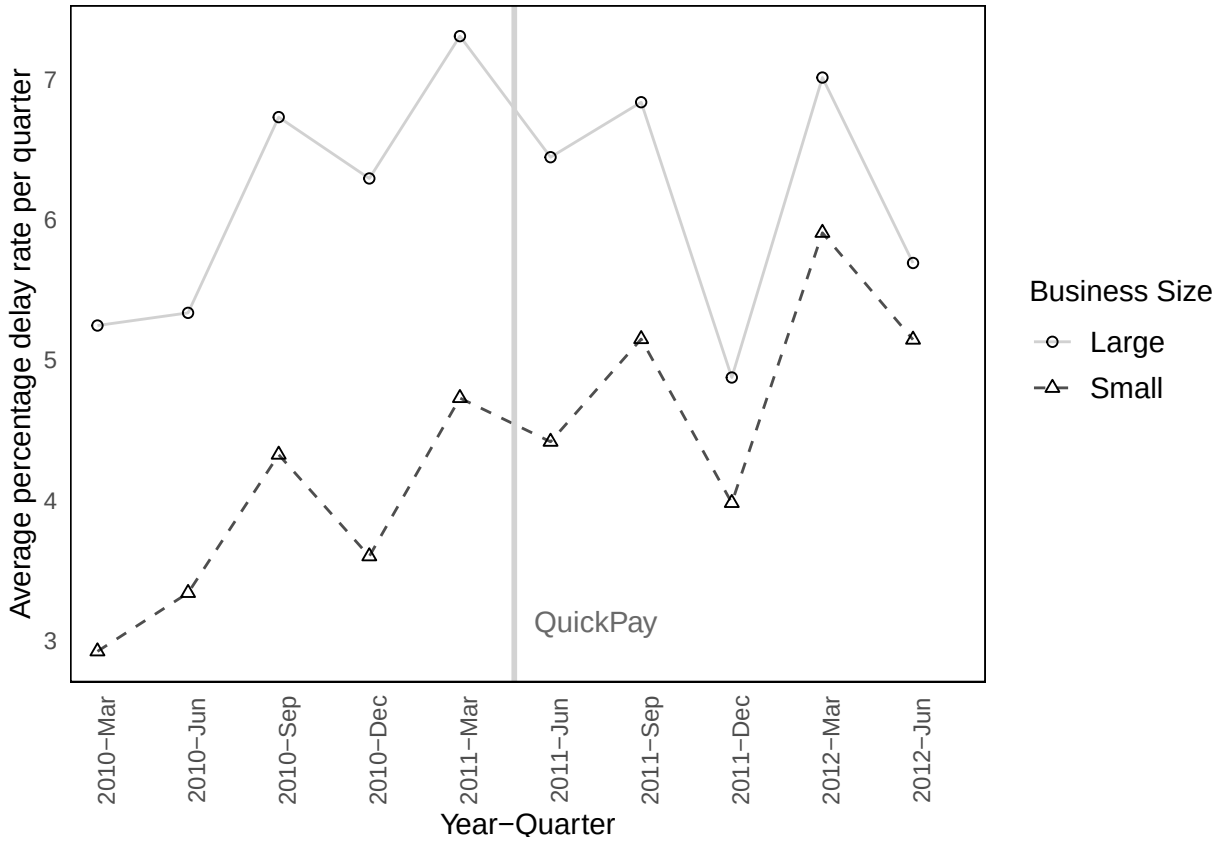
Percentage Delay Rate: QuickPay (2009-2012)

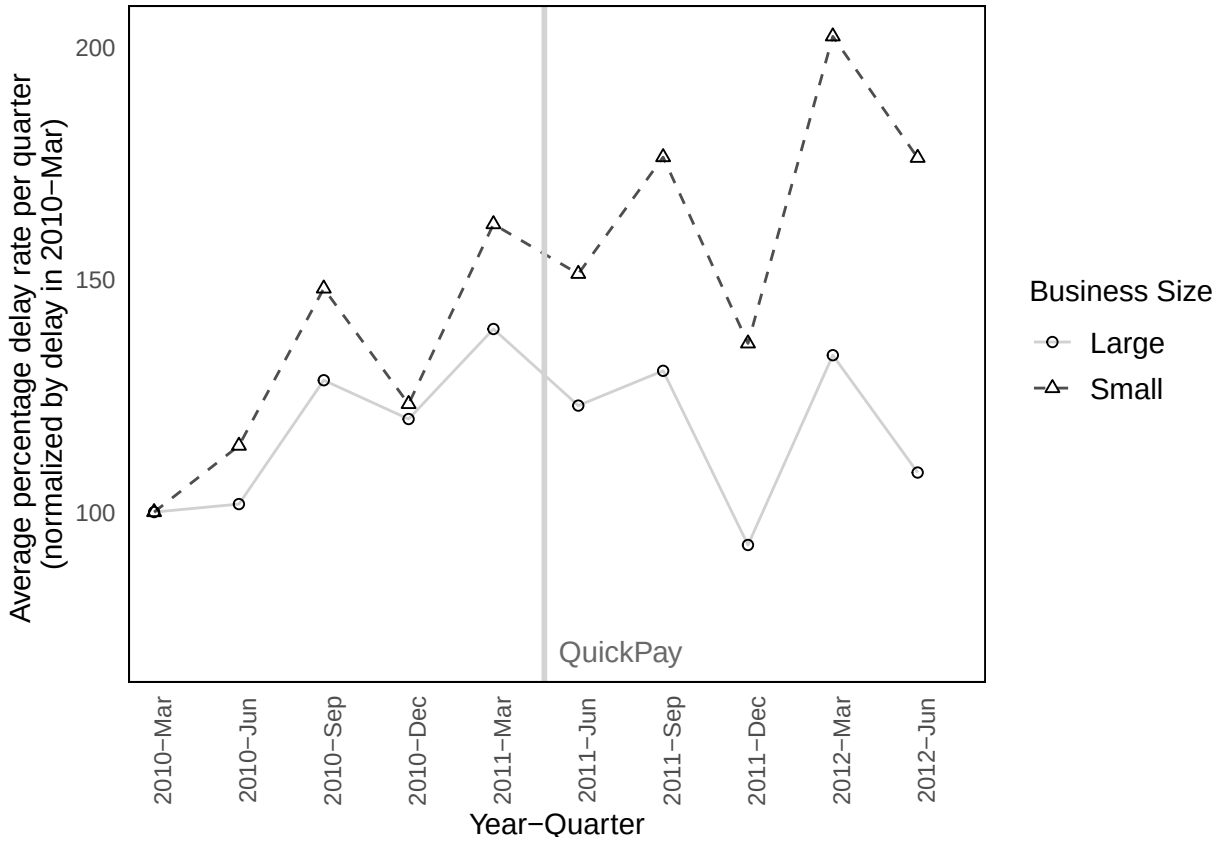
Mar 11, 2022

1 Percentage delays over time

- Sample restricted to projects for which start dates matches the one in API
  - This is done by using first reported "action_date" and "date_signed"
- $PercentDelay_{it} = 100 \times Delay_{it}/Duration_{i,t-1}$
  - $Duration_{i,t-1} = Deadline_{i,t-1} - StartDate_i$



