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

Feb 06, 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

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## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
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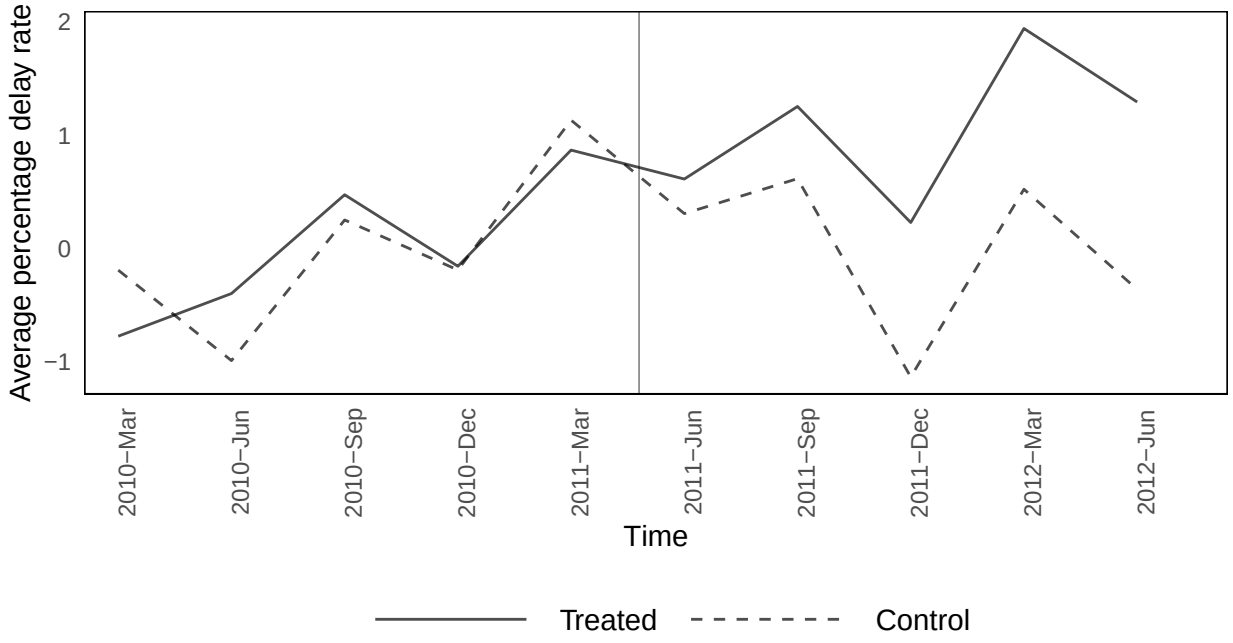



## 3 Baseline Regressions

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

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

Table 1: Effect of QuickPay on project delay rates

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-1.76^{***}$ | $-1.30^{***}$ | $-1.35^{***}$ | $-0.90^{***}$ | $-0.91^{***}$ |
| | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) |
| $Post_t$ | $-0.21^{*}$ | $-5.57^{***}$ | | | |
| | (0.12) | (0.78) | | | |
| $Treat_i \times Post_t$ | $1.10^{***}$ | $0.97^{***}$ | $1.01^{***}$ | $0.99^{***}$ | $1.01^{***}$ |
| | (0.14) | (0.14) | (0.14) | (0.13) | (0.13) |
| Constant | $5.27^{***}$ | $43.19^{***}$ | | | |
| | (0.10) | (0.61) | | | |
| 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 | 223,244 | 201,738 | 201,738 | 201,738 | 201,738 |
| $R^2$ | 0.002 | 0.17 | 0.18 | 0.21 | 0.21 |
| Adjusted $R^2$ | 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.

### 3.1 Days of delay

Table 2: Effect of QuickPay on project delay rates

| | $DelayDays_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-3.44^{***}$ | $-2.28^{***}$ | $-2.38^{***}$ | $-1.81^{***}$ | $-1.84^{***}$ |
| | (0.19) | (0.18) | (0.18) | (0.18) | (0.18) |
| $Post_t$ | $1.24^{***}$ | $-5.79^{***}$ | | | |
| | (0.20) | (1.23) | | | |
| $Treat_i \times Post_t$ | $1.51^{***}$ | $1.69^{***}$ | $1.78^{***}$ | $1.72^{***}$ | $1.74^{***}$ |
| | (0.24) | (0.24) | (0.24) | (0.24) | (0.24) |
| Constant | $8.80^{***}$ | $53.07^{***}$ | | | |
| | (0.16) | (0.92) | | | |
| 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 | 223,373 | 201,867 | 201,867 | 201,867 | 201,867 |
| $R^2$ | 0.004 | 0.14 | 0.14 | 0.18 | 0.18 |
| Adjusted $R^2$ | 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.

