Working paper

International Growth Centre

Making moves matter

Experimental evidence on incentivising bureaucrats through performance-based transfers

Appendix

Adnan Q. Khan
Asim Ijaz Khwaja
Benjamin A. Olken

July 2016

When citing this paper, please use the title and the following reference number:
S-89109-PAK-1

DIRECTED BY

FUNDED BY

A Simulating the Model

A.1 Simulation Procedure

To simulate the marginal incentives, we use data we collected at baseline on the preference vector $\mathbf{P}$. We also use administrative data from the control group to predict y_0, i.e. revenue levels in the absence of the treatment. Specifically, recall that our performance measure y_i is the change in log outcomes, i.e. $\Delta \log y_i$.[17] We regress

$$\Delta \log y_{igt} = \alpha_g + \beta_1 \log y_{t-1} + \beta_2 \log y_{t-2} + \beta_3 \log d_{t-1} + \beta_4 \log d_{t-2} + \epsilon_{igt} \tag{10}$$

where α_g is a group fixed effect, d_{t-1} and d_{t-2} are lags of the size of the tax base in the circle (i.e. net demand), and y_{t-1} and y_{t-2} are lags of log revenue.. Results are in Appendix Table 18. We take the predicted values from this equation to form a prediction of y_{0i}, i.e. the predictable part of consumption in the business-as-usual case, and use the residuals to estimate σ^2_ϵ.[18]

We then simulate the model as follows. We draw 10,000 draws, indexed by k, from the joint distribution of $\mathbf{y}$ given $\mathbf{y_0}$. Denote one such draw as $\mathbf{y^k}$. We then rewrite equation (4) summing over ranks of the outcome variable $\mathbf{y}$ (rather than over ranks in the preference distribution, as it is currently written). As in the text, for each draw k, order realizations of $\mathbf{y^k_{-i}}$ from smallest to largest, and denote these as $z_1....z_{J-1}$, and let $z_0 = -\infty$ and $z_J = \infty$. Denote $u_i(j) = u_{ij}$, i.e the utility for inspector i of receiving his j'th ranked preference. We can then rewrite the left-hand side of equation (4) as

$$\frac{dEu}{de_i} = \sum_{\mathbf{j=1}}^{\mathbf{J}} u_i \left(r_i(z^k_{j-1} - y_{i0} + \delta, \mathbf{y^k_{-i}}, \mathbf{P}) \right) \left[\phi(z^k_{j-1} - y_{i0}) - \phi(z^k_j - y_{i0}) \right] \tag{11}$$

where δ is arbitrarily small. Although this expression is heavy on notation, it is actually quite easy to interpret: the expression $u_i \left(r_i(z^k_{j-1} - y_{i0} + \delta, \mathbf{y^k_{-i}}, \mathbf{P}) \right)$ denotes the utility inspector i receives from having an outcome y between z^k_{j-1} and z^k_j (taking the full assignment mechanism and preference vector into account), and the expression $\left[\phi(z^k_{j-1} - y_{i0}) - \phi(z^k_j - y_{i0}) \right]$ captures the marginal change in the probability of having an outcome y between y^j_{k-i} and y^{j+1}_{k-i} from a slight increase in effort e, evaluted at $e = 0$. Note that this expression is just a generalization of equation (6) allowing for arbitrary preference vectors $\mathbf{P}$ and arbitrary $\mathbf{y}_0$.

To simulate the marginal incentives faced by inspector i, we take the average marginal return i from equation (11) over all draws of $\mathbf{y^k}$. To simulate the average incentive for an entire group of inspectors, we take the average of (11) over all inspectors in the group.

The expression in equation (11) assumes inspector i has full knowledge of the complete pref-

[17] In the simulations, we use change in log revenue as the performance vector for all inspectors, regardless of whether they were randomized into the groups where incentives were based on revenue or tax base.

[18] Note that in the model in equation (4), the inspector actually considers y_{0i} for himself, but his expectations of z_{-i} for everyone else, which includes the optimal effort choice of all other inspectors. We abstract from the predicted effort of other inspectors this when doing the simulations.

erence matrix P and of the complete predicted performance levels $\mathbf{y}_0$. We also simulate versions of (11) where we relax this assumption. To capture possible ignorance over heterogeneity in predicted performance, we simply set $\mathbf{y}_0 = 0$ for all inspectors. To capture possible ignorance over heterogeneity in preferences, we assume that inspectors assume that everyone else has the same preferences they do (as in equation 5). We also simulate the case where inspectors know neither $\mathbf{y}_0$ nor $\mathbf{P}$, as in equation (6).

A.2 Comparing simulated marginal returns with descriptive statistics about preferences

While the model-based marginal returns to effort provide a precise description of returns under the scheme, it is useful to see how they compare with various simpler descriptive statistics of the preferences and the y distribution, which may (or may not) better correspond to the heuristics inspectors use when assessing their own marginal returns. These descriptive statistics (particularly the analytical ones in Section A.2.1) are substantially easier to calculate than the full marginal incentives calcualted above, since they do not require simulating the model or taking a stand on the particular utility function.

A.2.1 Analytical measures

Intuitively, the key aspect of the preference matrix $\mathbf{P}$ that determines the level of incentives is the correlation of inspector i's preferences with those of other inspectors. Recall the notation that u_{ij} is inspector i's preference for circle j, and normalize them such that preferences are on $[0, 1]$, where 1 is their highest rank circle and 0 is their lowest rank circle. (This corresponds to $u1$). A measure of the degree of correlation of i's preferences with others can be calculated as

$$\rho_i = 1 - \frac{1}{J\,(J-1)} \sum_{j=1}^{J} \sum_{m \neq i}^{J} \left(u_{mj} - u_{ij}\right)^2 \tag{12}$$

While this does not take into account the full patterns of assignment as in (4), it is much simpler to calculate and intuitively easy to understand.

With respect to the $\mathbf{y}$ distribution, a measure of how 'competitive' a position is the density of the expected y distribution at the predicted level of y_0. This captures intuitively the likelihood that inspector i will be competing with another inspector m Since ϵ_i and ϵ_m an are *iid* Normal with standard deviation σ_ϵ, the difference $\epsilon_i - \epsilon_m$ is also Normal, with standard deviation $2\sigma_\epsilon$. For inspector i, the probability density that another inspector will have the same y outcome as him is therefore

$$\gamma_i = \frac{1}{J-1} \sum_{m \neq i} \phi_{2\sigma_\epsilon}\left(y_{i0} - y_{m0}\right) \tag{13}$$

where $\phi_{2\sigma_\epsilon}$ denotes the Normal PDF with standard deivation $2\sigma_\epsilon$. The expression γ_i is simply an intuitive measure for how likely it is that another inspector will be competing directly with him.

