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

Jan 16, 2023

- Sample consists of a clean control group
  - This means we keep all small projects.
  - We keep only those large project-quarters that don't have a concurrent small project.
- 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.

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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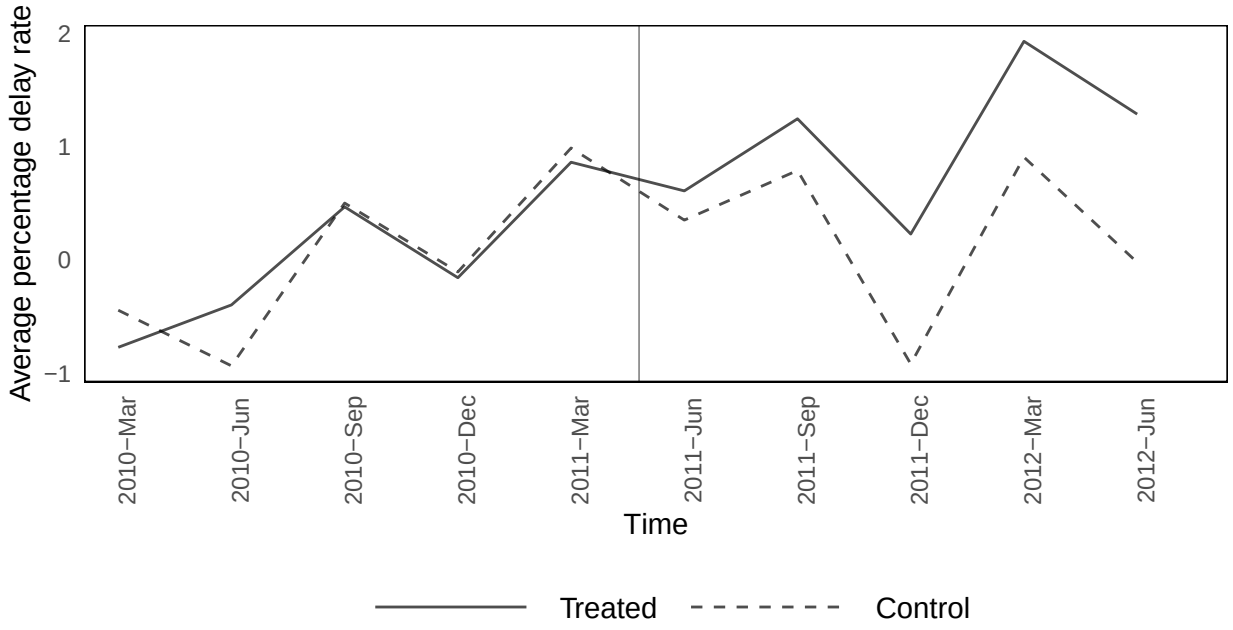

3 Baseline Regressions

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

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

Table 1: Effect of QuickPay on project delay rates

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.42^{***}	-1.18^{***}	-1.22^{***}	-0.87^{***}	-0.88^{***}
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
$Post_t$	-0.002	-5.39^{***}			
	(0.10)	(0.76)			
$Treat_i \times Post_t$	0.89^{***}	0.94^{***}	0.97^{***}	0.90^{***}	0.92^{***}
	(0.13)	(0.13)	(0.13)	(0.12)	(0.12)
Constant	4.90^{***}	41.78^{***}			
	(0.09)	(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	237,093	212,627	212,627	212,627	212,627
R^2	0.001	0.17	0.17	0.21	0.21
Adjusted R^2	0.001	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.

4 Event study

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

