,540 of the observations are the ones near the threshold that are used to estimate the local impact of the program.

Table 5 shows the coefficients with standard errors of the RD Sharp estimator, using a polynomial regression on the cost overruns defined as a percentage of the initial approved budget. The effect of the program on the cost overruns was evaluated using a filtered sample of outsourced works. As mentioned previously, the filtered works only include works of local governments located in districts with MCC visits. The results show a positive and significant impact of the MCC program on the reduction of cost overruns of outsourced works.

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Table 5. Discontinuity Regression Analysis on Cost Overruns

|	Works (with filters)
Coefficient	0,09**
	(0,05)
Observations	11.297

Note: Robust standard errors are in parentheses.
Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

6.5   State of Execution of the Work

Another result analyzed is the state of execution of the work, especially if the work has been stopped. Figure 12 shows that there is more stoppage of works visited by MCCs (to the left of the PEN 10 million threshold). The effects are not significant, and the difference is minimal, so the effects of the program on the state of execution are inconclusive. In this sense, it seems that MCC visits do not have a relationship with the state of execution of the works.

Figure 12. Works Stopped, with Application of Filter
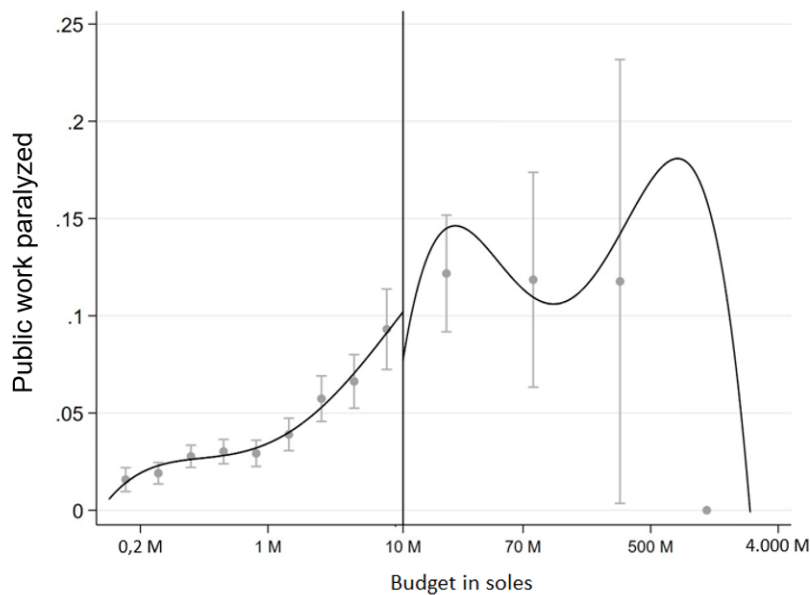
Source: Prepared by the authors based on InfObras data and Invierte.pe.

Another outcome of interest if the percentage of physical progress on execution of the work. Figure 13 shows that works with MCC visits (to the left of the PEN 10 million threshold) have a slightly higher percentage of physical progress than works without visits (to the right of the threshold).

Figure 13. Physical Progress of the Work, with Application of Filter (percent)
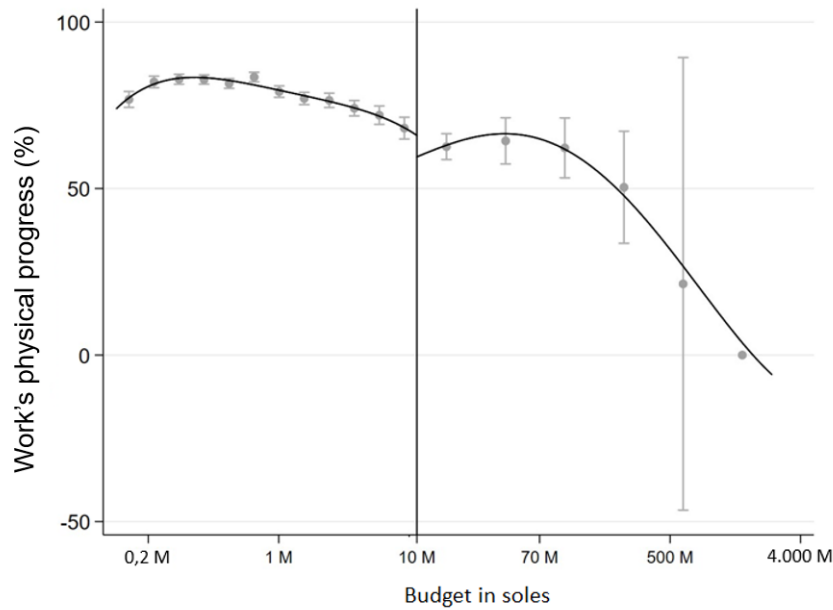
Source: Prepared by the authors based on InfObras data.

Finally, in terms of execution of the work, Figure 14 shows whether the work has had extensions of its execution deadline. In this case, no significant differences are observed between works with MCC visits (to the left of the PEN 10 million threshold) and works without MCC visits (to the right of the threshold).

