

# 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.

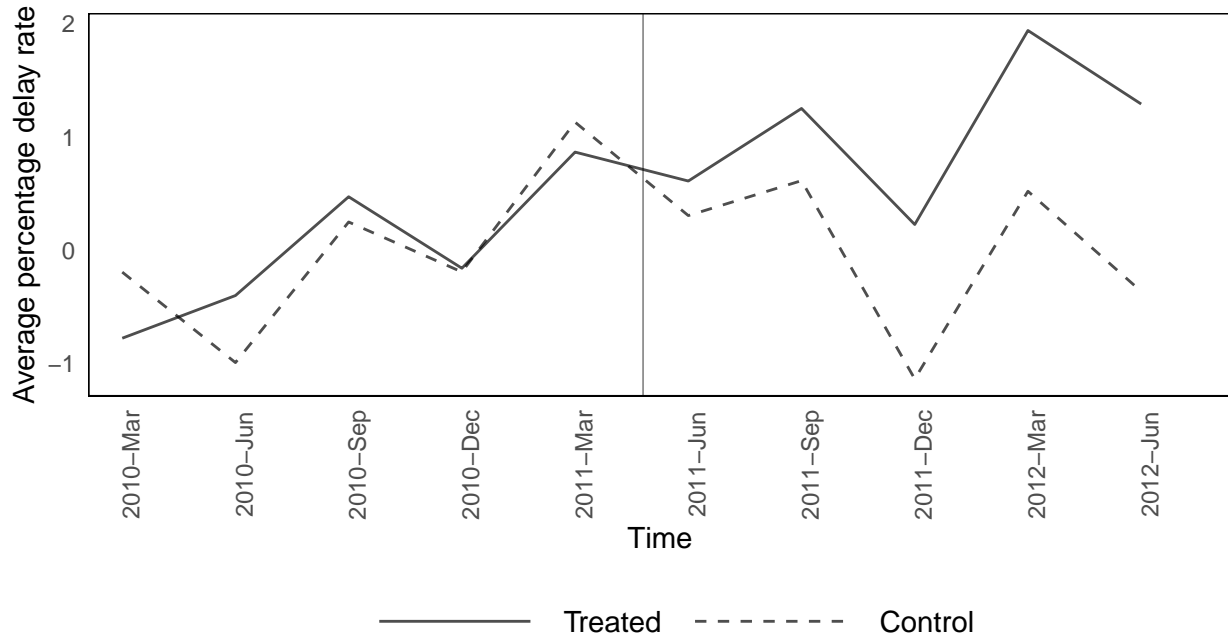
## 1 Setup

## 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.
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## i Please use `linewidth` instead.
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## 3 Baseline Regressions

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

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

Table 1: 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*** (0.11)	-1.30*** (0.11)	-1.35*** (0.11)	-0.90*** (0.11)	-0.91*** (0.11)
<i>Post<sub>t</sub></i>	-0.21* (0.12)	-5.57*** (0.78)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	1.10*** (0.14)	0.97*** (0.14)	1.01*** (0.14)	0.99*** (0.13)	1.01*** (0.13)
Constant	5.27*** (0.10)	43.19*** (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>	0.002	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.

## 4 Days of delay (One Quarter)

Table 2: 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*** (0.19)	-2.28*** (0.18)	-2.38*** (0.18)	-1.81*** (0.18)	-1.84*** (0.18)
<i>Post<sub>t</sub></i>	1.24*** (0.20)	-5.79*** (1.23)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	1.51*** (0.24)	1.69*** (0.24)	1.78*** (0.24)	1.72*** (0.24)	1.74*** (0.24)
Constant	8.80*** (0.16)	53.07*** (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.

## 5 Days of delay (Two Quarters)

Table 3: 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*** (0.52)	-5.20*** (0.53)	-5.37*** (0.53)	-3.93*** (0.55)	-3.77*** (0.55)
<i>Post<sub>t</sub></i>	4.43*** (0.59)	-18.77*** (3.66)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	3.17*** (0.70)	3.58*** (0.73)	3.75*** (0.73)	3.89*** (0.74)	3.87*** (0.74)
Constant	21.06*** (0.45)	116.48*** (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.

