Effect of Electronic Public Procurement

Evidence from Bangladesh

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Abstract

Public Procurement in a developing country is often plagued with collusive practices and various forms of corruption. In Bangladesh, the public procurement at local government level are also subject to local and political capture where non-political bidders are often forced not to participate in the procurement process. An IT based procurement system may curb such malpractices and promote competition from both local bidders and outside-the-region bidders. This greater competition in turn should result into lower procurement prices. This paper looks at detailed procurement level data to investigate the effect of electronic government procurement system on procurement prices, normalized by estimated costs in one public agency in Bangladesh. The variation in timing of adoption of this electronic government procurement (e-GP) system at various offices of the agency around the country provides a quasi-experimental design that helps identify the effect of e-GP. It turns out that adoption of e-GP reduces price to cost ratio by at least 10.25% and in the most robust case, by 11.85%. It is also found that the effect of competition on price to cost ratio is only local at the low level of competition and irresponsive at high level of competition in bidding under e-GP system. This suggests that e-GP facilitates at least some local competition which probably was not earlier possible due to local political capture.

I. Introduction

An efficient public procurement system is an important necessary condition for ensuring efficient public investment and therefore, economic growth. However, different sorts of economic and political misgovernance often make such public institutions weak, resulting into poor performance of public projects. The solution to this may lie into simple solutions like adopting an electronic procurement system. Whether such electronic system has any impact on efficiency of the public procurement process remains to be an open, empirical question.

In this paper, we investigate this case empirically by using package level procurement data of one of the largest public agencies in Bangladesh. Local Government Engineering Department (LGED) is the local government organization that is responsible to build infrastructure at the local level around the whole country.The Ministry of Planning of Government of Bangladesh has piloted an electronic government procurement (e-GP) system in four agencies of Bangladesh including LGED.

The traditional public procurement system has a few problems, especially in a developing country context. Typically, the system is plagued with various types of collusive activities and corruption. For example, bidders often collude with each other and manage to keep winning contract price high. For small enough procurement projects or in emergency situations, procuring entities may procure goods directly from a vender without advertisement, leaving ways to collude and over-invoice procured items. These illegal activities results into higher prices of a procured good or work. In addition, an inefficient bidder may win the contract resulting into poorer quality output, delays in project completion and cost overrun.

In Bangladesh, political pressure at local level is anotherfactor that influences the procurement process. The influence often takes the form of blocking non-political contractors to participate physically in the bidding process. Since the local law and order administration are captured as well, many bidders therefore either fail to participate or shy away from placing bids.[2] This paves the way for the politically connected bidders to collude with each other. With lower participation and competition from non-political bidders and higher opportunity to collude at procurement process, it is expected that the procurement price is high. Had there been no such influences, the price should have been lower.

A more transparent and IT based electronic procurement system may play an important role in curbing this sort of political influences and also increase competition. First, an electronic procurement system can allow more bidders to participate in the bidding process. Since cost of participation is minimal, bidders from outside the procuring district can also apply and win, resulting into greater competition and lower price. Second, it may reduce the political influence of the type mentioned above by letting a bidder place a bid online from office or a remote location instead of going physically to the procuring entity's office. This will also raise competition and reduce price.

In this paper, we investigate the effect of e-GP on contract prices of procured items in LGED. Since the contract price may differ depending on size of the project, we normalize the contract price with the agency's own cost estimates. We then investigate whether there is any systematic differences in items procured under traditional and e-GP systems. We hypothesize that items procured under e-GP will have a lower price than the items procured under traditional system.

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[2] The news regarding such influences are abound. For recent example, see an incident reported in the online edition of Daily Star published on the March 26, 2014.

Our identification strategy to estimate the effect of e-GP hinges on the variation in the timing of adoption of e-GP system permitting a quasi-experimental design. LGED through its various procurement points in 64 districts of Bangladesh has implemented this system gradually over time. The rate of adoption of this new system varies across districts. Hence, we have a quasi-experimental set-up to identify the effect of e-GP on price to cost ratio.

We find two important results. First, the items procured through e-GP system has a robust 12% decrease in price to cost ratio in comparison to that under traditional procurement system. Given that LGED procured 1,845 items at an average price of 3,911,064 Taka (≈US$ 50,161) and the price reduction is at least 10.25%, the cost savings amounts to 739,631,090.7 Taka (≈US$ 9422052).[3] However, our most robust estimates suggest an 11.85% decrease which amounts to 855,085,700 Taka (≈US$ 10,892,811) in the year 2013 only.

Our second result indicates a particular pattern on effect of competition on price to cost ratio.Measuring competition by number of participating bidders, we observe that the effect of competition is only local and at low level of participation where price to cost ratio falls due to higher bidder participation. However, the price to cost ratio is almost irresponsive to number of bidders at higher level of competition, even though the price to cost ratio remains lower than that under traditional system. We argue that this is indicative of a weaker effect of nation-wide bidder participation on price to cost ratio, suggesting at least existence of reduction in political influence caused by e-GP.

We contribute to two strands of economic literature. First, there is a growing empirical literature that deals with corruption and inefficiencies in public procurement. Our paper has a close resemblance to another paper by Lewis-Faupel, Neggers, Olken and Pande (2014) where they also investigate the effect of electronic procurement on infrastructure provision in India and Indonesia using a similar quasi-experimental design. They have not found any reduction in price, but the quality of service has been improved with higher quality of output in India and fewer delays in project completion in Indonesia.

There are a few other papers that work on the efficiency of public procurement and corruption. Di Tella and Schargrodsky (2003) show that a crackdown on corruption in hospitals of Buenos Aires has significantly reduced the price of procured items, eventhough this effect were not sustainable. Tran (2008) uses internal bribery records of an Asian firm to show that certain policies (best value VS best price) are more effective in combating corruption in procurement indicates presence of secret auctions employed by officials to find largest bribe-payers. Bandiera, Prat and Valletti (2009) show that there systematic differences in procurement prices across public agencies that can be attributed to differences in governance structure and these differences is particularly due to passive wastes rather than active wastes. D'Souza and Kaufmann (2013) showed that national governance factors are associated with bribery in procurements with foreign firms are less likely to bribe. Coviello and Mariniello (2014) use publicity requirements of public procurement beyond a threshold to a regression discontinuity design and show that this requirement increases greater participation and winning rebates reducing the cost of procurement. We also contribute to the empirical literature of effect of political connections.

We also contribute to empirical literature on effects of political connection. Khwaja and Miah (2005) analyze 90,000 loan data to report that politically connected firms borrow more and default more whereas such political rents are sensitive to the strength of the politician in the party and also whether

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[3] 1 US$ = 78.5 Taka.

the politician is from ruling party. Faccio (2006) finds that politically connected firms exist in most countries and are more prevalent in countries that are perceived to be highly corrupt, where citizens restrict foreign investments and where system is more transparent. Li, Meng, Wang and Zhou (2008) show that party membership of the Communist Party in China has a positive effect on firm performance and helps private entrepreneurs to get loans from banks and other institutions. Imai (2009) examines prefecture level panel data to show that size of government loans depend on electoral vulnerability of politicians of ruling party and their seniority in the party. Sukhtankar (2012) finds that embezzlements are higher in politically controlled firms in election years. Markussen and Tarp (2014) find that households with a relative in a position of political or bureaucratic power increase their investments in land improvements.