Figure 14. Expansion in Execution of the Work
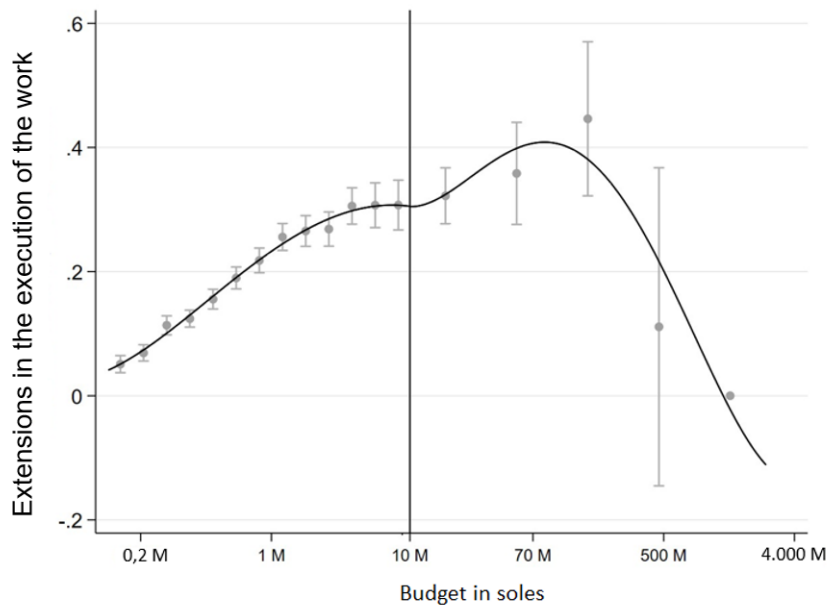
Source: Prepared by the authors based on InfObras data.

There are two reasons behind the effects found in cost overruns and not in the other

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variables. First is the nature of the oversight program. The MCC program focuses more on monitoring cost overruns because they are more associated with corruption than are variables such as the work's execution time. Second, many of the causes of delays of works are more associated with problems of technical analysis of preinvestment than with the behavior of the implementing firm.

In general, the conditions linked to progress in execution of a work usually respond to many factors and are related to, for example, deficiencies in preinvestment studies and the development of technical standards – that is, prior to the start of execution – as well as other controversies that can arise during the process of executing the contract. In this way, it is possible to assume that those other factors could have direct effects on meeting the work's execution deadlines, independent of the effect of the citizen oversight or monitoring of the work.

For example, in the operational controls put in place for works within the framework of the Reconstruction with Changes (RCC) Program, the CGR identified delays in physical progress of slightly over 34 percent of works. On the other hand, with respect to the works that were stopped, the CGR noted that the stoppage (which at the same time extends the period of execution) in 51.6 percent of the cases corresponded to deficiencies in technical standards and 19.4 percent to cases of force majeure, such as natural disasters, social conflicts, etc.[8]

7   Conclusion

This document analyzed the impact of the CGR's MCC program on the efficiency of public works in Peru. Taking advantage of the program design – which establishes that only those works with an initial approved budget of less than PEN 10 million are eligible for MCC monitoring – a discontinuity regression analysis was conducted to evaluate the local effect of the program on works within the eligibility threshold. The findings of this study are statistically significant for citizen monitoring in the presence of digital government initiatives such as InfObras and Invierte.pe in terms of the efficiency of public works. In particular, the analysis finds that the program's monitoring visits had a significant impact of 9 percent in reducing cost overruns for the works executed by construction firms. No such effect was identified in works executed by direct administration. Nor were any impacts found in other variables of the analyzed results, such as the status of execution of the work, its physical progress, and its delays. A possible explanation for the findings is that, given the nature of the oversight program, it makes more sense for the monitoring to focus on cost overruns, which can be directly related to corruption. By contrast, variables such as the physical progress of the work and its period of execution are more related to external factors like deficiencies in the pre-investment studies and the preparation of technical standards, which are more difficult to control. In this sense, the findings show that the MCC program is an effective strategy to detect cost overruns of works of up to PEN 10 million and in this way help to reduce corruption through cost-effective monitoring.

This document contributes to closing the gaps in the literature related to the impact of citizen monitoring programs on the supply of public goods and services. This is possible

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[8]For more information on the reports of the CGR control operations and government control, see https://apps5.contraloria.gob.pe/sroc/wfrm/Inicio.aspx and https://appbp.contraloria.gob.pe/BuscadorCGR/Informes/Inicio.html.

because the document generates evidence on the effect of strategic social oversight interventions that combine access to public information via digital government tools (InfObras and Invierte.pe) with citizen monitoring mechanisms (the MCC program) that make the use of the information actionable. In addition, the study shows that this type of program produces synergies between the governmental oversight exercised by the high-level auditing entity (the CGR) and society, since the above-mentioned oversight is complemented by a low-cost program that helps to expand coverage to public works that, in the absence of this program, could not be supervised.

Finally, although this program has brought about promising results for social monitoring of the efficiency of public works, there is still a need to produce rigorous evidence on its effects on the quality of works as well as evidence that contributes to improving the current design of the initiative itself. Toward this end, it is proposed that steps going forward include advancing with an experimental evaluation of the MCC program that proposes improvements to its design and that extends to other results related to the quality of the works. This involves proposing the evaluation of three treatments: (1) the status quo of the MCC (the program in its current form); (2) local monitors (the recruitment of direct beneficiaries of the works to sign up as MCCs); and (3) improvements in the questionnaire used by the MCCs to evaluate the works. Each of these three treatments will be evaluated for two different stages during execution of the works: one group will evaluate during the bidding and assessment of the technical standards, and another will evaluate during the execution period itself (as is currently done). It is hoped that this experimental evaluation will provide evidence-based proposals to improve the MCC program with an eye towards promoting anti-corruption actions in the execution of public works in Peru.

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