## 6 Positive delays: Logit

Table 4: Logit model: Effect of QuickPay

Dependent Variable:	$I(Delay_{it} > 0)$				
Model:	(1)	(2)	(3)	(4)	(5)
<i>Variables</i>					
Constant	-1.99*** (0.02)	3.22*** (0.13)			
$Treat_i$	-0.44*** (0.03)	-0.22*** (0.03)	-0.24*** (0.03)	-0.21*** (0.03)	-0.23*** (0.03)
$Post_t$	0.10*** (0.02)	-1.42*** (0.15)			
$Treat_i \times Post_t$	0.21*** (0.03)	0.21*** (0.04)	0.23*** (0.04)	0.23*** (0.04)	0.23*** (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*

## 7 Positive delays: Conditional TE

Table 5: 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 (5.42)	-22.68*** (4.28)	-22.85*** (4.28)	-25.17*** (4.59)	-25.24*** (4.64)
<i>Post<sub>t</sub></i>	-51.73*** (4.68)	-36.01* (19.74)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	15.61** (6.20)	22.58*** (4.98)	22.77*** (4.99)	26.76*** (5.03)	28.25*** (5.03)
Constant	160.76*** (4.08)	694.17*** (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.

## 8 Negative delays: Logit

Table 6: Logit model: Effect of QuickPay

Dependent Variable:	$I(Delay_{it} < 0)$				
Model:	(1)	(2)	(3)	(4)	(5)
<i>Variables</i>					
Constant	-4.61*** (0.06)	-10.07*** (0.44)			
$Treat_i$	-0.29*** (0.08)	0.13 (0.09)	0.14* (0.09)	0.02 (0.09)	0.02 (0.09)
$Post_t$	0.07 (0.07)	1.50*** (0.56)			
$Treat_i \times Post_t$	-0.24** (0.10)	-0.31*** (0.11)	-0.32*** (0.11)	-0.29*** (0.10)	-0.29*** (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*

## 9 Negative delays: Conditional TE

Table 7: 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* (2.15)	2.28 (1.98)	2.27 (2.00)	0.74 (2.43)	1.06 (2.47)
<i>Post<sub>t</sub></i>	8.13*** (2.01)	−2.26 (9.66)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	−8.74*** (2.72)	−5.62** (2.47)	−5.44** (2.48)	−2.87 (3.00)	−3.55 (3.03)
Constant	−35.47*** (1.66)	7.39 (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:

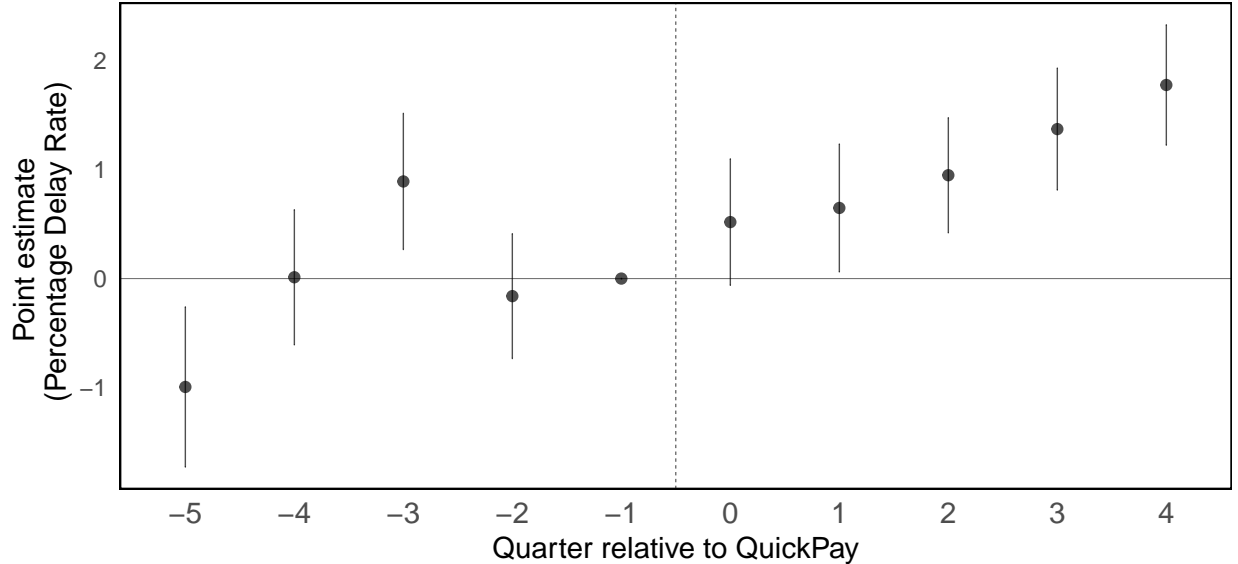
\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Each observation is a project-quarter.