1.1 Normalized delay rate (in percentage)



2 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

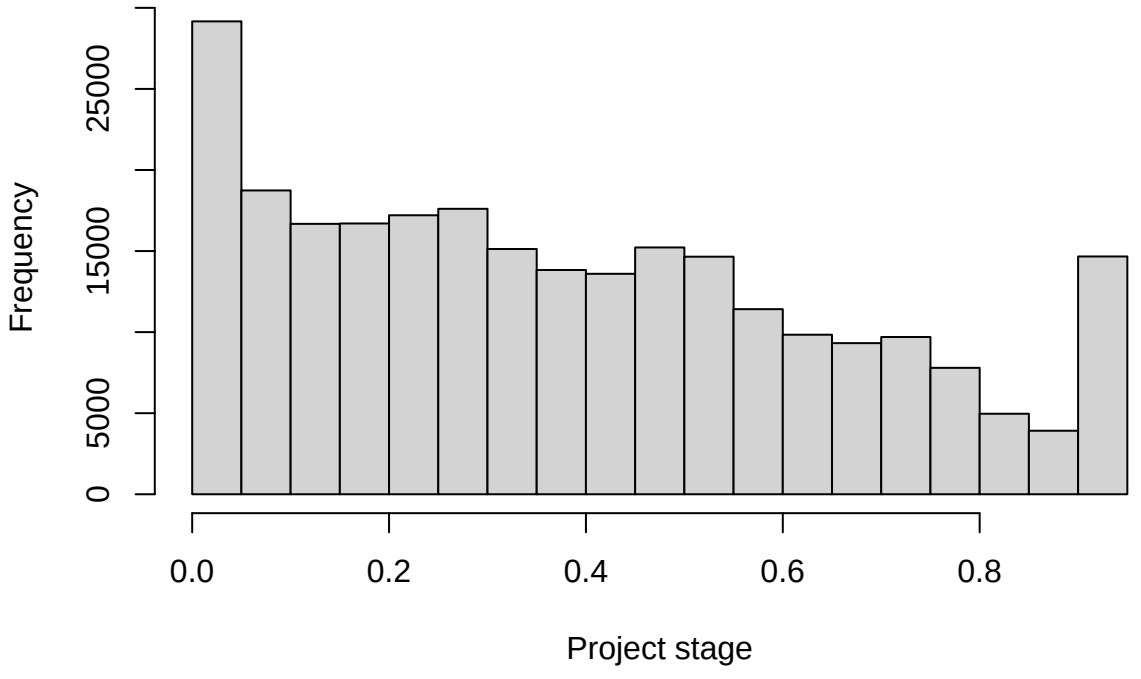
	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.48^{***}	-1.59^{***}	-1.62^{***}	-1.31^{***}	-1.33^{***}
	(0.12)	(0.10)	(0.10)	(0.10)	(0.10)
$Post_t$	-0.32^{***}	-8.32^{***}			
	(0.12)	(0.81)			
$Treat_i \times Post_t$	1.27^{***}	1.10^{***}	1.13^{***}	1.18^{***}	1.23^{***}
	(0.14)	(0.13)	(0.13)	(0.13)	(0.13)
Constant	6.44^{***}	53.81^{***}			
	(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
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	260,056	235,960	235,960	235,960	235,960
R^2	0.003	0.22	0.22	0.25	0.26
Adjusted R^2	0.003	0.22	0.22	0.25	0.25

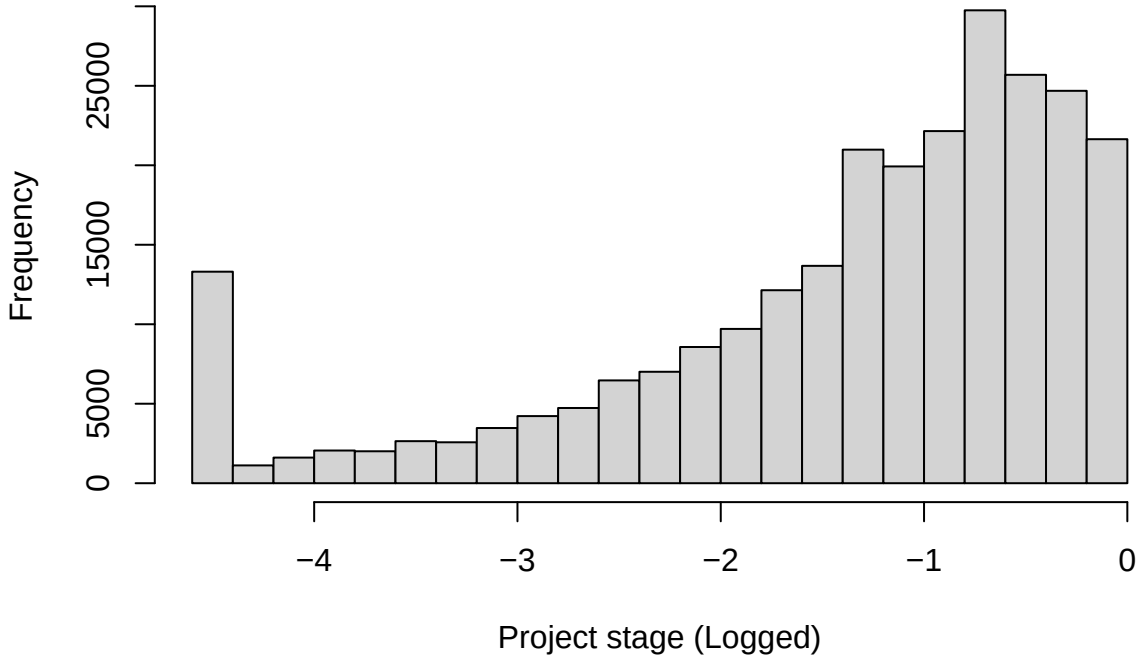
Note: *p<0.1; **p<0.05; ***p<0.01
Each observation is a project-quarter.
SEs are robust and clustered at the project level.