```
## NOTE: 222,512 observations removed because of NA values (LHS: 222,512, RHS: 9,862).
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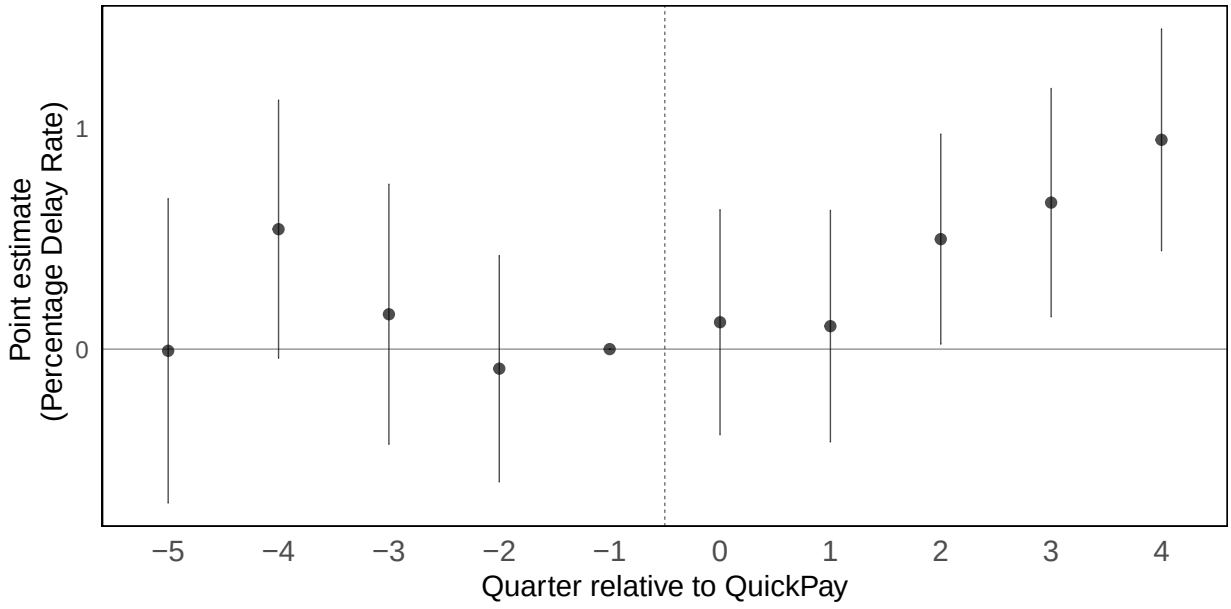

5 Parallel Trends Test

Table 2: Linear Time Trend Before QuickPay

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.11^{***}	-0.85^{**}	-0.85^{**}	-0.47	-0.56
	(0.37)	(0.36)	(0.36)	(0.37)	(0.37)
$QuarterNum$	0.40^{***}	-1.06^{**}			
	(0.07)	(0.47)			
$Treat_i \times QuarterNum$	-0.07	-0.09	-0.09	-0.03	-0.02
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Constant	3.08^{***}	46.85^{***}			
	(0.31)	(2.20)			
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	89,463	81,930	81,930	81,930	81,930
R^2	0.004	0.20	0.20	0.26	0.26
Adjusted R^2	0.003	0.20	0.20	0.25	0.25

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.

6 Placebo Test

[1] 3

Table 3: Placebo test: Treatment Time 2010-06-30

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-3.04^{***}	-3.99^{***}	-4.00^{***}	-2.22^{***}	-2.31^{***}
	(0.62)	(0.63)	(0.63)	(0.61)	(0.61)
$Post$	0.84	-10.27^{**}			
	(0.54)	(4.42)			
$Treat_i \times Post$	0.48	1.43^{**}	1.40^{**}	0.96	1.01
	(0.65)	(0.67)	(0.67)	(0.64)	(0.64)
Constant	7.77^{***}	91.65^{***}			
	(0.53)	(4.18)			
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	89,463	81,930	81,930	81,930	81,930
R^2	0.002	0.20	0.20	0.26	0.26
Adjusted R^2	0.002	0.20	0.20	0.25	0.25

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.

[1] 4

Table 4: Placebo test: Treatment Time 2010-09-30

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.09^{***}	-2.85^{***}	-2.86^{***}	-1.40^{***}	-1.50^{***}
	(0.38)	(0.37)	(0.37)	(0.38)	(0.38)
$Post$	1.89^{***}	-8.89^{***}			
	(0.36)	(2.96)			
$Treat_i \times Post$	-0.68	0.15	0.16	0.07	0.14
	(0.43)	(0.44)	(0.44)	(0.43)	(0.43)
Constant	7.10^{***}	89.44^{***}			
	(0.31)	(2.58)			
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	89,463	81,930	81,930	81,930	81,930
R^2	0.003	0.20	0.20	0.26	0.26
Adjusted R^2	0.003	0.20	0.20	0.25	0.25

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.

