# Logistic regression: Negative Delay Rate – QuickPay (2009-2012)

Nov 22, 2021

## 1 Logistic Regressions (Negative Delay)

## 2 Contract Financing

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

## 3 Competition

### 3.1 Impact on delays

Define

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

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

#### 3.1.1 Subsample model

#### 3.1.2 Four-way interaction

| | $I(Delay_{it} < 0)$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Constant | $-4.64^{***}$ | $-5.53^{***}$ | | | |
| | (0.05) | (0.09) | | | |
| $Treat_i$ | $-0.15^{**}$ | 0.10 | 0.11 | 0.04 | 0.15 |
| | (0.07) | (0.07) | (0.07) | (0.07) | (0.21) |
| $Post_t$ | $0.15^{***}$ | $0.46^{***}$ | | | |
| | (0.06) | (0.12) | | | |
| $Treat_i \times Post_t$ | $-0.30^{***}$ | $-0.35^{***}$ | $-0.36^{***}$ | $-0.34^{***}$ | $-0.29^{***}$ |
| | (0.08) | (0.08) | (0.09) | (0.09) | (0.10) |
| Duration, Budget, Bids | No | Yes | Yes | Yes | Yes |
| $Post_t\times$ (Duration, Budget, Bids) | No | Yes | Yes | Yes | Yes |
| Year-Quarter FE | No | No | Yes | Yes | Yes |
| Task FE | No | No | No | Yes | Yes |
| Contractor FE | No | No | No | No | Yes |
| AIC | 29277.55 | 28025.28 | | | |
| BIC | 29319.83 | 28130.10 | | | |
| Log Likelihood | −14634.78 | −14002.64 | | | |
| Deviance | 29269.55 | 28005.28 | 27992.65 | 25649.39 | 19131.26 |
| Num. obs. | 287530 | 263488 | 263488 | 236352 | 106630 |

Each observation is a project-quarter. SEs are robust and clustered at the project level.

Table 1:

| | $I(Delay_{it} < 0)$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Constant | $-4.82^{***}$ | $-5.55^{***}$ | | | |
| | (0.05) | (0.09) | | | |
| $Treat_i$ | $-0.13^{**}$ | 0.07 | 0.08 | 0.04 | 0.15 |
| | (0.07) | (0.07) | (0.07) | (0.07) | (0.21) |
| $Post_t$ | $0.23^{***}$ | $0.49^{***}$ | | | |
| | (0.06) | (0.12) | | | |
| $CF_i$ | $0.91^{***}$ | $0.43^{***}$ | $0.45^{***}$ | 0.10 | 0.09 |
| | (0.07) | (0.08) | (0.08) | (0.08) | (0.11) |
| $Treat_i \times Post_t$ | $-0.39^{***}$ | $-0.38^{***}$ | $-0.39^{***}$ | $-0.37^{***}$ | $-0.28^{***}$ |
| | (0.09) | (0.09) | (0.09) | (0.09) | (0.11) |
| $Post_t \times CF_i$ | $-0.32^{***}$ | $-0.24^{**}$ | $-0.26^{**}$ | −0.16 | −0.02 |
| | (0.11) | (0.11) | (0.12) | (0.12) | (0.14) |
| $Treat_i \times Post_t \times CF_i$ | $0.38^{***}$ | $0.20^{*}$ | 0.20 | 0.13 | 0.01 |
| | (0.12) | (0.12) | (0.12) | (0.13) | (0.17) |
| Duration, Budget, Bids | No | Yes | Yes | Yes | Yes |
| $Post_t\times$ (Duration, Budget, Bids) | No | Yes | Yes | Yes | Yes |
| Year-Quarter FE | No | No | Yes | Yes | Yes |
| Task FE | No | No | No | Yes | Yes |
| Contractor FE | No | No | No | No | Yes |
| AIC | 29002.56 | 27981.70 | | | |
| BIC | 29076.55 | 28117.96 | | | |
| Log Likelihood | −14494.28 | −13977.85 | | | |
| Deviance | 28988.56 | 27955.70 | 27940.33 | 25646.78 | 19130.44 |
| Num. obs. | 287530 | 263488 | 263488 | 236352 | 106630 |

Each observation is a project-quarter. SEs are robust and clustered at the project level.