# 4 Positive delays: Logit

Table 3: Logit model: Effect of QuickPay

| Dependent Variable: | $I(Delay_{it} > 0)$ | | | | |
|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) |
| *Variables* | | | | | |
| Constant | -1.99*** | 3.22*** | | | |
| | (0.02) | (0.13) | | | |
| $Treat_i$ | -0.44*** | -0.22*** | -0.24*** | -0.21*** | -0.23*** |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| $Post_t$ | 0.10*** | -1.42*** | | | |
| | (0.02) | (0.15) | | | |
| $Treat_i \times Post_t$ | 0.21*** | 0.21*** | 0.23*** | 0.23*** | 0.23*** |
| | (0.03) | (0.04) | (0.04) | (0.04) | (0.04) |
| Controls | | Yes | Yes | Yes | Yes |
| Controls $\times Post_t$ | | Yes | Yes | Yes | Yes |
| *Fixed-effects* | | | | | |
| Time | | | Yes | Yes | Yes |
| Task code | | | | Yes | Yes |
| NAICS code | | | | | Yes |
| *Fit statistics* | | | | | |
| 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*

# 5 Positive delays: Conditional TE

Table 4: Conditional TE: Positive delay

| | $PercentDelay_{it}(conditionalonpositive)$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | −5.87 | −22.68*** | −22.85*** | −25.17*** | −25.24*** |
| | (5.42) | (4.28) | (4.28) | (4.59) | (4.64) |
| $Post_t$ | −51.73*** | −36.01* | | | |
| | (4.68) | (19.74) | | | |
| $Treat_i \times Post_t$ | 15.61** | 22.58*** | 22.77*** | 26.76*** | 28.25*** |
| | (6.20) | (4.98) | (4.99) | (5.03) | (5.03) |
| Constant | 160.76*** | 694.17*** | | | |
| | (4.08) | (15.55) | | | |
| 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 | 24,084 | 24,045 | 24,045 | 24,045 | 24,045 |
| $R^2$ | 0.01 | 0.39 | 0.39 | 0.46 | 0.47 |
| Adjusted $R^2$ | 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.

# 6 Negative delays: Logit

Table 5: Logit model: Effect of QuickPay

| Dependent Variable: | $I(Delay_{it} < 0)$ | | | | |
|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) |
| *Variables* | | | | | |
| Constant | -4.61*** | -10.07*** | | | |
| | (0.06) | (0.44) | | | |
| $Treat_i$ | -0.29*** | 0.13 | 0.14* | 0.02 | 0.02 |
| | (0.08) | (0.09) | (0.09) | (0.09) | (0.09) |
| $Post_t$ | 0.07 | 1.50*** | | | |
| | (0.07) | (0.56) | | | |
| $Treat_i \times Post_t$ | -0.24** | -0.31*** | -0.32*** | -0.29*** | -0.29*** |
| | (0.10) | (0.11) | (0.11) | (0.10) | (0.10) |
| Controls | | Yes | Yes | Yes | Yes |
| Controls $\times Post_t$ | | Yes | Yes | Yes | Yes |
| *Fixed-effects* | | | | | |
| Time | | | Yes | Yes | Yes |
| Task code | | | | Yes | Yes |
| NAICS code | | | | | Yes |
| *Fit statistics* | | | | | |
| Observations | 223,373 | 201,867 | 201,867 | 177,464 | 176,917 |
| Squared Correlation | 0.0004 | 0.007 | 0.008 | 0.02 | 0.03 |
| Pseudo $R^2$ | 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*

# 7 Negative delays: Conditional TE

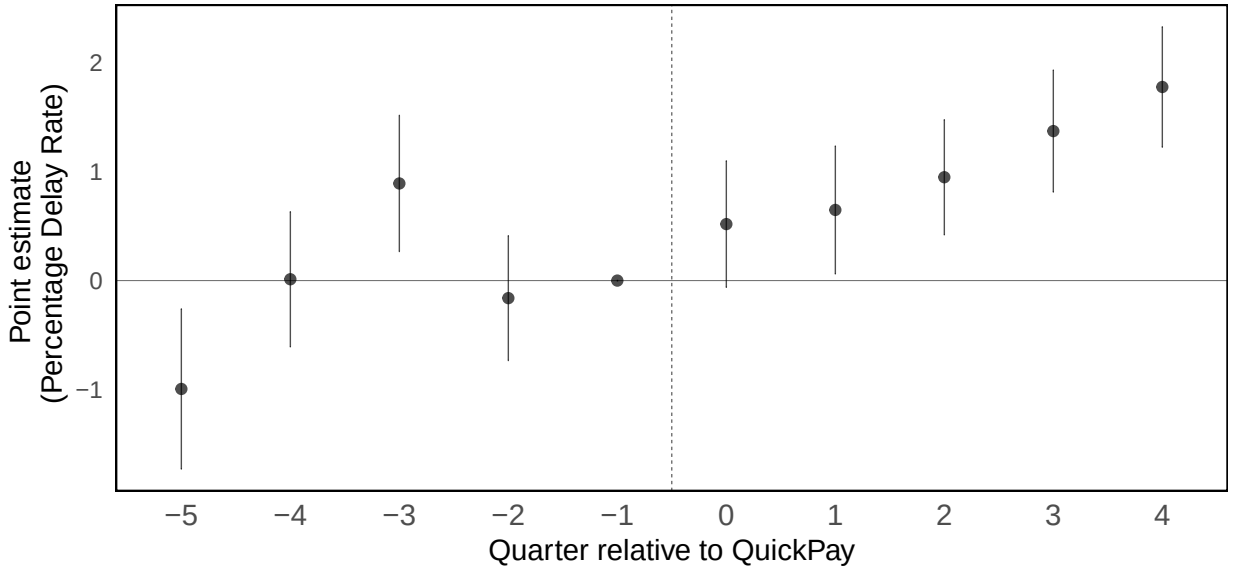
Table 6: Conditional TE: Negative delay (conditional on negative)