SEs are robust and clustered at the project level.

## 10 Event study

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





## 11 Parallel Trends Test

Table 8: Linear Time Trend Before QuickPay

	<i>PercentDelay<sub>it</sub></i>				
	(1)	(2)	(3)	(4)	(5)
<i>Treat<sub>i</sub></i>	-1.37*** (0.41)	-0.65 (0.41)	-0.65 (0.41)	-0.44 (0.41)	-0.52 (0.41)
<i>QuarterNum</i>	0.42*** (0.08)	-1.16** (0.50)			
<i>Treat<sub>i</sub> × QuarterNum</i>	-0.09 (0.09)	-0.17* (0.09)	-0.17* (0.09)	-0.03 (0.09)	-0.03 (0.09)
Constant	3.36*** (0.35)	48.76*** (2.32)			
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	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.

## 12 Temporal Placebo Test

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

[1] 4

Table 9: Placebo test: Treatment Time 2010-09-30

	<i>PercentDelay<sub>it</sub></i>				
	(1)	(2)	(3)	(4)	(5)
<i>Treat<sub>i</sub></i>	-1.62*** (0.22)	-1.56*** (0.22)	-1.57*** (0.22)	-0.80*** (0.22)	-0.85*** (0.22)
<i>Post</i>	1.12*** (0.21)	-5.03*** (1.50)			
<i>Treat<sub>i</sub> × Post</i>	-0.20 (0.25)	0.23 (0.25)	0.23 (0.25)	0.31 (0.25)	0.32 (0.25)
Constant	4.45*** (0.19)	48.36*** (1.30)			
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	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.

## 13 Cross-sectional placebo

- Projects are randomly assigned into treatment or control

Table 10: Effect of QuickPay on project delay rates

	<i>PercentDelay<sub>it</sub></i>				
	(1)	(2)	(3)	(4)	(5)
<i>Treat<sub>i</sub></i>	−0.04 (0.10)	−0.10 (0.09)	−0.10 (0.09)	−0.07 (0.09)	−0.07 (0.09)
<i>Post<sub>t</sub></i>	0.52*** (0.09)	−4.41*** (0.75)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	0.02 (0.13)	0.02 (0.12)	0.02 (0.12)	0.03 (0.11)	0.03 (0.11)
Constant	4.14*** (0.07)	41.68*** (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.