Table 2: Contract Financing

| | $I(Delay_{it} < 0)$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Constant | $-4.61^{***}$ | $-5.56^{***}$ | | | |
| | (0.05) | (0.10) | | | |
| $Treat_i$ | $-0.23^{***}$ | 0.07 | 0.08 | 0.04 | $-0.05$ |
| | (0.07) | (0.07) | (0.08) | (0.08) | (0.23) |
| $SA_i$ | $-0.11$ | $-0.02$ | $-0.05$ | 0.06 | 0.02 |
| | (0.07) | (0.07) | (0.09) | (0.09) | (0.10) |
| $Post_t$ | $0.28^{***}$ | $0.56^{***}$ | | | |
| | (0.07) | (0.13) | | | |
| $Treat_i \times SB_i \times Post_t$ | $-0.39^{***}$ | $-0.42^{***}$ | $-0.43^{***}$ | $-0.40^{***}$ | $-0.33^{***}$ |
| | (0.10) | (0.11) | (0.11) | (0.11) | (0.12) |
| $Treat_i \times SA_i \times Post_t$ | $-0.33^{***}$ | $-0.41^{***}$ | $-0.43^{***}$ | $-0.30^{***}$ | $-0.21$ |
| | (0.11) | (0.11) | (0.11) | (0.11) | (0.14) |
| Duration, Budget, Bids | No | Yes | Yes | Yes | Yes |
| $Post_t \times$ (Duration, Budget, Bids) | No | Yes | Yes | Yes | Yes |
| Year-Quarter FE | No | No | Yes | Yes | Yes |
| Task FE | No | No | No | Yes | Yes |
| Contractor FE | No | No | No | No | Yes |
| AIC | 24092.14 | 23032.22 | | | |
| BIC | 24154.34 | 23155.53 | | | |
| Log Likelihood | $-12040.07$ | $-11504.11$ | | | |
| Deviance | 24080.14 | 23008.22 | 22995.84 | 20987.70 | 15802.03 |
| Num. obs. | 234573 | 214421 | 214421 | 190854 | 83067 |

Each observation is a project-quarter. SEs are robust and clustered at the project level. Sample restricted to fully competed projects.

Table 3: Full Competition

| | $I(Delay_{it} < 0)$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Constant | $-4.80^{***}$ | $-4.65^{***}$ | | | |
| | (0.12) | (1.65) | | | |
| $Treat_i$ | $0.30^{*}$ | $0.37^{**}$ | $0.37^{**}$ | 0.18 | 0.66 |
| | (0.16) | (0.16) | (0.16) | (0.19) | (0.56) |
| $SA_i$ | 0.03 | 0.09 | $0.38^{*}$ | $0.42^{**}$ | 0.13 |
| | (0.15) | (0.16) | (0.19) | (0.20) | (0.25) |
| $Post_t$ | $-0.10$ | $-0.56$ | | | |
| | (0.16) | (1.67) | | | |
| $Treat_i \times SB_i \times Post_t$ | $-0.32$ | $-0.35$ | $-0.37$ | $-0.43^{*}$ | $-0.63^{*}$ |
| | (0.24) | (0.24) | (0.24) | (0.25) | (0.33) |
| $Treat_i \times SA_i \times Post_t$ | $-0.00$ | $-0.12$ | $-0.12$ | $-0.24$ | $-0.15$ |
| | (0.23) | (0.23) | (0.23) | (0.25) | (0.36) |
| Duration, Budget, Bids | No | Yes | Yes | Yes | Yes |
| $Post_t \times$ (Duration, Budget, Bids) | No | Yes | Yes | Yes | Yes |
| Year-Quarter FE | No | No | Yes | Yes | Yes |
| Task FE | No | No | No | Yes | Yes |
| Contractor FE | No | No | No | No | Yes |
| AIC | 5139.81 | 4985.84 | | | |
| BIC | 5193.07 | 5091.45 | | | |
| Log Likelihood | $-2563.90$ | $-2480.92$ | | | |
| Deviance | 5127.81 | 4961.84 | 4947.44 | 4138.81 | 2718.24 |
| Num. obs. | 52957 | 49067 | 49067 | 34410 | 14812 |

Each observation is a project-quarter. SEs are robust and clustered at the project level. Sample restricted to non-competed projects.

