

# Percentage Delay Rate (with Time Independent Clean Control): QuickPay (2009-2012)

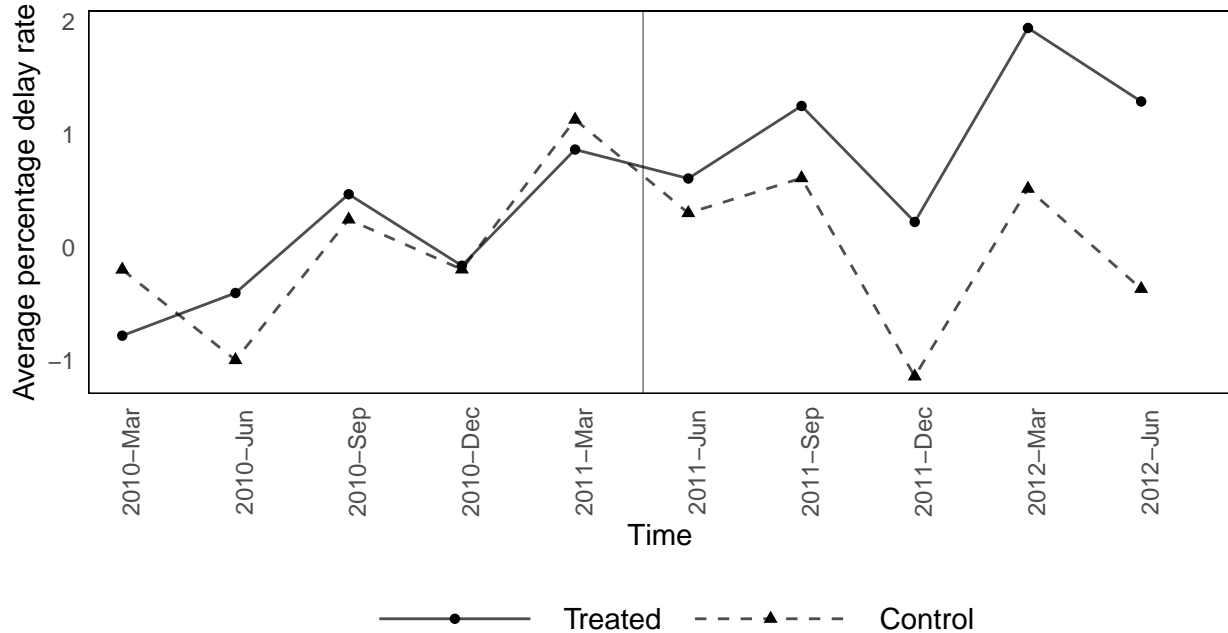
Feb 22, 2023

- Sample consists of a “time independent” clean control group
  - This means we keep all small projects.
  - We keep only those large projects that don’t have a concurrent small project in *any* quarter.
- When we analyze congestion effect, we restrict to only one type of contractor. That is, contractors that hold only small project or only large project in the sample horizon.
- Number of offers received is also winsorized.

## 1 Setup

## 2 Demeaned delay rate (in percentage)

- Subtract the average pre-quickpay delay rate from each observation



## 3 Summary statistics

## 4 Baseline Regressions

$$PercentDelay_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \beta_3 (Treat_i \times Post_t) + e_{it}$$

| Variable                          | SB.Mean | SB.Std Dev | SB.5% | SB.95%  | SB.Obs | LB.Mean | LB.Std Dev | LB.5% | LB.95%  | LB.Obs |
|-----------------------------------|---------|------------|-------|---------|--------|---------|------------|-------|---------|--------|
| Percentage delay                  | 3.88    | 25.08      | 0.00  | 14.07   | 45944  | 5.69    | 30.93      | 0.00  | 33.59   | 35894  |
| Initial duration (in days)        | 256.25  | 155.34     | 76.00 | 489.00  | 45944  | 282.14  | 163.94     | 80.00 | 568.00  | 35894  |
| Initial budget (000s)             | 534.94  | 2338.67    | 3.31  | 2535.99 | 45944  | 1440.09 | 5164.52    | 3.71  | 7492.45 | 35894  |
| Number of offers                  | 4.58    | 6.59       | 1.00  | 15.00   | 45944  | 3.96    | 9.30       | 1.00  | 13.00   | 35894  |
| Project stage                     | 0.33    | 0.23       | 0.02  | 0.75    | 45944  | 0.34    | 0.24       | 0.02  | 0.75    | 35894  |
| Positive delay (indicator)        | 0.06    | 0.24       | 0.00  | 1.00    | 45944  | 0.08    | 0.28       | 0.00  | 1.00    | 35894  |
| Negative delay (indicator)        | 0.01    | 0.09       | 0.00  | 0.00    | 45944  | 0.01    | 0.09       | 0.00  | 0.00    | 35894  |
| Competitively awarded (indicator) | 0.87    | 0.33       | 0.00  | 1.00    | 45944  | 0.81    | 0.39       | 0.00  | 1.00    | 35894  |
| Contract financing (indicator)    | 0.13    | 0.33       | 0.00  | 1.00    | 45944  | 0.14    | 0.34       | 0.00  | 1.00    | 35894  |

Table 1: Before QuickPay

| Variable                          | SB.Mean | SB.Std Dev | SB.5% | SB.95%  | SB.Obs | LB.Mean | LB.Std Dev | LB.5% | LB.95%   | LB.Obs |
|-----------------------------------|---------|------------|-------|---------|--------|---------|------------|-------|----------|--------|
| Percentage delay                  | 4.36    | 23.32      | 0.00  | 27.22   | 67523  | 4.54    | 24.02      | 0.00  | 29.59    | 60748  |
| Initial duration (in days)        | 293.29  | 179.56     | 87.00 | 606.00  | 67523  | 337.92  | 199.09     | 90.00 | 733.00   | 60748  |
| Initial budget (000s)             | 750.96  | 2911.52    | 3.51  | 3886.88 | 67523  | 1824.54 | 6141.86    | 3.72  | 10306.48 | 60748  |
| Number of offers                  | 4.62    | 5.60       | 1.00  | 15.00   | 67523  | 3.67    | 7.12       | 1.00  | 12.00    | 60748  |
| Project stage                     | 0.41    | 0.26       | 0.03  | 0.85    | 67523  | 0.43    | 0.26       | 0.03  | 0.85     | 60748  |
| Positive delay (indicator)        | 0.09    | 0.28       | 0.00  | 1.00    | 67523  | 0.10    | 0.29       | 0.00  | 1.00     | 60748  |
| Negative delay (indicator)        | 0.01    | 0.08       | 0.00  | 0.00    | 67523  | 0.01    | 0.10       | 0.00  | 0.00     | 60748  |
| Competitively awarded (indicator) | 0.87    | 0.34       | 0.00  | 1.00    | 67523  | 0.72    | 0.45       | 0.00  | 1.00     | 60748  |
| Contract financing (indicator)    | 0.13    | 0.33       | 0.00  | 1.00    | 67523  | 0.14    | 0.35       | 0.00  | 1.00     | 60748  |

Table 2: After QuickPay

$$\begin{aligned}
PercentDelay_{it} = & \alpha + \beta_0 Treat_i + \beta_1 Post_t + \beta_2 (Treat_i \times Post_t) \\
& + X_i + (Post_t \times X_i) + \mu_t + \theta_{firm} + \lambda_{task} + \epsilon_{it}
\end{aligned}$$

| var_name             | SB.before | LB.before | SB.after | LB.after |
|----------------------|-----------|-----------|----------|----------|
| Number of tasks      | 786       | 707       | 947      | 900      |
| Number of industries | 64        | 65        | 62       | 64       |

Table 3: Effect of QuickPay on project delay rates

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                           | -1.76***<br>(0.11)               | -1.30***<br>(0.11) | -1.35***<br>(0.11) | -0.90***<br>(0.11) | -0.91***<br>(0.11) |
| <i>Post<sub>t</sub></i>                            | -0.21*<br>(0.12)                 | -5.57***<br>(0.78) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | 1.10***<br>(0.14)                | 0.97***<br>(0.14)  | 1.01***<br>(0.14)  | 0.99***<br>(0.13)  | 1.01***<br>(0.13)  |
| Constant   | 5.27***<br>(0.10)                | 43.19***<br>(0.61) |                    |                    |                    |
| Duration, Budget, Bids                             | No                               | Yes                | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub></i> × (Duration, Budget, Bids) | No                               | Yes                | Yes                | Yes                | Yes                |
| Project stage                                      | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects                                 | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects                                 | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                             | No                               | No                 | No                 | No                 | Yes                |
| Observations                                       | 223,244                          | 201,738            | 201,738            | 201,738            | 201,738            |
| R <sup>2</sup>                                     | 0.002                            | 0.17               | 0.18               | 0.21               | 0.21               |
| Adjusted R <sup>2</sup>                            | 0.002                            | 0.17               | 0.18               | 0.21               | 0.21               |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 5 Relative delay