[1] 5

Table 5: Placebo test: Treatment Time 2010-12-31

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.31^{***}	-2.14^{***}	-2.18^{***}	-0.85^{***}	-0.93^{***}
	(0.30)	(0.29)	(0.29)	(0.31)	(0.31)
$Post$	0.92^{***}	-14.59^{***}			
	(0.33)	(2.54)			
$Treat_i \times Post$	-0.52	-1.08^{***}	-1.00^{**}	-0.82^{**}	-0.77^{*}
	(0.39)	(0.40)	(0.40)	(0.41)	(0.41)
Constant	8.03^{***}	90.98^{***}			
	(0.25)	(1.96)			
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	89,463	81,930	81,930	81,930	81,930
R^2	0.002	0.20	0.21	0.26	0.26
Adjusted R^2	0.002	0.20	0.21	0.25	0.25

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.

7 Summary statistics

8 Congestion Effect

8.1 Number of projects per contractor

8.1.1 Contractors holding only small or only large projects

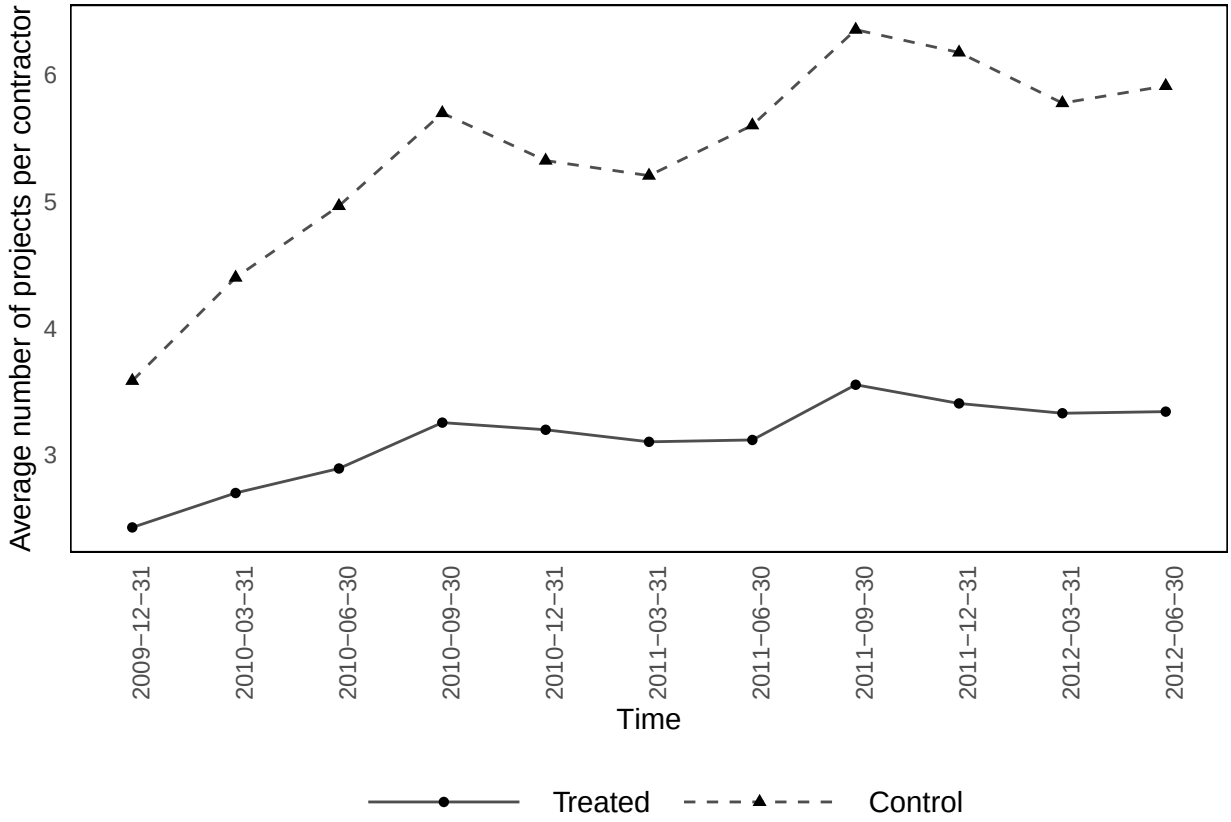

Table 6: Num Contractor Projects and QuickPay reform

	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.