A.2.2 Simulation-based measures

In addition to simulating the estimated marginal utility from effort under the model using equation (11), we can also calculate some simple reduced form summary statistics from the simulations. We keep track of the following statistics for each inspector i: the standard deviation of inspector i's preference rank of his outcomes accross draws of $\mathbf{y}$, the fraction of draws of $\mathbf{y}$ that the inspector i is strictly or weakly better off than status quo, and the fraction of draws of y that the inspector i is strictly or weakly worse off than status quo.

It is worth noting that these measures capture something about the level of utility under the scheme. For example, the fraction of draws that the inspector is strictly better off than the status quo is equal to the level of utility given in equation (2) using $u3$ and fixing $e = 0$. Of course, the level of utility will not necessarily be correlated with the marginal utility from increased effort in (4), but the empirical correlation of these simple statistics with the utility based metrics of marginal utility is helpful for developing intuition.

A.2.3 Results

The results comparing the simpler measures developed in this section with the full implied marginal utility $\frac{dEu1_i}{de_i}$ are presented in Table 2. Each cell reports the correlation between the marginal utility based under the information assumptions shown in the column based on equation (4) and the summary statistic shown in the row. All utility metrics in the columns are derived using linear utility ($u1$); results for other utility functions are shown in Appendix Table 13 and are essentially similar.

The first row shows that the preference correlation ρ_i from equation (12) is highly correlated with $\frac{dEu1_i}{de_i}$. Intuitively, this is only true for all the versions $\frac{dEu1_i}{de_i}$ in columns (1) and (2) that incorporate knowledge of the preference matrix $\mathbf{P}$; while there is also a correlation in column (3), due to a correlation between P and y, it is much smaller . This suggests that when preferences among circles are more correlated as captured by ρ_i, inspectors have stronger incentives to work.

The second row shows that the probability density that another inspector will have the same outcome as him, given by γ_i in equation (13), is also highly correlated with $\frac{dEu1_i}{de_i}$. However, in this case, γ_i only has predictive power in column (3), where the inspectors are not assumed to know information about $\mathbf{P}$. Once information about $\mathbf{P}$ is incorporated, column (1) shows that γ_i no longer has predictive power, even when inspectors know $\mathbf{y}$. While this is not a general theorem, it suggests that at least with the configuration of preference heterogeneity and predicted $\mathbf{y}$ we observe in our data, the preference heterogeneity dominates in terms of what drives marginal incentives.

The remaining rows examine the correlation with the simulation based measures outlined in Section A.2.2. The third row shows that more variance of outcomes in the simulations (under the base-case assumption of $e = 0$) is correlated with higher $\frac{dEu1_i}{de_i}$. There is also an interesting difference between fraction of time an inspector is strictly better (worse) off vs. weakly better (worse) off: the fraction of the time an inspector is strictly better off , and especially, the fraction of time an inspector is strictly worse off is positively correlated with $\frac{dEu1_i}{de_i}$, but weakly better and, to a lesser degree, weakly worse is negatively correlated with $\frac{dEu1_i}{de_i}$. This implies that preference allocations with a high likelihood the inspector stays put lead to weak incentives, but opportunities to do better or worse than the status quo are correlated with greater marginal returns.

In sum, the simple descriptive statistics suggest that while the incentives embodied in the system are complex, and depend on the interaction of preferences and predicted performance, the best summary statistic to predict incentives is simply the correlation of preferences with those of everyone else – i.e. ρ_i.

A.3 Additional Utility Functions

Note that in doing the simulations, one needs to take a stand on the utility function used to evaluate different positions. In general, we focus on linear utility in ranks, i.e.

$$u1\,(j) = \frac{j-1}{J-1} \tag{14}$$

where $u\,(j)$ is the utility from receiving the jth highest preference out of J possible choices (where 1 is lowest choice and J is highest choice). This implies that $u1$ is linear utility, with 1 for being posted in one's top-ranked circle and 0 for being posted in one's least ranked circle.

In addition, we also explore alternative utility functions that put full weight on achieving ones top-choice ($u2$), or achieving any circle strictly preferred to the status quo ($u3$), as follows:

$$\begin{aligned} u2\,(j) &= \begin{cases} 1 & \text{if } j = J \\ 0 & \text{otherwise} \end{cases} \\ u3\,(j) &= \begin{cases} 1 & \text{if } j > p \\ 0 & \text{otherwise} \end{cases} \end{aligned} \tag{15}$$

Appendix Table 15 shows that the results using these alterate utility functions are qualitatively similar; indeed, if anything, Appendix Table 15b shows that the predicted heterogeneity is even stronger heterogeneity effects using $\frac{dEu3_c}{de_c}$, the utility function which focuses on improvements from the status quo.

A.4 Does re-allocation reduce performance?

To estimate the effect of changing allocation per se – as distinct from the incentive effects of the transfer scheme, we use baseline the preference matrix $\mathbf{P}$ and predicted performance matrix $\mathbf{y}$ to construct an instrument for being transferred under the scheme.

We follow a related procedure to the simulations in Section 3.2. Specifically, as above, we draw 10,000 draws, indexed by k, from the joint distribution of $\mathbf{y}$ given $\mathbf{y_0}$. We then calculate the predicted probability an inspector moves circles as:

$$Pr\_AnyMove_{ik} = \sum_{\mathbf{j=0}}^{\mathbf{J-1}} \mathbf{1}\Big(r_i(z_{j-1}^k - y_{i0} + \delta, \mathbf{y^k_{-i}}, \mathbf{P})\Big) \left[\Phi(z_j^k - y_{i0}) - \Phi(z_{j-1}^k - y_{i0})\right] \tag{16}$$

We take the average of $Pr\_AnyMove_{ik}$ over all draws k to compute $Pr\_AnyMove_i$.

