Online Appendix

Contract Duration and the Costs of Market Transactions

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Additional Appendices

Note: Appendices A and B are included with the main text.

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E Measurement Error in FPDS

Though the FPDS data are broadly appealing for research, there is measurement error in the data. Examining the stream of entries under each contract suggests that user input error can be significant. For example, the initial entry for the contract may report the completion date to be equal to the start date of the contract, even though a later entry shows that the contract was for a longer period. Likewise, there are inconsistencies in how the dollar values of the contract are reported across entries. As most contracts have multiple entries and multiple indicators of duration and value within each entry, different assumptions about data quality could lead to widely different measures of price. As I obtained high-quality measures of price and duration from a second data source, FedBizOpps, I was able to cross-validate the data and construct preferred measures from the FPDS.

E.1 Cross-Validating Initial Entries in FPDS with Realized Contracts

Obtaining a quality measure of initial contract value is important. In this paper, I examine how this value shifts with contract duration. As another example, recent papers study cost overruns, or charges over and above the initial contract value (see, e.g., Decarolis et al., 2020). In my sample, I have found the initial measures of total contract value taking directly from the FPDS to be unreliable. This is likely due to entry error, as FPDS data are not automatically generated directly from the signed contracts.

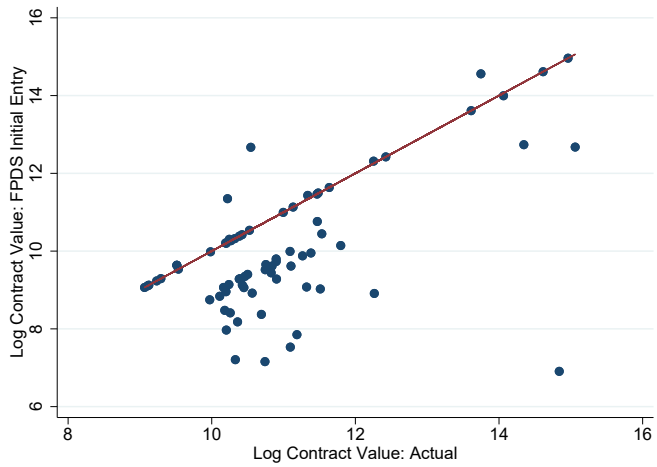
To account for this potential measurement error, I obtained a sample of 75 realized contracts from FedBizOpps that had finalized terms for price, duration, and total contract value. By comparing the terms on the contract to what is reported in FPDS, I am able to to get a sense for the degree of measurement error.

Each entry in FPDS has three measures of value: dollars obligated, base and exercised options value, and base and all options value. The first corresponds to the accounting amount owed at the time of the action, the second should correspond to the total value of future payments for the options that have been exercised, and the third should correspond to the full value of all options on the contract. The third measure is the greatest of the three (except for additional input error), so, as a conservative measure, I consider this the initial reported value in FPDS.[6] Using the other two measures exacerbates the measurement error I show below.

Comparing the initial entries to actual contract terms shows that the initial contract value reported in FPDS does not accurately measure the initial contract value. Figure E1 shows the initial reported contract value in FPDS plotted against the actual initial value obtained directly from the contract. The plot is in log terms, and the 45-degree red line indicates an exact correspondence between the two values. Points lying below the red line indicate underreporting. 45

[6] Instructions from the FPDS user manual corresponding to this variable: "Enter the mutually agreed upon total contract or order value including all options (if any). For modifications, this is the change (positive or negative, if any) in the mutually agreed upon total contract value." https://fpds.gov/wiki/index.php/FPDS-NG_User_Manual

Figure E1: Measurement Error in FPDS Initial Entries



Notes: Figure displays the (log) contract value according to the initial entry in the Federal Procurement Data System (FPDS) versus the actual initial (log) contract value. The actual initial contract value was obtained for a sample of 75 completed contracts from the analysis sample. Roughly three-quarters of the points lie below the 45-degree line (plotted in red), which indicates systematic underreporting in the FPDS relative to the true contract value. The initial measure from the FPDS corresponds to "Base And All Options Value", which is the largest of the three measures reported in each FPDS entry.

of the 75 contracts show underreporting in the initial entry in the FPDS. The median (mean) difference is -1.099 log points, corresponding to a 67 percent difference.