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

8.2 Total budget

8.2.1 Contractors holding only small or only large projects

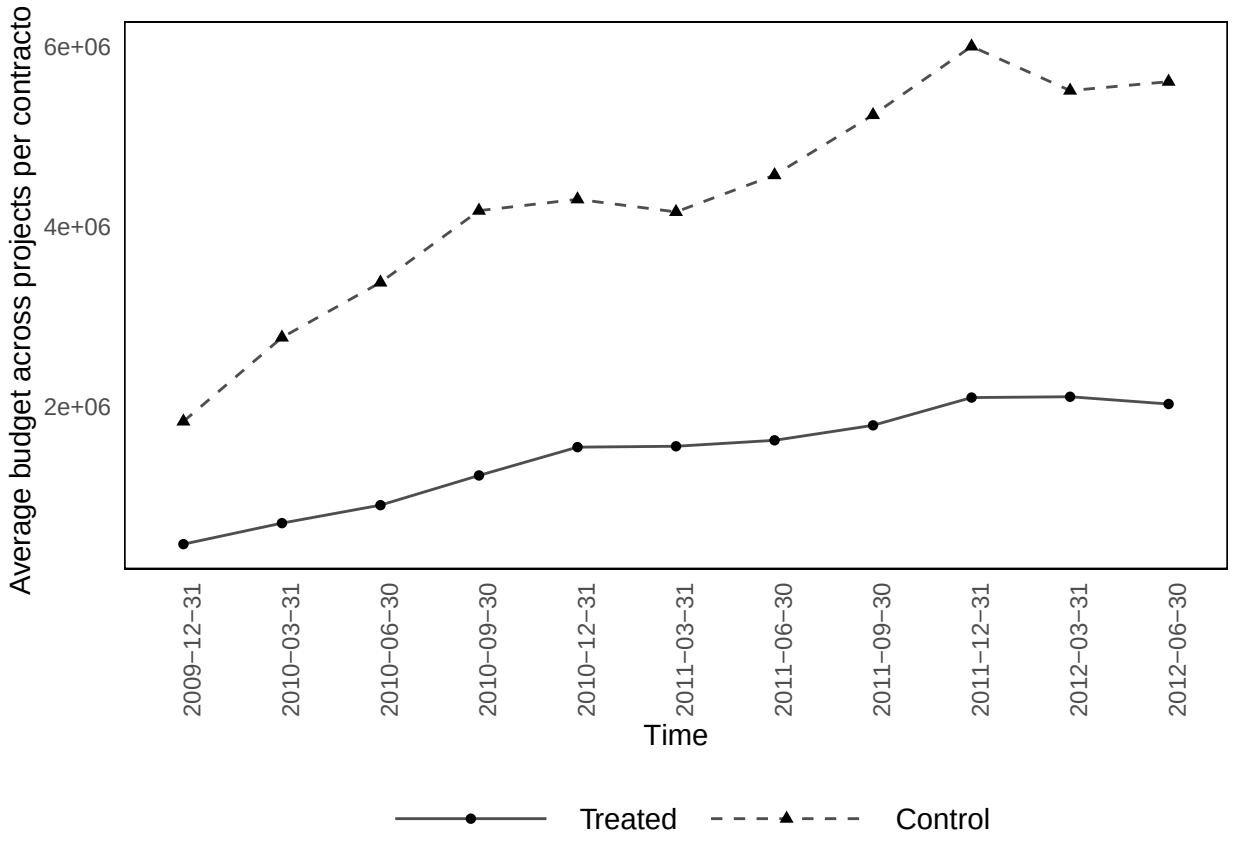

Table 7: Contractor Project Budget and QuickPay reform

	Total budget	
	(1)	(2)
$Treat_i$	$-2{,}503{,}033.00^{***}$	$-2{,}497{,}737.00^{***}$
	(454,885.70)	(456,972.80)
$Post_t$	$1{,}715{,}503.00^{***}$	
	(229,333.50)	
$Treat_i \times Post_t$	$-953{,}041.30^{***}$	$-955{,}237.70^{***}$
	(231,908.60)	(233,131.80)
Constant	$3{,}666{,}740.00^{***}$	
	(453,287.80)	
Time fixed effects	No	Yes
Observations	84,391	84,391
R^2	0.01	0.02
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.