## 14 Summary statistics

## 15 Congestion Effect

### 15.1 Number of projects per contractor

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

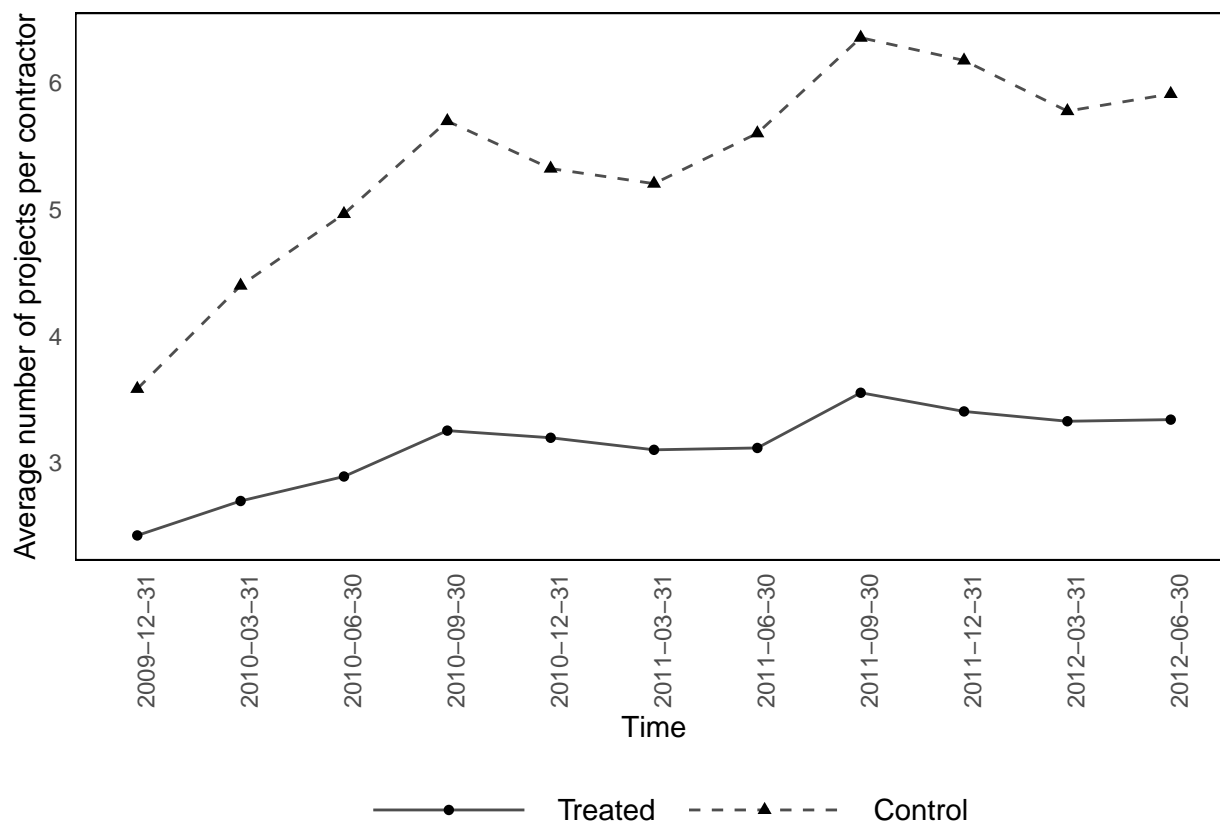


Table 11: Num Contractor Projects and QuickPay reform

	Number of projects	
	(1)	(2)
$Treat_i$	-2.03*** (0.39)	-2.03*** (0.39)
$Post_t$	0.94** (0.41)	
$Treat_i \times Post_t$	-0.58 (0.41)	-0.58 (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.