Table 4: Non-competitive projects

| | $I(Delay_{it} < 0)$ | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Constant | $-4.80^{***}$ | $-5.57^{***}$ | | | |
| | (0.12) | (0.14) | | | |
| $Treat_i$ | $0.30^{*}$ | $0.36^{**}$ | $0.36^{**}$ | 0.11 | 0.34 |
| | (0.16) | (0.16) | (0.16) | (0.17) | (0.34) |
| $StartedAfterQP_i$ | 0.03 | 0.10 | 0.11 | 0.20 | 0.01 |
| | (0.15) | (0.16) | (0.16) | (0.17) | (0.19) |
| $Competitive_i$ | 0.19 | 0.05 | 0.03 | $-0.06$ | $-0.25$ |
| | (0.13) | (0.13) | (0.13) | (0.14) | (0.21) |
| $Post_t$ | $-0.10$ | 0.21 | | | |
| | (0.16) | (0.19) | | | |
| $Treat_i \times Competitive_i$ | $-0.53^{***}$ | $-0.30^{*}$ | $-0.30^{*}$ | $-0.08$ | $-0.24$ |
| | (0.18) | (0.18) | (0.18) | (0.19) | (0.31) |
| $Post_t \times Competitive_i$ | $0.39^{**}$ | $0.32^{*}$ | $0.34^{*}$ | 0.10 | 0.11 |
| | (0.17) | (0.18) | (0.17) | (0.18) | (0.21) |
| $StartedAfterQP_i \times Competitive_i$ | $-0.14$ | $-0.12$ | $-0.11$ | $-0.11$ | 0.04 |
| | (0.17) | (0.17) | (0.17) | (0.18) | (0.21) |
| $Treat_i \times Post_t$ | $-0.32$ | $-0.34$ | $-0.34$ | $-0.45^{*}$ | $-0.60^{**}$ |
| | (0.24) | (0.24) | (0.24) | (0.24) | (0.30) |
| $Treat_i \times Post_t \times Competitive_i$ | $-0.07$ | $-0.06$ | $-0.07$ | 0.05 | 0.29 |
| | (0.26) | (0.26) | (0.26) | (0.27) | (0.33) |
| $Treat_i \times Post_t \times StartedAfterQP_i$ | 0.32 | 0.23 | 0.24 | 0.25 | 0.39 |
| | (0.24) | (0.24) | (0.25) | (0.25) | (0.33) |
| $Treat_i \times Post_t \times StartedAfterQP_i \times Competitive_i$ | $-0.25$ | $-0.22$ | $-0.23$ | $-0.16$ | $-0.25$ |
| | (0.27) | (0.27) | (0.27) | (0.28) | (0.36) |
| Duration, Budget, Bids | No | Yes | Yes | Yes | Yes |
| $Post_t\times$ (Duration, Budget, Bids) | No | Yes | Yes | Yes | Yes |
| Year-Quarter FE | No | No | Yes | Yes | Yes |
| Task FE | No | No | No | Yes | Yes |
| Contractor FE | No | No | No | No | Yes |
| AIC | 29231.95 | 28016.45 | | | |
| BIC | 29358.78 | 28205.12 | | | |
| Log Likelihood | $-14603.97$ | $-13990.23$ | | | |
| Deviance | 29207.95 | 27980.45 | 27967.23 | 25636.76 | 19119.92 |
| Num. obs. | 287530 | 263488 | 263488 | 236352 | 106846 |

Each observation is a project-quarter. SEs are robust and clustered at the project level.

Table 5: Competition: Four-way Interaction