8.3 Number of tasks

8.3.1 Contractors holding only small or only large projects

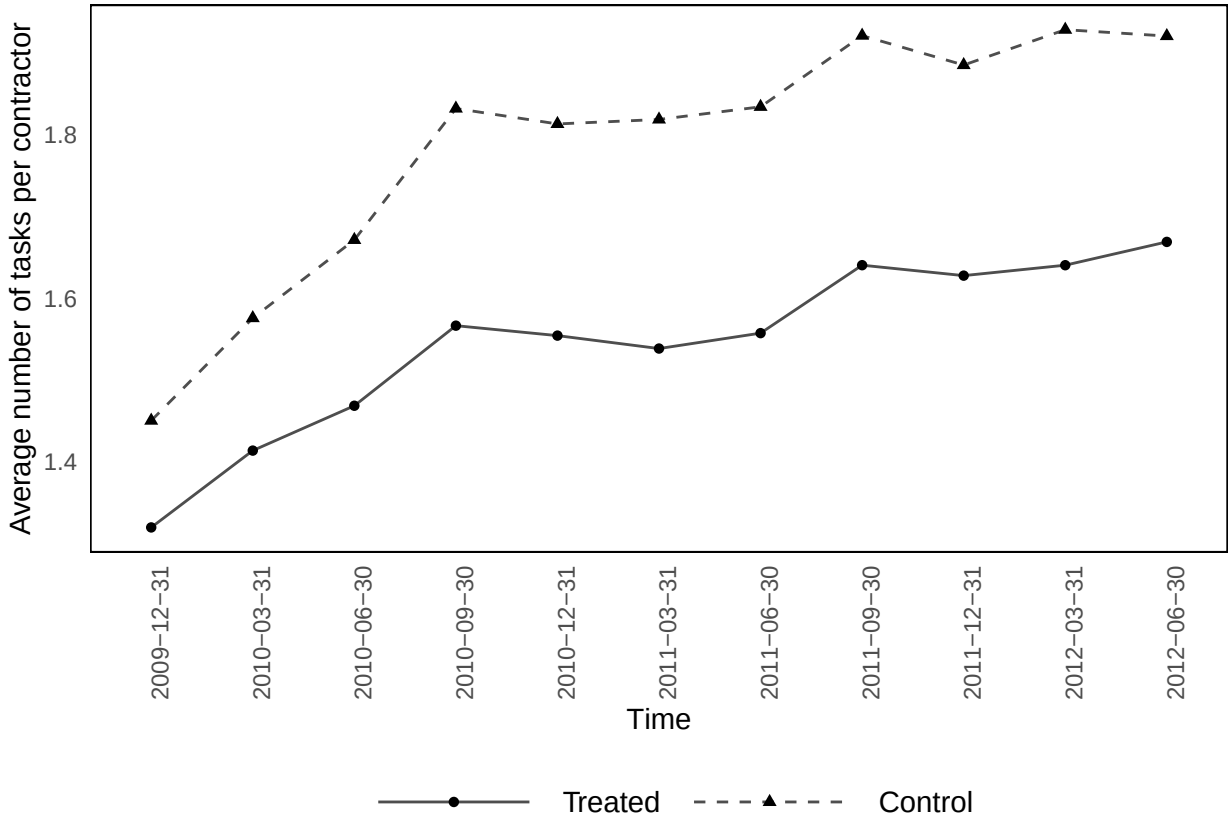

Table 8: Contractor Project Tasks and QuickPay reform

	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.

9 Project portfolio: Spillover effect

9.1 Regression 1: DID on large projects

- Sample restricted to large projects only.
- Treat is an indicator that equals one for LARGE projects that have at least one parallel small project in the same quarter, and is zero otherwise.

Table 9: Project Portfolio and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	4.41^{***}	0.70^{***}	0.64^{***}	1.15^{***}	1.16^{***}
	(0.31)	(0.20)	(0.20)	(0.20)	(0.20)
$Post_t$	-0.10	-13.38^{***}			
	(0.12)	(1.17)			
$Treat_i \times Post_t$	-1.17^{***}	0.02	0.03	-0.65^{**}	-0.56^{**}
	(0.36)	(0.26)	(0.26)	(0.26)	(0.26)
Constant	5.59^{***}	63.76^{***}			
	(0.10)	(0.89)			
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	0.01	0.26	0.26	0.30	0.30
Adjusted R^2	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.

9.2 Regression 2: Incremental effect on small project with existing large project

- $Treat_{i,l}$ is an indicator that equals 1 for small projects with co-existing large projects, and is zero otherwise.
- $Treat_{i,l} = 1 \implies Treat_i = 1$. This means we have:
  - $Treat_{i,l} \times Post_t = Treat_i \times Treat_{i,l} \times Post_t$
  - $Treat_{i,l} \times Treat_i = Treat_{i,l}$
- Large projects with parallel small projects are removed to get a clean control group.