$Pr\_AnyMove_i$ simulates the probability that an inspector i is moved, under the assumption that $e = 0$. Note the close relationship between equation (16) and equation (11). There are two key differences. The first, and most important, difference is that equation (16) weights each possible rank position j by the probability it occurs $\left[\Phi(z_j^k - y_{i0}) - \Phi(z_{j-1}^k - y_{i0})\right]$, whereas equation (11) weights each possible rank position j by the *derivative* of the probability it occurs, given by $\left[\phi(z_{j-1}^k - y_{i0}) - \phi(z_j^k - y_{i0})\right]$ (note that Φ is a CDF whereas ϕ is a PDF). Thus equation (16) captures the probability an outcome occurs, whereas equation (11) calculates the marginal return to shifting the probabilities by exerting a bit more effort. The second difference is that instead of using a utility function u, equation (16) weights each outcome by a dummy variable for whether the inspector is moved or not. While $Pr\_AnyMove_i$ from equation (16) may be correlated with $\frac{dE[u_i]}{de_i}$ from equation (11), they are not perfectly correlated, and, indeed, the correlation is .58 for u_1.

We use the interaction of $Pr\_AnyMove_i$ with the experimental treatment as an instrument for an inspector being moved. Given the correlation with the incentives from the scheme, we also control for $\frac{dE[u_i]}{de_i}$ and its interaction with the experimental treatment. Specifically, to estimate the impact of a move, we use the year 2 data and estimate

$$\begin{aligned} \log y_{ct} &= \alpha_t + \gamma_t \log y_{c0} + \beta_1 TREAT_c \\ &\quad + \beta_2 TREAT_c \times \frac{dEu_c}{de_c} + \beta_3 \frac{dEu_c}{de_c} \\ &\quad + \beta_4 MOVE_c + \beta_5 Pr\_AnyMove_c + \epsilon_{ct} \end{aligned} \tag{17}$$

where $MOVE_c$ is a dummy for the inspector in circle c being different in year 2 than it was in year 1, and where we instrument for $MOVE_c$ with $TREAT_c \times Pr\_AnyMove_c$. Note that even though we use year 2 outcome data in estimating equation (17), the $TREAT_c$ variable is defined using the year 1 treatment status, since year 1 treatments are what influence being moved in year 2. We estimate this on all circles that participated in the year 1 lottery, and, to make sure we are not capturing dynamic incentive effects, on the subset of year 1 circles that were randomly allocated not to participate in the treatment in year 2.

The first stage – which estimates the degree to which we can predict $MOVE_c$ with $TREAT_c \times Pr\_AnyMove_c$ – is presented in Table 20, and the results from estimating equation (17) are presented in Table 21. The results in Table 20 show that the instrument has substantial predictive power – moving from $Pr\_AnyMove_i$ from 0 to 1 increases the probability of a move by 76 percent in treatment groups, but only 13 percent in control groups.

Panel A of Table 21 shows the reduced form results. The coefficient on $TREAT_c \times Pr\_AnyMove_c$

is negative on total and current revenue, both for all circles and for the case where we exclude year 2 circles. To interpret magnitudes, we focus on Panel B, which gives the instrumental variable results, where we instrument for $MOVE_c$ with $TREAT_c \times Pr\_AnyMove_c$. Overall, the estimates suggest a substantial negative effect of movements on total revenue – a 39 percent decline overall, or 19 percent if we focus on the cleanest estimates in column (4) where year 2 treatments are excluded. While these estimates are borderline statistically significant, they are quite noisy. OLS estimates in Panel (C) also show negative effects, but while they are statistically significant they are substantially smaller in magnitude (a 5 percent decline overall; 7 percent if we focus on the year 2 excluded group).

Though the magnitudes in this section are a bit uncertain, they all point in the direction that reallocations do cause disruptions, which reduce revenue as people are moved. That said: the results in the previous section suggest that – at least in this context – the scheme did not cause substantially more disruptions than were experienced in the status quo. This suggests that at least in this context, where movements are quite frequent in the status quo, the movements induced by the scheme induced very little net losses in total.

A.5 Appendix Tables and Figures

Table 9: Summary statistics

	Mean	SD	Mean of within-group SD	N
Log Revenue (Total)	16.12	0.79	0.67	518
Log Revenue (Current)	16.00	0.80	0.69	518
Log Revenue (Arrears)	13.54	1.20	0.90	514
Log Tax Base (Total)	16.45	0.82	0.65	518
Log Tax Base (Current)	16.29	0.79	0.65	518
Log Tax Base (Arrears)	14.05	1.43	1.08	514
Log Recovery Rate (Total)	-0.08	0.11	0.10	518
Log Recovery Rate (Current)	-0.08	0.10	0.09	518
Log Recovery Rate (Arrears)	-0.13	0.22	0.16	514
Log Non-Exemption Rate (Total)	-0.25	0.22	0.17	518
Log Non-Exemption Rate (Current)	-0.22	0.17	0.13	518
Log Non-Exemption Rate (Arrears)	-0.38	0.58	0.45	514

Notes: Statistics from administrative data are shown at the end of Year 2 of the study (FY 2015). Each observation is one of the 525 circles as defined at the time of randomization.

Table 10: Balance

	Year 1 Randomization				Year 2 Randomization			
	Control	Treatment	Revenue	Demand	Control	Treatment	Revenue	Demand
Log Recovery	15.746	-0.001	-0.048	0.052	15.694	-0.128	-0.224**	-0.022
		(0.085)	(0.111)	(0.104)		(0.082)	(0.111)	(0.102)
Log Recovery Rate	-0.185	0.003	0.001	0.005	-0.178	-0.009	-0.012	-0.006
		(0.028)	(0.042)	(0.031)		(0.027)	(0.043)	(0.030)
Log Non-Exemption Rate	-0.258	0.043**	0.032	0.054*	-0.237	0.028	0.030	0.025
		(0.021)	(0.025)	(0.028)		(0.021)	(0.031)	(0.025)
FY 12-13 Log Growth Rate	0.089	-0.021	0.009	-0.053***	0.102	-0.015	0.005	-0.037*
		(0.019)	(0.028)	(0.019)		(0.022)	(0.034)	(0.021)
P-val, joint significance		0.203	0.939	0.347		0.334	0.631	0.911

Notes: This table presents balance tests for the randomization into the different treatments. Columns labelled Control reflect control group means. Values in the treatment columns are the coefficients of a regression of the baseline value of the variable indicated in the row on a treatment dummy (or the set of subtreatment dummies), controlling for the relevant randomization strata. Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 11: Treatment Effect on Tax Revenue, with previous year as baseline

	Year 1 (Y1 Q4)			Year 2 (Y2 Q4)			Pooled		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears	(7) Total	(8) Current	(9) Arrears
Treatment	0.048**	0.044*	0.067	0.045	0.021	0.011	0.047**	0.037*	0.050
	(0.023)	(0.024)	(0.058)	(0.036)	(0.036)	(0.109)	(0.020)	(0.021)	(0.052)
N (Total)	405	405	396	259	259	257	664	664	653
Mean of control group (Total)	15.907	15.692	14.072	16.255	16.134	13.794	16.061	15.888	13.948