Table 4: Effect of QuickPay on project delay rates

|  | <i>RelativeDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|-----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                               | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                           | -1.98***<br>(0.16)                | -1.73***<br>(0.14) | -1.79***<br>(0.14) | -1.17***<br>(0.14) | -1.17***<br>(0.14) |
| <i>Post<sub>t</sub></i>                            | 0.09<br>(0.16)                    | -4.20***<br>(1.08) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | 1.65***<br>(0.19)                 | 1.17***<br>(0.18)  | 1.23***<br>(0.18)  | 1.20***<br>(0.17)  | 1.23***<br>(0.17)  |
| Constant   | 6.72***<br>(0.13)                 | 56.90***<br>(0.83) |                    |                    |                    |
| Duration, Budget, Bids                             | No                                | Yes                | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i> | No                                | Yes                | Yes                | Yes                | Yes                |
| Project stage                                      | No                                | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects                                 | No                                | No                 | Yes                | Yes                | Yes                |
| Task fixed effects                                 | No                                | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                             | No                                | No                 | No                 | No                 | Yes                |
| Observations                                       | 200,855                           | 200,789            | 200,789            | 200,789            | 200,789            |
| R <sup>2</sup>                                     | 0.002                             | 0.17               | 0.18               | 0.21               | 0.22               |
| Adjusted R <sup>2</sup>                            | 0.002                             | 0.17               | 0.18               | 0.21               | 0.21               |

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 6 Days of delay (One Quarter)

Table 5: Effect of QuickPay on project delay rates

|  | <i>DelayDays<sub>it</sub></i> |                    |                    |                    |                    |
|--|-------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                           | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                           | -3.44***<br>(0.19)            | -2.28***<br>(0.18) | -2.38***<br>(0.18) | -1.81***<br>(0.18) | -1.84***<br>(0.18) |
| <i>Post<sub>t</sub></i>                            | 1.24***<br>(0.20)             | -5.79***<br>(1.23) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | 1.51***<br>(0.24)             | 1.69***<br>(0.24)  | 1.78***<br>(0.24)  | 1.72***<br>(0.24)  | 1.74***<br>(0.24)  |
| Constant   | 8.80***<br>(0.16)             | 53.07***<br>(0.92) |                    |                    |                    |
| Duration, Budget, Bids                             | No                            | Yes                | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub></i> × (Duration, Budget, Bids) | No                            | Yes                | Yes                | Yes                | Yes                |
| Project stage                                      | No                            | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects                                 | No                            | No                 | Yes                | Yes                | Yes                |
| Task fixed effects                                 | No                            | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                             | No                            | No                 | No                 | No                 | Yes                |
| Observations                                       | 223,373                       | 201,867            | 201,867            | 201,867            | 201,867            |
| R <sup>2</sup>                                     | 0.004                         | 0.14               | 0.14               | 0.18               | 0.18               |
| Adjusted R <sup>2</sup>                            | 0.004                         | 0.14               | 0.14               | 0.17               | 0.17               |

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 7 Days of delay (Two Quarters)

Table 6: Effect of QuickPay on project delay rates

|  | <i>DelayRate<sub>it</sub></i> |                     |                    |                    |                    |
|--|-------------------------------|---------------------|--------------------|--------------------|--------------------|
|  | (1)                           | (2)                 | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                           | -8.52***<br>(0.52)            | -5.20***<br>(0.53)  | -5.37***<br>(0.53) | -3.93***<br>(0.55) | -3.77***<br>(0.55) |
| <i>Post<sub>t</sub></i>                            | 4.43***<br>(0.59)             | -18.77***<br>(3.66) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | 3.17***<br>(0.70)             | 3.58***<br>(0.73)   | 3.75***<br>(0.73)  | 3.89***<br>(0.74)  | 3.87***<br>(0.74)  |
| Constant   | 21.06***<br>(0.45)            | 116.48***<br>(2.67) |                    |                    |                    |
| Duration, Budget, Bids                             | No                            | Yes                 | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i> | No                            | Yes                 | Yes                | Yes                | Yes                |
| Project stage                                      | No                            | Yes                 | Yes                | Yes                | Yes                |
| Year-Quarter fixed effects                         | No                            | No                  | Yes                | Yes                | Yes                |
| Task fixed effects                                 | No                            | No                  | No                 | Yes                | Yes                |
| Industry fixed effects                             | No                            | No                  | No                 | No                 | Yes                |
| Observations                                       | 94,123                        | 84,737              | 84,737             | 84,737             | 84,737             |
| R <sup>2</sup>                                     | 0.01                          | 0.17                | 0.17               | 0.22               | 0.22               |
| Adjusted R <sup>2</sup>                            | 0.01                          | 0.17                | 0.17               | 0.20               | 0.21               |

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
SEs are robust and clustered at the project level.

## 8 Positive delays: Logit

Table 7: Logit model: Effect of QuickPay

| Dependent Variable:      | $I(Delay_{it} > 0)$ |                    |                    |                    |                    |
|--------------------------|---------------------|--------------------|--------------------|--------------------|--------------------|
| Model:                   | (1)                 | (2)                | (3)                | (4)                | (5)                |
| <i>Variables</i>         |                     |                    |                    |                    |                    |
| Constant                 | -1.99***<br>(0.02)  | 3.22***<br>(0.13)  |                    |                    |                    |
| $Treat_i$                | -0.44***<br>(0.03)  | -0.22***<br>(0.03) | -0.24***<br>(0.03) | -0.21***<br>(0.03) | -0.23***<br>(0.03) |
| $Post_t$                 | 0.10***<br>(0.02)   | -1.42***<br>(0.15) |                    |                    |                    |
| $Treat_i \times Post_t$  | 0.21***<br>(0.03)   | 0.21***<br>(0.04)  | 0.23***<br>(0.04)  | 0.23***<br>(0.04)  | 0.23***<br>(0.04)  |
| Controls                 |                     | Yes                | Yes                | Yes                | Yes                |
| Controls $\times Post_t$ |                     | Yes                | Yes                | Yes                | Yes                |
| <i>Fixed-effects</i>     |                     |                    |                    |                    |                    |
| Time                     |                     |                    | Yes                | Yes                | Yes                |
| Task code                |                     |                    |                    | Yes                | Yes                |
| NAICS code               |                     |                    |                    |                    | Yes                |
| <i>Fit statistics</i>    |                     |                    |                    |                    |                    |
| Observations             | 223,373             | 201,867            | 201,867            | 199,508            | 199,470            |
| Squared Correlation      | 0.003               | 0.24               | 0.24               | 0.28               | 0.28               |
| Pseudo $R^2$             | 0.005               | 0.24               | 0.24               | 0.30               | 0.30               |
| BIC                      | 152,027.7           | 112,255.0          | 112,164.9          | 113,713.7          | 113,928.5          |

*Clustered (Project ID) standard-errors in parentheses*

*Signif. Codes: \*\*\*: 0.01, \*\*: 0.05, \*: 0.1*

## 9 Positive delays: Conditional TE

Table 8: Conditional TE: Positive delay

|  | <i>PercentDelay<sub>it</sub>(conditional on positive)</i> |                      |                     |                     |                     |
|--|---|----------------------|---------------------|---------------------|---------------------|
|  | (1)   | (2)                  | (3)                 | (4)                 | (5)                 |
| <i>Treat<sub>i</sub></i>                           | -5.87<br>(5.42)   | -22.68***<br>(4.28)  | -22.85***<br>(4.28) | -25.17***<br>(4.59) | -25.24***<br>(4.64) |
| <i>Post<sub>t</sub></i>                            | -51.73***<br>(4.68)                                       | -36.01*<br>(19.74)   |                     |                     |                     |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | 15.61**<br>(6.20)   | 22.58***<br>(4.98)   | 22.77***<br>(4.99)  | 26.76***<br>(5.03)  | 28.25***<br>(5.03)  |
| Constant   | 160.76***<br>(4.08)                                       | 694.17***<br>(15.55) |                     |                     |                     |
| Duration, Budget, Bids                             | No  | Yes                  | Yes                 | Yes                 | Yes                 |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i> | No  | Yes                  | Yes                 | Yes                 | Yes                 |
| Project stage                                      | No  | Yes                  | Yes                 | Yes                 | Yes                 |
| Time fixed effects                                 | No  | No                   | Yes                 | Yes                 | Yes                 |
| Task fixed effects                                 | No  | No                   | No                  | Yes                 | Yes                 |
| Industry fixed effects                             | No  | No                   | No                  | No                  | Yes                 |
| Observations                                       | 24,084  | 24,045               | 24,045              | 24,045              | 24,045              |
| R <sup>2</sup>                                     | 0.01  | 0.39                 | 0.39                | 0.46                | 0.47                |
| Adjusted R <sup>2</sup>                            | 0.01  | 0.39                 | 0.39                | 0.44                | 0.45                |