Table 10: (Incremental effect) Project Portfolio and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.04^{***}	-0.96^{***}	-1.00^{***}	-0.80^{***}	-0.82^{***}
	(0.11)	(0.10)	(0.10)	(0.10)	(0.10)
$Treat_{i,l}$	-2.14^{***}	-1.26^{***}	-1.29^{***}	-0.37^{***}	-0.32^{***}
	(0.12)	(0.12)	(0.12)	(0.11)	(0.11)
$Post_t$	-0.002	-5.37^{***}			
	(0.10)	(0.76)			
$Treat_i \times Post_t$	1.04^{***}	1.08^{***}	1.11^{***}	1.03^{***}	1.04^{***}
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
$Treat_{i,l} \times Post_t$	-0.63^{***}	-0.62^{***}	-0.61^{***}	-0.64^{***}	-0.58^{***}
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Constant	4.90^{***}	41.79^{***}			
	(0.09)	(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	237,093	212,627	212,627	212,627	212,627
R^2	0.004	0.17	0.18	0.21	0.21
Adjusted R^2	0.004	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.
Large projects with parallel small projects are removed.

9.3 Regression 3: Total effect on small project with existing large project

- $Treat_{i,l}$ is an indicator that equals 1 for small projects with co-existing large projects, and is zero otherwise.
- $Treat_{i,s}$ is an indicator that equals 1 for small projects without co-existing large projects, and is zero otherwise.
- Large projects with parallel small projects are removed to get a clean control group.

Table 11: (Total effect) Project Portfolio and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_{i,s}$	-1.04^{***}	-0.96^{***}	-1.00^{***}	-0.80^{***}	-0.82^{***}
	(0.11)	(0.10)	(0.10)	(0.10)	(0.10)
$Treat_{i,l}$	-3.18^{***}	-2.22^{***}	-2.28^{***}	-1.16^{***}	-1.14^{***}
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
$Post_t$	-0.002	-5.37^{***}			
	(0.10)	(0.76)			
$Treat_{i,s} \times Post_t$	1.04^{***}	1.08^{***}	1.11^{***}	1.03^{***}	1.04^{***}
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
$Treat_{i,l} \times Post_t$	0.41^{**}	0.46^{***}	0.50^{***}	0.39^{**}	0.46^{***}
	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Constant	4.90^{***}	41.79^{***}			
	(0.09)	(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	237,093	212,627	212,627	212,627	212,627
R^2	0.004	0.17	0.18	0.21	0.21
Adjusted R^2	0.004	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.
Large projects with parallel small projects are removed.

10 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)

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

10.1 Stage Quintile

10.2 Logged Stage Regressions

Table 12: Project Stage and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.25^{***}	-1.41^{***}	-1.47^{***}	-1.15^{***}	-1.19^{***}
	(0.22)	(0.20)	(0.20)	(0.19)	(0.19)
Log(Stage)	3.03^{***}	2.42^{***}	2.36^{***}	2.42^{***}	2.42^{***}
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$Post_t$	-1.09^{***}	-4.82^{***}			
	(0.21)	(0.78)			
$Treat_i \times Post_t$	1.81^{***}	1.62^{***}	1.67^{***}	1.65^{***}	1.69^{***}
	(0.26)	(0.24)	(0.24)	(0.24)	(0.24)
$Treat_i \times$ Log(Stage)	-0.59^{***}	-0.13	-0.15^{*}	-0.17^{**}	-0.19^{**}
	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)
$Post_t \times$ Log(Stage)	-0.001	0.52^{***}	0.53^{***}	0.28^{***}	0.28^{***}
	(0.09)	(0.08)	(0.08)	(0.08)	(0.08)
$Treat_i \times Post_t \times$ Log(Stage)	0.53^{***}	0.48^{***}	0.50^{***}	0.54^{***}	0.55^{***}
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
Constant	9.75^{***}	41.62^{***}			
	(0.18)	(0.60)			
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	234,963	212,627	212,627	212,627	212,627
R^2	0.05	0.17	0.18	0.21	0.21
Adjusted R^2	0.05	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.