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

## 15.2 Total budget

15.2.1 Contractors holding only small or only large projects

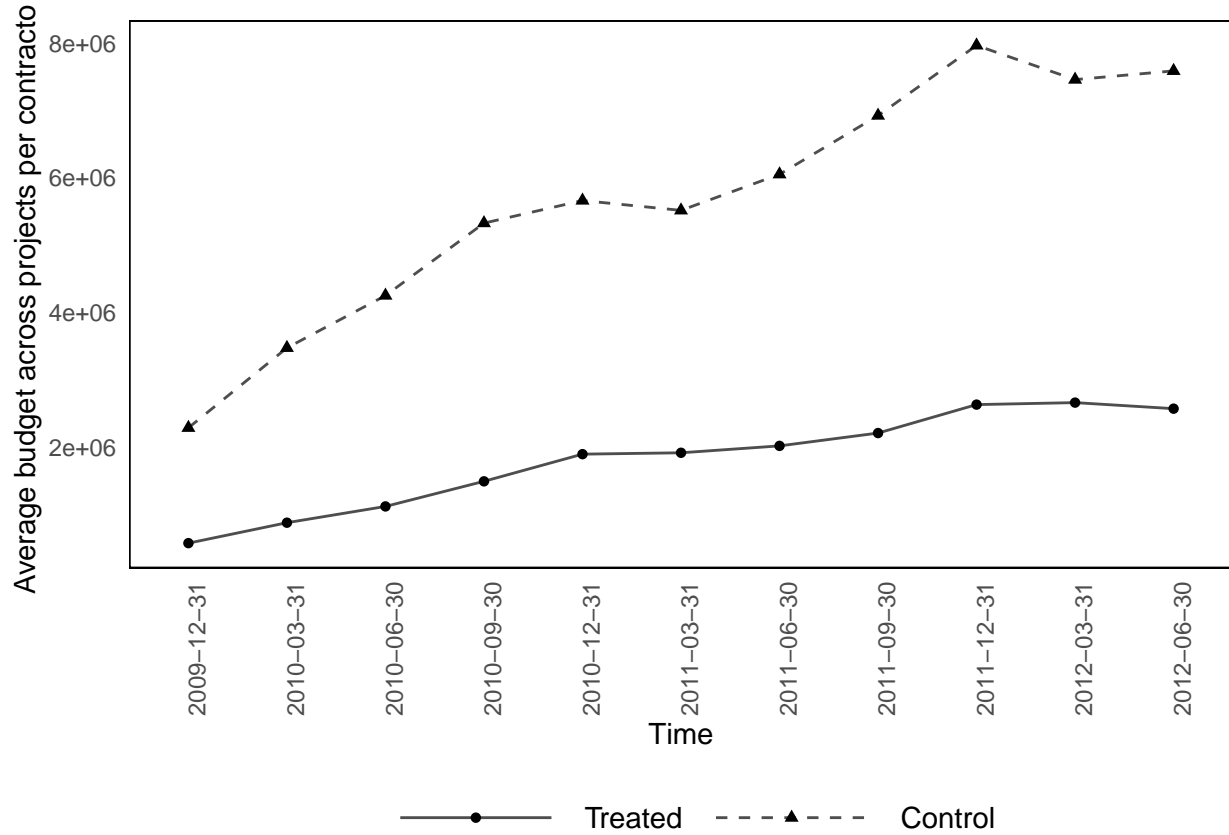


Table 12: Contractor Project Budget and QuickPay reform

	Total budget	
	(1)	(2)
$Treat_i$	-3,303,977.00*** (525,130.10)	-3,296,074.00*** (527,240.20)
$Post_t$	2,457,755.00*** (287,992.90)	
$Treat_i \times Post_t$	-1,472,315.00*** (291,443.10)	-1,475,519.00*** (292,600.50)
Constant	4,733,618.00*** (522,700.30)	
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.