Rest of the paper is organized as follows. In section II, the background on public procurement and electronic government procurement is presented. Section III discusses briefly about data. Section IV provides a descriptive analysis, section V presents an econometric analysis VI discusses the results and indicates future research and finally section VII concludes.

II. Public Procurement and Electronic Government procurement (e-GP) in Bangladesh

The Bangladesh Government has undertaken an initiative to introduce electronic Government Procurement system in 2011. Initially, three agencies (Local Government Engineering Department (LGED), Roads and Highways Division (RHD) and Bangladesh Water Development Board (BWDB)) are selected to implement it. The Central Procurement Technical Unit (CPTU) in the Ministry of Planning is assigned to manage the e-procurement process of all the agencies.

According to the e-Government Procurement Rule , a bidder needs to log-on to the e-GP website managed by CPTU and place their bids for tenders of their interest. However, a bidder needs to register first in the national e-GP system for a lump-sum fee in order to participate in the bidding process. The Tender Notices of projects to be procured under e-GP are advertised in the national dailies as well as in e-GP website.

Local Government Engineering Department is the largest local government department and one of the largest procuring agency in the country. The district executive engineer's office is responsible for all the procurement that are done at the district whereas the sub-district engineers also procure a few items. Most of these items are public works kind, usually construction of roads, bridges and culverts and sometimes maintenance of these items.

III. Data

We collect detailed package level data procured through both traditional and e-GP system from the government. More specifically, we asked for award price, estimated cost, date of contract award, procuring district, procuring agency, some description of the good or work to be procured and number of bidders in each package.

We approached in all the relevant agencies (LGED, BWDB, RHD and CPTU). Since the e-GP office is a project of and is located in CPTU, we were able to collect all the e-GP related data from CPTU. For

traditional system, we went to each agency where e-GP is being piloted. Only LGED were able to share their data on procurement. The other agencies had their procurement data at their field offices collection of which was beyond the scope of this paper. We therefore focused only on effect of e-GP on LGED procurement packages.

Given the above information, we were able to collect 6, 651 package level data on procurement through both traditional and e-GP system done in LGED. These data span between the years 2010 and January of 2014. We also have 270 observations of packages procured through e-GP by BWDB and 183 observations of packages procured through e-GP by RHD.

IV. Descriptive Analysis

We present a few descriptive statistics of our data in this section. On the process, we would present a clear picture about the progress of e-GP implementation in LGED over time, some indication of potential impact of e-GP on price to cost ratio and the degree of competition in e-GP system and its implications to price to cost ratio. We will also provide a comparison of e-GP implementation and potential impact on price across agencies.

Implementation of e-GP over time in LGED

The benefits of e-GP can be expected to be well understood, at least at the top management level. If anything, e-GP makes the procurement process very easy and hassle free for the procuring office. Then, there are other effects (price and quality effects for instance). Despite potential benefits of e-GP, the agencies took a go-slow policy in implementing e-GP. Anecdotal evidences suggest several reasons. First, it was not clear how the bidders would respond to a new, ICT driven procurement system. The technical know-how of the bidders may not be strong enough to be able to participate in the e-GP, at least in the initial phase. Second, there is a registration fee which may deter contractors from registration, especially if the benefit from registration (expected return from participating in e-GP) is less than cost (the fee).

Given that, e-GP implementation started slowly. This progress of e-GP implementation is shown in figure 1. Between 2010 and January 2014, LGED procured about 4,806 goods, works and services through traditional procurement system. Starting in 2012, LGED procured 1,845 goods, works and services using e-GP. Most of the procurement under e-GP occurred in 2013 and 2014. In 2012, only 0.4% of all the procured items by LGED were under e-GP. This picked-up very well in 2013 at 61.4% and further up at 76.5% in January, 2014. Currently, LGED officials claim and CPTU officials claim that around 95% procurement of LGED are done through e-GP. The rest 5% could not be procured in this way since these projects are donor supported which have clauses that cannot be accommodated by e-GP.

[Figure 1 here]

LGED is also the largest implementing agency of e-GP. For example, of all items procured under e-GP, LGED has the largest share of packages. Even though only 11.4% of all e-GP procured items were by LGED in 2012, it dominated in 2013 and 2014 with more than 80% of all e-GP procured items done by LGED, as depicted in figure 2.

[Figure 2 here]

There is a similar trend in terms of total value of procurement as well. Figure 3 shows this trend. In 2012, LGED procured 10% of 697 million taka worth of items procured under e-GP. In 2013, e-GP implementation picked-up with about 9,247 million taka worth of items procured through e-GP. Of this, 74% was done by LGED. Furthermore, 315 million taka worth of items are procured through e-GP in January, 2014. About 94% of them are procured by LGED.

[Figure 3 here]

Impact of e-GP

We now turn to our research question: does e-GP reduce price to cost ratio? We calculate price to cost ratio by

$$Price - Cost\ Ratio = \frac{Contract\ Price}{Estimated\ Cost}.$$

We use the procurement data from 2010 till 2014 which consists of 6,651 observations of procurement packages. Considering traditional system, it is evident that the price-cost ratio is increasing mildly since 2010 until 2014. In 2010, the mean price-cost ratio of LGED-procured items under traditional system was 98%. This has risen slightly over the next three years. In 2012, the mean price to cost ratio is 104% in 2012. In the same year, the mean price to cost ratio procured through e-GP was 117% and this mean difference is statistically significant at 1% level. In 2013, this differences has been switched. The mean price to cost ratio in 2013 was 102% under traditional system whereas it is 90% under e-GP and the mean difference is statistically significant as well at 1% level. In 2014, the differences of 2013 was maintained: the mean price to cost ratio was 103% under traditional system whereas it is 91% under e-GP system and the mean differences are statistically significant.

[Figure 4 here]

This suggests that e-GP system has a potential impact on price-cost ratio. This is depicted clearly in figure 4 where we present trend lines of price to cost ratio over time under the two procurement systems. Whereas the price-cost ratio is higher under e-GP system than the traditional system in the first year, it drops significantly in 2013 and is maintained in 2014.

Comparison with other Agencies

How do other agencies' prices change over time? We do not have data of traditionally procurement items by other agencies. But we do have all the procurements under e-GP. We compare price-cost ratio of items procured under e-GP over time by other agencies (BWDB and RHD). The comparative statistics are presented in figure 5. It turns out that the trends are similar: the prices drop quite a bit from 2012 level in 2013. In 2014, it remains at a similar in both LGED and RHD, even though at BWDB, it has risen a bit, but is still lower than 2012.

