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

Feb 10, 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.

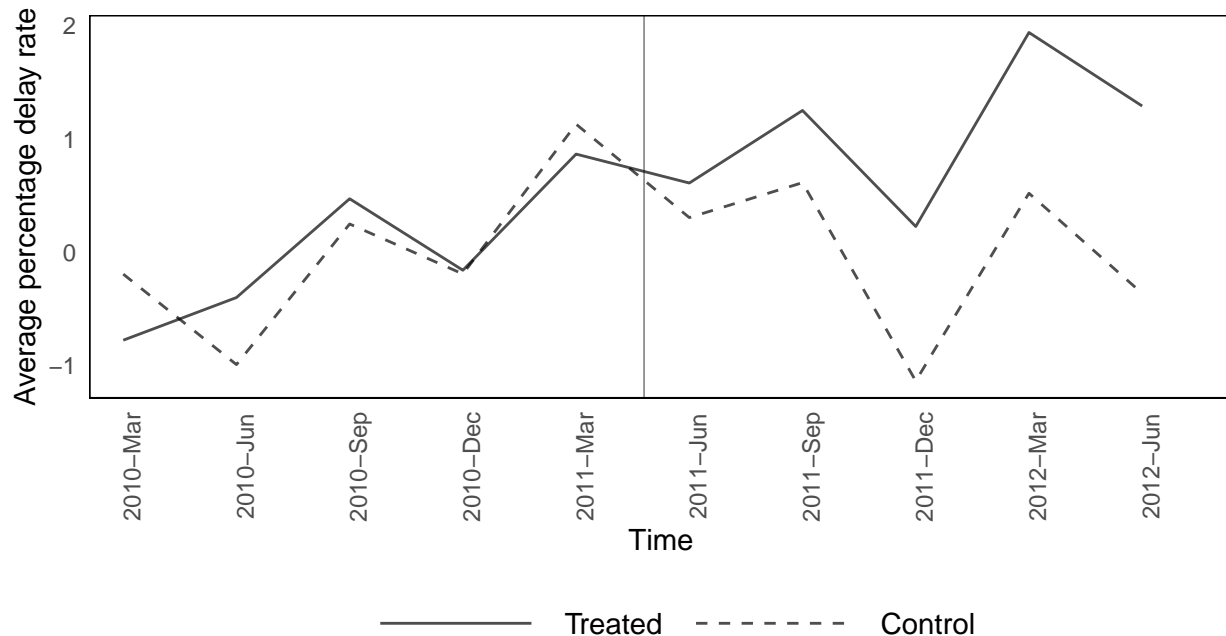- Number of offers received is also winsorized.

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 Summary statistics

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

4 Baseline Regressions

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

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

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

	$PercentDelay_{it}$				
	(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.

5 Days of delay (One Quarter)

Table 4: 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.

6 Days of delay (Two Quarters)

Table 5: Effect of QuickPay on project delay rates

	$DelayRate_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-8.52^{***}	-5.20^{***}	-5.37^{***}	-3.93^{***}	-3.77^{***}
	(0.52)	(0.53)	(0.53)	(0.55)	(0.55)
$Post_t$	4.43^{***}	-18.77^{***}			
	(0.59)	(3.66)			
$Treat_i \times Post_t$	3.17^{***}	3.58^{***}	3.75^{***}	3.89^{***}	3.87^{***}
	(0.70)	(0.73)	(0.73)	(0.74)	(0.74)
Constant	21.06^{***}	116.48^{***}			
	(0.45)	(2.67)			
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
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^2	0.01	0.17	0.17	0.22	0.22
Adjusted R^2	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.

7 Positive delays: Logit

Table 6: 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*

8 Positive delays: Conditional TE

Table 7: Conditional TE: Positive delay

	$PercentDelay_{it}(conditional on positive)$				
	(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.