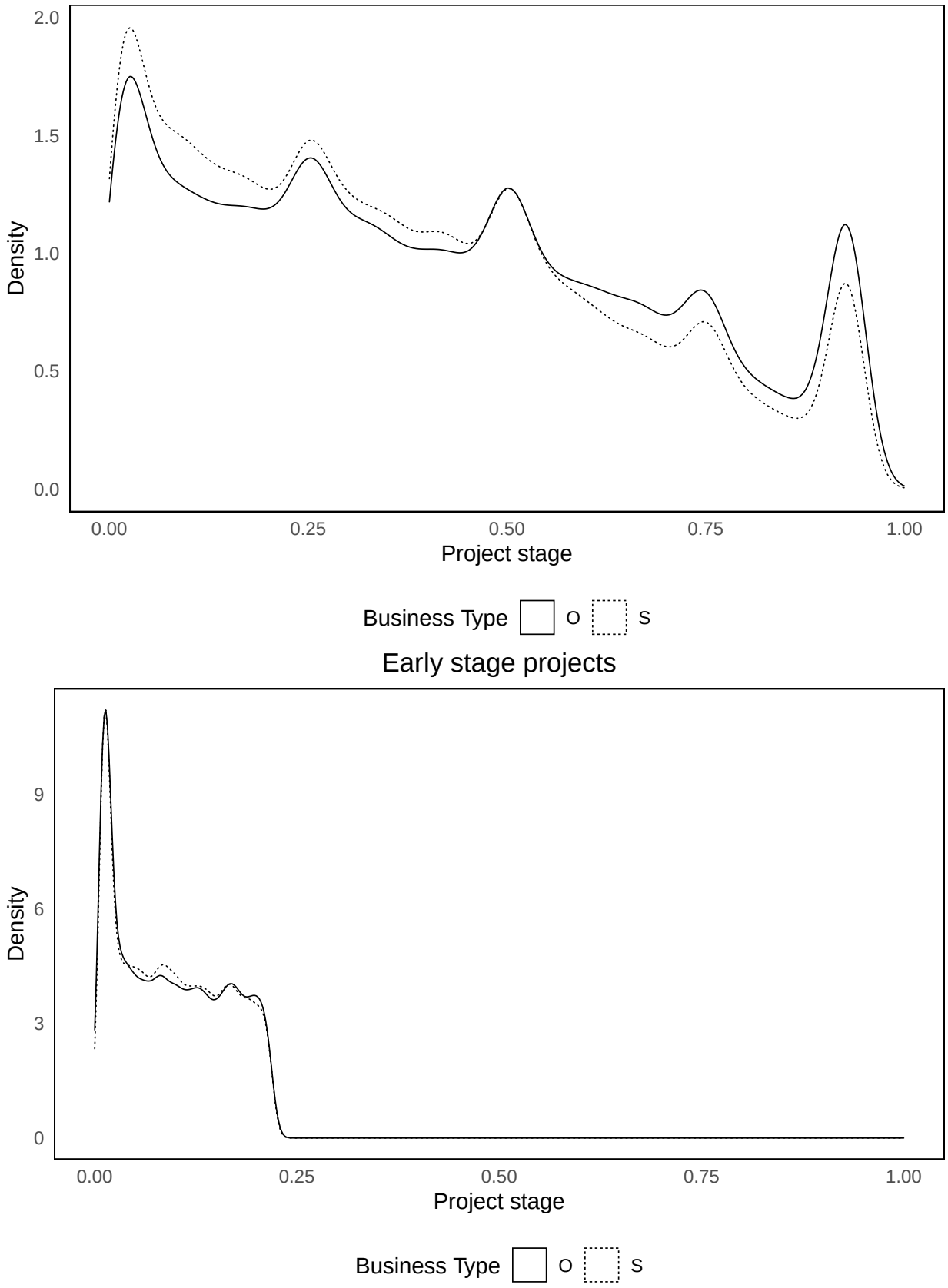
3 Project Stage

- 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)

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


Frequency
0
5000
15000
25000
0.0
0.2
0.4
0.6
0.8
Project stage


Frequency
0
5000
15000
25000
−4
−3
−2
−1
0
Project stage (Logged)


2.0
1.5
1.0
0.5
0.0
Density
0.00
0.25
0.50
0.75
1.00
Project stage
Business Type
O
S
Early stage projects
9
6
3
0
Density
0.00
0.25
0.50
0.75
1.00
Project stage
Business Type
O
S

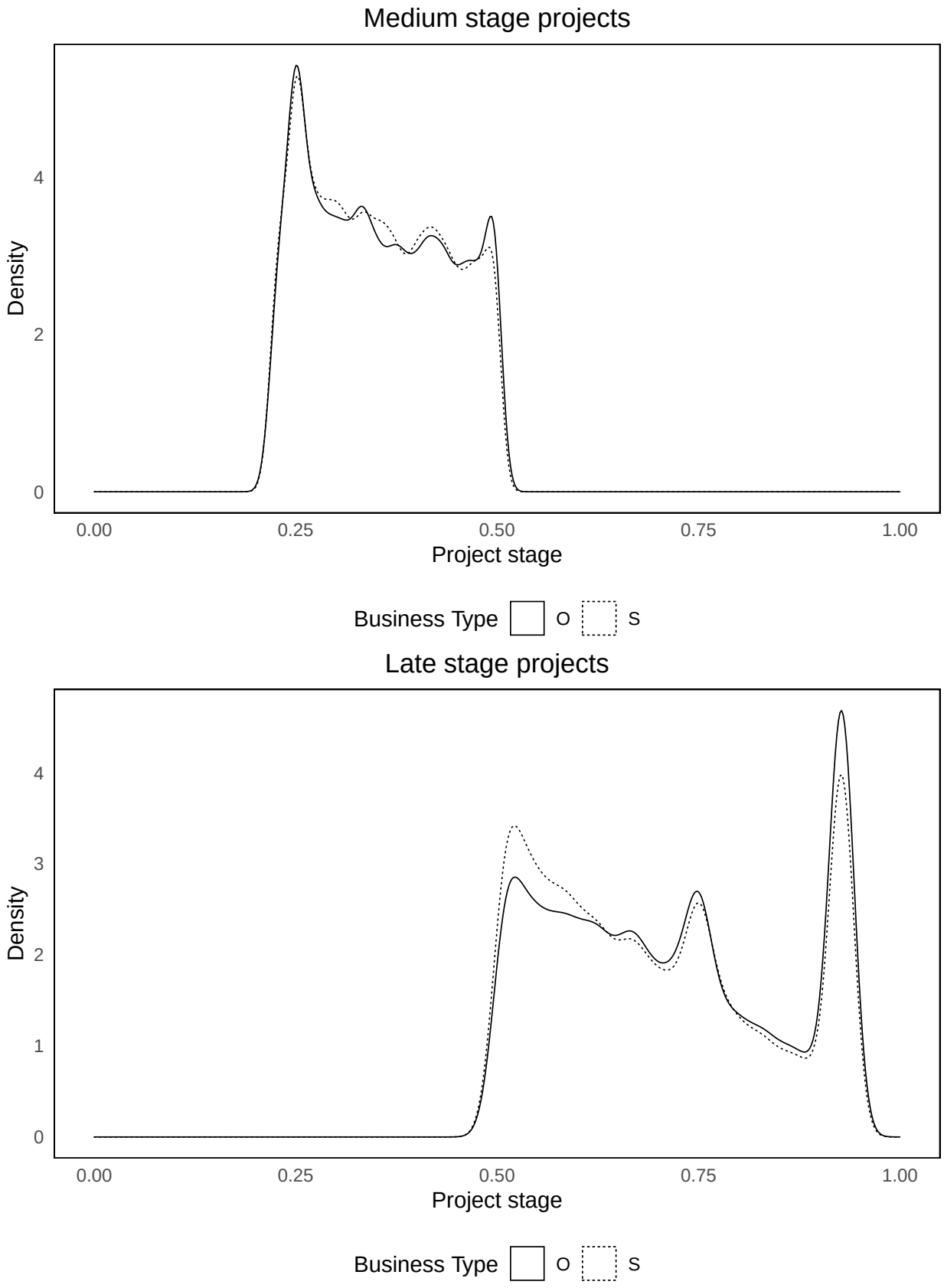

Medium stage projects
Density
0
2
4
0.00
0.25
0.50
0.75
1.00
Project stage
Business Type
O
S
Late stage projects
Density
0
1
2
3
4
0.00
0.25
0.50
0.75
1.00
Project stage
Business Type
O
S