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 10 Negative delays: Logit



Table 9: Logit model: Effect of QuickPay

| Dependent Variable:      | $I(Delay_{it} < 0)$ |                     |                    |                    |                    |
|--------------------------|---------------------|---------------------|--------------------|--------------------|--------------------|
| Model:                   | (1)                 | (2)                 | (3)                | (4)                | (5)                |
| <i>Variables</i>         |                     |                     |                    |                    |                    |
| Constant                 | -4.61***<br>(0.06)  | -10.07***<br>(0.44) |                    |                    |                    |
| $Treat_i$                | -0.29***<br>(0.08)  | 0.13<br>(0.09)      | 0.14*<br>(0.09)    | 0.02<br>(0.09)     | 0.02<br>(0.09)     |
| $Post_t$                 | 0.07<br>(0.07)      | 1.50***<br>(0.56)   |                    |                    |                    |
| $Treat_i \times Post_t$  | -0.24**<br>(0.10)   | -0.31***<br>(0.11)  | -0.32***<br>(0.11) | -0.29***<br>(0.10) | -0.29***<br>(0.10) |
| Controls                 |                     | Yes                 | Yes                | Yes                | Yes                |
| Controls $\times Post_t$ |                     | Yes                 | Yes                | Yes                | Yes                |
| <i>Fixed-effects</i>     |                     |                     |                    |                    |                    |
| Time                     |                     |                     | Yes                | Yes                | Yes                |
| Task code                |                     |                     |                    | Yes                | Yes                |
| NAICS code               |                     |                     |                    |                    | Yes                |
| <i>Fit statistics</i>    |                     |                     |                    |                    |                    |
| Observations             | 223,373             | 201,867             | 201,867            | 177,464            | 176,917            |
| Squared Correlation      | 0.0004              | 0.007               | 0.008              | 0.02               | 0.03               |
| Pseudo R <sup>2</sup>    | 0.004               | 0.05                | 0.06               | 0.12               | 0.12               |
| BIC                      | 20,766.4            | 19,492.5            | 19,549.3           | 21,853.5           | 22,368.3           |

Clustered (Project ID) standard-errors in parentheses

Signif. Codes: \*\*\*: 0.01, \*\*: 0.05, \*: 0.1

## 11 Negative delays: Conditional TE

Table 10: Conditional TE: Negative delay (conditional on negative)

|  | <i>PercentDelay<sub>it</sub></i> |                   |                   |                 |                 |
|--|----------------------------------|-------------------|-------------------|-----------------|-----------------|
|  | (1)                              | (2)               | (3)               | (4)             | (5)             |
| <i>Treat<sub>i</sub></i>                           | 3.72*<br>(2.15)                  | 2.28<br>(1.98)    | 2.27<br>(2.00)    | 0.74<br>(2.43)  | 1.06<br>(2.47)  |
| <i>Post<sub>t</sub></i>                            | 8.13***<br>(2.01)                | -2.26<br>(9.66)   |                   |                 |                 |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | -8.74***<br>(2.72)               | -5.62**<br>(2.47) | -5.44**<br>(2.48) | -2.87<br>(3.00) | -3.55<br>(3.03) |
| Constant   | -35.47***<br>(1.66)              | 7.39<br>(8.06)    |                   |                 |                 |
| Duration, Budget, Bids                             | No                               | Yes               | Yes               | Yes             | Yes             |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i> | No                               | Yes               | Yes               | Yes             | Yes             |
| Project stage                                      | No                               | Yes               | Yes               | Yes             | Yes             |
| Time fixed effects                                 | No                               | No                | Yes               | Yes             | Yes             |
| Task fixed effects                                 | No                               | No                | No                | Yes             | Yes             |
| Industry fixed effects                             | No                               | No                | No                | No              | Yes             |
| Observations                                       | 1,786                            | 1,786             | 1,786             | 1,786           | 1,786           |
| R <sup>2</sup>                                     | 0.01                             | 0.22              | 0.23              | 0.39            | 0.43            |
| Adjusted R <sup>2</sup>                            | 0.01                             | 0.22              | 0.22              | 0.24            | 0.27            |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

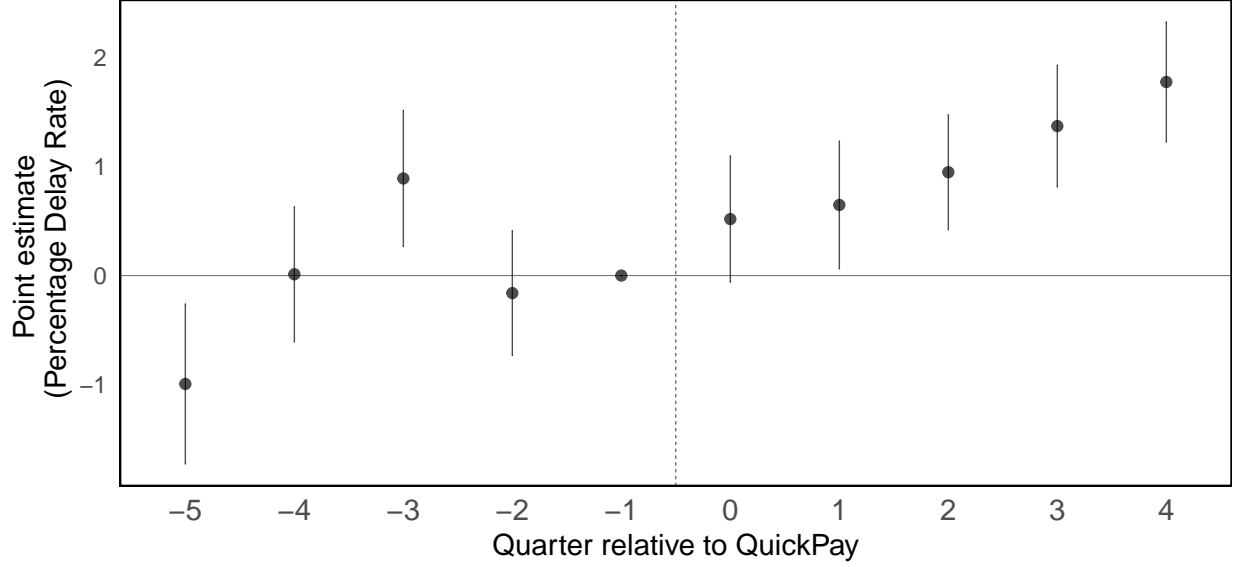
SEs are robust and clustered at the project level.

## 12 Event study

$$PercentDelay_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Treat_i \times Quarter_t + Controls + \gamma_{task} + \theta_{naics} + \lambda_{quarter} + \epsilon_{it}$$

## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.

## i Please use `linewidth` instead.



### 13 Parallel Trends Test

Table 11: Linear Time Trend Before QuickPay

|  | <i>PercentDelay<sub>it</sub></i> |                    |                  |                 |                 |
|--|----------------------------------|--------------------|------------------|-----------------|-----------------|
|  | (1)                              | (2)                | (3)              | (4)             | (5)             |
| <i>Treat<sub>i</sub></i>                           | -1.37***<br>(0.41)               | -0.65<br>(0.41)    | -0.65<br>(0.41)  | -0.44<br>(0.41) | -0.52<br>(0.41) |
| <i>QuarterNum</i>                                  | 0.42***<br>(0.08)                | -1.16**<br>(0.50)  |                  |                 |                 |
| <i>Treat<sub>i</sub> × QuarterNum</i>              | -0.09<br>(0.09)                  | -0.17*<br>(0.09)   | -0.17*<br>(0.09) | -0.03<br>(0.09) | -0.03<br>(0.09) |
| Constant   | 3.36***<br>(0.35)                | 48.76***<br>(2.32) |                  |                 |                 |
| Duration, Budget, Bids                             | No                               | Yes                | Yes              | Yes             | Yes             |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i> | No                               | Yes                | Yes              | Yes             | Yes             |
| Project stage                                      | No                               | Yes                | Yes              | Yes             | Yes             |
| Time fixed effects                                 | No                               | No                 | Yes              | Yes             | Yes             |
| Task fixed effects                                 | No                               | No                 | No               | Yes             | Yes             |
| Industry fixed effects                             | No                               | No                 | No               | No              | Yes             |
| Observations                                       | 84,367                           | 77,984             | 77,984           | 77,984          | 77,984          |
| R <sup>2</sup>                                     | 0.005                            | 0.20               | 0.20             | 0.26            | 0.27            |
| Adjusted R <sup>2</sup>                            | 0.005                            | 0.20               | 0.20             | 0.25            | 0.26            |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Observations are for quarters before quickpay.

## 14 Temporal Placebo Test

- Restrict to pre-QuickPay observations
- Assign “treatment date” as 2010-09-30

[1] 4

Table 12: Placebo test: Treatment Time 2010-09-30

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                |
| $Treat_i$                                | -1.62***<br>(0.22)               | -1.56***<br>(0.22) | -1.57***<br>(0.22) | -0.80***<br>(0.22) | -0.85***<br>(0.22) |
| $Post$                                   | 1.12***<br>(0.21)                | -5.03***<br>(1.50) |                    |                    |                    |
| $Treat_i \times Post$                    | -0.20<br>(0.25)                  | 0.23<br>(0.25)     | 0.23<br>(0.25)     | 0.31<br>(0.25)     | 0.32<br>(0.25)     |
| Constant                                 | 4.45***<br>(0.19)                | 48.36***<br>(1.30) |                    |                    |                    |
| Duration, Budget, Bids                   | No                               | Yes                | Yes                | Yes                | Yes                |
| $Post_t \times$ (Duration, Budget, Bids) | No                               | Yes                | Yes                | Yes                | Yes                |
| Project stage                            | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects                       | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects                       | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                   | No                               | No                 | No                 | No                 | Yes                |
| Observations                             | 84,367                           | 77,984             | 77,984             | 77,984             | 77,984             |
| R <sup>2</sup>                           | 0.004                            | 0.20               | 0.20               | 0.26               | 0.27               |
| Adjusted R <sup>2</sup>                  | 0.004                            | 0.20               | 0.20               | 0.25               | 0.26               |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Observations are for quarters before quickpay.