Notes: OLS regessions of log recovery on treatment assignment. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline values (FY 2013). Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 13: Comparing simulation results to "reduced form" results

	Full knowledge of P, y		Full knowledge of P, no knowledge of y		Assume identical P, full knowledge of y		Assume random P, full knowledge of y	
	(1) dEu2dy	(2) dEu3dy	(3) dEu2dy	(4) dEu3dy	(5) dEu2dy	(6) dEu3dy	(7) dEu2dy	(8) dEu3dy
Reduced form preference correlation (ρ)	0.383***	0.403***	0.351***	0.514***	-0.136***	-0.212***	0.192***	0.101*
Reduced form Y density (γ)	0.169***	0.148***	0.065	0.033	0.296***	0.541***	0.252***	0.175***
Outcome stdev	0.443***	0.419***	0.532***	0.637***	-0.207***	-0.329***	0.249***	0.052
Fraction weakly better	-0.389***	-0.406***	-0.351***	-0.419***	0.205***	0.066	-0.255***	-0.179***
Fraction strictly better	0.275***	0.159***	0.321***	0.230***	0.033	-0.092*	-0.008	-0.135***
Fraction weakly worse	-0.221***	-0.117**	-0.261***	-0.169***	-0.059	0.067	0.033	0.139***
Fraction strictly worse	0.394***	0.410***	0.351***	0.424***	-0.205***	-0.068	0.260***	0.180***

Notes: Correlation coefficient of dEu2dy and dEu3dy against various measures of returns to effort. * p<0.10, ** p<0.05, *** p<0.01

Table 12: Treatment Effect on Tax Revenue by Sub-Treatment, with previous year as baseline

	Year 1			Year 2			Pooled		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears	(7) Total	(8) Current	(9) Arrears
Panel A: Effect on Recovery									
Revenue	0.058	0.041	0.041	0.064	0.058	-0.080	0.060**	0.046	0.003
	(0.036)	(0.035)	(0.083)	(0.045)	(0.054)	(0.114)	(0.029)	(0.030)	(0.067)
Demand	0.037*	0.046	0.097	0.016	-0.039	0.161	0.032	0.026	0.109
	(0.022)	(0.031)	(0.066)	(0.054)	(0.029)	(0.198)	(0.021)	(0.025)	(0.070)
N (Total)	405	405	396	259	259	257	664	664	653
Mean of control group (Total)	15.907	15.692	14.072	16.255	16.134	13.794	16.061	15.888	13.948
Revenue = Demand (p-value)	0.586	0.914	0.563	0.473	0.102	0.270	0.402	0.602	0.239
Panel B: Effect on Net Demand									
Revenue	0.110**	0.064	0.188	0.004	-0.030	-0.039	0.082*	0.039	0.129
	(0.054)	(0.047)	(0.134)	(0.052)	(0.051)	(0.203)	(0.043)	(0.038)	(0.112)
Demand	0.022	0.012	0.114	0.143**	0.050	0.636**	0.042	0.016	0.211*
	(0.039)	(0.029)	(0.116)	(0.068)	(0.044)	(0.304)	(0.034)	(0.026)	(0.111)
N (Total)	406	405	388	204	204	202	610	609	590
Mean of control group (Total)	16.411	16.317	13.854	16.605	16.471	14.108	16.485	16.376	13.953
Revenue = Demand (p-value)	0.136	0.314	0.646	0.082	0.203	0.055	0.412	0.599	0.577

Notes: OLS regessions of log net demand on treatment assignment. Note that Net Demand outcomes are measured using values from the first quarter of the following fiscal year. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline value. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 14: Heterogeneity in treatment effects by simulated marginal returns to effort, no fixed effects

	Y1 Q4			Y2 Q4			Pooled		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears	(7) Total	(8) Current	(9) Arrears
Panel A: Full knowledge of P, y									
Treatment	-0.028	0.001	-0.056	0.002	0.027	-0.464**	-0.023	0.008	-0.159*
	(0.038)	(0.044)	(0.093)	(0.059)	(0.057)	(0.212)	(0.031)	(0.033)	(0.086)
Treatment * dEu1dy	0.320*	0.285	0.267	0.162*	0.100	0.681**	0.236**	0.182*	0.356**
	(0.184)	(0.185)	(0.282)	(0.090)	(0.088)	(0.301)	(0.099)	(0.101)	(0.179)
dEu1dy	-0.008	0.083	-0.208***	-0.089*	0.006	-0.349***	-0.043	0.050	-0.274***
	(0.048)	(0.053)	(0.080)	(0.050)	(0.049)	(0.123)	(0.041)	(0.043)	(0.081)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel B: Full knowledge of P, no knowledge of y									
Treatment	0.043	0.061	0.046	0.047	0.116*	-0.680**	0.041	0.076*	-0.164
	(0.047)	(0.055)	(0.129)	(0.078)	(0.070)	(0.279)	(0.041)	(0.044)	(0.124)
Treatment * dEu1dy	0.008	-0.022	0.024	0.046	-0.060	0.772***	0.023	-0.031	0.241*
	(0.062)	(0.069)	(0.148)	(0.086)	(0.081)	(0.291)	(0.052)	(0.055)	(0.137)
dEu1dy	0.002	0.061*	-0.112	-0.028	0.064*	-0.359***	-0.010	0.063**	-0.218***
	(0.031)	(0.033)	(0.079)	(0.040)	(0.038)	(0.122)	(0.030)	(0.030)	(0.082)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel C: Assume identical P, full knowledge of y									
Treatment	-0.269***	-0.168**	-0.524**	-0.101	-0.081	-1.126**	-0.219***	-0.141**	-0.569***
	(0.068)	(0.074)	(0.212)	(0.130)	(0.126)	(0.545)	(0.061)	(0.063)	(0.196)
Treatment * dEu1dy	0.318***	0.244***	0.514**	0.147	0.128	0.809*	0.257***	0.199***	0.491***
	(0.079)	(0.084)	(0.211)	(0.107)	(0.101)	(0.412)	(0.060)	(0.062)	(0.176)
dEu1dy	-0.088*	0.020	-0.345***	-0.094	-0.020	-0.271	-0.085*	0.009	-0.325**
	(0.053)	(0.063)	(0.120)	(0.075)	(0.082)	(0.210)	(0.049)	(0.056)	(0.127)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel D: Assume random P, full knowledge of y									
Treatment	-0.154***	-0.099*	-0.248*	-0.034	-0.009	-0.709**	-0.105***	-0.056	-0.291**
	(0.048)	(0.054)	(0.131)	(0.080)	(0.079)	(0.327)	(0.041)	(0.043)	(0.117)
Treatment * dEu1dy	0.879***	0.782***	1.003*	0.282	0.207	1.435**	0.544***	0.437***	0.835**
	(0.281)	(0.289)	(0.567)	(0.193)	(0.180)	(0.716)	(0.150)	(0.149)	(0.367)
dEu1dy	-0.116	0.069	-0.506**	-0.207	-0.062	-0.459	-0.139	0.028	-0.511**
	(0.099)	(0.119)	(0.198)	(0.133)	(0.140)	(0.297)	(0.095)	(0.106)	(0.201)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952