Table 2: Project Stage and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-0.40^{***}	-1.21^{***}	-1.18^{***}	-0.88^{***}	-0.87^{***}
	(0.09)	(0.11)	(0.11)	(0.12)	(0.12)
Medium Stage	0.93^{***}	0.52^{***}	0.38^{***}	0.69^{***}	0.68^{***}
	(0.12)	(0.13)	(0.13)	(0.13)	(0.13)
Late Stage	16.93^{***}	11.90^{***}	11.75^{***}	11.42^{***}	11.40^{***}
	(0.28)	(0.23)	(0.23)	(0.23)	(0.23)
$Post_t$	-0.15	-6.48^{***}			
	(0.09)	(0.79)			
$Treat_i \times Post_t$	0.19^{*}	0.10	0.09	0.08	0.13
	(0.12)	(0.15)	(0.15)	(0.15)	(0.15)
$Treat_i\times$ Medium Stage	-0.48^{***}	0.32^{**}	0.30^{*}	0.24	0.24
	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)
$Treat_i\times$ Late Stage	-5.01^{***}	-1.68^{***}	-1.75^{***}	-1.88^{***}	-1.96^{***}
	(0.36)	(0.31)	(0.31)	(0.30)	(0.30)
$Post_t\times$ Medium Stage	-0.80^{***}	0.37^{**}	0.25	-0.04	-0.05
	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)
$Post_t\times$ Late Stage	-5.50^{***}	-1.93^{***}	-1.99^{***}	-2.45^{***}	-2.46^{***}
	(0.32)	(0.27)	(0.27)	(0.27)	(0.27)
$Treat_i \times Post_t\times$ Medium Stage	0.39^{**}	-0.01	-0.02	0.15	0.15
	(0.18)	(0.21)	(0.21)	(0.20)	(0.20)
$Treat_i \times Post_t\times$ Late Stage	3.80^{***}	2.81^{***}	2.86^{***}	3.04^{***}	3.09^{***}
	(0.41)	(0.37)	(0.37)	(0.36)	(0.36)
Constant	1.51^{***}	44.16^{***}			
	(0.07)	(0.60)			
Duration, Budget, Bids	No	Yes	Yes	Yes	Yes
$Post_t\times$ (Duration, Budget, Bids)	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	260,000	235,960	235,960	235,960	235,960
R^2	0.11	0.24	0.24	0.27	0.27
Adjusted R^2	0.11	0.24	0.24	0.27	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.

Table 3: Project Stage and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-4.72^{***}	-2.45^{***}	-2.50^{***}	-2.14^{***}	-2.19^{***}
	(0.25)	(0.21)	(0.21)	(0.20)	(0.20)
Log(Stage)	4.50^{***}	3.17^{***}	3.12^{***}	3.14^{***}	3.14^{***}
	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)
$Post_t$	-2.20^{***}	-7.92^{***}			
	(0.23)	(0.83)			
$Treat_i \times Post_t$	2.88^{***}	2.10^{***}	2.14^{***}	2.25^{***}	2.33^{***}
	(0.30)	(0.26)	(0.26)	(0.25)	(0.25)
$Treat_i \times$ Log(Stage)	-1.65^{***}	-0.54^{***}	-0.55^{***}	-0.52^{***}	-0.55^{***}
	(0.11)	(0.09)	(0.09)	(0.09)	(0.09)
$Post_t \times$ Log(Stage)	-0.36^{***}	0.53^{***}	0.53^{***}	0.23^{***}	0.22^{**}
	(0.10)	(0.09)	(0.09)	(0.09)	(0.09)
$Treat_i \times Post_t \times$ Log(Stage)	0.93^{***}	0.64^{***}	0.65^{***}	0.71^{***}	0.73^{***}
	(0.13)	(0.12)	(0.12)	(0.12)	(0.12)
Constant	13.35^{***}	53.91^{***}			
	(0.20)	(0.62)			
Duration, Budget, Bids	No	Yes	Yes	Yes	Yes
$Post_t \times$ (Duration, Budget, Bids)	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	260,000	235,960	235,960	235,960	235,960
R^2	0.06	0.22	0.22	0.25	0.26
Adjusted R^2	0.06	0.22	0.22	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.

3.1 Aliter: Stage definition

- t indicates the end of the quarter

$Stage_{it} = \frac{ActionDate_t - StartDate_i}{Duration_{i,t}}$ $Stage_{it} = \frac{t - StartDate_i}{Duration_{i,t}}$

Table 4: Project Stage and QuickPay reform

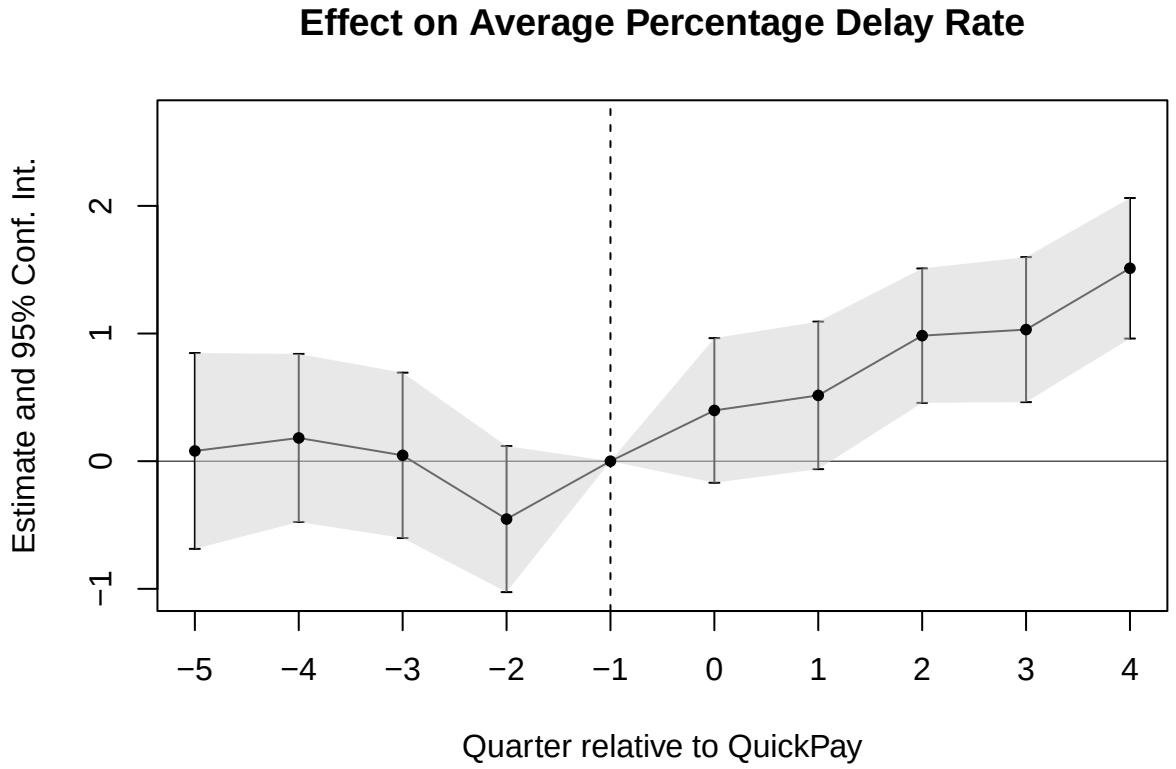
	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.34^{***}	-0.64^{***}	-0.48^{**}	-0.60^{**}	-0.62^{***}
	(0.17)	(0.23)	(0.24)	(0.24)	(0.24)
Medium Stage	3.01^{***}	-2.26^{***}	-2.66^{***}	-1.80^{***}	-1.79^{***}
	(0.20)	(0.22)	(0.22)	(0.22)	(0.22)
Late Stage	6.37^{***}	-7.43^{***}	-8.25^{***}	-6.77^{***}	-6.70^{***}
	(0.24)	(0.27)	(0.28)	(0.27)	(0.27)
$Post_t$	-0.93^{***}	-25.05^{***}			
	(0.18)	(1.09)			
$Treat_i \times Post_t$	1.17^{***}	1.04^{***}	0.97^{***}	0.79^{***}	0.85^{***}
	(0.22)	(0.30)	(0.30)	(0.30)	(0.30)
$Treat_i \times$ Medium Stage	-0.89^{***}	-1.05^{***}	-1.26^{***}	-0.76^{***}	-0.74^{***}
	(0.24)	(0.28)	(0.28)	(0.28)	(0.28)
$Treat_i \times$ Late Stage	-2.19^{***}	-1.39^{***}	-1.44^{***}	-0.76^{***}	-0.81^{***}
	(0.28)	(0.29)	(0.29)	(0.29)	(0.29)
$Post_t \times$ Medium Stage	0.78^{***}	3.54^{***}	3.52^{***}	2.86^{***}	2.83^{***}
	(0.24)	(0.26)	(0.27)	(0.27)	(0.27)
$Post_t \times$ Late Stage	0.26	6.38^{***}	6.81^{***}	5.47^{***}	5.38^{***}
	(0.29)	(0.31)	(0.32)	(0.32)	(0.32)
$Treat_i \times Post_t \times$ Medium Stage	0.08	0.36	0.51	0.61^{*}	0.59^{*}
	(0.30)	(0.36)	(0.36)	(0.35)	(0.35)
$Treat_i \times Post_t \times$ Late Stage	0.19	-0.21	-0.28	-0.03	-0.01
	(0.35)	(0.37)	(0.37)	(0.37)	(0.37)
Constant	2.81^{***}	68.49^{***}			
	(0.15)	(0.93)			
Duration, Budget, Bids	No	Yes	Yes	Yes	Yes
$Post_t \times$ (Duration, Budget, Bids)	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	260,056	236,016	236,016	236,016	236,016
R^2	0.02	0.18	0.19	0.23	0.23
Adjusted R^2	0.02	0.18	0.19	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.