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | 3.72* | 2.28 | 2.27 | 0.74 | 1.06 |
| | (2.15) | (1.98) | (2.00) | (2.43) | (2.47) |
| $Post_t$ | 8.13*** | −2.26 | | | |
| | (2.01) | (9.66) | | | |
| $Treat_i \times Post_t$ | −8.74*** | −5.62** | −5.44** | −2.87 | −3.55 |
| | (2.72) | (2.47) | (2.48) | (3.00) | (3.03) |
| Constant | −35.47*** | 7.39 | | | |
| | (1.66) | (8.06) | | | |
| 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 | 1,786 | 1,786 | 1,786 | 1,786 | 1,786 |
| $R^2$ | 0.01 | 0.22 | 0.23 | 0.39 | 0.43 |
| Adjusted $R^2$ | 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.

# 8 Event study

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



# 9 Parallel Trends Test

Table 7: Linear Time Trend Before QuickPay

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-1.37^{***}$ | $-0.65$ | $-0.65$ | $-0.44$ | $-0.52$ |
| | (0.41) | (0.41) | (0.41) | (0.41) | (0.41) |
| $QuarterNum$ | $0.42^{***}$ | $-1.16^{**}$ | | | |
| | (0.08) | (0.50) | | | |
| $Treat_i \times QuarterNum$ | $-0.09$ | $-0.17^{*}$ | $-0.17^{*}$ | $-0.03$ | $-0.03$ |
| | (0.09) | (0.09) | (0.09) | (0.09) | (0.09) |
| Constant | $3.36^{***}$ | $48.76^{***}$ | | | |
| | (0.35) | (2.32) | | | |
| 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 |
| $R^2$ | 0.005 | 0.20 | 0.20 | 0.26 | 0.27 |
| Adjusted $R^2$ | 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.

# 10 Temporal Placebo Test

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

[1] 4

Table 8: Placebo test: Treatment Time 2010-09-30

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-1.62^{***}$ | $-1.56^{***}$ | $-1.57^{***}$ | $-0.80^{***}$ | $-0.85^{***}$ |
| | (0.22) | (0.22) | (0.22) | (0.22) | (0.22) |
| $Post$ | $1.12^{***}$ | $-5.03^{***}$ | | | |
| | (0.21) | (1.50) | | | |
| $Treat_i \times Post$ | $-0.20$ | 0.23 | 0.23 | 0.31 | 0.32 |
| | (0.25) | (0.25) | (0.25) | (0.25) | (0.25) |
| Constant | $4.45^{***}$ | $48.36^{***}$ | | | |
| | (0.19) | (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 |
| $R^2$ | 0.004 | 0.20 | 0.20 | 0.26 | 0.27 |
| Adjusted $R^2$ | 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.

# 11 Cross-sectional placebo

- Projects are randomly assigned into treatment or control

Table 9: Effect of QuickPay on project delay rates

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | −0.04 | −0.10 | −0.10 | −0.07 | −0.07 |
| | (0.10) | (0.09) | (0.09) | (0.09) | (0.09) |
| $Post_t$ | $0.52^{***}$ | $-4.41^{***}$ | | | |
| | (0.09) | (0.75) | | | |
| $Treat_i \times Post_t$ | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 |
| | (0.13) | (0.12) | (0.12) | (0.11) | (0.11) |
| Constant | $4.14^{***}$ | $41.68^{***}$ | | | |
| | (0.07) | (0.58) | | | |
| 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 | 223,244 | 201,738 | 201,738 | 201,738 | 201,738 |
| $R^2$ | 0.0003 | 0.17 | 0.17 | 0.21 | 0.21 |
| Adjusted $R^2$ | 0.0003 | 0.17 | 0.17 | 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.