[Figure 5 here]

Role of Competition

Figure 4 also poses an interesting observation. The mean price-cost ratio is *higher* in e-GP system than the traditional system in the first year of e-GP implementation (i.e., in 2012). This however drops significantly in 2013 and remains low in 2014. A major reason for this is low number of registered bidders in the first year (i.e., 2012), which grew in subsequent years (over 2013 and 2014), raising

competition and reducing price. This is reflected partly in the number of bidders participated in the biding process, as shown in figure 6. In 2012, the average number of participating bidders is 2.3 whereas it rose to 7.4 in 2013. In 2014, it drops to 3.4, but is higher than 2012. Besides, since the number of registered bidders is more likely to be higher in 2014 than 2013, the threat of more bidders was always present.

[Figure 6 here]

It seems that the relationship between degree of competition and price-to-cost ratio is non-linear. This is evident from comparing figure 4 and 6. Even though price to cost ratio in 2014 remained at the level of 2013, the competition was much less than 2013 and almost similar to 2012. How are then competition and prices related? Figure 7 provides a lowess smoother of number of bidders and price to cost ratio of items procured under e-GP only. It turns out that there is a non-linear relationship: increase in number of bidders decreases price to cost ratio, but this is very local and only affects up to a threshold level. After that, increase in number of bidders actually increases price to cost ratio and after a while, it becomes flat. One important observation here is that when it flattens, it stays around 95% suggesting that the effect on price-cost ratio of e-GP are possibly realized even at high number-of-bidders cases. We will look into this case in results section in greater details.

[Figure 7 here]

V. Econometric Analysis

Effect of e-GP on Price to Cost Ratio

We estimate the effect of e-GP using the follow linear model:

$$y_{idt} = \alpha_d + \beta_t + \gamma X_{idt} + \delta Z_{idt} + \epsilon_{ist}$$

Where y_{idt} is price to cost ratio of procurement package i in district d in year t, α_d is the district fixed effect, β_t is the year fixed effect, X_{idt} is a dummy variable denoting whether the package i in district t is procured under e-GP in year t and Z_{idt} is the estimated cost of package i in district d in year t. When year trend is considered, β_t is replaced by βT where T is the time trend. We are interested in γ, coefficient of X_{idt} and expect it to be negative and statistically significant.

We present the results of the above econometric model below. The descriptive statistics section already indicates that there is a strong negative effect of e-GP on price to cost ratio. Is this decrease remain significant when more robust econometric techniques are applied?

The results are presented in table 1. In all the cases, we consider robust standard errors (cluster robust for OLS estimates). We first consider simple OLS regression. In column 1, we present the results of the specifications without any control variable. It turns out that there is a 10.5% drop in price to cost ratio due to e-GP and this change is statistically significant at 1% level. This differences however could capture a few other factors as well. We consider each possibility one at a time.

First, the packages procured under e-GP could be smaller in terms of money involved and may also be less complex. Indeed, evaluation of bidding processed under e-GP system are also done electronically, eliminating any possibility to allow for human judgment. As a result, projects that are more complex,

reflected on higher estimated cost, may be procured under traditional system whereas simpler and more standardized items, reflected in lower estimated cost, are procured under e-GP system. We therefore control for estimated cost to capture this possibility. We find that after controlling for estimated cost, the coefficient of e-GP has decreased a little to .1025, but it is still statistically significant at 1% level. This implies that after controlling for estimated cost, there is a 10.25% drop in price to cost ratio due to e-GP system.

It is possible that e-GP may have capture the time effects. Time plays important role through various ways. First, the price of construction inputs may have decreased over time (even though anecdotal evidences suggest otherwise). Since e-GP implementation coverage has also increased over time, the e-GP variable may have captured this time effect. Furthermore, contractors may have become more efficient in general over the few years in question, giving them opportunity to bid lower which is reflected in the price-cost ratio, but captured in e-GP effect. Hence, it is important to control for time effect. We first consider the year fixed effects. The results are presented in column 3. After controlling for time effect, we find that the effect of e-GP increases to 12.2%. We present the result of replacing the year effect with a time trend. We get an even higher effect of e-GP: the price to cost ratio has gone down by 13.2% due to adoption of e-GP system.

Third, the districts where the procurement is taking place are likely to have different characteristics which may influence the rate at which e-GP is being adopted as well as the effectiveness of the e-GP system. An important factor in this regard is the prices of construction materials and labor costs. LGED estimates of package costs are usually done by national average prices of construction inputs. These prices however varies across districts and may be reflected in the contract prices. It is however not clear how it can be correlated to e-GP implementation and hence, influence the effect of e-GP.

Another important factor is internet accessibility, knowledge and usage behavior. Since e-GP works through internet and some districts have better internet accessibility than others, this may have influence internet knowledge and usage of the contractors and adaptability of the contractors to the internet based e-GP system. Whereas this was a problem in the beginning of e-GP implementation as mentioned above, it worked out later. One driver was existence of professional internet cafes run by computer experts in all districts which facilitated participation of the contractors. Many contractors themselves took initiatives to learn and use internet to participate in e-GP system. Hence, as these anecdotal evidences suggest, this may not be a significant factor in e-GP implementation.

There are other factors too. Number of bidders and competition among the bidders may also vary across the districts and influence the contract price. Finally, weather and natural disasters are different across districts and may play an important role in measuring estimated costs and also the contract prices. The role of district executive engineer, the district-in-charge of LGED district offices is also important. As a result of these factors or some other innate reasons, it is possible that some district may utilize e-GP more than others which may cause a differential between traditional and e-GP prices.

In order to take care of these district variations, we apply district-specific random effects and fixed effects. Column 5 presents the case of considering a district-specific random effect model with time fixed effects in place. We find that the effect of e-GP on price to cost ratio is 11.87% and this change is statistically significant at 1% level. Column 6 presents the effect when a fixed effect model is considered instead. The effect does not change much remaining in 11.85% with the coefficient being statistically

significant at 1% level. The Hausman test does not indicate any systematic differences of the two sets of coefficients (The chi-square statistic = 2.94).

In column 7 and 8, we consider year trends instead of year fixed effects, with district random effects and fixed effects respectively. The coefficients vary between 12.49% (in random effect model) and 12.46% (in fixed effect model), both are statistically significant at 1% level. Again, the Hausman test does not indicate any systematic differences of the two sets of coefficients (The chi-square statistic = 0.78).