4 Event study

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

```
## NOTE: 242,843 observations removed because of NA values (LHS: 242,843, RHS: 9,862).
```



5 Contract Financing

$$CF_i = \begin{cases} 1, & \text{if project } i \text{ receives contract financing} \\ 0, & \text{otherwise} \end{cases}$$

$$\begin{aligned} PercentDelay_{it} = \quad & \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \beta_3 (Treat_i \times Post_t) \\ + \quad & \beta_4 CF_i + \beta_5 (CF_i \times Post_t) + \beta_6 (Treat_i \times Post_t \times CF_i) \\ + \quad & X_i + (Post_t \times X_i) + \mu_t + \theta_{firm} + \lambda_{task} + \epsilon_{it} \end{aligned}$$

Table 5: Financial constraints and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.45^{***}	-1.64^{***}	-1.67^{***}	-1.30^{***}	-1.31^{***}
	(0.12)	(0.10)	(0.10)	(0.10)	(0.10)
$Post_t$	-0.36^{***}	-8.19^{***}			
	(0.12)	(0.82)			
$Treat_i \times Post_t$	1.08^{***}	0.98^{***}	0.99^{***}	1.09^{***}	1.15^{***}
	(0.15)	(0.13)	(0.13)	(0.13)	(0.13)
CF_i	2.59^{***}	2.08^{***}	1.97^{***}	-0.59^{***}	-0.68^{***}
	(0.19)	(0.17)	(0.17)	(0.17)	(0.17)
$Post_t \times CF_i$	0.12	-0.63^{**}	-0.53^{**}	0.07	0.08
	(0.28)	(0.25)	(0.25)	(0.25)	(0.25)
$Post_t \times CF_i \times Treat_i$	1.95^{***}	1.05^{***}	1.09^{***}	0.55^{**}	0.49^{*}
	(0.30)	(0.24)	(0.24)	(0.25)	(0.26)
Constant	6.09^{***}	54.48^{***}			
	(0.10)	(0.62)			
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	260,056	235,960	235,960	235,960	235,960
R^2	0.01	0.22	0.22	0.25	0.26
Adjusted R^2	0.01	0.22	0.22	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.

5.1 With Treat x CF term

Table 6: Financial constraints and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.83^{***}	-1.86^{***}	-1.88^{***}	-1.43^{***}	-1.44^{***}
	(0.13)	(0.11)	(0.11)	(0.11)	(0.11)
$Post_t$	-0.57^{***}	-8.35^{***}			
	(0.13)	(0.82)			
CF_i	1.01^{***}	1.26^{***}	1.16^{***}	-1.08^{***}	-1.16^{***}
	(0.28)	(0.24)	(0.24)	(0.25)	(0.25)
$Treat_i \times Post_t$	1.45^{***}	1.19^{***}	1.21^{***}	1.21^{***}	1.27^{***}
	(0.15)	(0.14)	(0.14)	(0.14)	(0.14)
$Post_t \times CF_i$	1.70^{***}	0.19	0.27	0.54^{*}	0.54^{*}
	(0.34)	(0.31)	(0.31)	(0.31)	(0.31)
$Treat_i \times CF_i$	2.90^{***}	1.53^{***}	1.52^{***}	0.92^{***}	0.90^{***}
	(0.38)	(0.31)	(0.31)	(0.31)	(0.31)
$Treat_i \times Post_t \times CF_i$	-0.96^{**}	-0.48	-0.43	-0.34	-0.37
	(0.47)	(0.41)	(0.41)	(0.41)	(0.41)
Constant	6.30^{***}	54.65^{***}			
	(0.11)	(0.62)			
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	260,056	235,960	235,960	235,960	235,960
R^2	0.01	0.22	0.22	0.25	0.26
Adjusted R^2	0.01	0.22	0.22	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.

5.2 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 7: Financial constraints and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-3.07^{***}	-1.52^{***}	-1.59^{***}	-1.01^{***}	-1.08^{***}
	(0.17)	(0.15)	(0.14)	(0.15)	(0.15)
$Post_t$	1.43^{***}	-19.81^{***}			
	(0.28)	(2.41)			
CF_i	0.52	1.19^{***}	1.00^{***}	-1.35^{***}	-1.48^{***}
	(0.38)	(0.33)	(0.32)	(0.35)	(0.35)
$Treat_i \times Post_t$	-0.05	2.64^{***}	2.68^{***}	2.74^{***}	2.75^{***}
	(0.34)	(0.45)	(0.45)	(0.47)	(0.47)
$Post_t \times CF_i$	0.28	-1.15^{*}	-0.97	0.67	0.73
	(0.68)	(0.69)	(0.68)	(0.71)	(0.71)
$Treat_i \times CF_i$	2.96^{***}	1.41^{***}	1.39^{***}	1.08^{**}	1.07^{**}
	(0.51)	(0.44)	(0.43)	(0.45)	(0.45)
$Treat_i \times Post_t \times CF_i$	0.79	-1.55	-1.50	-1.04	-1.12
	(0.97)	(0.98)	(0.97)	(1.00)	(1.00)
Constant	6.74^{***}	58.27^{***}			
	(0.14)	(0.85)			
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	75,119	64,292	64,292	64,292	64,292
R^2	0.01	0.23	0.23	0.27	0.28
Adjusted R^2	0.01	0.23	0.23	0.26	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.