11 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 13: Contract Financing and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.80^{***}	-1.15^{***}	-1.26^{***}	-0.68^{***}	-0.72^{***}
	(0.14)	(0.14)	(0.14)	(0.15)	(0.15)
$Post_t$	1.83^{***}	-9.39^{***}			
	(0.26)	(2.50)			
CF_i	1.37^{***}	1.46^{***}	1.25^{***}	-0.73^{**}	-0.81^{**}
	(0.35)	(0.30)	(0.30)	(0.32)	(0.33)
$Treat_i \times Post_t$	-0.41	2.29^{***}	2.39^{***}	2.22^{***}	2.25^{***}
	(0.32)	(0.42)	(0.42)	(0.43)	(0.43)
$Post_t \times CF_i$	0.18	-1.11^{*}	-0.91	0.47	0.52
	(0.64)	(0.64)	(0.64)	(0.66)	(0.67)
$Treat_i \times CF_i$	1.92^{***}	1.10^{***}	1.12^{***}	0.79^{*}	0.77^{*}
	(0.46)	(0.39)	(0.39)	(0.41)	(0.41)
$Treat_i \times Post_t \times CF_i$	0.61	-1.62^{*}	-1.63^{*}	-1.01	-1.07
	(0.88)	(0.88)	(0.88)	(0.91)	(0.90)
Constant	5.00^{***}	45.28^{***}			
	(0.12)	(0.82)			
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	68,694	58,056	58,056	58,056	58,056
R^2	0.01	0.17	0.18	0.22	0.23
Adjusted R^2	0.01	0.17	0.18	0.21	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.

12 Receives Grants/Financial Assistance (Projects active on/before June 2010)

- $CF = 1$ if receives_grants==‘t’
- The variable “receives_grants” used to be called “receives financial assistance”

Table 14: Receives grants and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.71^{***}	-1.00^{***}	-1.11^{***}	-0.57^{***}	-0.62^{***}
	(0.14)	(0.13)	(0.13)	(0.14)	(0.14)
$Post_t$	1.99^{***}	-8.68^{***}			
	(0.24)	(2.46)			
CF_i	1.28^{*}	2.31^{***}	2.08^{***}	1.53^{**}	1.49^{**}
	(0.74)	(0.67)	(0.66)	(0.64)	(0.64)
$Treat_i \times Post_t$	-0.35	1.92^{***}	2.03^{***}	1.98^{***}	1.97^{***}
	(0.30)	(0.37)	(0.37)	(0.39)	(0.39)
$Post_t \times CF_i$	-1.33	-2.20^{*}	-1.93	-0.99	-1.00
	(1.11)	(1.31)	(1.30)	(1.35)	(1.35)
$Treat_i \times CF_i$	1.87^{**}	1.00	1.11	0.13	0.13
	(0.91)	(0.82)	(0.81)	(0.79)	(0.80)
$Treat_i \times Post_t \times CF_i$	0.24	0.50	0.38	0.80	1.06
	(1.41)	(1.73)	(1.72)	(1.77)	(1.76)
Constant	5.13^{***}	44.52^{***}			
	(0.12)	(0.81)			
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	68,694	58,056	58,056	58,056	58,056
R^2	0.01	0.17	0.18	0.22	0.23
Adjusted R^2	0.01	0.17	0.18	0.21	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.

13 Competition

13.1 Impact on bidding metrics [One type]

Table 15: Effect of Competition After QuickPay: Quickpay 2009-2011

	$NumberOfBids_{it}$	$InitialDuration_{it}$	$InitialBudget_{it}$
	(1)	(2)	(3)
$Treat_i$	0.89^{***}	-14.08^{***}	$-58{,}366.39^{***}$
	(0.15)	(1.12)	(4,530.81)
$Treat_i \times Post_t$	0.37^{*}	1.93	$-23{,}862.98^{***}$
	(0.19)	(1.38)	(5,996.59)
Task fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Observations	126,531	81,184	126,639
R^2	0.36	0.34	0.30
Adjusted R^2	0.35	0.33	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 fully competed projects.

13.2 Impact on delays

13.2.1 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 16: Effect of QuickPay on competitively awarded projects

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.82^{***}	-1.62^{***}	-1.63^{***}	-0.41^{***}	-0.42^{***}
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
SA_i	-1.75^{***}	0.97^{***}	1.47^{***}	1.60^{***}	1.56^{***}
	(0.15)	(0.15)	(0.16)	(0.16)	(0.16)
$Post_t$	1.26^{***}	-1.11^{***}			
	(0.14)	(0.14)			
$Treat_i \times Post_t$	0.15	0.26	0.29^{*}	0.12	0.12
	(0.17)	(0.17)	(0.17)	(0.16)	(0.16)
$Treat_i \times Post_t \times SA_i$	0.83^{***}	0.47^{***}	0.44^{**}	0.59^{***}	0.59^{***}
	(0.19)	(0.18)	(0.18)	(0.17)	(0.17)
Constant	5.02^{***}	9.65^{***}			
	(0.10)	(0.12)			
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	195,162	193,607	193,607	193,607	193,607
R^2	0.005	0.06	0.06	0.12	0.12
Adjusted R^2	0.005	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.