Competition

We estimate the effect of competition using the follow linear equation:

$$y_{idt} = \alpha_d + \beta_t + \gamma_1 X_{idt} + \gamma_2 X_{idt}^2 + \delta Z_{idt} + \epsilon_{ist}$$

Where y_{idt} is price-to-cost ratio procurement package i in district d in year t, α_d is the district fixed effect, β_t is the year fixed effect, X_{idt} is a number of bidders competing on package i in district d in year t and Z_{idt} is the estimated cost of package i in district d in year t. When year trend is considered, β_t is replaced by βT where T is the time trend. We are interested in γ_1 and γ_2, coefficient of X_{idt} and X_{idt}^2 to test the quadratic relationship between number of bidders and price to cost ratio and expect $\gamma_1 < 0$ and $\gamma_2 > 0$.

What is the role of competition here? We do not have any data on number of participating bidders in procurement process under traditional system. We however do have all the data on procurement under e-GP system. As figure 7 in descriptive section suggests, there is a non-linear relationship between number of bidders participated and the price to cost ratio. In this section, we will investigate the degree of differences between a linear and quadratic relationship between number of bidders and price to cost ratio.

For the sake of brevity, we consider only the robust models, i.e., RE and FE models. The results are presented in table 2. In column 1 and 2, we consider linear and quadratic models with district random effects, year fixed effects with controls of estimated cost. We find that the number of bidders does not have any impact on the linear model (column 1). On the other hand, the quadratic model indicates a U-shaped relationship between number of bidders and price to cost ratio and both the coefficients of the quadratic model are statistically significant at 1% level.

We next compare between the linear and quadratic models in the presence of district fixed effects. When the district fixed effects are considered instead, column 3 and 4 shows the same pattern: the coefficient of number of bidders is not significant in linear model, but both the coefficients are statistically significant at 1% level, suggesting a convex, quadratic relationship. The coefficients also are quite similar in RE and FE models.

We redo the above analysis using an annual trend instead of year fixed effects. The results are presented in columns 5 through 8 and are very similar. The quadratic models suggest a convex relationship between number of bidders and price to cost ratio. In RE models, the coefficients of number of bidders are not statistically significant in linear model, but both the coefficients in quadratic models are statistically significant at 1% level and similar in magnitude with specifications in column 2. In FE models, the number of bidders enters negatively in the linear model and the coefficient is statistically

significant at 1% level. However, both coefficients are statistically significant at 1% level in a quadratic model and similar to specifications in column 4. The RE and FE coefficients are also similar in magnitude.

VI. Discussion and Extension

The Dual Channel of Effect of e-GP

The previous section provides a robust observation that adoption of e-GP has decreased price to cost ratio by at least 12%. As argued earlier, this may happen through two avenues. First, e-GP lowers cost of participation significantly, especially for participants located at different districts. These participants now do not need to physically visit the procuring entity's office to place their bids as they can do so electronically from their office. Second, as participants can participate from office and avoid visiting the procuring entity's office, they do not have to face potential tender snatching and other security problems during submitting their bids physically. In other words, the local political elites will not be able to ambush the procuring entity's office and/or snatch potential competitor's tender documents, forcing these competitors to stay away from participating in bidding process.

Which if these two effects are dominant? Given the data at our hand, there is no way to separate the two effects. We however can shed some light based on the descriptive statistics and the results on completion in e-GP. To see this, note the obvious that in the package implementation phase, managerial cost of firms outside the districts are likely to be higher than that of firms located inside the districts. For example, an outside-the-district contractor either has to travel more (greater travel cost) from his mother district or have to rent a new place as temporary office and residence, whereas in-district contractors travel less and already has a residence.

This will influences their participation in bidding. The in-district contractors will be able bid less than outsiders, has a higher probability of winning and therefore, will participate in more procurement packages than outside-the-district contractors. Hence, it can be said that if an outside-the-district bidder participates in a bid, it is very likely that most other in-district contractors have participated as well. On the other hand, if an in-district contractor participates, it does not automatically imply that many other outside-the-district firms participated in the bidding process. Hence, a low number of participating bidder implies that probability of participation (or number) of outside-the-district contractors is low whereas high number would indicate otherwise.

However, as figure 7 and table 2 suggest, greater number of participants does not necessarily lower prices. The effect of competition lowers price only when the number of bidders are small enough. After certain threshold, increased competition actually is associated with higher price, although figure 7 indicates that it remains constant after a certain degree of participation. This is indicative that the national competition effect caused by e-GP system's easier participation from any contractor outside the district is less probable. However, this in no way is a robust test.

What are the robust ways to separate the two effects? One possibility is to focus on the nature of competition that emerge through these channels. The reduction of political influence facilitate local competition, as e-GP allows secured participation of local bidders, who were willing to, but were failing to, participate in the bidding process at least to certain extent due to local political influence. The increased competition due to reduction in economic cost of competition however increases national

competition.[4]It is still important to stress that bidders outside the district will also face higher cost of delivering the package in question since a bidder needs to relocate to the new district, increasing the cost of project implementation.

Given the above potential channels of effects, there is a simple yet robust way to separate the two effects. This is to consider the number of bidders participated from*outside* the procuring district as an additional explanatory variable.This factor will work as a proxy for the increased national competition resultant from lower cost of participation due to e-GP and therefore, allow us to look at the national competition effect of e-GP. On the other hand, including this as a control variable would allow to filter out the national competition effect from the e-GP such that it will now represent the political effect only. The comparison of the two coefficients would help us determine which effect is dominant.

There is another way to check the existence of political effect. This can be done by finding outthe political connection of the contract winners. Names of award winners, both under traditional and e-GP system, are already available. A survey on these contractors can help identify political connection of each firm.[5] We can then check probability of winning a bid by a politically connected firm in e-GP system in comparison to traditional procurement system.

Extensions

To what extent is the above cost reduction actually realized? This is an important question due to potential ratchet effect caused by increased competition. Indeed, a winning contractor may deliberately bid low to win and request for a cost overrun later. This is particularly possible if the agency has previous records of allowing cost overruns frequently. It is therefore important to check to what extent does this happen.

Whereas ratchet effect may potentially increase final price to cost ratio, it may go other way too. To see this, note that there are two types of contractors: politically connected and business oriented. If the political elite case is true, the politically connected firms have higher probability of winning under traditional system. Since they will be connected well with the public agency, it is likely that they will be more successful in managing cost overruns for themselves. Procurement under e-GP on the other hand allows business oriented firms to relatively win more often. Since they have relatively less influence on

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[4]There are two implicit assumptions. First, economic cost differential in participating in a bid for a local bidder are not significant, given the expected gain. It is possible that greater number of local bidders may also participate due to lower economic cost of participation caused by e-GP. Given the size of a district (average size = 1,398 square km), however, the economic cost of participating in a bid in a bidder's own district under traditional procurement system is much less compared to expected gains of participation. Hence, even though cost of participation has been lowered significantly by e-GP, this cost was unlikely to be decisive in participating in bidding process under traditional system at the first place and hence, should not increase local participation through this channel. Second, bidders from other districts do not participate in procurement process under traditional system. This is possibly due to *higher* cost of participation in the bidding process. Also, the lower cost of participation under traditional system provides a natural cost advantage to the local bidders, making participating outside district unattractive. Anecdotal evidence from LGED and CPTU officials suggest that bidders typically participate only on their own district, procurement calls and very rarely in other districts' calls under traditional system.