Notes: OLS regessions of log recovery on treatment assignment. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline value. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 15: Heterogeneity in treatment effects by simulated marginal returns to effort

(a) Heterogeneity by $\frac{dE[u_2]}{de_i}$

	Y1 Q4			Y2 Q4			Pooled		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears	(7) Total	(8) Current	(9) Arrears
Panel A: Full knowledge of P, y									
Treatment	-0.011	0.024	-0.059	0.043	0.052	-0.424	-0.001	0.027	-0.141
	(0.035)	(0.045)	(0.102)	(0.067)	(0.064)	(0.275)	(0.032)	(0.037)	(0.105)
Treatment * dEu2dy	0.072*	0.041	0.113	0.035	0.023	0.284	0.065*	0.040	0.140
	(0.043)	(0.047)	(0.099)	(0.060)	(0.060)	(0.202)	(0.035)	(0.038)	(0.090)
dEu2dy	-0.010	0.037	-0.113**	-0.022	0.022	-0.128	-0.014	0.031	-0.119**
	(0.021)	(0.023)	(0.050)	(0.026)	(0.027)	(0.084)	(0.019)	(0.020)	(0.055)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel B: Full knowledge of P, no knowledge of y									
Treatment	0.051	0.087	-0.010	0.192**	0.239***	-0.486	0.084*	0.124**	-0.134
	(0.054)	(0.078)	(0.150)	(0.097)	(0.079)	(0.424)	(0.047)	(0.062)	(0.157)
Treatment * dEu2dy	-0.002	-0.032	0.060	-0.088	-0.130**	0.288	-0.021	-0.055	0.114
	(0.042)	(0.056)	(0.106)	(0.070)	(0.063)	(0.296)	(0.036)	(0.046)	(0.109)
dEu2dy	0.011	0.052**	-0.062	0.020	0.071***	-0.116	0.015	0.060***	-0.086
	(0.021)	(0.022)	(0.063)	(0.029)	(0.026)	(0.102)	(0.022)	(0.020)	(0.071)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel C: Assume identical P, full knowledge of y									
Treatment	0.653***	0.704***	0.665*	0.099	0.035	0.430	0.360***	0.338***	0.417*
	(0.196)	(0.230)	(0.367)	(0.128)	(0.123)	(0.374)	(0.114)	(0.120)	(0.248)
Treatment * dEu2dy	-0.380***	-0.403***	-0.394*	-0.013	0.029	-0.421	-0.203***	-0.186***	-0.284*
	(0.111)	(0.129)	(0.215)	(0.091)	(0.094)	(0.284)	(0.069)	(0.071)	(0.155)
dEu2dy	0.059	0.010	0.150*	0.071	0.043	0.111	0.050	0.006	0.137*
	(0.037)	(0.042)	(0.078)	(0.055)	(0.057)	(0.111)	(0.040)	(0.045)	(0.078)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel D: Assume random P, full knowledge of y									
Treatment	-0.250***	-0.135*	-0.530**	-0.088	-0.041	-1.164**	-0.206***	-0.109*	-0.583***
	(0.066)	(0.076)	(0.205)	(0.127)	(0.122)	(0.547)	(0.059)	(0.064)	(0.193)
Treatment * dEu2dy	0.346***	0.247***	0.581**	0.153	0.106	0.948**	0.278***	0.193***	0.563***
	(0.091)	(0.094)	(0.237)	(0.118)	(0.109)	(0.468)	(0.067)	(0.068)	(0.197)
dEu2dy	-0.092	0.034	-0.425***	-0.126	-0.023	-0.360	-0.099*	0.016	-0.412***
	(0.060)	(0.072)	(0.134)	(0.080)	(0.087)	(0.231)	(0.055)	(0.062)	(0.142)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952

Notes: OLS regessions of log recovery on treatment assignment. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline value. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 15: Heterogeneity in treatment effects by simulated marginal returns to effort (continued)

(b) Heterogeneity by $\frac{dE[u_3]}{de_i}$

	Y1 Q4			Y2 Q4			Pooled		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears	(7) Total	(8) Current	(9) Arrears
Panel A: Full knowledge of P, y									
Treatment	-0.039	0.001	-0.072	-0.018	0.000	-0.491**	-0.038	-0.002	-0.182*
	(0.037)	(0.047)	(0.095)	(0.064)	(0.060)	(0.248)	(0.033)	(0.038)	(0.095)
Treatment * dEu3dy	0.170**	0.119	0.202	0.142	0.116	0.502*	0.167***	0.121*	0.267**
	(0.079)	(0.088)	(0.153)	(0.092)	(0.088)	(0.283)	(0.062)	(0.067)	(0.133)
dEu3dy	-0.024	0.043	-0.144**	-0.053	0.022	-0.273***	-0.036	0.034	-0.201***
	(0.030)	(0.034)	(0.064)	(0.036)	(0.036)	(0.103)	(0.027)	(0.029)	(0.067)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel B: Full knowledge of P, no knowledge of y									
Treatment	0.041	0.080	0.010	0.066	0.140*	-0.742*	0.048	0.099*	-0.204
	(0.055)	(0.074)	(0.141)	(0.094)	(0.080)	(0.383)	(0.047)	(0.059)	(0.144)
Treatment * dEu3dy	0.006	-0.035	0.054	0.013	-0.066	0.602*	0.010	-0.044	0.208*
	(0.049)	(0.065)	(0.116)	(0.081)	(0.076)	(0.309)	(0.043)	(0.053)	(0.116)
dEu3dy	0.005	0.064**	-0.107	-0.003	0.079**	-0.306***	0.002	0.071***	-0.196***
	(0.026)	(0.028)	(0.067)	(0.034)	(0.032)	(0.108)	(0.026)	(0.025)	(0.072)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel C: Assume identical P, full knowledge of y									
Treatment	-0.017	0.017	-0.057	0.098	-0.054	0.101	0.034	0.019	-0.027
	(0.096)	(0.105)	(0.198)	(0.163)	(0.171)	(0.407)	(0.099)	(0.102)	(0.192)
Treatment * dEu3dy	0.050	0.020	0.097	-0.011	0.099	-0.170	0.018	0.025	0.031
	(0.072)	(0.079)	(0.153)	(0.126)	(0.132)	(0.320)	(0.074)	(0.076)	(0.147)
dEu3dy	-0.013	-0.024	-0.041	0.090	0.045	0.021	0.027	0.003	-0.015
	(0.060)	(0.067)	(0.106)	(0.082)	(0.086)	(0.169)	(0.065)	(0.069)	(0.114)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel D: Assume random P, full knowledge of y									
Treatment	-0.159***	-0.113**	-0.184	-0.115	-0.136	-0.616*	-0.143***	-0.113**	-0.269*
	(0.047)	(0.049)	(0.150)	(0.105)	(0.098)	(0.368)	(0.048)	(0.047)	(0.149)
Treatment * dEu3dy	0.370***	0.301***	0.415	0.300*	0.333**	0.726	0.344***	0.301***	0.435*
	(0.098)	(0.098)	(0.278)	(0.172)	(0.158)	(0.506)	(0.087)	(0.087)	(0.247)
dEu3dy	-0.108**	-0.035	-0.206	-0.071	-0.004	-0.305	-0.092*	-0.023	-0.246
	(0.052)	(0.058)	(0.148)	(0.079)	(0.083)	(0.232)	(0.054)	(0.057)	(0.162)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952