# 12 Summary statistics

# 13 Congestion Effect

## 13.1 Number of projects per contractor

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

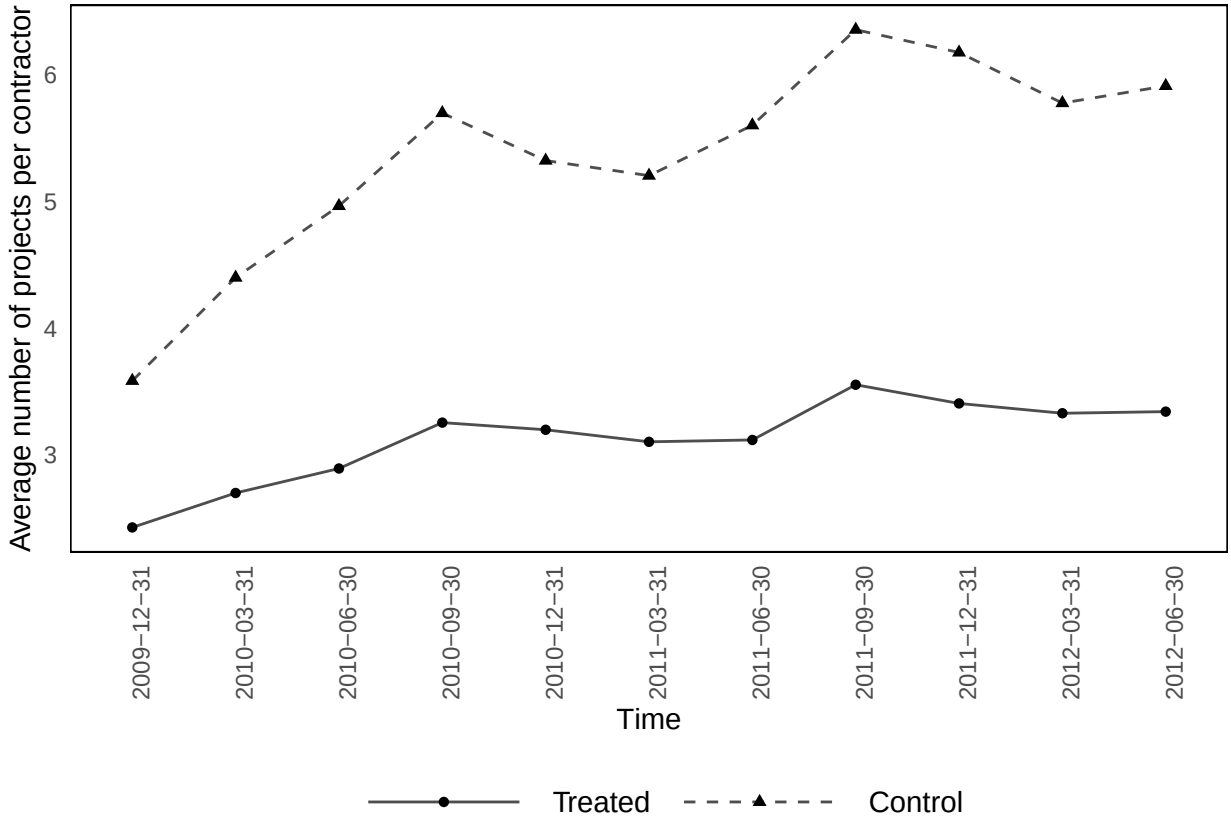



Table 10: Num Contractor Projects and QuickPay reform

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

#### 13.1.2 Contractors holding at least one small project are "treated"

## 13.2 Total budget

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

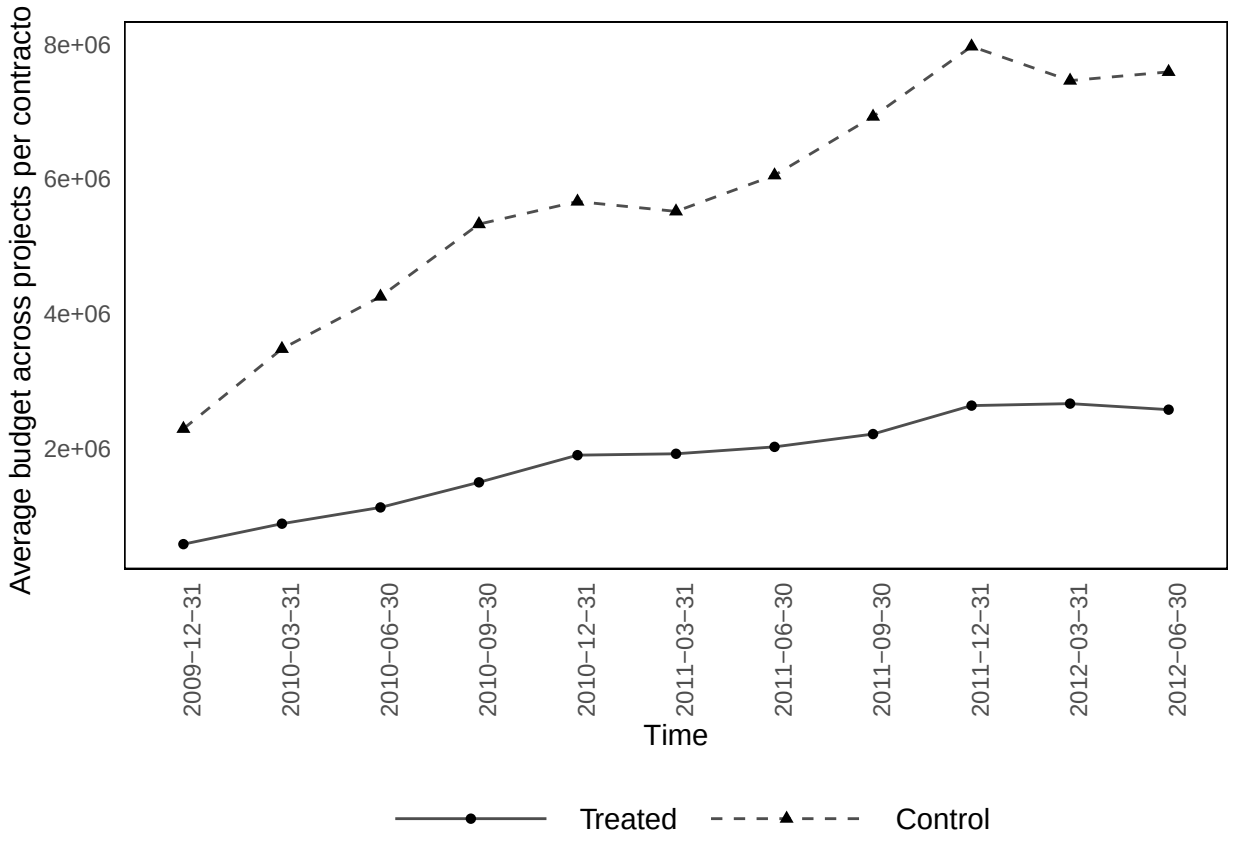


Table 11: Contractor Project Budget and QuickPay reform

| | Total budget | |
|---|---|---|
| | (1) | (2) |
| $Treat_i$ | $-3{,}303{,}977.00^{***}$ | $-3{,}296{,}074.00^{***}$ |
| | (525,130.10) | (527,240.20) |
| $Post_t$ | $2{,}457{,}755.00^{***}$ | |
| | (287,992.90) | |
| $Treat_i \times Post_t$ | $-1{,}472{,}315.00^{***}$ | $-1{,}475{,}519.00^{***}$ |
| | (291,443.10) | (292,600.50) |