## 15 Cross-sectional placebo

- Projects are randomly assigned into treatment or control

Table 13: Effect of QuickPay on project delay rates

|  | <i>PercentDelay<sub>it</sub></i> |                    |                 |                 |                 |
|--|----------------------------------|--------------------|-----------------|-----------------|-----------------|
|  | (1)                              | (2)                | (3)             | (4)             | (5)             |
| <i>Treat<sub>i</sub></i>                           | 0.03<br>(0.10)                   | -0.02<br>(0.09)    | -0.01<br>(0.09) | 0.01<br>(0.09)  | 0.004<br>(0.09) |
| <i>Post<sub>t</sub></i>                            | 0.59***<br>(0.09)                | -4.34***<br>(0.75) |                 |                 |                 |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | -0.13<br>(0.13)                  | -0.12<br>(0.12)    | -0.13<br>(0.12) | -0.12<br>(0.11) | -0.11<br>(0.11) |
| Constant   | 4.10***<br>(0.07)                | 41.64***<br>(0.58) |                 |                 |                 |
| Duration, Budget, Bids                             | No                               | Yes                | Yes             | Yes             | Yes             |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i> | No                               | Yes                | Yes             | Yes             | Yes             |
| Project stage                                      | No                               | Yes                | Yes             | Yes             | Yes             |
| Time fixed effects                                 | No                               | No                 | Yes             | Yes             | Yes             |
| Task fixed effects                                 | No                               | No                 | No              | Yes             | Yes             |
| Industry fixed effects                             | No                               | No                 | No              | No              | Yes             |
| Observations                                       | 223,244                          | 201,738            | 201,738         | 201,738         | 201,738         |
| R <sup>2</sup>                                     | 0.0003                           | 0.17               | 0.17            | 0.21            | 0.21            |
| Adjusted R <sup>2</sup>                            | 0.0003                           | 0.17               | 0.17            | 0.21            | 0.21            |

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 16 Congestion Effect

### 16.1 Number of projects per contractor

### 16.1.1 Contractors holding only small or only large projects

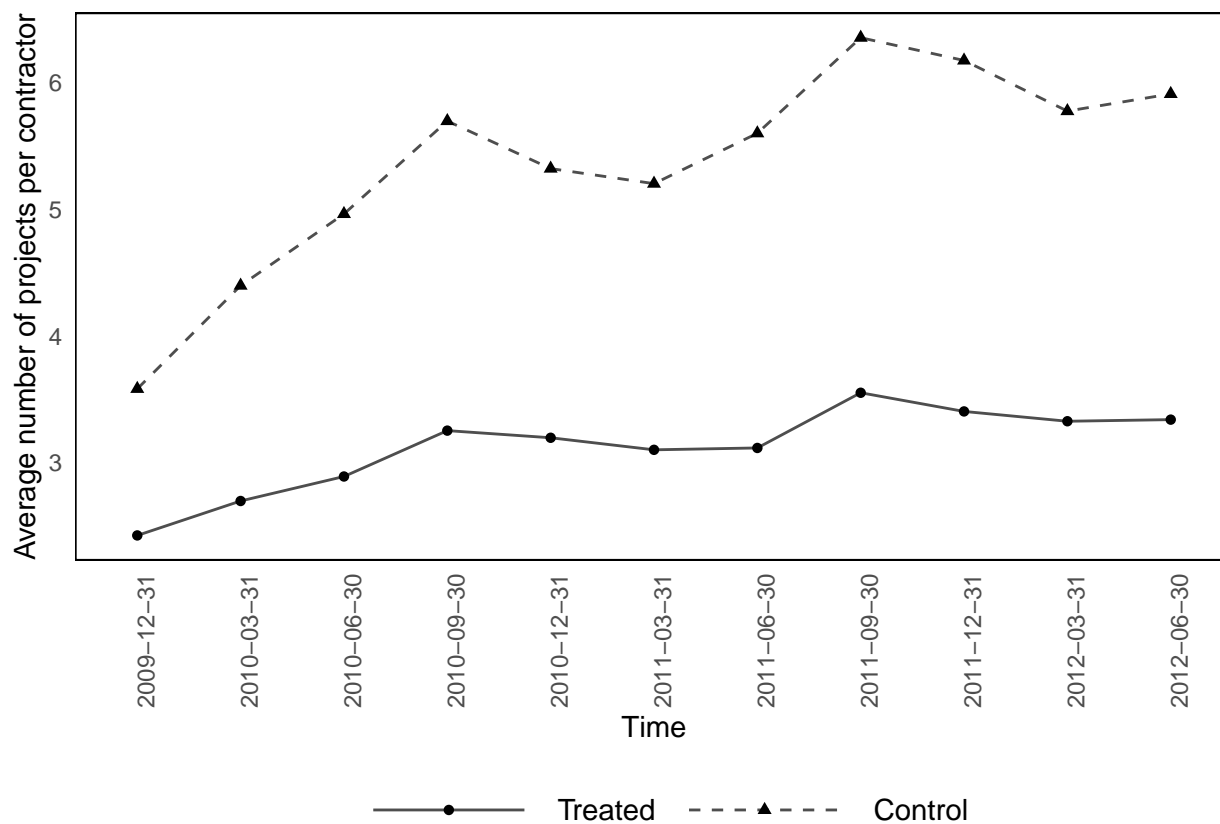


Table 14: Num Contractor Projects and QuickPay reform

|                         | Number of projects |                    |
|-------------------------|--------------------|--------------------|
|                         | (1)                | (2)                |
| $Treat_i$               | -2.03***<br>(0.39) | -2.03***<br>(0.39) |
| $Post_t$                | 0.94**<br>(0.41)   |                    |
| $Treat_i \times Post_t$ | -0.58<br>(0.41)    | -0.58<br>(0.41)    |
| Constant                | 5.03***<br>(0.38)  |                    |
| Time fixed effects      | No                 | Yes                |
| Observations            | 84,391             | 84,391             |
| R <sup>2</sup>          | 0.005              | 0.01               |
| Adjusted R <sup>2</sup> | 0.005              | 0.01               |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a contractor-quarter.

SEs are robust and clustered at the contractor level.

Sample restricted to contractors performing only one type of project.

