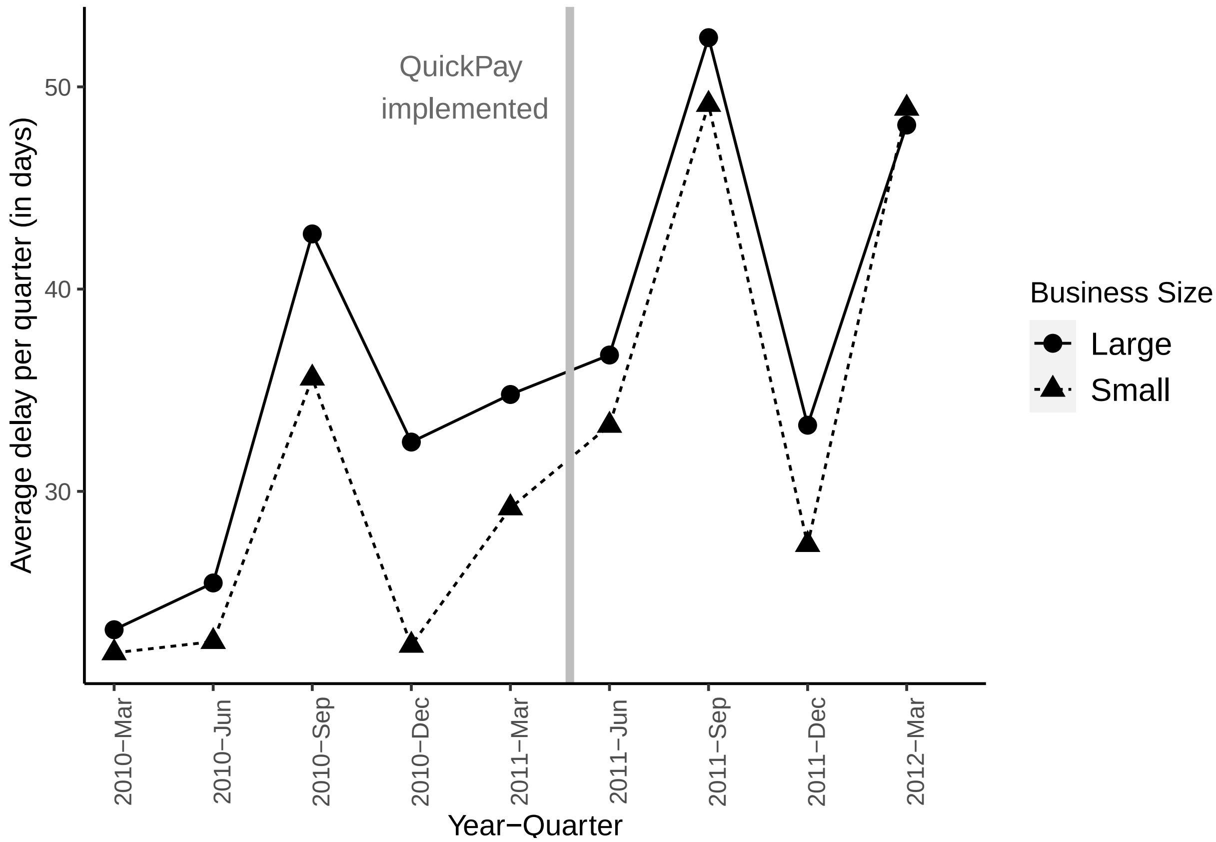
First Implementation of QuickPay (2009-2012)

Mar 14, 2021

1 Delays over Time



2 Notation

- Project i, Year-Quarter t
- X_i denotes project level controls: initial duration, initial budget, number of offers received
- $\mu_t, \theta_{firm}, \lambda_{task}$: Year-Quarter, Firm, and Product/Service code Fixed effects
- All continuous variables are winsorized at the 5% level

$$Treat_i = \begin{cases} 1, & \text{if project } i \text{ is a small business} \\ 0, & \text{otherwise} \end{cases}$$

$$Post_t = \begin{cases} 1, & \text{if year-quarter } t > \text{ April 27, 2011} \\ 0, & \text{otherwise} \end{cases}$$

3 Parallel Trends Test

Let $Time$ denote q-th quarter since the beginning of time horizon. For $Post_t = 0$, we run the following regression:

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

The coefficient of interest is β_1. If this is significant, we would find evidence of a linear time trend before quickpay implementation – violating the parallel trends assumption.