| Constant | $4{,}733{,}618.00^{***}$ | |
| | (522,700.30) | |
| Time fixed effects | No | Yes |
| Observations | 84,391 | 84,391 |
| $R^2$ | 0.02 | 0.02 |
| Adjusted $R^2$ | 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.

## 13.3 Number of tasks

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

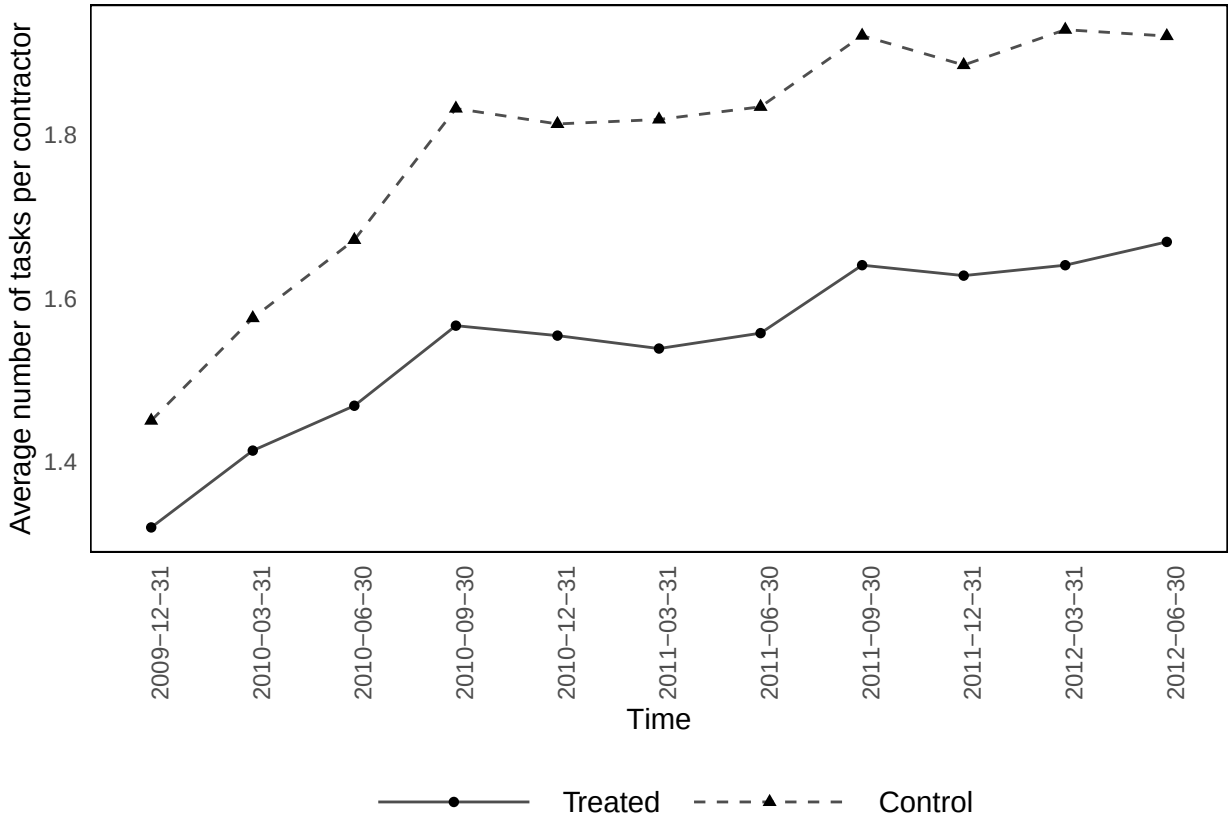



Table 12: Contractor Project Tasks and QuickPay reform

| | Number of tasks | |
|---|---|---|
| | (1) | (2) |
| $Treat_i$ | $-0.23^{***}$ | $-0.23^{***}$ |
| | (0.04) | (0.04) |
| $Post_t$ | $0.17^{***}$ | |
| | (0.02) | |
| $Treat_i \times Post_t$ | $-0.04$ | $-0.04$ |
| | (0.03) | (0.03) |
| Constant | $1.73^{***}$ | |
| | (0.04) | |
| Time fixed effects | No | Yes |
| Observations | 84,391 | 84,391 |
| $R^2$ | 0.01 | 0.01 |
| Adjusted $R^2$ | 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.