Notes: OLS regessions of log recovery on treatment assignment. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline value. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 16: Heterogeneity in treatment effects by reduced form measures of competitiveness

(a) Heterogeneity by analytical measures and outcome standard deviation

	Y1 Q4			Y2 Q4			Pooled		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears	(7) Total	(8) Current	(9) Arrears
Panel A: Reduced form correlation (ρ)									
Treatment	0.366	0.537	0.532	-0.439	-0.194	-3.551**	0.059	0.267	-0.981
	(0.293)	(0.442)	(0.754)	(0.414)	(0.413)	(1.561)	(0.245)	(0.309)	(0.740)
Treatment * Reduced form preference correlation (ρ)	-0.378	-0.591	-0.552	0.654	0.352	4.173**	0.009	-0.249	1.215
	(0.353)	(0.525)	(0.908)	(0.517)	(0.516)	(1.841)	(0.299)	(0.372)	(0.882)
Reduced form preference correlation (ρ)	0.005	0.256	-0.073	-0.202	0.402*	-1.289	-0.074	0.326*	-0.565
	(0.203)	(0.195)	(0.518)	(0.268)	(0.238)	(0.805)	(0.198)	(0.175)	(0.542)
N	374	374	366	232	232	225	606	606	591
Mean of control group	15.902	15.693	14.036	16.262	16.142	13.795	16.061	15.892	13.929
Panel B: Y density (γ)									
Treatment	1.188	1.682*	-0.360	1.093	0.112	3.057	0.750	0.721	1.069
	(0.833)	(0.945)	(1.862)	(1.370)	(1.465)	(3.452)	(1.301)	(1.185)	(1.702)
Treatment * Y density (γ)	-1.089	-1.560*	0.381	-0.909	-0.002	-2.966	-0.656	-0.639	-0.996
	(0.772)	(0.874)	(1.732)	(1.279)	(1.365)	(3.226)	(1.207)	(1.099)	(1.585)
Y density (γ)	0.477	0.671	-0.532	2.543**	1.682	0.410	1.115	0.983	-0.209
	(0.585)	(0.551)	(1.050)	(1.187)	(1.298)	(2.955)	(0.807)	(0.746)	(1.452)
N	357	357	352	225	225	220	582	582	572
Mean of control group	15.936	15.731	14.050	16.308	16.190	13.826	16.101	15.934	13.951
Panel C: Outcome Stdev									
Treatment	0.023	0.047	-0.112	0.070	0.195**	-0.766***	0.032	0.084*	-0.293**
	(0.056)	(0.059)	(0.147)	(0.095)	(0.093)	(0.270)	(0.049)	(0.049)	(0.135)
Treatment * Outcome Stdev	0.016	0.001	0.099	0.006	-0.069	0.359***	0.015	-0.017	0.169**
	(0.032)	(0.032)	(0.072)	(0.043)	(0.042)	(0.129)	(0.027)	(0.027)	(0.067)
Outcome Stdev	0.008	0.037**	-0.099**	-0.000	0.044**	-0.204***	0.005	0.040***	-0.143***
	(0.014)	(0.015)	(0.040)	(0.020)	(0.019)	(0.065)	(0.014)	(0.014)	(0.044)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952

Notes: OLS regessions of log recovery on various regressors. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline value. Robust standard errors in parentheses. Standard errors are clustered by circle. * $p<0.10$, ** $p<0.05$, *** $p<0.01$

Table 16: Heterogeneity in treatment effects by reduced form measures of competitiveness (continued)