9 Negative delays: Logit

Table 8: 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*

10 Negative delays: Conditional TE

Table 9: Conditional TE: Negative delay (conditional on negative)

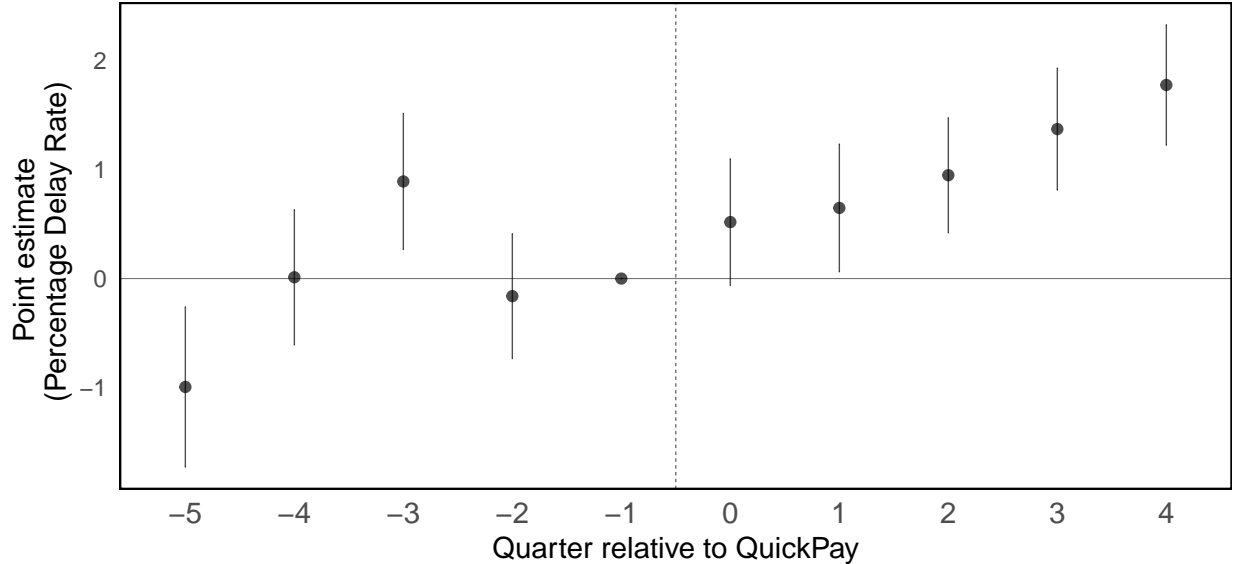|	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	3.72*	2.28	2.27	0.74	1.06
	(2.15)	(1.98)	(2.00)	(2.43)	(2.47)
$Post_t$	8.13***	−2.26			
	(2.01)	(9.66)			
$Treat_i \times Post_t$	−8.74***	−5.62**	−5.44**	−2.87	−3.55
	(2.72)	(2.47)	(2.48)	(3.00)	(3.03)
Constant	−35.47***	7.39			
	(1.66)	(8.06)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

11 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

12 Parallel Trends Test

Table 10: 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.

13 Temporal Placebo Test

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

[1] 4

Table 11: 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.

14 Cross-sectional placebo

- Projects are randomly assigned into treatment or control

Table 12: 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.

15 Congestion Effect

15.1 Number of projects per contractor

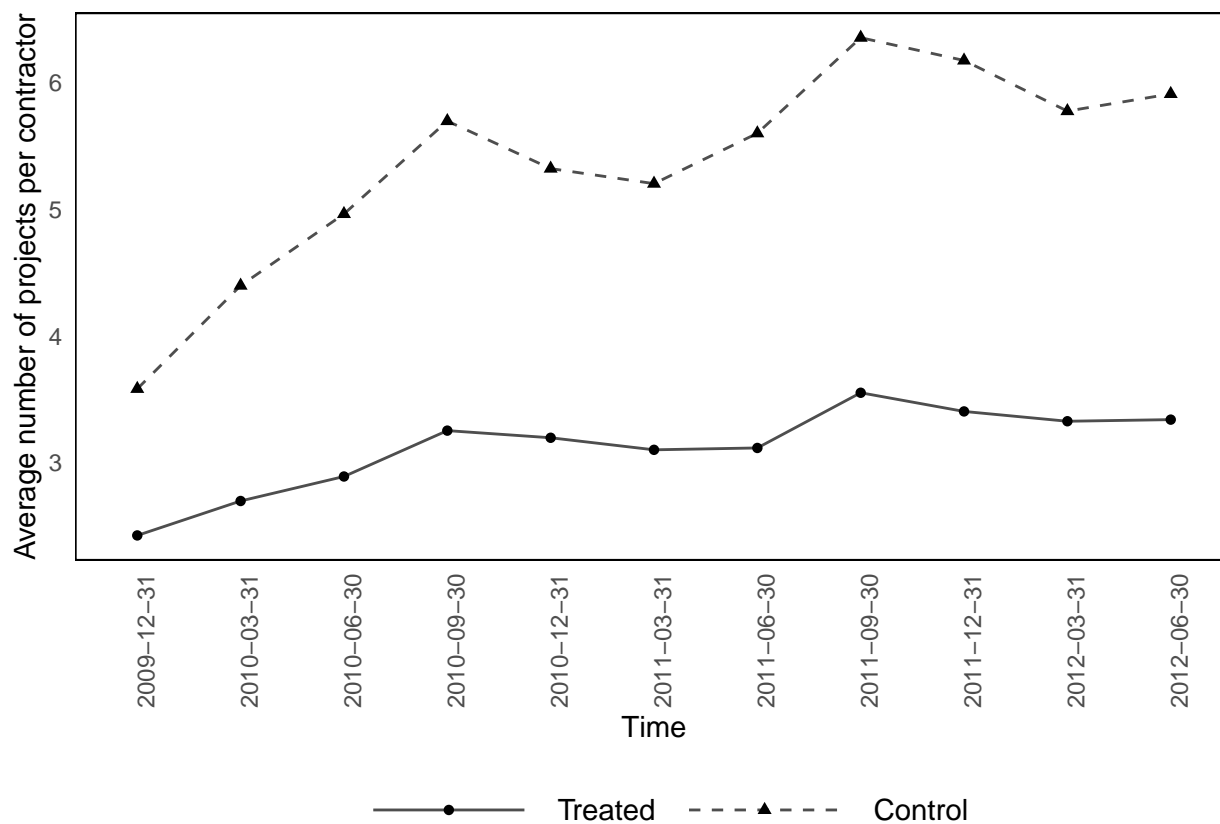### 15.1.1 Contractors holding only small or only large projects