# 14 Project portfolio: Spillover effect

## 14.1 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 13: Project Portfolio and QuickPay reform

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $1.53^{***}$ | $-0.55^{***}$ | $-0.64^{***}$ | $0.43^{**}$ | $0.46^{***}$ |
| | (0.23) | (0.17) | (0.17) | (0.17) | (0.17) |
| $Post_t$ | $-0.35^{***}$ | $-13.73^{***}$ | | | |
| | (0.13) | (1.19) | | | |
| $Treat_i \times Post_t$ | 0.08 | $0.52^{**}$ | $0.60^{***}$ | 0.23 | 0.33 |
| | (0.27) | (0.22) | (0.22) | (0.22) | (0.22) |
| Constant | $5.96^{***}$ | $64.62^{***}$ | | | |
| | (0.11) | (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 |
| $R^2$ | 0.002 | 0.26 | 0.26 | 0.30 | 0.30 |
| Adjusted $R^2$ | 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.

## 14.2 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 14: (Incremental effect) Project Portfolio and QuickPay reform

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-0.79^{***}$ | $-0.48^{***}$ | $-0.54^{***}$ | $-0.68^{***}$ | $-0.71^{***}$ |
| | (0.13) | (0.11) | (0.11) | (0.12) | (0.12) |
| $Treat_{i,l}$ | $-2.74^{***}$ | $-2.46^{***}$ | $-2.41^{***}$ | $-0.72^{***}$ | $-0.64^{***}$ |
| | (0.11) | (0.10) | (0.10) | (0.10) | (0.10) |
| $Post_t$ | $-0.21^{*}$ | $-5.41^{***}$ | | | |
| | (0.12) | (0.79) | | | |
| $Treat_i \times Post_t$ | $1.22^{***}$ | $1.04^{***}$ | $1.09^{***}$ | $1.11^{***}$ | $1.13^{***}$ |
| | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) |
| $Treat_{i,l} \times Post_t$ | $-0.48^{***}$ | $-0.28^{**}$ | $-0.33^{**}$ | $-0.38^{***}$ | $-0.38^{***}$ |
| | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) |
| Constant | $5.27^{***}$ | $43.79^{***}$ | | | |
| | (0.10) | (0.61) | | | |
| 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 | 223,244 | 201,738 | 201,738 | 201,738 | 201,738 |
| $R^2$ | 0.01 | 0.18 | 0.18 | 0.21 | 0.21 |
| Adjusted $R^2$ | 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.

# 15 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)

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

## 15.1 Stage Quintile

## 15.2 Logged Stage Regressions

Table 15: Project Stage and QuickPay reform

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-2.65^{***}$ | $-1.65^{***}$ | $-1.73^{***}$ | $-1.34^{***}$ | $-1.37^{***}$ |
| | (0.23) | (0.21) | (0.21) | (0.21) | (0.20) |
| Log(Stage) | $3.16^{***}$ | $2.51^{***}$ | $2.45^{***}$ | $2.53^{***}$ | $2.53^{***}$ |
| | (0.08) | (0.07) | (0.07) | (0.07) | (0.07) |
| $Post_t$ | $-1.33^{***}$ | $-5.06^{***}$ | | | |
| | (0.23) | (0.81) | | | |
| $Treat_i \times Post_t$ | $2.06^{***}$ | $1.74^{***}$ | $1.82^{***}$ | $1.85^{***}$ | $1.90^{***}$ |
| | (0.28) | (0.26) | (0.26) | (0.25) | (0.25) |
| $Treat_i \times$ Log(Stage) | $-0.70^{***}$ | $-0.20^{**}$ | $-0.23^{**}$ | $-0.27^{***}$ | $-0.29^{***}$ |
| | (0.10) | (0.09) | (0.09) | (0.09) | (0.09) |
| $Post_t \times$ Log(Stage) | $-0.06$ | $0.48^{***}$ | $0.49^{***}$ | $0.23^{**}$ | $0.22^{**}$ |
| | (0.10) | (0.09) | (0.09) | (0.09) | (0.09) |
| $Treat_i \times Post_t \times$ Log(Stage) | $0.59^{***}$ | $0.54^{***}$ | $0.56^{***}$ | $0.62^{***}$ | $0.63^{***}$ |
| | (0.12) | (0.11) | (0.11) | (0.11) | (0.11) |
| Constant | $10.20^{***}$ | $43.10^{***}$ | | | |
| | (0.19) | (0.62) | | | |
| Duration, Budget, Bids | No | Yes | Yes | Yes | Yes |
| $Post_t \times$ (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 |
| $R^2$ | 0.06 | 0.18 | 0.18 | 0.21 | 0.22 |
| Adjusted $R^2$ | 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.