[5] Focus Group Discussions, Key Informant Interview and Event Analysis can also be used instead of a survey to find out political connectivity of a firm.

the public agency, it is less likely that they will be able to manage the cost overruns. In addition, the business oriented firms may be more cost efficient than the politically connected firms and hence, are less likely to request for an overrun. Hence, it is possible to observe the opposite as well. Nevertheless, it is a very important factor worth investigated.

How can this be tested? Two strategies can be done in order to check this. First, it can be tested whether e-GP system is also associated with higher incidence of cost overruns. A probit/logit model with a dummy dependent variable equals 1 if the project has a cost overrun) and 0 if not) can be regressed over the e-GP dummy over time in the same manner as above.[6]

Second, and more important, we can make use of the final payment made to the contractor against the contract price or estimated cost. If this final price-to-contract price is higher in e-GP by the margin as it is lower in contract price-to-estimated cost under e-GP, then the gain from increased competition is completely crowded out, suggesting the presence of ratchet effect. On the other hand, if there is no such differences or even the price-to-price ratio is actually lower, then the business orientation story is at play. Another way to look at the same thing is to investigate final price-to-estimated cost ratio. If ratchet effect is present, this measure should not be different between traditional and e-GP system. If it goes down by the same margin or more, then we have business orientation effect.

Lewis-Faupel et al. (2013) have looked at a few additional indicators. In India, they find that e-procurement improves road quality whereas in Indonesia, e-procurement reduces delays in project completion. They also find that there is a broader distribution of winners with better performers are coming from outside the region. Their findings suggest that e-procurement is effective in facilitating better firms to participate and obtain the public contracts where there are also efficiency gains from higher quality outputs being delivered. These indicators are however not very easy to estimate for LGED in Bangladesh due to unavailability of data. For example, an independent data on quality of such public works packages are not available in Bangladesh. The official testing results are there, but they are not well maintained and potentially manipulated as well. The expected date of completion is not available making it impossible to estimate delays in package completion.

One possibility to check the time efficiency is to calculate a time per dollar indicator for a package. The contract begin date and the completion dates are available. Using these dates, the number of days to complete a package can be calculated. This can then be divided by the contract or final price information to estimate number of days taken per dollar spent in the package. It can then be tested whether e-GP has any impact on time per dollar spent of a package.

VII. Conclusion

This paper looks at the effect of electronic government procurement in price to cost ratio in a public agency in Bangladesh. The electronic procurement system allows a bidder to place a bid from anywhere

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[6] We are currently collecting data on actual costs. Our current data reveals that out of 329 completed packages that were procured under traditional system, 19 packages experienced a cost overrun, even though these overruns are very minimal in magnitude (less than 1,000 taka or US$ 12.75 over the contract prices). On the other hand, about 53 packages procured under e-GP system are completed and none experience a cost overrun. This generally indicates that cost overrun is not a common phenomenon in LGED.

in the country through electronic government procurement portal. We hypothesized that this will reduce prices of procured items through two channels. First, it will allow bidders from all around the country to participate in a bid, opening up the competition a nationwide. Second, it will allow the local bidders to participate in the bidding process, who under traditional system often used to face illegal coercion not to participate in the bidding process.

We collect detailed procurement package level data from a public agency in Bangladesh. The timing of e-GP implementation varies across the districts allowing us to design a quasi-experiment and identify the effect of e-GP. We find that introduction of e-GP has reduced price to cost ratio by at least 10.25% and in most robust estimation, by 11.85%, resulting into cost savings of more than US$ 10 million. We further observe suggestive evidence that e-GP more likely helps foster local competition rather than nationwide competition, an indicator of restricting the political influence.

There are a few additional factors that need to be checked or tested. First, a more robust strategy needs to be used to separate the two effects. A potential way could be to see the effect of participation of outside-district contractors. Second, to what extent this cost savings are actually realized need to be tested through using final bill payments for each packages rather than contract prices. Of little data that we have, it does not indicate possibility of cost overruns suggesting that the cost savings are probably real. Nevertheless, it should be checked on all the packages. Third, there are a few other qualitative indicators to be tracked. One is the quality of the package. Another one is how quickly the package is delivered normalized by package size. These would indicate other improvements resultant from e-GP system, potentially through a different set of contractors.

Bibliography

Bandiera, Oriana, Andrea Prat, and TommasoValletti. 2009. "Active and Passive Waste in Government Spending: Evidence from a Policy Experiment." *American Economic Review,* 94(4): 1278-1308.

Coviello, Decio, and Mario Mariniello. 2014. "Publicity Requirements in Public Procurement: Evidence from a regression discontinuity design." *Journal of Public Economics,* 109: 76-100.

D'Souza, Anna and Daniel Triesman. 2013."Who bribes in Public Contracting and Why: Worldwide Evidence from Firms." *Economics of Governance,* 14: 333 – 367.

Di Tella, Rafael, and Ernesto Schargrodsky. 2003. "The role of Wages and Auditing during a Crackdown on Corruption in the city of Buenos Aires." *Journal of Law and Economics, 46(1): 269-292.*

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes and Andrei Shleifer. 2010. Disclosure by Politicians*. American Economic Journal: Applied Economics*, 2(2): 179 – 209.

Faccio, Mara. 2006. "Politically Connected Firms." *The American Economic Review,* 96(1): 369-386.

Fan, C. Simon, Chen Lin and Daniel Treisman. 2009. "Political Decentralization and Corruption: Evidence From around the world." *Journal of Public Economics*, 93: 14-34.

Ferraz, Claudio and FredericoFenan. 2011. "Electoral Accountability and Corruption: Evidence from the Audits of Local Governments." *American Economic Review*, 101(4): 1274 – 1311.

Henderson, J. Vernon, and Ari Kuncoro. 2011. "Corruption and Local Democratization in Indonesia: The role of Islamic parties." *Journal of Development Economics,* 94: 164-180.

Imai, Misami. 2009. "Political Determinants of Government Loans in Japan." *Journal of Law and Economics,* 52(1): 41-70.

Khemani, Stuti. 2004. "Political Cycles in a Developing Economy: effect of elections in the Indian States." *Journal of Development Economics*, 73: 125-154.

Khwaja, AsimIjaz, and AtifMian. 2005. "Do Lenders Favor Politically Connected Firms? Rent Provision in an Emerging Financial Market." *The Quarterly Journal of Economics.* 120(4): 1371-1411.

Lewis-Faupel, Sean, Yusuf Neggers, Benjamin A. Olken, and RohiniPande. 2014."Can Electronic Procurement Improve Infrastructure Provision? Evidence from Public Works in India and Indonesia." NBER Working paper No.