Table 13: 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.

15.1.2 Contractors holding at least one small project are "treated"

15.2 Total budget

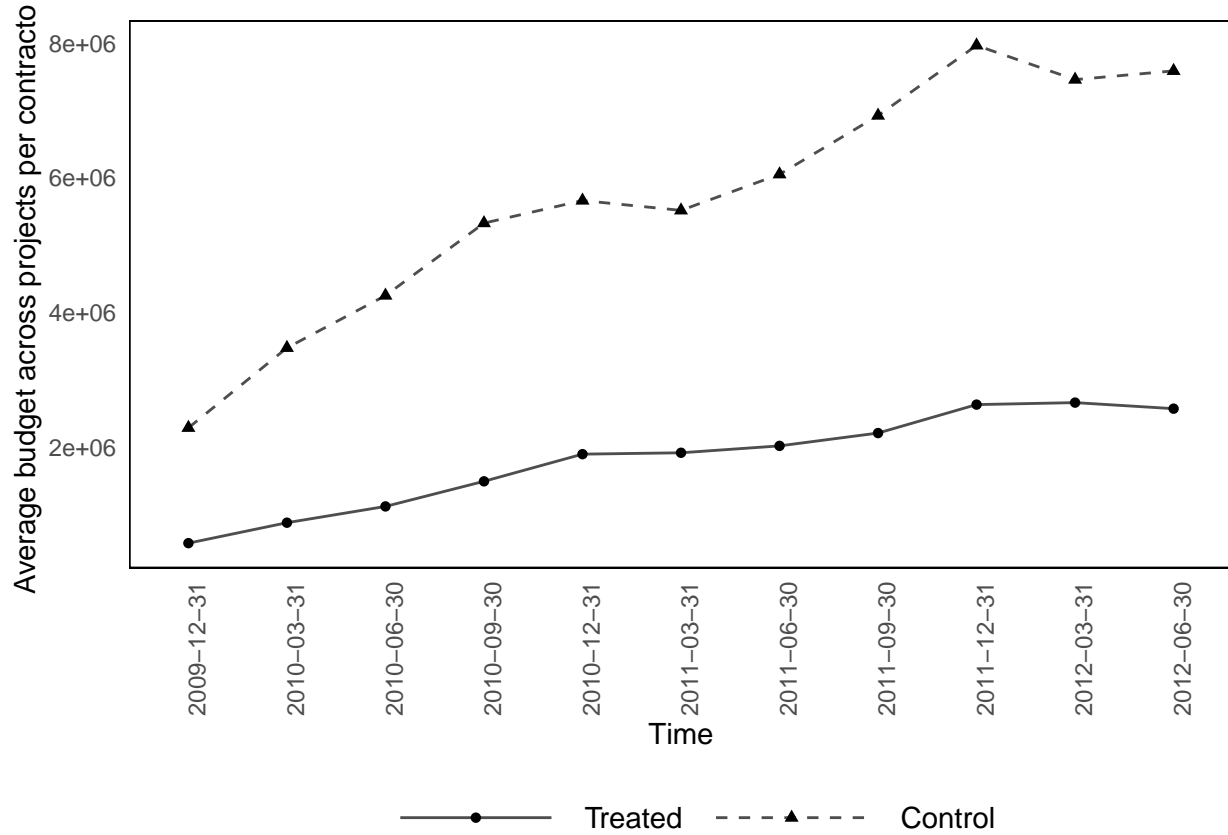### 15.2.1 Contractors holding only small or only large projects

Table 14: 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.