# 16 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

Table 16: Contract Financing and QuickPay reform

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-2.11^{***}$ | $-1.19^{***}$ | $-1.31^{***}$ | $-0.67^{***}$ | $-0.71^{***}$ |
| | (0.16) | (0.15) | (0.15) | (0.16) | (0.16) |
| $Post_t$ | $1.44^{***}$ | $-8.73^{***}$ | | | |
| | (0.28) | (2.64) | | | |
| $CF_i$ | $1.32^{***}$ | $1.64^{***}$ | $1.40^{***}$ | $-0.56$ | $-0.64^{*}$ |
| | (0.37) | (0.32) | (0.31) | (0.34) | (0.34) |
| $Treat_i \times Post_t$ | $-0.03$ | $2.35^{***}$ | $2.46^{***}$ | $2.40^{***}$ | $2.43^{***}$ |
| | (0.33) | (0.43) | (0.43) | (0.45) | (0.45) |
| $Post_t \times CF_i$ | 0.04 | $-1.30^{**}$ | $-1.07$ | 0.39 | 0.44 |
| | (0.65) | (0.66) | (0.65) | (0.68) | (0.68) |
| $Treat_i \times CF_i$ | $1.98^{***}$ | $1.00^{**}$ | $1.05^{***}$ | 0.60 | 0.59 |
| | (0.48) | (0.41) | (0.40) | (0.42) | (0.42) |
| $Treat_i \times Post_t \times CF_i$ | 0.77 | $-1.40$ | $-1.44$ | $-0.81$ | $-0.88$ |
| | (0.89) | (0.90) | (0.89) | (0.92) | (0.92) |
| Constant | $5.33^{***}$ | $46.80^{***}$ | | | |
| | (0.14) | (0.84) | | | |
| 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 | 65,191 | 55,291 | 55,291 | 55,291 | 55,291 |
| $R^2$ | 0.01 | 0.18 | 0.18 | 0.23 | 0.23 |
| Adjusted $R^2$ | 0.01 | 0.18 | 0.18 | 0.22 | 0.22 |

*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.

# 17 Competition

## 17.1 Impact on bidding metrics [All projects]

Table 17: Effect of Competition After QuickPay: Quickpay 2009-2011

| | $NumberOfBids_{it}$ | $InitialDuration_{it}$ | $InitialBudget_{it}$ |
|---|---|---|---|
| | (1) | (2) | (3) |
| $Treat_i$ | $1.08^{***}$ | $-7.27^{***}$ | $-15{,}055.20^{***}$ |
| | (0.02) | (0.72) | (1,586.13) |
| $Treat_i \times Post_t$ | $0.09^{***}$ | $-3.38^{***}$ | $-29{,}491.30^{***}$ |
| | (0.03) | (1.00) | (2,296.49) |
| Task fixed effects | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | Yes |
| Observations | 227,609 | 220,550 | 227,732 |
| $R^2$ | 0.20 | 0.20 | 0.24 |
| Adjusted $R^2$ | 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.

## 17.2 Impact on delays

### 17.2.1 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 18: Effect of QuickPay on competitively awarded projects

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $-2.26^{***}$ | $-1.93^{***}$ | $-1.94^{***}$ | $-0.50^{***}$ | $-0.51^{***}$ |
| | (0.13) | (0.12) | (0.12) | (0.12) | (0.12) |
| $SA_i$ | $-1.90^{***}$ | $0.87^{***}$ | $1.45^{***}$ | $1.52^{***}$ | $1.48^{***}$ |
| | (0.17) | (0.16) | (0.18) | (0.18) | (0.18) |
| $Post_t$ | $1.18^{***}$ | $-1.16^{***}$ | | | |
| | (0.16) | (0.16) | | | |
| $Treat_i \times Post_t$ | 0.23 | 0.28 | $0.30^{*}$ | 0.16 | 0.16 |
| | (0.19) | (0.18) | (0.18) | (0.17) | (0.17) |
| $Treat_i \times Post_t \times SA_i$ | $0.98^{***}$ | $0.60^{***}$ | $0.58^{***}$ | $0.76^{***}$ | $0.76^{***}$ |
| | (0.20) | (0.19) | (0.19) | (0.19) | (0.19) |
| Constant | $5.48^{***}$ | $10.06^{***}$ | | | |
| | (0.11) | (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 |
| $R^2$ | 0.01 | 0.06 | 0.06 | 0.12 | 0.13 |
| Adjusted $R^2$ | 0.01 | 0.06 | 0.06 | 0.12 | 0.12 |

*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.