Table 1: Linear Time Trend Before QuickPay

	Dependent variable:
	$Delay_{it}$ (in days)
$Treat_i$	-1.10
	(2.98)
$Treat_i \times Time$	-0.01
	(0.49)
Fixed effects	Firm, Task, and Year-Quarter
Controls	Budget, Duration, Bids
Observations	74,677
R^2	0.14
Adjusted R^2	0.03
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.

4 Baseline Regressions

$$Delay_{it} = \alpha + \beta_0 Treat_i + \beta_1 Post_t + \beta_2 (Treat_i \times Post_t) + \epsilon_{it}$$

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

Table 2: Quickpay 2009-2011

	$Delay_{it}$ (in days)		
	(1)	(2)	(3)
$Treat_i$	-6.19^{***}	-3.58^{**}	-3.09^{*}
	(0.50)	(1.55)	(1.59)
$Post_t$	13.04^{***}		
	(0.52)		
$Treat_i \times Post_t$	3.35^{***}	6.88^{***}	6.83^{***}
	(0.73)	(0.91)	(0.92)
Constant	33.00^{***}		
	(0.36)		
Year-Quarter Fixed Effects	No	Yes	Yes
Firm Fixed Effects	No	Yes	Yes
Task Fixed Effects	No	No	Yes
Duration, Budget, Bids	No	Yes	Yes
$Post_t \times$ (Duration, Budget, Bids)	No	Yes	Yes
Observations	173,900	155,638	155,638
R^2	0.01	0.11	0.12
Adjusted R^2	0.01	0.05	0.05

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 Contract Financing

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

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

Table 3: Effect of Contract Financing: Quickpay 2009-2011

	$Delay_{it}$ (in days)		
	(1)	(2)	(3)
$Treat_i$	-6.12^{***}	-3.37^{**}	-2.89^{*}
	(0.50)	(1.55)	(1.59)
$Post_t$	13.00^{***}		
	(0.57)		
$Treat_i \times Post_t$	1.53^{**}	5.89^{***}	5.90^{***}
	(0.78)	(1.00)	(1.01)
CF_i	-3.97^{***}	-4.68^{***}	-4.76^{***}
	(0.61)	(0.81)	(0.82)
$Post_t \times CF_i$	0.72	-0.20	-0.37
	(1.13)	(1.31)	(1.32)
$Post_t \times CF_i \times Treat_i$	9.24^{***}	3.94^{**}	3.70^{**}
	(1.38)	(1.65)	(1.67)
Constant	33.64^{***}		
	(0.38)		
Year-Quarter Fixed Effects	No	Yes	Yes
Firm Fixed Effects	No	Yes	Yes
Task Fixed Effects	No	No	Yes
Duration, Budget, Bids	No	Yes	Yes
$Post_t \times$ (Duration, Budget, Bids)	No	Yes	Yes
Observations	173,900	155,638	155,638
R^2	0.01	0.11	0.12
Adjusted R^2	0.01	0.05	0.05

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 Receives Financial Aid

$$FinancialAid = \begin{cases} 1, & \text{if firm receives grants or is a c8A participant} \\ 0, & \text{otherwise} \end{cases}$$