(b) Heterogeneity by fraction strictly/weakly better/worse

	Y1 Q4			Y2 Q4			Pooled		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears	(7) Total	(8) Current	(9) Arrears
Panel A: Fraction strictly better									
Treatment	0.021	0.014	0.058	0.129***	0.168***	-0.309**	0.050**	0.058**	-0.050
	(0.024)	(0.029)	(0.076)	(0.046)	(0.047)	(0.140)	(0.022)	(0.026)	(0.070)
Treatment * Fraction strictly better	0.083	0.089	0.035	-0.149	-0.284***	0.584*	0.020	-0.019	0.193
	(0.069)	(0.068)	(0.171)	(0.100)	(0.075)	(0.314)	(0.059)	(0.056)	(0.156)
Fraction strictly better	-0.032	-0.016	0.020	-0.038	0.013	-0.091	-0.034	-0.003	-0.029
	(0.028)	(0.027)	(0.079)	(0.041)	(0.039)	(0.116)	(0.030)	(0.029)	(0.083)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel B: Fraction weakly better									
Treatment	-0.027	-0.079	0.357*	0.137	0.082	0.245	0.016	-0.031	0.350**
	(0.057)	(0.058)	(0.195)	(0.093)	(0.095)	(0.314)	(0.049)	(0.050)	(0.172)
Treatment * Fraction weakly better	0.100	0.161**	-0.380	-0.080	-0.018	-0.480	0.054	0.109	-0.445*
	(0.082)	(0.082)	(0.258)	(0.142)	(0.142)	(0.414)	(0.071)	(0.071)	(0.229)
Fraction weakly better	-0.140***	-0.200***	0.142	-0.156**	-0.173***	0.379*	-0.147***	-0.188***	0.248*
	(0.047)	(0.057)	(0.134)	(0.062)	(0.066)	(0.195)	(0.046)	(0.050)	(0.138)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel C: Fraction strictly worse									
Treatment	0.072**	0.081**	-0.013	0.065	0.075	-0.252	0.073**	0.080**	-0.092
	(0.035)	(0.036)	(0.092)	(0.065)	(0.063)	(0.169)	(0.031)	(0.031)	(0.084)
Treatment * Fraction strictly worse	-0.102	-0.157*	0.342	0.058	-0.018	0.560	-0.063	-0.118	0.438*
	(0.082)	(0.083)	(0.257)	(0.146)	(0.150)	(0.423)	(0.072)	(0.072)	(0.228)
Fraction strictly worse	0.129***	0.194***	-0.175	0.151**	0.173***	-0.418**	0.139***	0.185***	-0.283**
	(0.048)	(0.058)	(0.135)	(0.062)	(0.066)	(0.194)	(0.047)	(0.051)	(0.138)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952
Panel D: Fraction weakly worse									
Treatment	0.101*	0.103*	0.085	0.069	0.023	0.152	0.093*	0.076*	0.111
	(0.057)	(0.053)	(0.126)	(0.080)	(0.072)	(0.230)	(0.048)	(0.044)	(0.115)
Treatment * Fraction weakly worse	-0.083	-0.093	-0.021	0.022	0.087	-0.455	-0.057	-0.039	-0.155
	(0.066)	(0.064)	(0.164)	(0.097)	(0.092)	(0.299)	(0.056)	(0.054)	(0.150)
Fraction weakly worse	0.029	0.025	-0.052	0.045	0.002	0.114	0.035	0.015	0.022
	(0.027)	(0.028)	(0.076)	(0.040)	(0.038)	(0.117)	(0.029)	(0.028)	(0.081)
N	403	403	394	257	257	249	660	660	643
Mean of control group	15.910	15.698	14.069	16.261	16.141	13.804	16.066	15.893	13.952

Notes: OLS regessions of log recovery on various regressors. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline value. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 17: Margins, reduced form

	Y1 Q4				Y2 Q4				Pooled			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Revenue	Tax Base	Non-Exemption Rate	Recovery Rate	Revenue	Tax Base	Non-Exemption Rate	Recovery Rate	Revenue	Tax Base	Non-Exemption Rate	Recovery Rate
Panel A: Any treatment												
Treatment	0.044**	0.068**	-0.008	-0.017	0.072*	0.028	0.034	0.010	0.052***	0.056**	0.005	-0.009
	(0.021)	(0.033)	(0.015)	(0.016)	(0.041)	(0.039)	(0.022)	(0.015)	(0.019)	(0.026)	(0.013)	(0.013)
N (Total)	405	406	405	405	259	259	259	259	664	665	664	664
Mean of control group (Total)	15.907	16.324	-0.302	-0.119	16.255	16.603	-0.260	-0.088	16.061	16.447	-0.284	-0.106
Panel B: Sub-treatment												
Revenue	0.056*	0.090*	0.008	-0.043*	0.113**	0.078*	0.023	0.012	0.074***	0.084**	0.014	-0.026
	(0.034)	(0.053)	(0.021)	(0.024)	(0.046)	(0.046)	(0.030)	(0.012)	(0.027)	(0.039)	(0.017)	(0.018)
Demand	0.030	0.045	-0.027	0.011	0.008	-0.049	0.050**	0.007	0.026	0.021	-0.007	0.012
	(0.021)	(0.032)	(0.018)	(0.017)	(0.063)	(0.057)	(0.025)	(0.029)	(0.023)	(0.028)	(0.016)	(0.015)
N (Total)	405	406	405	405	259	259	259	259	664	665	664	664
Mean of control group (Total)	15.907	16.324	-0.302	-0.119	16.255	16.603	-0.260	-0.088	16.061	16.447	-0.284	-0.106

Notes: OLS regessions of various margins on treatment assignment. The unit of observation is a circle, as defined at the time of randomization. Specification controls for baseline value. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 18: Base Growth Predictions, with Group FE

	(1) Y1 Total Revenue
Log Recovery 2013	-0.276**
	(0.118)
Log Recovery 2012	0.127
	(0.115)
Log Net Demand 2013	0.077
	(0.085)
Log Net Demand 2012	0.034
	(0.078)
N	250
Joint significance (p-value)	0.001

Notes: OLS regessions of performance on time-lagged performance, using group fixed effects. The unit of observation is a circle, as defined at the time of randomization. Robust standard errors in parentheses. Standard errors are clustered by group. * p<0.10, ** p<0.05, *** p<0.01

Table 19: How does the serial dictatorship change allocations? (Probit/Ordered Probit)

	(1) Any move	(2) Any move
Treatment	0.074	0.116
	(0.131)	(0.171)
Continuing treatment		-0.081
		(0.210)
N	404	404
Mean of Y1 control group	0.519	0.519

Notes: Probit regressions of Any Transfer dummy on various regressors. The unit of observation is an circle. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Table 20: Predicting movements

	All circles	Y2 Treatment excluded
	(1)	(2)
	Any move	Any move
Y1 Treatment * Pr(Any move)	0.633**	1.517***
	(0.314)	(0.440)
Y1 Treatment * dEu1dy	0.239	0.466
	(0.223)	(0.288)
Pr(Any move)	0.131	0.150
	(0.195)	(0.226)
dEu1dy	-0.306***	-0.303***
	(0.092)	(0.103)
Y1 Treatment	-0.423**	-0.893***
	(0.170)	(0.220)
N	404	275
Mean of Y1 Control group	0.519	0.519
Y1 Treatment * Pr(Any move) = 0 (F statistic)	4.066	11.884

Notes: First stage regessions of any move dummy on various regressors. The unit of observation is a circle, as defined at the time of randomization. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