Examining each of the 75 contracts shows that measurement error arises from a variety of inconsistencies in how data are entered into FPDS. One error that occurs with some frequency is that the user enters only the contract value for that fiscal year, rather than the full value of the contract. In the sample of 75 contracts, the median duration is 3 years, so applying this error across all the contracts would result underreporting of 67 percent as above. Because the typical building cleaning contract is 3 to 4 times longer that the average service contract, this error may be of more importance for this category relative to other service contracts; however, other forms of entry error could also lead to systematic underreporting.

Another common entry error is that the user enters the amount of dollars obligated across all three of the variables for contract value, rather than indicating the total value of the contract using base and all options value. Table E1 provides an example of the first five entries in FPDS corresponding to a single contract. The entry for the total value is equivalent to the dollars obligated in the first entry ($10,740), as well as in all following entries. According to the posting on FedBizOpps on January 26, 2010, the total value of the five-year contract ("Contract Award Dollar Amount") was $54,300. This is equal to the sum of dollars obligated across all 13 entries in FPDS for the contract. The amounts entered in FPDS in these cases are best interpreted as accounting measures for past and current payments, rather than future obligations that capture

Table E1: Entries in FPDS for an Example Contract

modnumber	reasonformodification	effectivedate	ultimatecompletiondate	dollarsobligated	baseandalloptionsvalue
0		1/1/2010	12/31/2014	10740	10740
1	C: FUNDING ONLY ACTION	12/8/2010	12/8/2010	2700	2700
2	M: OTHER ADMINISTRATIVE ACTION	4/14/2011	9/30/2011	900	900
3	C: FUNDING ONLY ACTION	5/6/2011	9/30/2011	4500	4500
4	C: FUNDING ONLY ACTION	10/18/2011	3/31/2012	5415	5415
...	...	...	...	...	...

Notes: Table displays the first five entries in FPDS corresponding to contract PIID AG0276P100005. This contract illustrates a typical entry mistake in FPDS, where the user enters the same amount for dollars obligated and the total value of the contract (base and all options value). On the FedBizOpps website, a posting dated January 26, 2010 states the total value of the five-year contract ("Contract Award Dollar Amount") of $54,300. The total of dollars obligated across all 13 entries in FPDS is equal to this value.

total contract value.

E.2 Constructing Accurate Measures of Contract Value

Though the initial entry is not reliable for estimating the total contract value, additional measures can be obtained from the FPDS that perform well. For example, if the same value of dollars obligated are reported in consecutive years, then that value likely represents the annual price of the contract. In supplemental work, I detail the steps to cross-check the data and different candidate measures for price and duration. These comparisons result in the following recommendations:

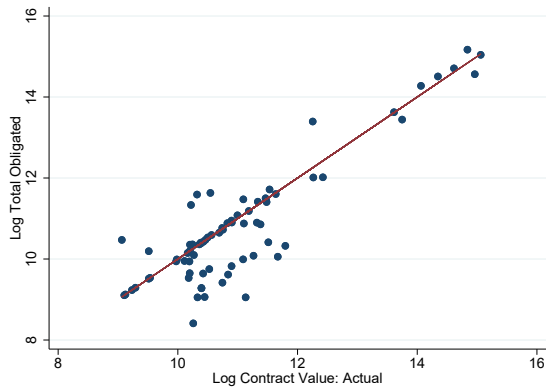
Duration *The maximum observed date in the contract, minus the start date in the first entry within a contract.*

Price *The price is the value of obligated dollars if it is the same (or within 10 percent) in consecutive years. If this is not observable, use the maximum value of the three (summed) measures of dollar amounts for the total value of the contract. Divide this by the duration measure above to obtain the price.*