Table 19: Effect of QuickPay on non-competitively awarded projects

| | $PercentDelay_{it}$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $Treat_i$ | $1.16^{***}$ | $0.96^{***}$ | $0.89^{***}$ | $-0.17$ | $-0.11$ |
| | (0.28) | (0.27) | (0.27) | (0.29) | (0.28) |
| $SA_i$ | $-0.61^{***}$ | $1.94^{***}$ | $3.19^{***}$ | $2.82^{***}$ | $2.74^{***}$ |
| | (0.22) | (0.22) | (0.26) | (0.26) | (0.26) |
| $Post_t$ | $-0.79^{***}$ | $-3.11^{***}$ | | | |
| | (0.24) | (0.25) | | | |
| $Treat_i \times Post_t$ | $2.69^{***}$ | $2.44^{***}$ | $2.34^{***}$ | $1.85^{***}$ | $1.76^{***}$ |
| | (0.40) | (0.38) | (0.39) | (0.38) | (0.39) |
| $Treat_i \times Post_t \times SA_i$ | $-1.89^{***}$ | $-1.67^{***}$ | $-1.63^{***}$ | $-1.87^{***}$ | $-1.75^{***}$ |
| | (0.39) | (0.37) | (0.37) | (0.37) | (0.37) |
| Constant | $4.40^{***}$ | $9.65^{***}$ | | | |
| | (0.20) | (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 |
| $R^2$ | 0.01 | 0.06 | 0.07 | 0.15 | 0.15 |
| Adjusted $R^2$ | 0.01 | 0.06 | 0.07 | 0.13 | 0.13 |

*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 non-competed projects.

### 17.2.2 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 20: Effect of Competition After QuickPay: Quickpay 2009-2011

| | $PercentDelay_{it}$ | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $Treat_i$ | $1.16^{***}$ | $1.16^{***}$ | $0.97^{***}$ | $0.92^{***}$ | $-0.26$ | $-0.28$ |
| | (0.28) | (0.28) | (0.27) | (0.27) | (0.27) | (0.27) |
| $SA_i$ | $-0.61^{***}$ | $-0.61^{***}$ | $1.79^{***}$ | $2.50^{***}$ | $2.32^{***}$ | $2.26^{***}$ |
| | (0.22) | (0.22) | (0.21) | (0.22) | (0.21) | (0.21) |
| $Competitive_i$ | $1.08^{***}$ | $1.08^{***}$ | $0.79^{***}$ | $0.77^{***}$ | $-0.74^{***}$ | $-0.69^{***}$ |
| | (0.23) | (0.23) | (0.22) | (0.22) | (0.23) | (0.23) |
| $Post_t$ | $-0.79^{***}$ | $-0.79^{***}$ | $-2.97^{***}$ | | | |
| | (0.24) | (0.24) | (0.24) | | | |
| $Treat_i \times Competitive_i$ | $-3.42^{***}$ | $-3.42^{***}$ | $-2.90^{***}$ | $-2.85^{***}$ | $-0.27$ | $-0.25$ |
| | (0.31) | (0.31) | (0.29) | (0.29) | (0.30) | (0.30) |
| $Post_t \times Competitive_i$ | $1.97^{***}$ | $1.97^{***}$ | $1.78^{***}$ | $1.74^{***}$ | $0.73^{***}$ | $0.64^{**}$ |
| | (0.29) | (0.29) | (0.28) | (0.28) | (0.28) | (0.28) |
| $SA_i \times Competitive_i$ | $-1.29^{***}$ | $-1.29^{***}$ | $-0.88^{***}$ | $-0.89^{***}$ | $-0.72^{***}$ | $-0.71^{***}$ |
| | (0.28) | (0.28) | (0.26) | (0.26) | (0.26) | (0.26) |
| $Treat_i \times Post_t$ | $2.69^{***}$ | $2.69^{***}$ | $2.45^{***}$ | $2.42^{***}$ | $1.66^{***}$ | $1.59^{***}$ |
| | (0.40) | (0.40) | (0.38) | (0.38) | (0.38) | (0.38) |
| $Treat_i \times Post_t \times Competitive_i$ | $-2.45^{***}$ | $-2.45^{***}$ | $-2.17^{***}$ | $-2.13^{***}$ | $-1.48^{***}$ | $-1.41^{***}$ |
| | (0.44) | (0.44) | (0.42) | (0.42) | (0.42) | (0.42) |
| $Treat_i \times Post_t \times SA_i$ | $-1.89^{***}$ | $-1.89^{***}$ | $-1.68^{***}$ | $-1.68^{***}$ | $-1.44^{***}$ | $-1.44^{***}$ |
| | (0.39) | (0.39) | (0.37) | (0.37) | (0.36) | (0.36) |
| $Treat_i \times Post_t \times SA_i \times Competitive_i$ | $2.87^{***}$ | $2.87^{***}$ | $2.28^{***}$ | $2.25^{***}$ | $2.19^{***}$ | $2.21^{***}$ |
| | (0.44) | (0.44) | (0.42) | (0.42) | (0.41) | (0.41) |
| Constant | $4.40^{***}$ | $4.40^{***}$ | $9.33^{***}$ | | | |
| | (0.20) | (0.20) | (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 |
| $R^2$ | 0.01 | 0.01 | 0.06 | 0.06 | 0.12 | 0.12 |
| Adjusted $R^2$ | 0.01 | 0.01 | 0.06 | 0.06 | 0.11 | 0.12 |

*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.