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

Table 4: Effect of Grants or C8A Participant: Quickpay 2009-2011

	$Delay_{it}$ (in days)		
	(1)	(2)	(3)
$Treat_i$	-6.96^{***}	-3.15^{**}	-2.63^{*}
	(0.51)	(1.55)	(1.59)
$Post_t$	12.89^{***}		
	(0.53)		
$Treat_i \times Post_t$	3.43^{***}	5.65^{***}	5.57^{***}
	(0.77)	(0.98)	(0.99)
$FinancialAid$	5.72^{***}	1.36	0.45
	(0.70)	(1.39)	(1.42)
$Post_t \times FinancialAid$	1.94	4.06^{*}	3.93^{*}
	(1.61)	(2.10)	(2.12)
$Post_t \times FinancialAid \times Treat_i$	-1.80	2.51	2.75
	(1.73)	(2.46)	(2.50)
Constant	32.42^{***}		
	(0.37)		
Year-Quarter Fixed Effects	No	Yes	Yes
Firm Fixed Effects	No	Yes	Yes
Task Fixed Effects	No	No	Yes
Duration, Budget, Bids	No	Yes	Yes
$Post_t \times$ (Duration, Budget, Bids)	No	Yes	Yes
Observations	173,900	155,638	155,638
R^2	0.01	0.11	0.12
Adjusted R^2	0.01	0.05	0.05

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.

7 Receives Contracts and Financial Aid

$$CFA = \begin{cases} 1, \text{ if firm receives "contracts and grants"} \\ \text{or grants or is a c8A participant} \\ 0, \text{ otherwise} \end{cases}$$

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

Table 5: Effect of Contracts, Grants, or C8A Participant: Quickpay 2009-2011

	$Delay_{it}$ (in days)		
	(1)	(2)	(3)
$Treat_i$	-6.68^{***}	-3.19^{**}	-2.71^{*}
	(0.51)	(1.55)	(1.59)
$Post_t$	12.17^{***}		
	(0.55)		
$Treat_i \times Post_t$	4.19^{***}	5.71^{***}	5.84^{***}
	(0.79)	(1.02)	(1.03)
CFA	4.90^{***}	-5.44^{***}	-5.92^{***}
	(0.62)	(1.78)	(1.80)
$Post_t \times CFA$	3.91^{***}	5.00^{***}	5.83^{***}
	(1.21)	(1.60)	(1.64)
$Post_t \times CFA \times Treat_i$	-4.04^{***}	2.60	1.61
	(1.38)	(2.12)	(2.16)
Constant	32.18^{***}		
	(0.37)		
Year-Quarter Fixed Effects	No	Yes	Yes
Firm Fixed Effects	No	Yes	Yes
Task Fixed Effects	No	No	Yes
Duration, Budget, Bids	No	Yes	Yes
$Post_t \times$ (Duration, Budget, Bids)	No	Yes	Yes
Observations	173,900	155,638	155,638
R^2	0.01	0.11	0.12
Adjusted R^2	0.01	0.05	0.05

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 Firm's rank order

- Consider a project i of firm f in quarter t.
- Let $\Pi_{f,2010}$ denote all projects of firm f in Fiscal Year 2010.
- Consider $\rho_f = \sum_{i \in \Pi_{f,2010}} (Treat_i \times FAO_{if})/Sales_{f,2010}$ as the fraction of revenue a firm earns from small government projects.
- Let $\Theta_f = rank(\rho_f)/N$ where $rank(\rho_f)$ is the rank statistic of ρ_f and N = number of firms. For example, $rank(\rho_f) = 1$ if $\rho_f = \min(\rho_1, \rho_2, \ldots, \rho_N)$.
- Put simply, Θ_f is a firm's rank order based on the fraction of revenue it earned from small government projects in FY 2010.