5.3 Firm level financial Constraints (on/before June 2010)

- $CF = 1$ if contractor was receiving financing on any project prior on or before June 2010
- Jobs act was launched in Sept 2010

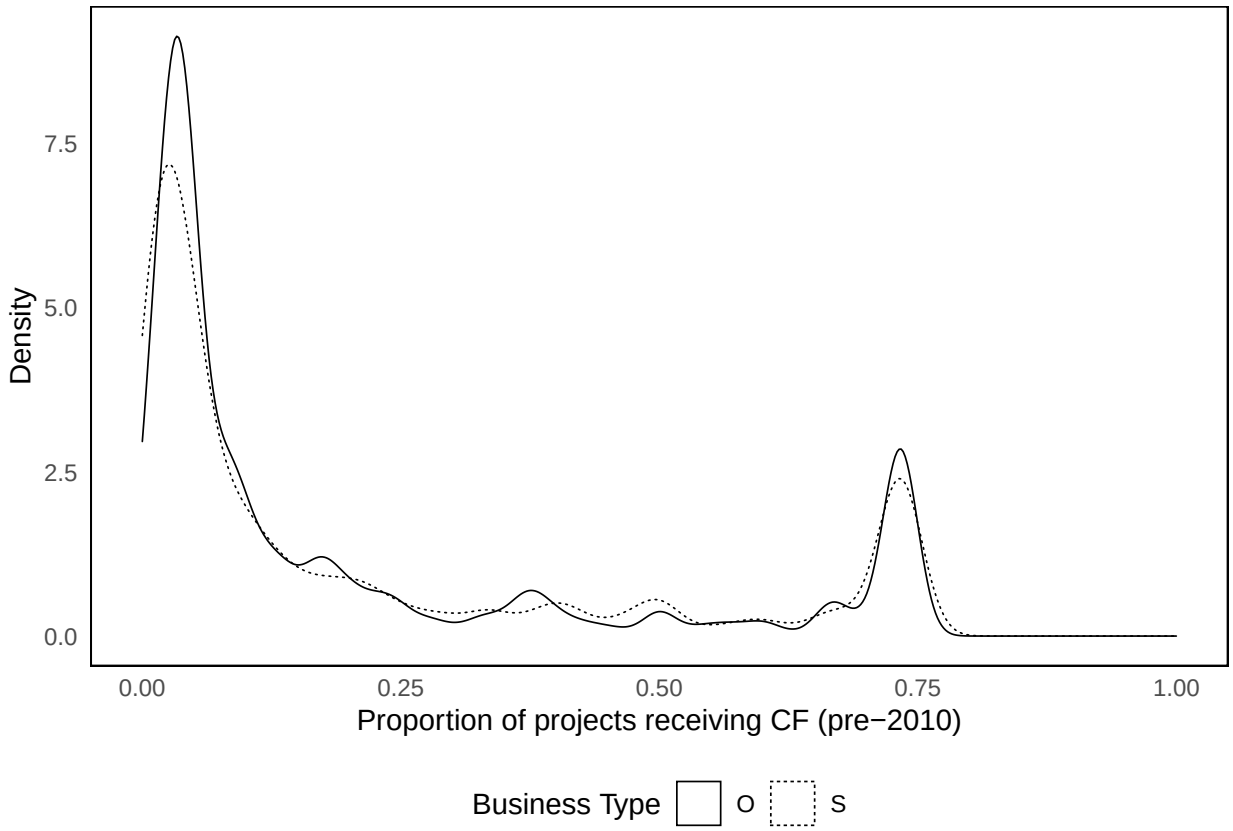
Table 8: Financial constraints and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-0.38^{***}	-0.19	-0.24^{*}	-0.74^{***}	-0.75^{***}
	(0.14)	(0.13)	(0.13)	(0.13)	(0.13)
$Post_t$	0.17	-8.13^{***}			
	(0.14)	(0.85)			
CF_i	4.74^{***}	3.57^{***}	3.47^{***}	1.07^{***}	1.07^{***}
	(0.20)	(0.15)	(0.15)	(0.16)	(0.16)
$Treat_i \times Post_t$	0.34^{*}	0.03	0.06	0.60^{***}	0.70^{***}
	(0.18)	(0.17)	(0.17)	(0.17)	(0.17)
$Post_t \times CF_i$	-1.17^{***}	-1.83^{***}	-1.74^{***}	-1.09^{***}	-1.04^{***}
	(0.24)	(0.20)	(0.20)	(0.20)	(0.20)
$Treat_i \times CF_i$	-4.17^{***}	-2.68^{***}	-2.60^{***}	-1.07^{***}	-1.09^{***}
	(0.24)	(0.20)	(0.20)	(0.20)	(0.20)
$Treat_i \times Post_t \times CF_i$	1.62^{***}	1.76^{***}	1.71^{***}	0.95^{***}	0.90^{***}
	(0.30)	(0.27)	(0.27)	(0.26)	(0.26)
Constant	4.00^{***}	51.77^{***}			
	(0.11)	(0.63)			
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	229,552	209,046	209,046	209,046	209,046
R^2	0.01	0.22	0.22	0.26	0.26
Adjusted R^2	0.01	0.22	0.22	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.

5.4 Plots

```
## Warning: Removed 255008 rows containing non-finite values (stat_density).
```



6 Receives Grants/Financial Assistance

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

6.1 All projects

Table 9: Financial constraints and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.98^{***}	-1.45^{***}	-1.46^{***}	-1.11^{***}	-1.13^{***}
	(0.12)	(0.11)	(0.11)	(0.10)	(0.10)
$Post_t$	-0.04	-8.70^{***}			
	(0.12)	(0.85)			
CF_i	12.86^{***}	6.26^{***}	6.16^{***}	4.84^{***}	4.86^{***}
	(0.74)	(0.44)	(0.44)	(0.44)	(0.44)
$Treat_i \times Post_t$	0.76^{***}	0.79^{***}	0.79^{***}	0.92^{***}	1.00^{***}
	(0.15)	(0.14)	(0.14)	(0.14)	(0.14)
$Post_t \times CF_i$	-8.21^{***}	-4.36^{***}	-4.28^{***}	-3.99^{***}	-3.85^{***}
	(0.79)	(0.55)	(0.55)	(0.55)	(0.55)
$Treat_i \times CF_i$	-9.13^{***}	-2.65^{***}	-2.55^{***}	-2.64^{***}	-2.69^{***}
	(0.90)	(0.63)	(0.63)	(0.64)	(0.64)
$Treat_i \times Post_t \times CF_i$	7.42^{***}	3.37^{***}	3.27^{***}	3.50^{***}	3.35^{***}
	(1.01)	(0.81)	(0.81)	(0.81)	(0.81)
Constant	5.70^{***}	52.96^{***}			
	(0.10)	(0.63)			
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	229,552	209,046	209,046	209,046	209,046
R^2	0.01	0.22	0.22	0.26	0.26
Adjusted R^2	0.01	0.22	0.22	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.

6.2 Projects active on/before June 2010

Table 10: Financial constraints and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-2.14^{***}	-1.08^{***}	-1.17^{***}	-0.67^{***}	-0.75^{***}
	(0.15)	(0.14)	(0.14)	(0.14)	(0.14)
$Post_t$	1.93^{***}	-17.54^{***}			
	(0.26)	(2.37)			
CF_i	13.75^{***}	6.69^{***}	6.18^{***}	4.61^{***}	4.67^{***}
	(1.00)	(0.58)	(0.58)	(0.59)	(0.59)
$Treat_i \times Post_t$	-0.30	1.93^{***}	2.01^{***}	2.14^{***}	2.11^{***}
	(0.33)	(0.41)	(0.41)	(0.42)	(0.42)
$Post_t \times CF_i$	-9.62^{***}	-7.54^{***}	-6.96^{***}	-5.34^{***}	-5.29^{***}
	(1.30)	(1.30)	(1.29)	(1.30)	(1.30)
$Treat_i \times CF_i$	-10.12^{***}	-2.92^{***}	-2.53^{***}	-2.86^{***}	-2.95^{***}
	(1.18)	(0.81)	(0.80)	(0.80)	(0.80)
$Treat_i \times Post_t \times CF_i$	8.03^{***}	5.29^{***}	4.92^{***}	5.05^{***}	5.27^{***}
	(1.63)	(1.84)	(1.83)	(1.85)	(1.84)
Constant	6.03^{***}	56.30^{***}			
	(0.13)	(0.83)			
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	74,942	64,129	64,129	64,129	64,129
R^2	0.02	0.23	0.23	0.27	0.28
Adjusted R^2	0.02	0.23	0.23	0.27	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.