Li, Hongbin, LingshengMeng, Qian Wang, and Li-An Zhou. 2008. "Political Connections, Financing and Firm Performance: Evidence from Chinese private firms." *Journal of Development Economics,* 87: 283-299.

Mahmood, Shakeel Ahmed Ibne. 2013. "Public Procurement System and e-Government Implementation in Bangladesh: The role of Public Administration." *Journal of Public Administration and Policy Research*, 5(5): 117 – 123.

Markussen, Thomas, and Finn Tarp. 2014. "Political Connections and Land-Rated Investment in Rural Vietnam." *Journal of Development Economics,* 110: 291-302.

Sukhtankar, Sandip. 2012. "Sweetening the Deal? Political Connections and Sugar Mills in India." *American Economic Journal: Applied Economics,* 4(3): 43-63.

Tran, Anh.2008. "Can procurement Auctions Reduce Corruption? Evidence from the Internal Records of a Bribe- Paying Firm." *Harvard Kennedy School job- market paper.*

World Bank. 2007. "Electronic Government Procurement (e-GP): Opportunities and Challenges." *World Bank Resources.*

Appendix

Figure 1: % of procured items under e-GP over time at LGED
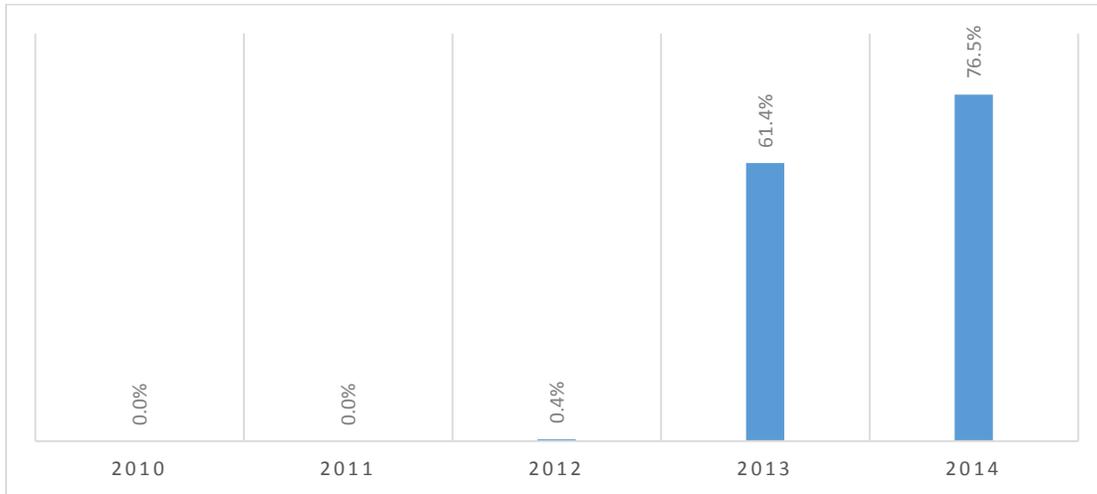

Figure 2: Percentage of e-GP procured items done by LGED
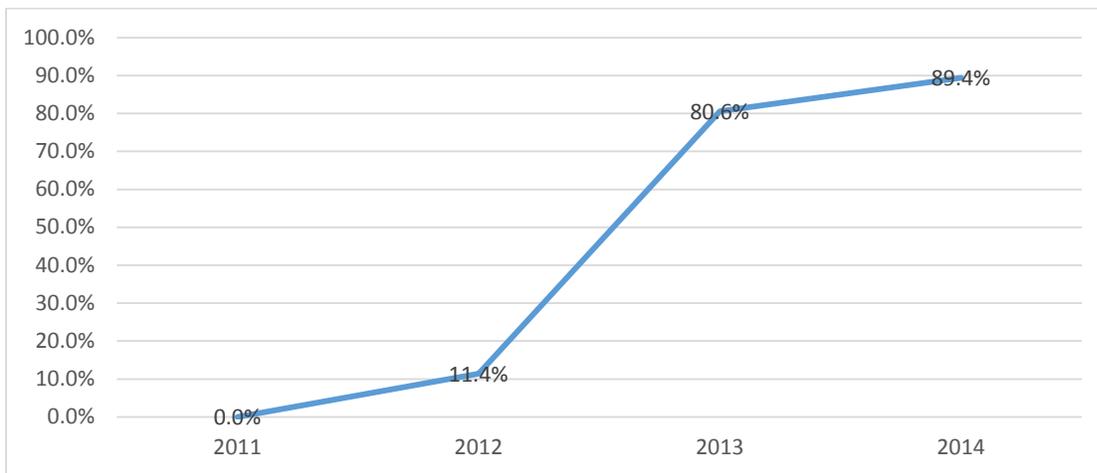
Figure 3: Value of procurement under e-GP and LGED share in it over time
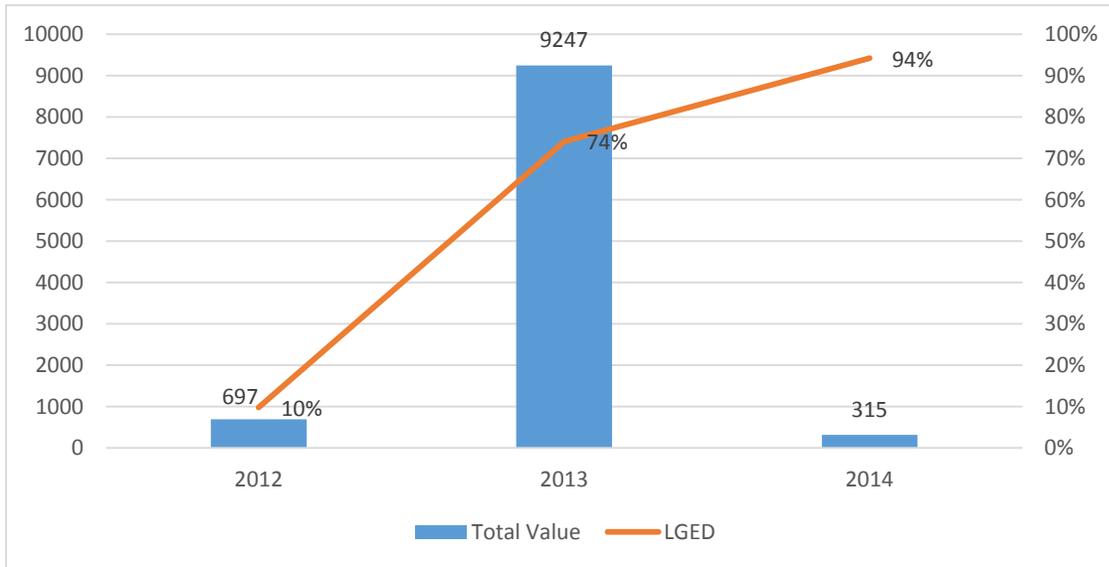