16.1.2 Contractors holding at least one small project are “treated”

## 16.2 Total budget

16.2.1 Contractors holding only small or only large projects

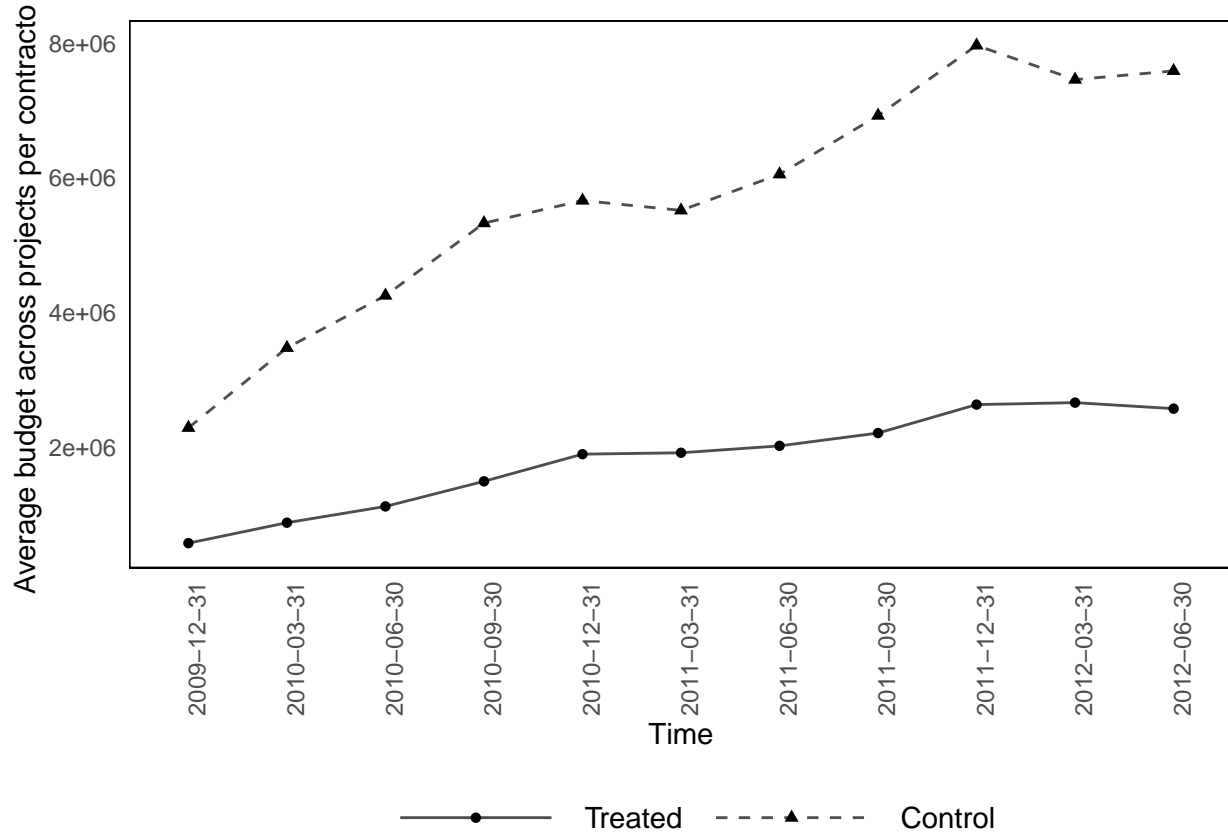


Table 15: Contractor Project Budget and QuickPay reform

| Total budget (000,000s) |                    |                    |
|-------------------------|--------------------|--------------------|
|                         | (1)                | (2)                |
| $Treat_i$               | -3.30***<br>(0.53) | -3.30***<br>(0.53) |
| $Post_t$                | 2.46***<br>(0.29)  |                    |
| $Treat_i \times Post_t$ | -1.47***<br>(0.29) | -1.48***<br>(0.29) |
| Constant                | 4.73***<br>(0.52)  |                    |
| Time fixed effects      | No                 | Yes                |
| Observations            | 84,391             | 84,391             |
| R <sup>2</sup>          | 0.02               | 0.02               |
| Adjusted R <sup>2</sup> | 0.02               | 0.02               |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a contractor-quarter.

SEs are robust and clustered at the contractor level.

Sample restricted to contractors performing only one type of project.

### 16.3 Number of tasks



### 16.3.1 Contractors holding only small or only large projects

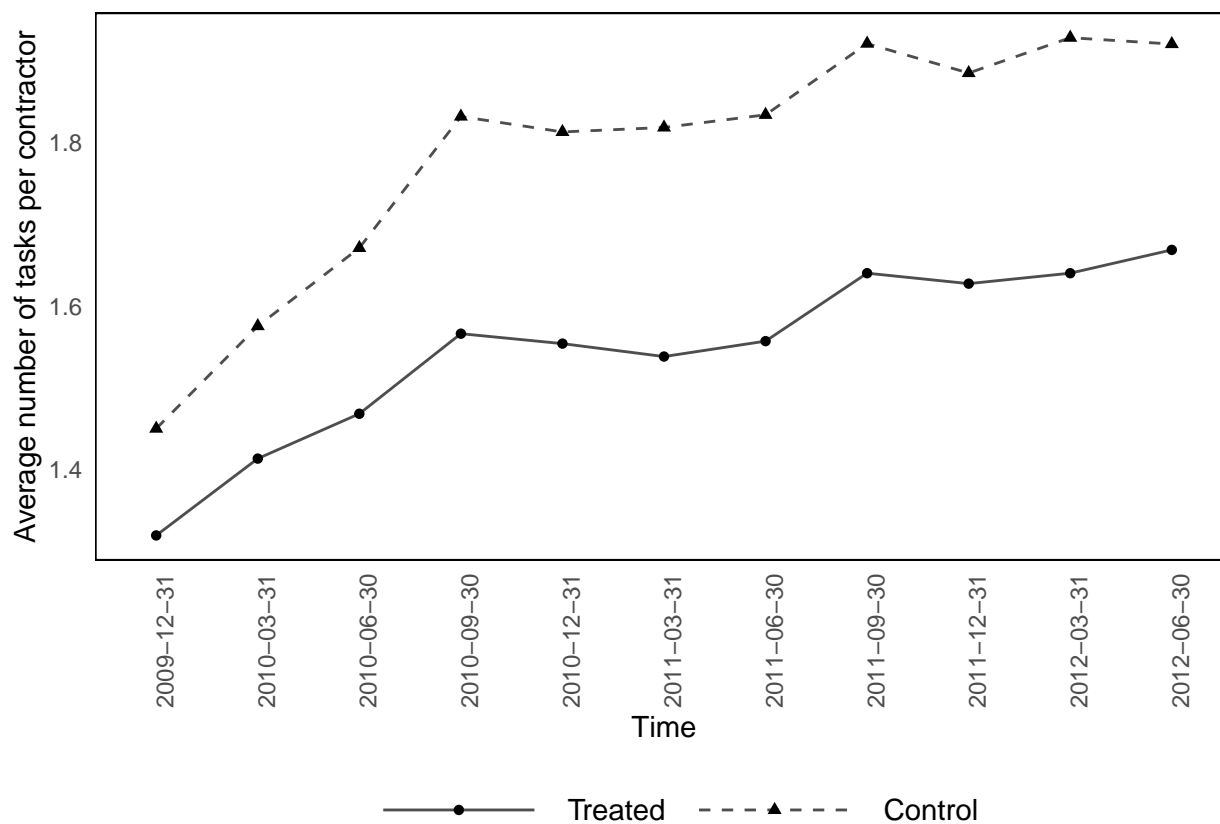


Table 16: Contractor Project Tasks and QuickPay reform

|                         | Number of tasks    |                    |
|-------------------------|--------------------|--------------------|
|                         | (1)                | (2)                |
| $Treat_i$               | -0.23***<br>(0.04) | -0.23***<br>(0.04) |
| $Post_t$                | 0.17***<br>(0.02)  |                    |
| $Treat_i \times Post_t$ | -0.04<br>(0.03)    | -0.04<br>(0.03)    |
| Constant                | 1.73***<br>(0.04)  |                    |
| Time fixed effects      | No                 | Yes                |
| Observations            | 84,391             | 84,391             |
| R <sup>2</sup>          | 0.01               | 0.01               |
| Adjusted R <sup>2</sup> | 0.01               | 0.01               |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a contractor-quarter.

SEs are robust and clustered at the contractor level.

Sample restricted to contractors performing only one type of project.

## 17 Project portfolio: Spillover effect

### 17.1 Regression 1: DID on large projects

- Sample restricted to large projects only.
- $Treat$  is an indicator that equals one for LARGE projects whose contractor has at least one small project at any point, and is zero otherwise

Table 17: Project Portfolio and QuickPay reform

|  | <i>PercentDelay<sub>it</sub></i> |                     |                    |                  |                   |
|--|----------------------------------|---------------------|--------------------|------------------|-------------------|
|  | (1)                              | (2)                 | (3)                | (4)              | (5)               |
| $Treat_i$                                | 1.53***<br>(0.23)                | -0.55***<br>(0.17)  | -0.64***<br>(0.17) | 0.43**<br>(0.17) | 0.46***<br>(0.17) |
| $Post_t$                                 | -0.35***<br>(0.13)               | -13.73***<br>(1.19) |                    |                  |                   |
| $Treat_i \times Post_t$                  | 0.08<br>(0.27)                   | 0.52**<br>(0.22)    | 0.60***<br>(0.22)  | 0.23<br>(0.22)   | 0.33<br>(0.22)    |
| Constant                                 | 5.96***<br>(0.11)                | 64.62***<br>(0.91)  |                    |                  |                   |
| Duration, Budget, Bids                   | No                               | Yes                 | Yes                | Yes              | Yes               |
| $Post_t \times$ (Duration, Budget, Bids) | No                               | Yes                 | Yes                | Yes              | Yes               |
| Project stage                            | No                               | Yes                 | Yes                | Yes              | Yes               |
| Time fixed effects                       | No                               | No                  | Yes                | Yes              | Yes               |
| Task fixed effects                       | No                               | No                  | No                 | Yes              | Yes               |
| Industry fixed effects                   | No                               | No                  | No                 | No               | Yes               |
| Observations                             | 117,787                          | 110,601             | 110,601            | 110,601          | 110,601           |
| R <sup>2</sup>                           | 0.002                            | 0.26                | 0.26               | 0.30             | 0.30              |
| Adjusted R <sup>2</sup>                  | 0.002                            | 0.26                | 0.26               | 0.29             | 0.29              |

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Sample restricted to large projects only.