6.3 Firm level financial constraints (on/before June 2010)

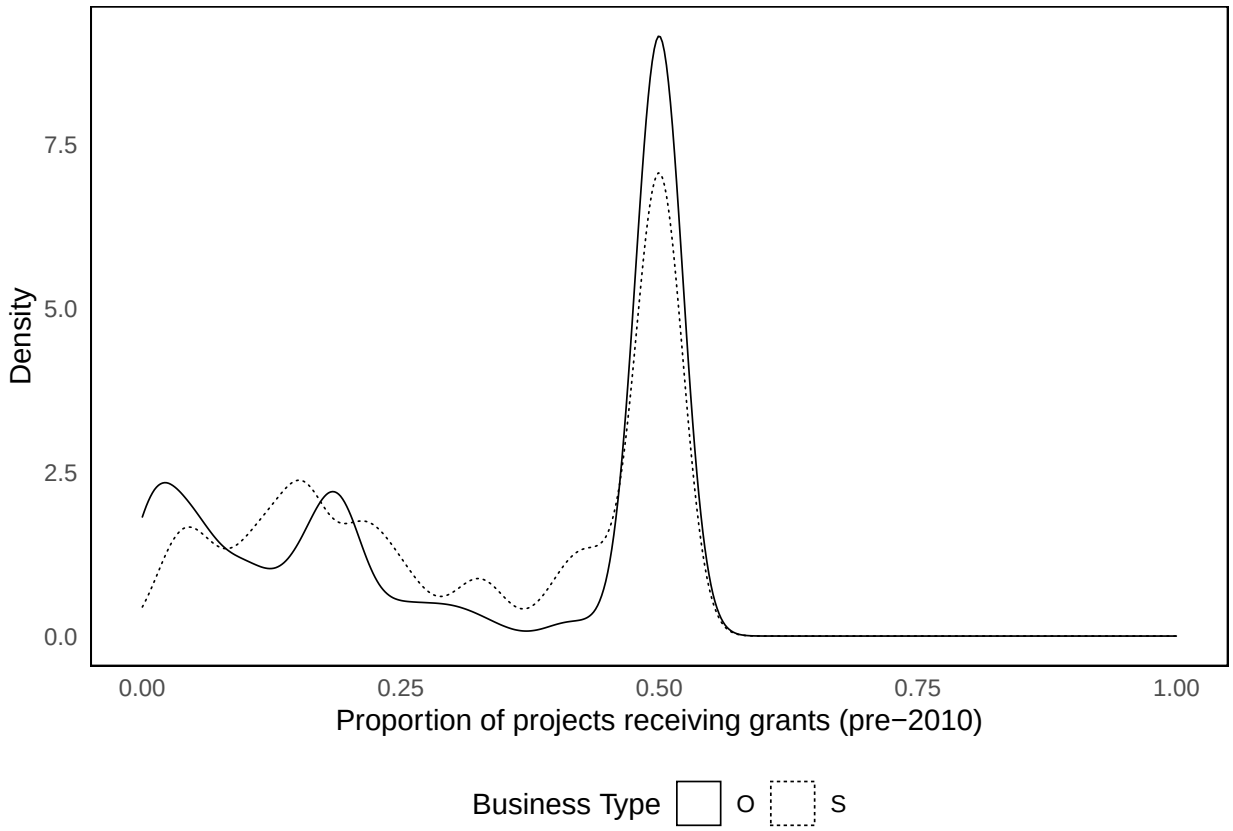
Table 11: Financial constraints and QuickPay reform

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.43^{***}	-1.14^{***}	-1.15^{***}	-0.82^{***}	-0.84^{***}
	(0.12)	(0.11)	(0.11)	(0.11)	(0.11)
$Post_t$	-0.13	-8.94^{***}			
	(0.12)	(0.85)			
CF_i	8.43^{***}	4.12^{***}	4.04^{***}	3.30^{***}	3.34^{***}
	(0.40)	(0.25)	(0.25)	(0.25)	(0.25)
$Treat_i \times Post_t$	0.86^{***}	0.78^{***}	0.79^{***}	0.89^{***}	0.98^{***}
	(0.15)	(0.14)	(0.14)	(0.14)	(0.14)
$Post_t \times CF_i$	-2.79^{***}	-1.85^{***}	-1.77^{***}	-1.90^{***}	-1.77^{***}
	(0.46)	(0.32)	(0.32)	(0.32)	(0.32)
$Treat_i \times CF_i$	-6.93^{***}	-2.88^{***}	-2.82^{***}	-2.47^{***}	-2.45^{***}
	(0.51)	(0.38)	(0.38)	(0.37)	(0.37)
$Treat_i \times Post_t \times CF_i$	2.37^{***}	1.20^{**}	1.14^{**}	1.30^{***}	1.14^{**}
	(0.61)	(0.50)	(0.50)	(0.49)	(0.49)
Constant	5.18^{***}	52.53^{***}			
	(0.10)	(0.63)			
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	229,552	209,046	209,046	209,046	209,046
R^2	0.01	0.22	0.22	0.26	0.26
Adjusted R^2	0.01	0.22	0.22	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.

6.4 Plots

```
## Warning: Removed 394825 rows containing non-finite values (stat_density).
```



7 Competition

7.1 Impact on bidding metrics

Table 12: Effect of Competition After QuickPay: Quickpay 2009-2011

	$NumberOfBids_{it}$	$InitialDuration_{it}$	$InitialBudget_{it}$
	(1)	(2)	(3)
$Treat_i$	0.88^{***}	-7.27^{***}	$-15{,}055.20^{***}$
	(0.09)	(0.72)	(1,586.13)
$Treat_i \times Post_t$	0.27^{**}	-3.38^{***}	$-29{,}491.30^{***}$
	(0.12)	(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	0.25	0.20	0.24
Adjusted R^2	0.24	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.

7.2 Impact on delays

Define

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

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

7.2.1 Subsample model

For a subsample of competitive or noncompetitive projects:

$$\begin{aligned} PercentDelay_{it} = & \quad \beta_0 + \beta_1 Treat_i + \beta_2 SA_i + \beta_3 Post_t \\ + & \quad \beta_4 (Treat_i \times Post_t \times SA_i) + \beta_5 (Treat_i \times Post_t \times SB_i) + e_{it} \end{aligned}$$

- According to our hypothesis, β_4 should be positive and significant for competitive projects, and insignificant for non-competitive projects.
- In the following regressions, we also control for the project's age. Project's age is defined as the number of quarters since it first showed up in the sample. We include the terciles of project's age as a control variable.