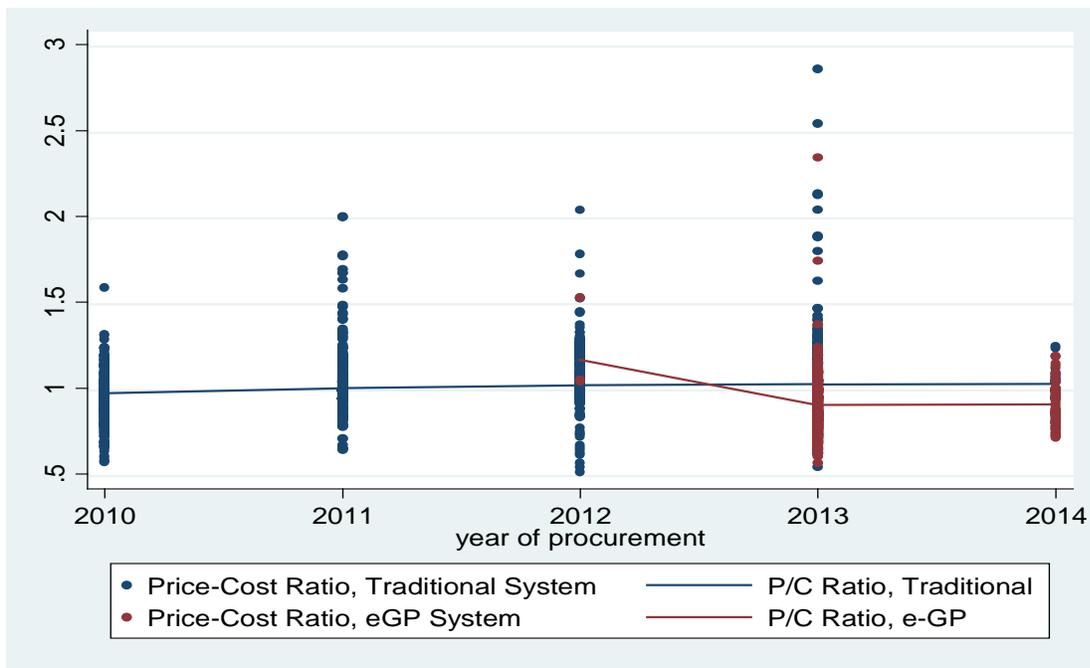Figure 4: Price-Cost Ratio over time under traditional system and e-GP system[7]

Figure 5: Price-Cost Ratio under e-GP system in all the three agencies over time

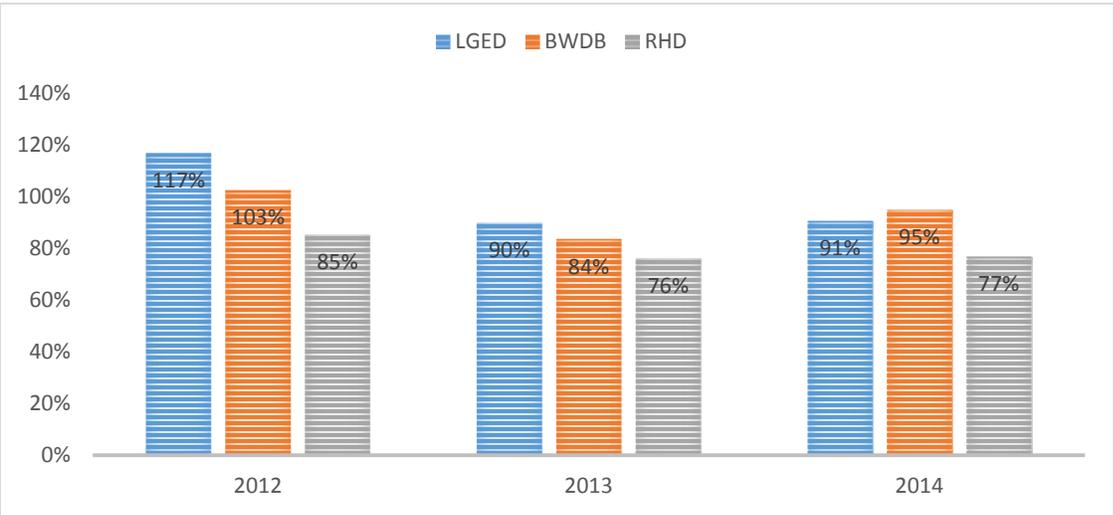[7] The trend lines are estimated by lowess smoother.

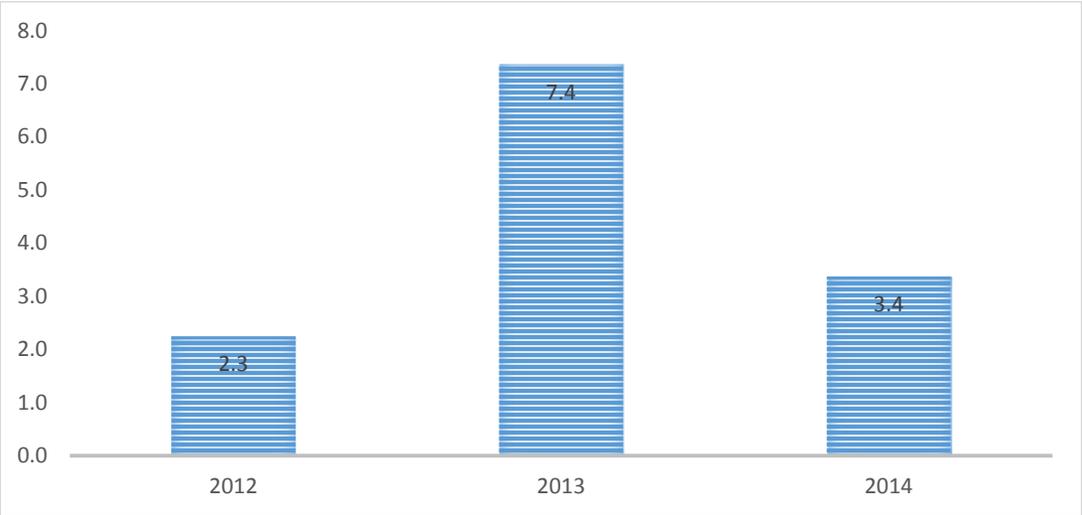Figure 6: Average Number of bidders participated in e-GP at LGED over time