## 17.2 Treatment intensity

Table 18: Project Portfolio and QuickPay reform

|   | <i>PercentDelay<sub>it</sub></i> |                     |                   |                    |                   |
|---|----------------------------------|---------------------|-------------------|--------------------|-------------------|
|   | (1)                              | (2)                 | (3)               | (4)                | (5)               |
| Num of small projects (logged)                            | 1.79***<br>(0.11)                | 0.22***<br>(0.06)   | 0.19***<br>(0.06) | 0.43***<br>(0.06)  | 0.44***<br>(0.06) |
| <i>Post<sub>t</sub></i>                                   | 0.10<br>(0.12)                   | -13.10***<br>(1.19) |                   |                    |                   |
| Num of small projects (logged) $\times Post_t$            | -0.68***<br>(0.12)               | -0.05<br>(0.08)     | -0.02<br>(0.08)   | -0.21***<br>(0.08) | -0.17**<br>(0.08) |
| Constant  | 5.21***<br>(0.10)                | 63.41***<br>(0.92)  |                   |                    |                   |
| Duration, Budget, Bids                                    | No                               | Yes                 | Yes               | Yes                | Yes               |
| <i>Post<sub>t</sub></i> $\times$ (Duration, Budget, Bids) | No                               | Yes                 | Yes               | Yes                | Yes               |
| Project stage   | No                               | Yes                 | Yes               | Yes                | Yes               |
| Time fixed effects  | No                               | No                  | Yes               | Yes                | Yes               |
| Task fixed effects  | No                               | No                  | No                | Yes                | Yes               |
| Industry fixed effects                                    | No                               | No                  | No                | No                 | Yes               |
| Observations  | 117,787                          | 110,601             | 110,601           | 110,601            | 110,601           |
| R <sup>2</sup>  | 0.01                             | 0.26                | 0.26              | 0.30               | 0.30              |
| Adjusted R <sup>2</sup>                                   | 0.01                             | 0.26                | 0.26              | 0.29               | 0.29              |

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Sample restricted to large projects only.

## 17.3 Regression 2: Incremental effect on small project with existing large project

- $Treat_{i,l}$  is an indicator that equals 1 for small projects whose contractor holds a large project at any point in time, and is zero otherwise.
- Large projects whose contractor holds small projects are removed to get a clean control group.

Table 19: (Incremental effect) Project Portfolio and QuickPay reform

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                           | −0.79***<br>(0.13)               | −0.48***<br>(0.11) | −0.54***<br>(0.11) | −0.68***<br>(0.12) | −0.71***<br>(0.12) |
| <i>Treat<sub>i,l</sub></i>                         | −2.74***<br>(0.11)               | −2.46***<br>(0.10) | −2.41***<br>(0.10) | −0.72***<br>(0.10) | −0.64***<br>(0.10) |
| <i>Post<sub>t</sub></i>                            | −0.21*<br>(0.12)                 | −5.41***<br>(0.79) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>        | 1.22***<br>(0.15)                | 1.04***<br>(0.15)  | 1.09***<br>(0.15)  | 1.11***<br>(0.15)  | 1.13***<br>(0.15)  |
| <i>Treat<sub>i,l</sub> × Post<sub>t</sub></i>      | −0.48***<br>(0.14)               | −0.28**<br>(0.14)  | −0.33**<br>(0.14)  | −0.38***<br>(0.14) | −0.38***<br>(0.14) |
| Constant   | 5.27***<br>(0.10)                | 43.79***<br>(0.61) |                    |                    |                    |
| Duration, Budget, Bids                             | No                               | Yes                | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i> | No                               | Yes                | Yes                | Yes                | Yes                |
| Project stage                                      | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects                                 | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects                                 | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                             | No                               | No                 | No                 | No                 | Yes                |
| Observations                                       | 223,244                          | 201,738            | 201,738            | 201,738            | 201,738            |
| R <sup>2</sup>                                     | 0.01                             | 0.18               | 0.18               | 0.21               | 0.21               |
| Adjusted R <sup>2</sup>                            | 0.01                             | 0.18               | 0.18               | 0.21               | 0.21               |

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Large projects whose contractor holds small projects are removed.

Consider three groups based on contractor's portfolio:

- Group 1: Small and Large projects
- Group 2: Only small projects
- Group 3: Only large projects

### 17.3.1 Treatment intensity 1

- $TreatIntensity\_i = \log(1 + \text{number of large projects held by contractor of small project } i)$ . [Group 1]
- $TreatIntensity\_i = 0$  if project  $i$  is a small project but with no large project. [Group 2]
- $TreatIntensity\_i = 0$  if project  $i$  is a large project. [Group 3]

Table 20: Project Portfolio and QuickPay reform

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                             | -1.25***<br>(0.12)               | -0.93***<br>(0.11) | -0.98***<br>(0.11) | -0.78***<br>(0.11) | -0.80***<br>(0.11) |
| <i>TreatIntensity<sub>i</sub></i>                    | -0.75***<br>(0.04)               | -0.56***<br>(0.04) | -0.55***<br>(0.04) | -0.19***<br>(0.04) | -0.17***<br>(0.04) |
| <i>Post<sub>t</sub></i>                              | -0.21*<br>(0.12)                 | -5.54***<br>(0.78) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>          | 1.22***<br>(0.15)                | 1.06***<br>(0.14)  | 1.11***<br>(0.14)  | 1.11***<br>(0.14)  | 1.13***<br>(0.14)  |
| <i>TreatIntensity<sub>i</sub> × Post<sub>t</sub></i> | -0.30***<br>(0.05)               | -0.20***<br>(0.05) | -0.22***<br>(0.05) | -0.24***<br>(0.05) | -0.22***<br>(0.05) |
| Constant   | 5.27***<br>(0.10)                | 43.34***<br>(0.60) |                    |                    |                    |
| Duration, Budget, Bids                               | No                               | Yes                | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i>   | No                               | Yes                | Yes                | Yes                | Yes                |
| Project stage  | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects                                   | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects                                   | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                               | No                               | No                 | No                 | No                 | Yes                |
| Observations   | 223,244                          | 201,738            | 201,738            | 201,738            | 201,738            |
| R <sup>2</sup>                                       | 0.01                             | 0.18               | 0.18               | 0.21               | 0.21               |
| Adjusted R <sup>2</sup>                              | 0.01                             | 0.18               | 0.18               | 0.21               | 0.21               |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Large projects whose contractor holds small projects are removed.

### 17.3.2 Treatment intensity 2

- Remove projects in Group 2 [only small projects].
- *Treat<sub>i</sub>* = 1 for remaining small projects.
- *Treat\_Intensity\_Small<sub>i</sub>* = log(1 + number of small projects) for treated project i  
– Equivalently, *Treat\_Intensity\_Small<sub>i</sub>* = *Treat<sub>i</sub>* × log(1 + number of small projects)
- *Treat\_Intensity\_Small<sub>i</sub>* = 0 for large project i
- *Treat\_Intensity\_Large<sub>i</sub>* = log(1 + number of large projects) for treated project i
- *Treat\_Intensity\_Large<sub>i</sub>* = 0 for large project i

Table 21: Project Portfolio and QuickPay reform

|   | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|---|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|   | (1)                              | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>  | -0.61**<br>(0.30)                | -1.10***<br>(0.29) | -1.08***<br>(0.29) | -0.91***<br>(0.29) | -0.85***<br>(0.29) |
| <i>TreatIntensity<sub>i</sub></i> (Small)                           | -0.66***<br>(0.05)               | -0.63***<br>(0.05) | -0.63***<br>(0.05) | -0.18***<br>(0.05) | -0.17***<br>(0.05) |
| <i>TreatIntensity<sub>i</sub></i> (Large)                           | 0.26***<br>(0.06)                | 0.47***<br>(0.05)  | 0.48***<br>(0.05)  | 0.08<br>(0.05)     | 0.07<br>(0.05)     |
| <i>Post<sub>t</sub></i>   | -0.21*<br>(0.12)                 | -7.62***<br>(1.07) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>                         | 1.77***<br>(0.40)                | 1.80***<br>(0.40)  | 1.78***<br>(0.40)  | 1.71***<br>(0.40)  | 1.67***<br>(0.40)  |
| <i>TreatIntensity<sub>i</sub></i> (Small) × <i>Post<sub>t</sub></i> | -0.19***<br>(0.07)               | -0.14**<br>(0.07)  | -0.14**<br>(0.07)  | -0.12*<br>(0.07)   | -0.10<br>(0.07)    |
| <i>TreatIntensity<sub>i</sub></i> (Large) × <i>Post<sub>t</sub></i> | 0.04<br>(0.07)                   | 0.02<br>(0.07)     | 0.01<br>(0.07)     | -0.17**<br>(0.07)  | -0.16**<br>(0.07)  |
| Constant  | 5.27***<br>(0.10)                | 45.49***<br>(0.83) |                    |                    |                    |
| Duration, Budget, Bids  | No                               | Yes                | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub></i> × (Duration, Budget, Bids)                  | No                               | Yes                | Yes                | Yes                | Yes                |
| Project stage   | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects  | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects  | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects  | No                               | No                 | No                 | No                 | Yes                |
| Observations  | 130,022                          | 120,951            | 120,951            | 120,951            | 120,951            |
| R <sup>2</sup>  | 0.01                             | 0.17               | 0.17               | 0.21               | 0.21               |
| Adjusted R <sup>2</sup>   | 0.01                             | 0.17               | 0.17               | 0.21               | 0.21               |

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Large projects whose contractor holds small projects are removed.

### 17.3.3 Treatment Intensity 3

- Treatment is continuous here.
- Num of small projects  $\geq 1 \iff Treat_i = 1$
- Num of small projects = 0  $\iff Treat_i = 0$
- Restricted to only projects in Groups 2 and 3, i.e., only small and only large.