15.3 Number of tasks

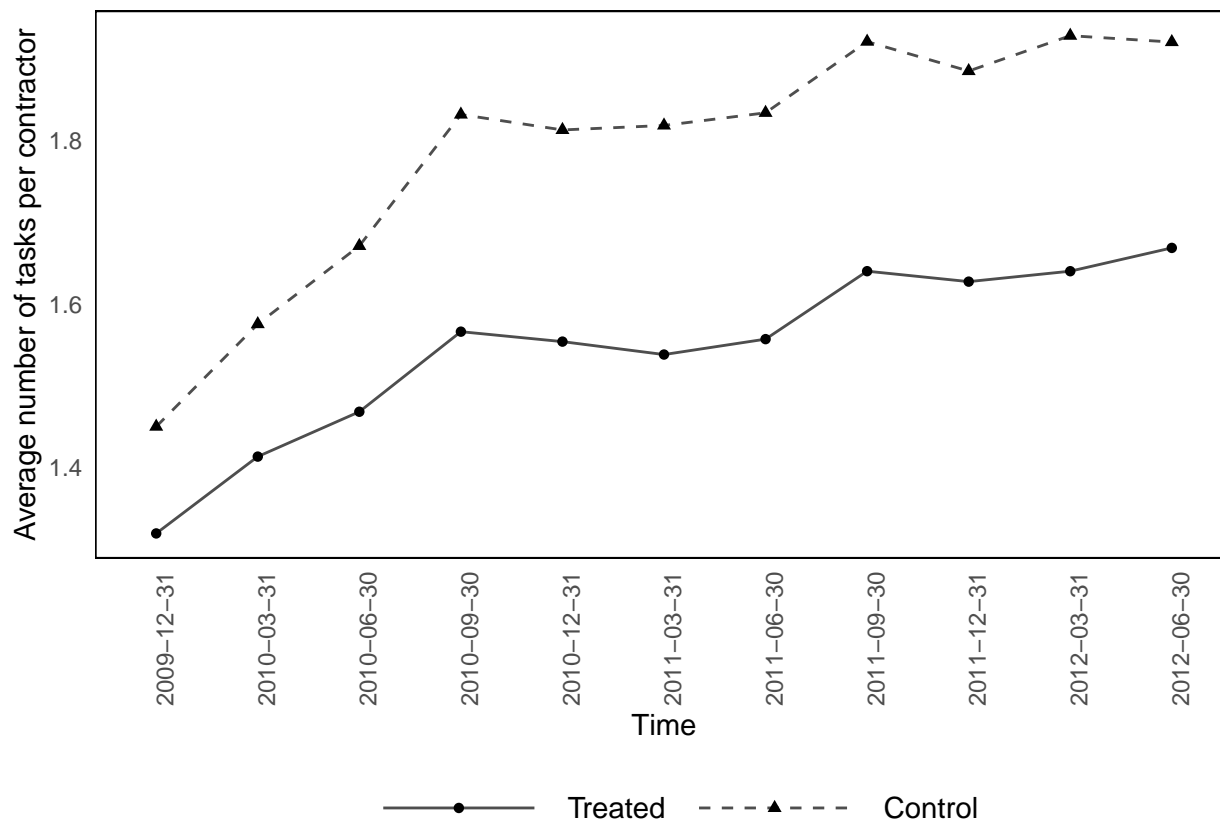### 15.3.1   Contractors holding only small or only large projects

Table 15: 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.

16 Project portfolio: Spillover effect

16.1 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 16: 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.

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 17: (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.

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)

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

17.1 Stage Quintile

17.2 Logged Stage Regressions

Table 18: 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.

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 19: 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.

19 Competition

19.1   Impact on bidding metrics [All projects]

Table 20: 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.

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 21: 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 22: 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.

19.2.2   Four-way interaction

We run the following model:

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

Interpretation:

- β_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.
- β_{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 23: 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.