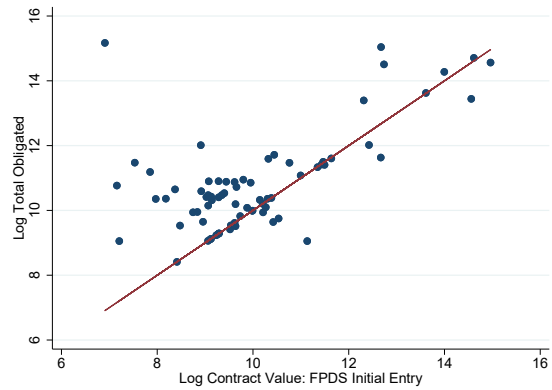
Any missing values of price or duration in the FedBizOpps data are imputed with the above values constructed from FPDS. Researchers interested working with the FPDS data may contact the author for additional details about the measurement error in the FPDS data and the accuracy of variables constructed under alternative assumptions. Though these measures are not completely free from measurement error, the cross-validation exercise suggests that they are centered on the true value, as opposed to being systematically underreported. These measures are most applicable to fixed-price contracts, where the ex post payments are not subject to the same degree of uncertainty as, for example, cost-plus contracts.

Figure E2: Cost Overruns or Measurement Error?

(a) Total Obligated vs. Actual Contract Value



(b) Total Obligated vs. FPDS Initial Value



Notes: Figure displays the (log) total payments on a contract (total obligated) vs. two different measures of initial contract value. Total payments are calculated from summing up dollars obligated across entries in the FPDS. Panel (a) compares total payments to the actual value obtained for a sample of 75 completed contracts. Panel (b) compares total payments to the initial reported contract value in the FPDS for the same sample. Points lying above the 45-degree line (plotted in red) correspond to inferred cost overruns. The median implied overrun in panel (a) is 0. The median implied overrun in panel (b) is 0.242 log points, or 27 percent. The fact that many of the points (61 percent) lie above the 45-degree line in panel (b) arises from the measurement error in the initial FPDS entry, which is captured in Figure E1.

E.3 Is There Evidence of Cost Overruns?

Examining the initial contract value from a sample of contracts provides further evidence that ex post incentive concerns may not be first-order for building cleaning services. One indicator of ex post incentive problems is the presence of cost overruns, or payments above and beyond the initially agreed-upon amount.

By calculating the total amount paid on an individual contract and comparing it to the total amount, we can examine whether the buyer (the government) ends up paying more in cost overruns. The sample of 75 contracts used to benchmark these figures all finished before the end of the data, so the total amounts reflect the full time series of payments.

Figure E2 examines cost overruns by plotting the (log) total amount obligated on the contract against measures of the initial value of the contract. The red 45-degree line indicates exact correspondence between the initial value and the total payments. Panel (a) compares the total payments to the actual initial value of the contract. The total payments follow the initial value of the payments quite closely. A regression of (log) total obligated on (log) initial contract value returns a coefficient of 0.99. The median cost overrun in the sample, defined as the difference between the two logged values, is zero.

Panel (b) compares the total payments to the total value according to the initial entry in FPDS. The median implied overrun is 0.242 log points, or 27 percent. The majority of points

(61 percent) lie above the 45-degree line, suggesting a substantial degree of cost overruns. Likewise, the 75 percentile of implied overruns is 1.27 log points, compared to only 0.05 log points when using the actual initial value in panel (a). The fact that this panel suggest cost overruns is a direct result of measurement error in the initial entry in FPDS. The underreporting showing in Figure E1 translates to implied cost overruns. Measurement error is further captured by a regression of (log) total obligated on (log) contract value according to the initial entry in FPDS. The coefficient estimate is only 0.57, compared to 0.99 when a more accurate measure of initial value is used.

Thus, a comparison of payments made to actual initial contract value demonstrates that cost overruns are not a significant concern for this product category (building cleaning services with an annual price less than $1 million). This provides suggestive evidence that ex post incentive concerns are not first-order in this market.