Table 22: Project Portfolio and QuickPay reform

|   | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|---|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|   | (1)                              | (2)                | (3)                | (4)                | (5)                |
| Num of small projects (logged)                            | -0.26***<br>(0.04)               | -0.37***<br>(0.03) | -0.39***<br>(0.03) | -0.28***<br>(0.03) | -0.29***<br>(0.03) |
| <i>Post<sub>t</sub></i>                                   | -0.09<br>(0.12)                  | -7.00***<br>(1.04) |                    |                    |                    |
| Num of small projects (logged) $\times Post_t$            | 0.30***<br>(0.05)                | 0.32***<br>(0.04)  | 0.34***<br>(0.04)  | 0.32***<br>(0.04)  | 0.33***<br>(0.04)  |
| Constant  | 5.90***<br>(0.10)                | 55.05***<br>(0.80) |                    |                    |                    |
| Duration, Budget, Bids                                    | No                               | Yes                | Yes                | Yes                | Yes                |
| <i>Post<sub>t</sub></i> $\times$ (Duration, Budget, Bids) | No                               | Yes                | Yes                | Yes                | Yes                |
| Project stage   | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects  | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects  | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                                    | No                               | No                 | No                 | No                 | Yes                |
| Observations  | 174,197                          | 157,166            | 157,166            | 157,166            | 157,166            |
| R <sup>2</sup>  | 0.0005                           | 0.18               | 0.19               | 0.22               | 0.22               |
| Adjusted R <sup>2</sup>                                   | 0.0004                           | 0.18               | 0.19               | 0.21               | 0.21               |

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Contractors holding both small and large projects are excluded.

## 18 Project Stage

- $t$  indicates the end of the quarter
- We want to get stage of the project at the beginning of a given quarter (before any delays materialize)

$$Stage_{it} = \frac{ActionDate_{i,t-1} - StartDate_i}{Duration_{i,t-1}} \quad Stage_{it} = \frac{(t-1) - StartDate_i}{Duration_{i,t-1}}$$

### 18.1 Stage Quintile

## 18.2 Logged Stage Regressions

Table 23: Project Stage and QuickPay reform

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                |
| $Treat_i$  | -2.65***<br>(0.23)               | -1.65***<br>(0.21) | -1.73***<br>(0.21) | -1.34***<br>(0.21) | -1.37***<br>(0.20) |
| Log(Stage)                                       | 3.16***<br>(0.08)                | 2.51***<br>(0.07)  | 2.45***<br>(0.07)  | 2.53***<br>(0.07)  | 2.53***<br>(0.07)  |
| $Post_t$   | -1.33***<br>(0.23)               | -5.06***<br>(0.81) |                    |                    |                    |
| $Treat_i \times Post_t$                          | 2.06***<br>(0.28)                | 1.74***<br>(0.26)  | 1.82***<br>(0.26)  | 1.85***<br>(0.25)  | 1.90***<br>(0.25)  |
| $Treat_i \times \text{Log(Stage)}$               | -0.70***<br>(0.10)               | -0.20**<br>(0.09)  | -0.23**<br>(0.09)  | -0.27***<br>(0.09) | -0.29***<br>(0.09) |
| $Post_t \times \text{Log(Stage)}$                | -0.06<br>(0.10)                  | 0.48***<br>(0.09)  | 0.49***<br>(0.09)  | 0.23**<br>(0.09)   | 0.22**<br>(0.09)   |
| $Treat_i \times Post_t \times \text{Log(Stage)}$ | 0.59***<br>(0.12)                | 0.54***<br>(0.11)  | 0.56***<br>(0.11)  | 0.62***<br>(0.11)  | 0.63***<br>(0.11)  |
| Constant   | 10.20***<br>(0.19)               | 43.10***<br>(0.62) |                    |                    |                    |
| Duration, Budget, Bids                           | No                               | Yes                | Yes                | Yes                | Yes                |
| $Post_t \times (\text{Duration, Budget, Bids})$  | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects                               | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects                               | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                           | No                               | No                 | No                 | No                 | Yes                |
| Observations                                     | 223,213                          | 201,738            | 201,738            | 201,738            | 201,738            |
| R <sup>2</sup>                                   | 0.06                             | 0.18               | 0.18               | 0.21               | 0.22               |
| Adjusted R <sup>2</sup>                          | 0.06                             | 0.18               | 0.18               | 0.21               | 0.21               |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 19 Contract Financing (Projects active on/before June 2010)

- $CF = 1$  if project was receiving contract financing
- Sample restricted to projects that started on or before June 2010
- Jobs act was launched in Sept 2010
- Archived, no significant effect (even when we consider all projects)

## 20 Contract financing (All Projects & Contractor level)

- For a given contractor, Percentage projects receiving  $CF = (100 \times \text{Number of projects receiving } CF) / (\text{Number of projects})$



Table 24: Contract Financing and QuickPay reform

|  | <i>PercentDelay<sub>it</sub></i> |                      |                      |                      |                      |
|--|----------------------------------|----------------------|----------------------|----------------------|----------------------|
|  | (1)                              | (2)                  | (3)                  | (4)                  | (5)                  |
| <i>Treat<sub>i</sub></i>   | -1.645***<br>(0.120)             | -1.328***<br>(0.114) | -1.372***<br>(0.114) | -0.966***<br>(0.116) | -0.950***<br>(0.116) |
| <i>Post<sub>t</sub></i>  | -0.033<br>(0.125)                | -5.172***<br>(0.787) |                      |                      |                      |
| Percentage projects receiving CF   | 0.047***<br>(0.004)              | 0.042***<br>(0.003)  | 0.041***<br>(0.003)  | -0.003<br>(0.003)    | -0.004<br>(0.003)    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>                                    | 0.812***<br>(0.148)              | 0.674***<br>(0.146)  | 0.704***<br>(0.146)  | 0.781***<br>(0.144)  | 0.817***<br>(0.144)  |
| <i>Post<sub>t</sub> × Percentage projects receiving CF</i>                     | -0.012***<br>(0.004)             | -0.023***<br>(0.004) | -0.022***<br>(0.004) | -0.009**<br>(0.004)  | -0.009**<br>(0.004)  |
| <i>Treat<sub>i</sub> × Percentage projects receiving CF</i>                    | 0.010*<br>(0.005)                | 0.007*<br>(0.004)    | 0.007*<br>(0.004)    | 0.004<br>(0.004)     | 0.002<br>(0.004)     |
| <i>Treat<sub>i</sub> × Post<sub>t</sub> × Percentage projects receiving CF</i> | 0.018***<br>(0.006)              | 0.018***<br>(0.005)  | 0.018***<br>(0.005)  | 0.012**<br>(0.005)   | 0.012**<br>(0.005)   |
| Constant   | 4.491***<br>(0.104)              | 43.799***<br>(0.606) |                      |                      |                      |
| Duration, Budget, Bids   | No                               | Yes                  | Yes                  | Yes                  | Yes                  |
| <i>Post<sub>t</sub> × (Duration, Budget, Bids)</i>                             | No                               | Yes                  | Yes                  | Yes                  | Yes                  |
| Project stage  | No                               | Yes                  | Yes                  | Yes                  | Yes                  |
| Time fixed effects   | No                               | No                   | Yes                  | Yes                  | Yes                  |
| Task fixed effects   | No                               | No                   | No                   | Yes                  | Yes                  |
| Industry fixed effects   | No                               | No                   | No                   | No                   | Yes                  |
| Observations   | 223,244                          | 201,738              | 201,738              | 201,738              | 201,738              |
| R <sup>2</sup>   | 0.010                            | 0.178                | 0.179                | 0.213                | 0.215                |
| Adjusted R <sup>2</sup>  | 0.010                            | 0.178                | 0.179                | 0.208                | 0.209                |

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 21 Competition

## 21.1 Impact on bidding metrics [All projects]

Table 25: Effect of Competition After QuickPay: Quickpay 2009-2011

|   | <i>NumberOfBids<sub>it</sub></i> | <i>InitialDuration<sub>it</sub></i> | <i>InitialBudget<sub>it</sub></i> |
|---|----------------------------------|-------------------------------------|-----------------------------------|
|   | (1)                              | (2)                                 | (3)                               |
| <i>Treat<sub>i</sub></i>                    | 1.08***<br>(0.02)                | -7.27***<br>(0.72)                  | -15,055.20***<br>(1,586.13)       |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i> | 0.09***<br>(0.03)                | -3.38***<br>(1.00)                  | -29,491.30***<br>(2,296.49)       |
| Task fixed effects                          | Yes                              | Yes                                 | Yes                               |
| Time fixed effects                          | Yes                              | Yes                                 | Yes                               |
| Observations                                | 227,609                          | 220,550                             | 227,732                           |
| R <sup>2</sup>                              | 0.20                             | 0.20                                | 0.24                              |
| Adjusted R <sup>2</sup>                     | 0.19                             | 0.19                                | 0.24                              |

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Sample restricted to fully competed projects.