Sample restricted to fully competed projects.

Table 17: Effect of QuickPay on non-competitively awarded projects

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	1.08^{***}	0.87^{***}	0.80^{***}	-0.45^{*}	-0.37
	(0.27)	(0.26)	(0.26)	(0.27)	(0.27)
SA_i	-0.74^{***}	1.81^{***}	3.04^{***}	2.61^{***}	2.54^{***}
	(0.21)	(0.21)	(0.25)	(0.26)	(0.26)
$Post_t$	-0.49^{**}	-2.92^{***}			
	(0.23)	(0.23)			
$Treat_i \times Post_t$	2.38^{***}	2.23^{***}	2.15^{***}	1.84^{***}	1.74^{***}
	(0.39)	(0.37)	(0.38)	(0.37)	(0.38)
$Treat_i \times Post_t \times SA_i$	-1.74^{***}	-1.51^{***}	-1.49^{***}	-1.65^{***}	-1.52^{***}
	(0.39)	(0.36)	(0.37)	(0.36)	(0.36)
Constant	4.44^{***}	9.73^{***}			
	(0.19)	(0.24)			
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	41,770	41,196	41,196	41,196	41,196
R^2	0.01	0.06	0.07	0.14	0.14
Adjusted R^2	0.01	0.06	0.07	0.12	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.

13.2.2 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:

- 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 18: Effect of Competition After QuickPay: Quickpay 2009-2011

	$PercentDelay_{it}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Treat_i$	1.08^{***}	1.08^{***}	0.88^{***}	0.83^{***}	-0.40	-0.39
	(0.27)	(0.27)	(0.26)	(0.26)	(0.26)	(0.26)
SA_i	-0.74^{***}	-0.74^{***}	1.62^{***}	2.27^{***}	2.14^{***}	2.09^{***}
	(0.21)	(0.21)	(0.20)	(0.21)	(0.21)	(0.21)
$Competitive_i$	0.58^{***}	0.58^{***}	0.40^{**}	0.39^{*}	-0.96^{***}	-0.88^{***}
	(0.21)	(0.21)	(0.20)	(0.20)	(0.21)	(0.21)
$Post_t$	-0.49^{**}	-0.49^{**}	-2.75^{***}			
	(0.23)	(0.23)	(0.23)			
$Treat_i \times Competitive_i$	-2.90^{***}	-2.90^{***}	-2.49^{***}	-2.45^{***}	-0.04	-0.06
	(0.29)	(0.29)	(0.28)	(0.28)	(0.28)	(0.28)
$Post_t \times Competitive_i$	1.75^{***}	1.75^{***}	1.59^{***}	1.55^{***}	0.69^{***}	0.63^{**}
	(0.27)	(0.27)	(0.26)	(0.26)	(0.26)	(0.26)
$SA_i \times Competitive_i$	-1.00^{***}	-1.00^{***}	-0.61^{**}	-0.62^{**}	-0.45^{*}	-0.45^{*}
	(0.26)	(0.26)	(0.25)	(0.25)	(0.24)	(0.24)
$Treat_i \times Post_t$	2.38^{***}	2.38^{***}	2.25^{***}	2.24^{***}	1.57^{***}	1.53^{***}
	(0.39)	(0.39)	(0.37)	(0.37)	(0.37)	(0.37)
$Treat_i \times Post_t \times Competitive_i$	-2.24^{***}	-2.24^{***}	-1.99^{***}	-1.94^{***}	-1.44^{***}	-1.40^{***}
	(0.42)	(0.42)	(0.41)	(0.41)	(0.40)	(0.40)
$Treat_i \times Post_t \times SA_i$	-1.74^{***}	-1.74^{***}	-1.54^{***}	-1.54^{***}	-1.34^{***}	-1.36^{***}
	(0.39)	(0.39)	(0.36)	(0.36)	(0.36)	(0.36)
$Treat_i \times Post_t \times SA_i \times Competitive_i$	2.58^{***}	2.58^{***}	2.00^{***}	1.97^{***}	1.91^{***}	1.94^{***}
	(0.43)	(0.43)	(0.40)	(0.41)	(0.40)	(0.40)
Constant	4.44^{***}	4.44^{***}	9.33^{***}			
	(0.19)	(0.19)	(0.19)			
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	236,932	236,932	234,803	234,803	234,803	234,803
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	0.11

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.