### 15.3 Number of tasks

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

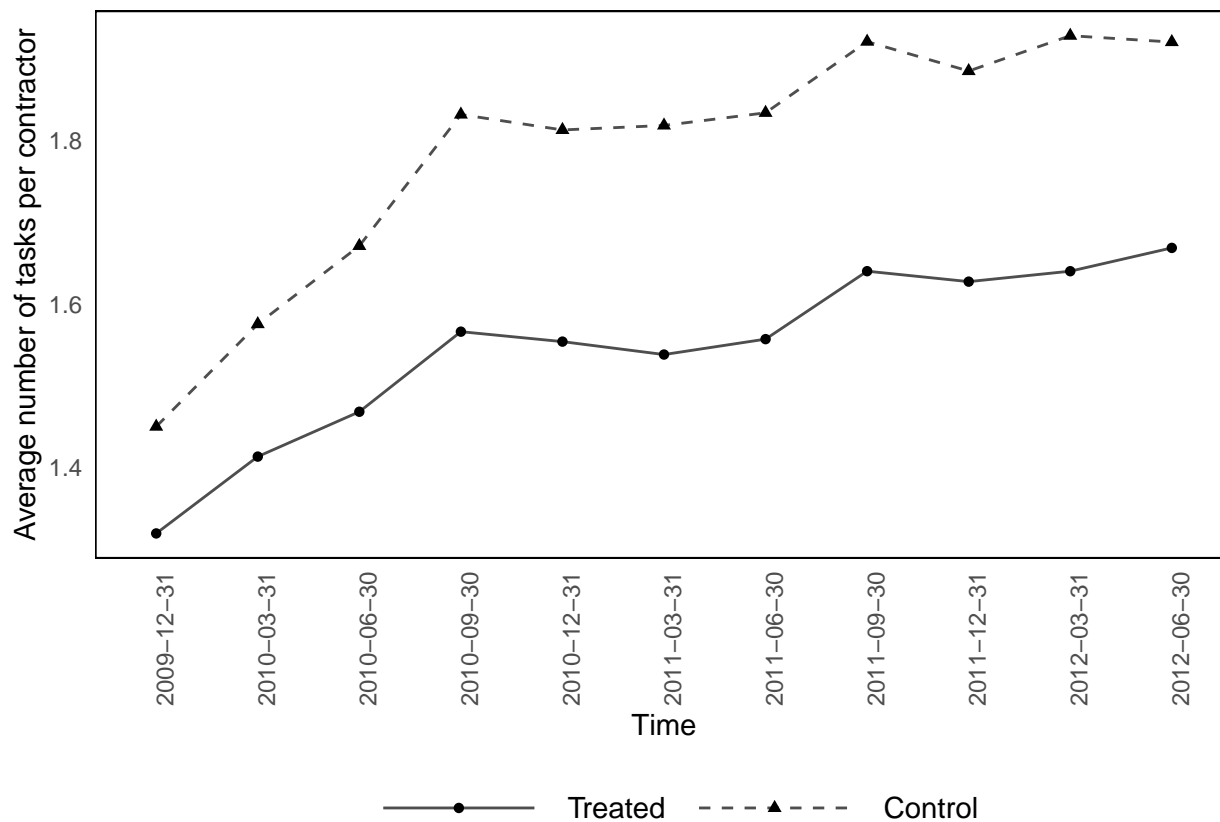


Table 13: Contractor Project Tasks and QuickPay reform

Number of tasks		
	(1)	(2)
$Treat_i$	-0.23*** (0.04)	-0.23*** (0.04)
$Post_t$	0.17*** (0.02)	
$Treat_i \times Post_t$	-0.04 (0.03)	-0.04 (0.03)
Constant	1.73*** (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.

## 16 Project portfolio: Spillover effect

### 16.1 Regression 1: DID on large projects

- Sample restricted to large projects only.
- $Treat_i$  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 14: Project Portfolio and QuickPay reform

	<i>PercentDelay<sub>it</sub></i>				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	1.53*** (0.23)	-0.55*** (0.17)	-0.64*** (0.17)	0.43** (0.17)	0.46*** (0.17)
$Post_t$	-0.35*** (0.13)	-13.73*** (1.19)			
$Treat_i \times Post_t$	0.08 (0.27)	0.52** (0.22)	0.60*** (0.22)	0.23 (0.22)	0.33 (0.22)
Constant	5.96*** (0.11)	64.62*** (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.

### 16.2 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 15: (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*** (0.13)	−0.48*** (0.11)	−0.54*** (0.11)	−0.68*** (0.12)	−0.71*** (0.12)
<i>Treat<sub>i,l</sub></i>	−2.74*** (0.11)	−2.46*** (0.10)	−2.41*** (0.10)	−0.72*** (0.10)	−0.64*** (0.10)
<i>Post<sub>t</sub></i>	−0.21* (0.12)	−5.41*** (0.79)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	1.22*** (0.15)	1.04*** (0.15)	1.09*** (0.15)	1.11*** (0.15)	1.13*** (0.15)
<i>Treat<sub>i,l</sub> × Post<sub>t</sub></i>	−0.48*** (0.14)	−0.28** (0.14)	−0.33** (0.14)	−0.38*** (0.14)	−0.38*** (0.14)
Constant	5.27*** (0.10)	43.79*** (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.

## 17 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)

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

### 17.1 Stage Quintile

## 17.2 Logged Stage Regressions

Table 16: Project Stage and QuickPay reform

	<i>PercentDelay<sub>it</sub></i>				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.65*** (0.23)	-1.65*** (0.21)	-1.73*** (0.21)	-1.34*** (0.21)	-1.37*** (0.20)
Log(Stage)	3.16*** (0.08)	2.51*** (0.07)	2.45*** (0.07)	2.53*** (0.07)	2.53*** (0.07)
$Post_t$	-1.33*** (0.23)	-5.06*** (0.81)			
$Treat_i \times Post_t$	2.06*** (0.28)	1.74*** (0.26)	1.82*** (0.26)	1.85*** (0.25)	1.90*** (0.25)
$Treat_i \times \text{Log(Stage)}$	-0.70*** (0.10)	-0.20** (0.09)	-0.23** (0.09)	-0.27*** (0.09)	-0.29*** (0.09)
$Post_t \times \text{Log(Stage)}$	-0.06 (0.10)	0.48*** (0.09)	0.49*** (0.09)	0.23** (0.09)	0.22** (0.09)
$Treat_i \times Post_t \times \text{Log(Stage)}$	0.59*** (0.12)	0.54*** (0.11)	0.56*** (0.11)	0.62*** (0.11)	0.63*** (0.11)
Constant	10.20*** (0.19)	43.10*** (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.

## 18 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 17: Contract Financing and QuickPay reform

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

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.

## 19 Competition

## 19.1 Impact on bidding metrics [All projects]

Table 18: 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*** (0.02)	-7.27*** (0.72)	-15,055.20*** (1,586.13)
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	0.09*** (0.03)	-3.38*** (1.00)	-29,491.30*** (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.