Table 13: Effect of QuickPay on competitively awarded projects

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-3.26^{***}	-2.81^{***}	-2.80^{***}	-1.48^{***}	-1.49^{***}
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
SA_i	-2.26^{***}	1.10^{***}	1.99^{***}	2.26^{***}	2.21^{***}
	(0.18)	(0.17)	(0.19)	(0.18)	(0.18)
$Post_t$	1.08^{***}	-1.77^{***}			
	(0.16)	(0.16)			
$Treat_i \times SB_i \times Post_t$	0.19	0.25	0.26	0.49^{***}	0.51^{***}
	(0.20)	(0.19)	(0.19)	(0.18)	(0.18)
$Treat_i \times SA_i \times Post_t$	1.41^{***}	1.08^{***}	1.07^{***}	1.25^{***}	1.28^{***}
	(0.20)	(0.19)	(0.19)	(0.18)	(0.18)
Constant	6.78^{***}	12.46^{***}			
	(0.12)	(0.14)			
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	189,977	189,933	189,933	189,933	189,933
R^2	0.01	0.07	0.07	0.14	0.15
Adjusted R^2	0.01	0.07	0.07	0.14	0.15

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 14: Effect of QuickPay on non-competitively awarded projects

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	1.40^{***}	1.16^{***}	1.09^{***}	-0.39	-0.22
	(0.31)	(0.30)	(0.30)	(0.32)	(0.31)
SA_i	-0.73^{***}	2.13^{***}	3.55^{***}	2.97^{***}	2.98^{***}
	(0.23)	(0.23)	(0.28)	(0.29)	(0.29)
$Post_t$	-0.66^{***}	-3.22^{***}			
	(0.25)	(0.25)			
$Treat_i \times SB_i \times Post_t$	2.53^{***}	2.25^{***}	2.14^{***}	1.77^{***}	1.67^{***}
	(0.47)	(0.45)	(0.46)	(0.45)	(0.46)
$Treat_i \times SA_i \times Post_t$	0.51	0.56	0.50	0.11	0.09
	(0.45)	(0.42)	(0.43)	(0.42)	(0.42)
Constant	4.91^{***}	10.90^{***}			
	(0.20)	(0.26)			
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	39,432	39,424	39,424	39,424	39,424
R^2	0.01	0.07	0.07	0.14	0.15
Adjusted R^2	0.01	0.07	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.

7.2.2 Subsample model II

Table 15: Effect of QuickPay on competitively awarded projects

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-3.26^{***}	-2.81^{***}	-2.80^{***}	-1.48^{***}	-1.49^{***}
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
SA_i	-2.26^{***}	1.10^{***}	1.99^{***}	2.26^{***}	2.21^{***}
	(0.18)	(0.17)	(0.19)	(0.18)	(0.18)
$Post_t$	1.08^{***}	-1.77^{***}			
	(0.16)	(0.16)			
$Treat_i \times Post_t$	0.19	0.25	0.26	0.49^{***}	0.51^{***}
	(0.20)	(0.19)	(0.19)	(0.18)	(0.18)
$Treat_i \times Post_t \times SA_i$	1.22^{***}	0.83^{***}	0.82^{***}	0.76^{***}	0.77^{***}
	(0.22)	(0.20)	(0.20)	(0.20)	(0.20)
Constant	6.78^{***}	12.46^{***}			
	(0.12)	(0.14)			
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	189,977	189,933	189,933	189,933	189,933
R^2	0.01	0.07	0.07	0.14	0.15
Adjusted R^2	0.01	0.07	0.07	0.14	0.15

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 16: Effect of QuickPay on non-competitively awarded projects

	$PercentDelay_{it}$				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	1.40^{***}	1.16^{***}	1.09^{***}	-0.39	-0.22
	(0.31)	(0.30)	(0.30)	(0.32)	(0.31)
SA_i	-0.73^{***}	2.13^{***}	3.55^{***}	2.97^{***}	2.98^{***}
	(0.23)	(0.23)	(0.28)	(0.29)	(0.29)
$Post_t$	-0.66^{***}	-3.22^{***}			
	(0.25)	(0.25)			
$Treat_i \times Post_t$	2.53^{***}	2.25^{***}	2.14^{***}	1.77^{***}	1.67^{***}
	(0.47)	(0.45)	(0.46)	(0.45)	(0.46)
$Treat_i \times Post_t \times SA_i$	-2.01^{***}	-1.70^{***}	-1.64^{***}	-1.66^{***}	-1.58^{***}
	(0.49)	(0.46)	(0.46)	(0.46)	(0.46)
Constant	4.91^{***}	10.90^{***}			
	(0.20)	(0.26)			
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	39,432	39,424	39,424	39,424	39,424
R^2	0.01	0.07	0.07	0.14	0.15
Adjusted R^2	0.01	0.07	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.

7.2.3 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 17: Effect of Competition After QuickPay: Quickpay 2009-2011

	$PercentDelay_{it}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Treat_i$	1.40^{***}	1.40^{***}	1.16^{***}	1.09^{***}	-0.63^{**}	-0.73^{**}
	(0.31)	(0.31)	(0.30)	(0.30)	(0.30)	(0.30)
SA_i	-0.73^{***}	-0.73^{***}	2.12^{***}	3.11^{***}	2.95^{***}	2.91^{***}
	(0.23)	(0.23)	(0.22)	(0.23)	(0.23)	(0.23)
$Competitive_i$	1.87^{***}	1.87^{***}	1.60^{***}	1.55^{***}	-0.16	-0.07
	(0.23)	(0.23)	(0.21)	(0.21)	(0.22)	(0.22)
$Post_t$	-0.66^{***}	-0.66^{***}	-3.21^{***}			
	(0.25)	(0.25)	(0.24)			
$Treat_i \times Competitive_i$	-4.65^{***}	-4.65^{***}	-3.97^{***}	-3.89^{***}	-0.89^{***}	-0.80^{**}
	(0.34)	(0.34)	(0.32)	(0.32)	(0.32)	(0.32)
$Post_t \times Competitive_i$	1.74^{***}	1.74^{***}	1.43^{***}	1.40^{***}	0.28	0.20
	(0.30)	(0.30)	(0.29)	(0.29)	(0.29)	(0.29)
$SA_i \times Competitive_i$	-1.53^{***}	-1.53^{***}	-1.01^{***}	-1.02^{***}	-0.66^{**}	-0.66^{**}
	(0.29)	(0.29)	(0.27)	(0.27)	(0.27)	(0.27)
$Treat_i \times Post_t$	2.53^{***}	2.53^{***}	2.25^{***}	2.21^{***}	1.67^{***}	1.66^{***}
	(0.47)	(0.47)	(0.45)	(0.45)	(0.45)	(0.45)
$Treat_i \times Post_t \times Competitive_i$	-2.33^{***}	-2.33^{***}	-2.01^{***}	-1.95^{***}	-1.16^{**}	-1.13^{**}
	(0.51)	(0.51)	(0.49)	(0.49)	(0.49)	(0.49)
$Treat_i \times Post_t \times SA_i$	-2.01^{***}	-2.01^{***}	-1.70^{***}	-1.69^{***}	-1.37^{***}	-1.37^{***}
	(0.49)	(0.49)	(0.46)	(0.46)	(0.45)	(0.45)
$Treat_i \times Post_t \times SA_i \times Competitive_i$	3.23^{***}	3.23^{***}	2.53^{***}	2.51^{***}	2.12^{***}	2.13^{***}
	(0.53)	(0.53)	(0.50)	(0.50)	(0.49)	(0.49)
Constant	4.91^{***}	4.91^{***}	10.87^{***}			
	(0.20)	(0.20)	(0.20)			
Project stage	No	No	Yes	Yes	Yes	Yes
Year-Quarter 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	229,409	229,409	229,357	229,357	229,357	229,357
R^2	0.01	0.01	0.07	0.07	0.14	0.14
Adjusted R^2	0.01	0.01	0.07	0.07	0.13	0.14

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.