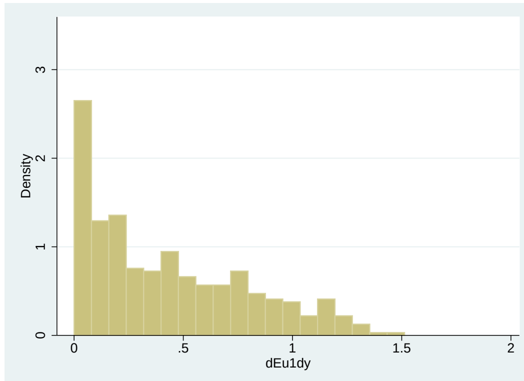
Table 21: Estimating the distruption effects from movements

	All circles			Y2 Treatment excluded		
	(1) Total	(2) Current	(3) Arrears	(4) Total	(5) Current	(6) Arrears
Panel A: Reduced form						
Y1 Treatment * Pr(Any move)	-0.279*	-0.134	0.064	-0.335	-0.233	2.234**
	(0.149)	(0.153)	(0.512)	(0.308)	(0.314)	(0.933)
Y1 Treatment * dEu1dy	0.526**	0.426**	0.303	0.459	0.467	0.040
	(0.245)	(0.217)	(0.505)	(0.289)	(0.302)	(0.465)
Pr(Any move)	-0.059	-0.072	-0.054	0.051	0.100	-0.226
	(0.101)	(0.096)	(0.326)	(0.105)	(0.097)	(0.375)
dEu1dy	0.064	0.161**	-0.141	-0.044	0.038	-0.215
	(0.075)	(0.073)	(0.143)	(0.078)	(0.075)	(0.154)
Y1 Treatment	0.092	0.066	-0.055	0.147	0.107	-1.072**
	(0.076)	(0.078)	(0.283)	(0.164)	(0.164)	(0.477)
Panel B: IV						
Any move dummy	-0.391	-0.181	0.102	-0.192	-0.130	1.770*
	(0.247)	(0.212)	(0.819)	(0.175)	(0.173)	(1.032)
Y1 Treatment * dEu1dy	0.615**	0.468*	0.282	0.545**	0.522*	-0.803
	(0.290)	(0.245)	(0.582)	(0.271)	(0.293)	(1.055)
Pr(Any move)	-0.023	-0.058	-0.060	0.076	0.115	-0.466
	(0.133)	(0.113)	(0.368)	(0.112)	(0.108)	(0.703)
dEu1dy	-0.034	0.122	-0.103	-0.087	0.013	0.439
	(0.108)	(0.092)	(0.383)	(0.100)	(0.091)	(0.550)
Y1 Treatment	-0.084	-0.016	-0.011	-0.042	-0.023	0.316
	(0.066)	(0.060)	(0.172)	(0.061)	(0.065)	(0.336)
Panel B: OLS						
Any move dummy	-0.051**	-0.043	0.116	-0.071**	-0.041	0.019
	(0.026)	(0.027)	(0.073)	(0.028)	(0.029)	(0.078)
Y1 Treatment * dEu1dy	0.449**	0.398**	0.276	0.425	0.434	0.680
	(0.228)	(0.199)	(0.461)	(0.323)	(0.334)	(0.471)
Pr(Any move)	-0.146**	-0.108	-0.064	0.026	0.078	0.091
	(0.074)	(0.075)	(0.240)	(0.095)	(0.094)	(0.341)
dEu1dy	0.080	0.163**	-0.097	-0.046	0.040	-0.349**
	(0.073)	(0.070)	(0.135)	(0.069)	(0.068)	(0.141)
Y1 Treatment	-0.037	0.002	-0.008	-0.011	-0.001	-0.127
	(0.047)	(0.049)	(0.136)	(0.063)	(0.065)	(0.170)
N	401	401	390	274	274	269
Mean of Y1 Control group	16.222	16.103	13.752	16.261	16.141	13.804

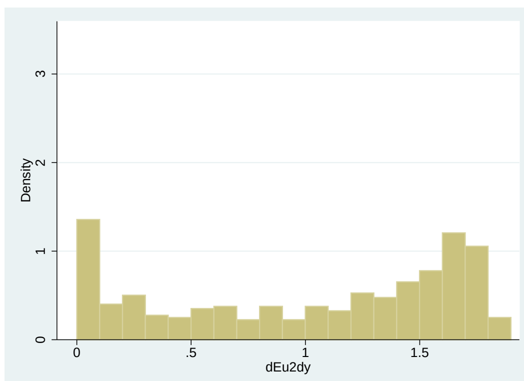
Notes: Reduced form, IV, and OLS regessions of Y2 log total recovery on various regressors. The unit of observation is a circle, as defined at the time of randomization. Robust standard errors in parentheses. Standard errors are clustered by circle. * p<0.10, ** p<0.05, *** p<0.01

Figure 5: Simulated Distribution of $\frac{dE[u_i]}{de_i}$ using baseline data

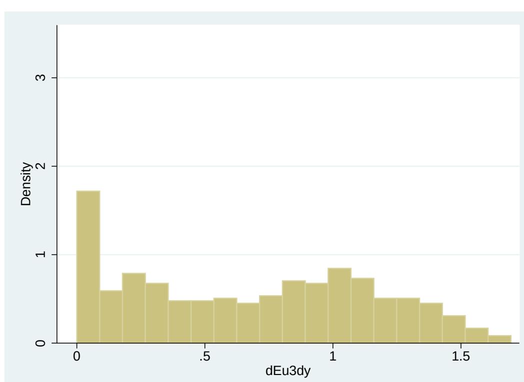
(a) Distribution of $\frac{dE[u_1]}{dy}$ (linear utility)



(b) Distribution of $\frac{dE[u_2]}{dy}$ (dummy for achieving first-choice)



(c) Distribution of $\frac{dE[u_3]}{dy}$ (dummy for improving on status quo)



Notes: Simulations are as described in Section (3.2), assuming full knowledge of preferences P and predicted y_0. For each inspector we use 20,000 draws of $\mathbf{y}$ to calculate $\frac{dE[u_i]}{de_i}$.

The International Growth Centre (IGC) aims to promote sustainable growth in developing countries by providing demand-led policy advice based on frontier research.

Find out more about
our work on our website
www.theigc.org

For media or communications
enquiries, please contact
mail@theigc.org

Subscribe to our newsletter
and topic updates
www.theigc.org/newsletter

Follow us on Twitter
@the_igc

Contact us
International Growth Centre,
London School of Economic
and Political Science,
Houghton Street,
London WC2A 2AE

IGC
International
Growth Centre

DIRECTED BY
LSE
UNIVERSITY OF OXFORD

FUNDED BY
UKaid
from the British people

Designed by soapbox.co.uk