## 21.2 Impact on delays

### 21.2.1 Subsample model II

Define

$$SA_i = \begin{cases} 1, & \text{if project was signed after QuickPay} \\ 0, & \text{otherwise} \end{cases}$$

$$SB_i = \begin{cases} 1, & \text{if project was signed before QuickPay} \\ 0, & \text{otherwise} \end{cases}$$

Table 26: Effect of QuickPay on competitively awarded projects

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                                     | -2.26***<br>(0.13)               | -1.93***<br>(0.12) | -1.94***<br>(0.12) | -0.50***<br>(0.12) | -0.51***<br>(0.12) |
| <i>SA<sub>i</sub></i>  | -1.90***<br>(0.17)               | 0.87***<br>(0.16)  | 1.45***<br>(0.18)  | 1.52***<br>(0.18)  | 1.48***<br>(0.18)  |
| <i>Post<sub>t</sub></i>                                      | 1.18***<br>(0.16)                | -1.16***<br>(0.16) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>                  | 0.23<br>(0.19)                   | 0.28<br>(0.18)     | 0.30*<br>(0.18)    | 0.16<br>(0.17)     | 0.16<br>(0.17)     |
| <i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub></i> | 0.98***<br>(0.20)                | 0.60***<br>(0.19)  | 0.58***<br>(0.19)  | 0.76***<br>(0.19)  | 0.76***<br>(0.19)  |
| Constant   | 5.48***<br>(0.11)                | 10.06***<br>(0.13) |                    |                    |                    |
| Project stage  | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects   | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects   | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                                       | No                               | No                 | No                 | No                 | Yes                |
| Observations   | 184,911                          | 184,885            | 184,885            | 184,885            | 184,885            |
| R <sup>2</sup>   | 0.01                             | 0.06               | 0.06               | 0.12               | 0.13               |
| Adjusted R <sup>2</sup>                                      | 0.01                             | 0.06               | 0.06               | 0.12               | 0.12               |

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Sample restricted to fully competed projects.

Table 27: Effect of QuickPay on non-competitively awarded projects

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                |
| <i>Treat<sub>i</sub></i>                                     | 1.16***<br>(0.28)                | 0.96***<br>(0.27)  | 0.89***<br>(0.27)  | -0.17<br>(0.29)    | -0.11<br>(0.28)    |
| <i>SA<sub>i</sub></i>  | -0.61***<br>(0.22)               | 1.94***<br>(0.22)  | 3.19***<br>(0.26)  | 2.82***<br>(0.26)  | 2.74***<br>(0.26)  |
| <i>Post<sub>t</sub></i>                                      | -0.79***<br>(0.24)               | -3.11***<br>(0.25) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>                  | 2.69***<br>(0.40)                | 2.44***<br>(0.38)  | 2.34***<br>(0.39)  | 1.85***<br>(0.38)  | 1.76***<br>(0.39)  |
| <i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub></i> | -1.89***<br>(0.39)               | -1.67***<br>(0.37) | -1.63***<br>(0.37) | -1.87***<br>(0.37) | -1.75***<br>(0.37) |
| Constant   | 4.40***<br>(0.20)                | 9.65***<br>(0.25)  |                    |                    |                    |
| Project stage  | No                               | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects   | No                               | No                 | Yes                | Yes                | Yes                |
| Task fixed effects   | No                               | No                 | No                 | Yes                | Yes                |
| Industry fixed effects                                       | No                               | No                 | No                 | No                 | Yes                |
| Observations   | 38,175                           | 38,170             | 38,170             | 38,170             | 38,170             |
| R <sup>2</sup>   | 0.01                             | 0.06               | 0.07               | 0.15               | 0.15               |
| Adjusted R <sup>2</sup>                                      | 0.01                             | 0.06               | 0.07               | 0.13               | 0.13               |

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

Sample restricted to non-competed projects.

### 21.2.2 Four-way interaction

We run the following model:

$$\begin{aligned}
PercentDelay_{it} = & \beta_0 + \beta_1 Treat_i + \beta_2 StartedAfterQP_i + \beta_3 Post_t + \beta_4 Competitive_i \\
& + \beta_5 (Treat_i \times Competitive_i) + \beta_6 (Post_t \times Competitive_i) \\
& + \beta_7 (StartedAfterQP_i \times Competitive_i) + \beta_8 (Treat_i \times Post_t) \\
& + \beta_9 (Treat_i \times Post_t \times Competitive_i) \\
& + \beta_{10} (Treat_i \times Post_t \times StartedAfterQP_i) \\
& + \beta_{11} (Treat_i \times Post_t \times StartedAfterQP_i \times Competitive_i) + e_{it}
\end{aligned}$$

#### Interpretation:

- $\beta_9$  is the difference between treatment effect for competitive and non-competitive projects signed before quickpay.
- $\beta_9 + \beta_{11}$  is the difference between treatment effect for competitive and non-competitive projects signed *after* quickpay.
- $\beta_{11}$  is our coefficient of interest because it tells us how much of the difference is there due to “aggressive bidding” after the policy.

Table 28: Effect of Competition After QuickPay: Quickpay 2009-2011

|  | <i>PercentDelay<sub>it</sub></i> |                    |                    |                    |                    |                    |
|--|----------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|  | (1)                              | (2)                | (3)                | (4)                | (5)                | (6)                |
| <i>Treat<sub>i</sub></i>   | 1.16***<br>(0.28)                | 1.16***<br>(0.28)  | 0.97***<br>(0.27)  | 0.92***<br>(0.27)  | -0.26<br>(0.27)    | -0.28<br>(0.27)    |
| <i>SA<sub>i</sub></i>  | -0.61***<br>(0.22)               | -0.61***<br>(0.22) | 1.79***<br>(0.21)  | 2.50***<br>(0.22)  | 2.32***<br>(0.21)  | 2.26***<br>(0.21)  |
| <i>Competitive<sub>i</sub></i>   | 1.08***<br>(0.23)                | 1.08***<br>(0.23)  | 0.79***<br>(0.22)  | 0.77***<br>(0.22)  | -0.74***<br>(0.23) | -0.69***<br>(0.23) |
| <i>Post<sub>t</sub></i>  | -0.79***<br>(0.24)               | -0.79***<br>(0.24) | -2.97***<br>(0.24) |                    |                    |                    |
| <i>Treat<sub>i</sub> × Competitive<sub>i</sub></i>                                     | -3.42***<br>(0.31)               | -3.42***<br>(0.31) | -2.90***<br>(0.29) | -2.85***<br>(0.29) | -0.27<br>(0.30)    | -0.25<br>(0.30)    |
| <i>Post<sub>t</sub> × Competitive<sub>i</sub></i>                                      | 1.97***<br>(0.29)                | 1.97***<br>(0.29)  | 1.78***<br>(0.28)  | 1.74***<br>(0.28)  | 0.73***<br>(0.28)  | 0.64**<br>(0.28)   |
| <i>SA<sub>i</sub> × Competitive<sub>i</sub></i>  | -1.29***<br>(0.28)               | -1.29***<br>(0.28) | -0.88***<br>(0.26) | -0.89***<br>(0.26) | -0.72***<br>(0.26) | -0.71***<br>(0.26) |
| <i>Treat<sub>i</sub> × Post<sub>t</sub></i>  | 2.69***<br>(0.40)                | 2.69***<br>(0.40)  | 2.45***<br>(0.38)  | 2.42***<br>(0.38)  | 1.66***<br>(0.38)  | 1.59***<br>(0.38)  |
| <i>Treat<sub>i</sub> × Post<sub>t</sub> × Competitive<sub>i</sub></i>                  | -2.45***<br>(0.44)               | -2.45***<br>(0.44) | -2.17***<br>(0.42) | -2.13***<br>(0.42) | -1.48***<br>(0.42) | -1.41***<br>(0.42) |
| <i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub></i>                           | -1.89***<br>(0.39)               | -1.89***<br>(0.39) | -1.68***<br>(0.37) | -1.68***<br>(0.37) | -1.44***<br>(0.36) | -1.44***<br>(0.36) |
| <i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub> × Competitive<sub>i</sub></i> | 2.87***<br>(0.44)                | 2.87***<br>(0.44)  | 2.28***<br>(0.42)  | 2.25***<br>(0.42)  | 2.19***<br>(0.41)  | 2.21***<br>(0.41)  |
| Constant   | 4.40***<br>(0.20)                | 4.40***<br>(0.20)  | 9.33***<br>(0.20)  |                    |                    |                    |
| Project stage  | No                               | No                 | Yes                | Yes                | Yes                | Yes                |
| Time fixed effects   | No                               | No                 | No                 | Yes                | Yes                | Yes                |
| Task fixed effects   | No                               | No                 | No                 | No                 | Yes                | Yes                |
| Industry fixed effects   | No                               | No                 | No                 | No                 | No                 | Yes                |
| Observations   | 223,086                          | 223,086            | 223,055            | 223,055            | 223,055            | 223,055            |
| R <sup>2</sup>   | 0.01                             | 0.01               | 0.06               | 0.06               | 0.12               | 0.12               |
| Adjusted R <sup>2</sup>  | 0.01                             | 0.01               | 0.06               | 0.06               | 0.11               | 0.12               |

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.