Figure 7: Relationship between number of bidders and price to cost ratio in e-GP system
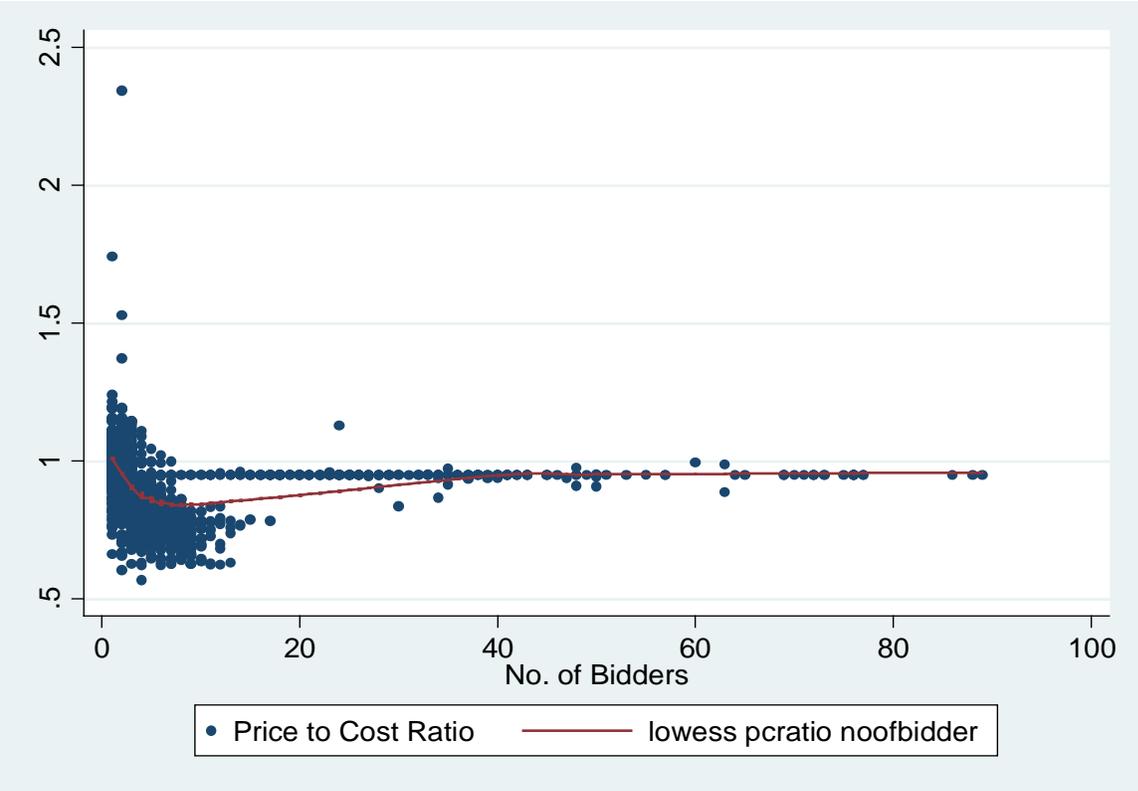
Table 1: Effect of e-GP on Price to Cost Ratio

VARIABLES	OLS (1)	OLS (2)	OLS (3)	OLS (4)	RE (5)	FE (6)	RE (7)	FE (8)
e-GP	-0.1050***	-0.1025***	-0.1217***	-0.1316***	-0.1187***	-0.1185***	-0.1249***	-0.1246***
	(0.0097)	(0.0095)	(0.0134)	(0.0126)	(0.0116)	(0.0117)	(0.0111)	(0.0112)
	[-10.8746]	[-10.8263]	[-9.1053]	[-10.4144]	[-10.2148]	[-10.1738]	[-11.2363]	[-11.1671]
Estimated Cost (million Taka)		0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
		[3.0973]	[3.0706]	[3.1390]	[3.3146]	[3.2902]	[3.3518]	[3.3287]
Yearly Trend				0.0165***			0.0188***	0.0188***
				(0.0041)			(0.0039)	(0.0039)
				[4.0521]			[4.8597]	[4.8243]
Constant	1.0053***	1.0029***	0.9786***	-32.1880***	0.9688***	0.9732***	-36.7446***	-36.8901***
	(0.0060)	(0.0059)	(0.0063)	(8.1892)	(0.0081)	(0.0062)	(7.7663)	(7.8545)
	[167.6289]	[169.5624]	[155.0909]	[-3.9306]	[119.8020]	[157.5161]	[-4.7313]	[-4.6967]
Observations	6,651	6,651	6,651	6,651	6,651	6,651	6,651	6,651
R-squared	0.1445	0.1571	0.1809	0.1761		0.1517		0.1490
Distrct FE	No	No	No	No	No	YES	No	YES
Year FE	NO	NO	YES	No	YES	YES	No	No
ll	4986	5035	5131	5111	.	5519	.	5509
Number of disttricts	65	65	65	65	65	65	65	65

Robust standard errors in first parentheses and t-statistic in second parenthesis. The p_values are indicated as *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Effect of number of Bidders on Price to Cost Ratio

VARIABLES	RE (1)	RE (2)	FE (3)	FE (4)	RE (5)	RE (6)	FE (7)	FE (8)
No. of bidders	-0.0010	-0.0095***	-0.0012	-0.0104***	-0.0011	-0.0095***	-0.0012*	-0.0105***
	(0.0007)	(0.0028)	(0.0007)	(0.0031)	(0.0007)	(0.0028)	(0.0007)	(0.0031)
	[-1.5946]	[-3.4148]	[-1.6650]	[-3.3451]	[-1.6403]	[-3.4225]	[-1.7060]	[-3.3515]
No. of bidder^2		0.0001***		0.0001***		0.0001***		0.0001***
		(0.0000)		(0.0000)		(0.0000)		(0.0000)
		[3.4077]		[3.3451]		[3.4030]		[3.3400]
Estimated Cost	0.0041***	0.0034***	0.0040***	0.0033***	0.0042***	0.0036***	0.0042***	0.0034***
	(0.0010)	(0.0010)	(0.0010)	(0.0011)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
	[4.0266]	[3.3250]	[3.8962]	[3.0876]	[4.3237]	[3.5899]	[4.1762]	[3.3296]
Yearly Trend					-0.0334	-0.0328	-0.0368*	-0.0360
					(0.0213)	(0.0212)	(0.0217)	(0.0219)
					[-1.5676]	[-1.5487]	[-1.6949]	[-1.6427]
Constant	1.1075***	1.1470***	1.1131***	1.1573***	68.0851	67.0444	75.0622*	73.3957
	(0.1147)	(0.1152)	(0.1132)	(0.1142)	(42.8667)	(42.6922)	(43.7591)	(44.1088)
	[9.6518]	[9.9557]	[9.8315]	[10.1352]	[1.5883]	[1.5704]	[1.7154]	[1.6640]
Observations	1,845	1,845	1,845	1,845	1,845	1,845	1,845	1,845
R-squared			0.0637	0.1509			0.0566	0.1435
Number of districts	64	64	64	64	64	64	64	64
Distrct FE	No	No	YES	YES	No	No	YES	YES
Year FE	YES	YES	YES	YES	No	No	No	No

Robust standard errors in first parentheses and t-statistic in second parenthesis. The p_values are indicated as *** p<0.01, ** p<0.05, * p<0.1.

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