## 19.2 Impact on delays

### 19.2.1 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 19: 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*** (0.13)	-1.93*** (0.12)	-1.94*** (0.12)	-0.50*** (0.12)	-0.51*** (0.12)
<i>SA<sub>i</sub></i>	-1.90*** (0.17)	0.87*** (0.16)	1.45*** (0.18)	1.52*** (0.18)	1.48*** (0.18)
<i>Post<sub>t</sub></i>	1.18*** (0.16)	-1.16*** (0.16)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	0.23 (0.19)	0.28 (0.18)	0.30* (0.18)	0.16 (0.17)	0.16 (0.17)
<i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub></i>	0.98*** (0.20)	0.60*** (0.19)	0.58*** (0.19)	0.76*** (0.19)	0.76*** (0.19)
Constant	5.48*** (0.11)	10.06*** (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 20: 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*** (0.28)	0.96*** (0.27)	0.89*** (0.27)	-0.17 (0.29)	-0.11 (0.28)
<i>SA<sub>i</sub></i>	-0.61*** (0.22)	1.94*** (0.22)	3.19*** (0.26)	2.82*** (0.26)	2.74*** (0.26)
<i>Post<sub>t</sub></i>	-0.79*** (0.24)	-3.11*** (0.25)			
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	2.69*** (0.40)	2.44*** (0.38)	2.34*** (0.39)	1.85*** (0.38)	1.76*** (0.39)
<i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub></i>	-1.89*** (0.39)	-1.67*** (0.37)	-1.63*** (0.37)	-1.87*** (0.37)	-1.75*** (0.37)
Constant	4.40*** (0.20)	9.65*** (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.

### 19.2.2 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 21: 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*** (0.28)	1.16*** (0.28)	0.97*** (0.27)	0.92*** (0.27)	-0.26 (0.27)	-0.28 (0.27)
<i>SA<sub>i</sub></i>	-0.61*** (0.22)	-0.61*** (0.22)	1.79*** (0.21)	2.50*** (0.22)	2.32*** (0.21)	2.26*** (0.21)
<i>Competitive<sub>i</sub></i>	1.08*** (0.23)	1.08*** (0.23)	0.79*** (0.22)	0.77*** (0.22)	-0.74*** (0.23)	-0.69*** (0.23)
<i>Post<sub>t</sub></i>	-0.79*** (0.24)	-0.79*** (0.24)	-2.97*** (0.24)			
<i>Treat<sub>i</sub> × Competitive<sub>i</sub></i>	-3.42*** (0.31)	-3.42*** (0.31)	-2.90*** (0.29)	-2.85*** (0.29)	-0.27 (0.30)	-0.25 (0.30)
<i>Post<sub>t</sub> × Competitive<sub>i</sub></i>	1.97*** (0.29)	1.97*** (0.29)	1.78*** (0.28)	1.74*** (0.28)	0.73*** (0.28)	0.64** (0.28)
<i>SA<sub>i</sub> × Competitive<sub>i</sub></i>	-1.29*** (0.28)	-1.29*** (0.28)	-0.88*** (0.26)	-0.89*** (0.26)	-0.72*** (0.26)	-0.71*** (0.26)
<i>Treat<sub>i</sub> × Post<sub>t</sub></i>	2.69*** (0.40)	2.69*** (0.40)	2.45*** (0.38)	2.42*** (0.38)	1.66*** (0.38)	1.59*** (0.38)
<i>Treat<sub>i</sub> × Post<sub>t</sub> × Competitive<sub>i</sub></i>	-2.45*** (0.44)	-2.45*** (0.44)	-2.17*** (0.42)	-2.13*** (0.42)	-1.48*** (0.42)	-1.41*** (0.42)
<i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub></i>	-1.89*** (0.39)	-1.89*** (0.39)	-1.68*** (0.37)	-1.68*** (0.37)	-1.44*** (0.36)	-1.44*** (0.36)
<i>Treat<sub>i</sub> × Post<sub>t</sub> × SA<sub>i</sub> × Competitive<sub>i</sub></i>	2.87*** (0.44)	2.87*** (0.44)	2.28*** (0.42)	2.25*** (0.42)	2.19*** (0.41)	2.21*** (0.41)
Constant	4.40*** (0.20)	4.40*** (0.20)	9.33*** (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.