8.1 Portfolio Effects: Discrete

- See Jie's notes for details.
- Let $Rank_f^{(k)}$ be an indicator for firm being in the k-th tercile of $Rank$.Define:

- $Medium_i = Treat_i * Rank_f^{(2)}$
- $High_i = Treat_i * Rank_f^{(3)}$

$$\begin{aligned} Delay_{it} = \quad & \beta_0 + \beta_1 Treat_i + \beta_2 Medium_i + \beta_3 High_i + \beta_4 Post_t \\ & + \beta_5 (Treat_i \times Post_t) + \beta_6 (Medium_i \times Post_t) + \beta_7 (High_i \times Post_t) + \epsilon_{it} \end{aligned}$$

Table 6: Discrete Portfolio Effects: Quickpay 2009-2011

	$Delay_{it}$ (in days)				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	2.85^{**}	-0.51	-0.37	0.38	-6.90
	(1.37)	(1.54)	(1.55)	(1.64)	(4.47)
$Medium_i$	-2.92^{**}	-1.11	-1.32	-0.60	12.24^{**}
	(1.40)	(1.56)	(1.57)	(1.63)	(6.17)
$High_i$	-3.26^{**}	0.09	-0.07	1.04	-3.11
	(1.31)	(1.49)	(1.50)	(1.58)	(6.04)
$Post_t$	15.67^{***}	6.87^{***}			
	(1.05)	(1.83)			
$Treat_i \times Post_t$	-2.42	2.15	1.26	1.32	7.32^{**}
	(2.04)	(2.36)	(2.39)	(2.43)	(3.16)
$Treat_i \times Post_t \times Medium_i$	4.28^{**}	1.54	2.31	2.45	0.10
	(2.09)	(2.38)	(2.41)	(2.45)	(3.22)
$Treat_i \times Post_t \times High_i$	6.76^{***}	3.46	4.16^{*}	3.58	-1.27
	(1.97)	(2.28)	(2.31)	(2.35)	(3.07)
Constant	27.08^{***}	46.30^{***}			
	(0.71)	(1.16)			
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
Firm Fixed Effects	No	No	No	No	Yes
Observations	71,753	63,216	63,216	63,216	63,216
R^2	0.01	0.02	0.03	0.06	0.12
Adjusted R^2	0.01	0.02	0.03	0.04	0.04

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.

8.2 Portfolio Effects: Continuous

- See Jie's notes for details.
- Define $\theta_i = Treat_i * Rank_f$

$$Delay_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 \theta_i + \beta_3 \theta_i^2 + \beta_4 Post_t + \beta_5 (Treat_i \times Post_t) + \beta_6 (\theta_i \times Post_t) + \beta_7 (\theta_i^2 \times Post_t) + \epsilon_{it}$$

Table 7: Discrete Portfolio Effects: Quickpay 2009-2011

	$Delay_{it}$ (in days)				
	(1)	(2)	(3)	(4)	(5)
$Treat_i$	-1.44	-4.54	-4.12	-2.25	-19.01^{**}
	(2.52)	(2.79)	(2.80)	(2.88)	(8.36)
θ_i	15.63^{*}	12.24	11.06	8.21	92.44^{***}
	(8.14)	(8.85)	(8.89)	(9.06)	(34.90)
θ_i^2	15.67^{***}	6.85^{***}			
	(1.05)	(1.83)			
$Post_t$	-3.83	2.64	1.05	0.34	9.39
	(3.74)	(4.31)	(4.38)	(4.45)	(5.79)
$Treat_i \times Post_t$	4.16	-3.40	-0.02	3.49	-4.73
	(12.19)	(13.75)	(13.98)	(14.13)	(17.63)
$\theta_i \times Post_t$	-16.17^{**}	-8.85	-8.10	-5.07	-88.48^{***}
	(6.56)	(7.11)	(7.15)	(7.30)	(31.25)
$\theta_i^2 \times Post_t$	4.91	6.92	4.92	1.51	1.46
	(9.87)	(11.09)	(11.27)	(11.38)	(13.78)
Constant	27.08^{***}	46.30^{***}			
	(0.71)	(1.16)			
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
Firm Fixed Effects	No	No	No	No	Yes
Observations	71,753	63,216	63,216	63,216	63,216
R^2	0.01	0.02	0.03	0.06	0.12
Adjusted R^2	0.01	0.02	0.03	0.04	0.04

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.

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