14.771: Public Finance Lecture 2

Ben Olken

Tax administration vs. tax rates

Basri et al 2019

- Is low tax revenue a fundamental constraint? Or – on the margin – discrete changes in tax administration and tax rates can nevertheless have substantial effects?
  - And if so – which approach is most effective, and why
- Study two separate major reforms in corporate tax policy in Indonesia using administrative tax data.
  - Taxpayer administration reform in 2007
    - Corporate taxes tend to be very skewed, so few taxpayers pay most tax. So most countries have the largest taxpayers served by special tax offices with much higher staff-to-taxpayer ratios (Lemgruber et al 2015; Alumnia and Lopez-Rodriguez 2018).
    - What are the returns in a developing country setting?
    - Indonesia implemented this idea at the regional office, with creation of "Medium Tax Offices" (MTOs) to serve largest ˜330 taxpayers in each region (˜4 percent).
    - We study the impact on firms when MTOs are first created
    - **Find**: affected firms' tax payments increase by 128% on average in the 6 years after moving to MTO, across a range of taxes (VAT, CIT, etc). Effects on tax payments and gross income increase over time.

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- Study two separate major reforms in corporate tax policy in Indonesia using administrative tax data.
  - Taxpayer administration reform in 2007
  - Tax rate reforms in 2008-2009
    - Pre-2008 system: progressive CIT with marginal rate based on taxable income (*profits*). Top marginal rate 30%.
    - Post-2008 system: flat CIT, but with discounts based on gross revenue (*revenue*). Top marginal rate 28% in 2009 and 25% from 2010 on.
    - Estimate elasticity of taxable income by instrumenting for change in CIT using pre-period revenues and tax schedule change (a la Gruber and Saez 2002 and others).
    - **Find:** ETI of 0.59. A bit higher than US (0.2; Gruber and Rauh); similar to Germany (0.6; Dwenger and Steiner). Smaller than small firms in Costa Rica (3; Bacchas forthcoming).

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- Study two separate major reforms in corporate tax policy in Indonesia using administrative tax data.
  - Taxpayer administration reform in 2007
  - Tax rate reforms in 2008-2009
- Benchmark improved administration effect to counterfactual tax rate increase using the ETI estimate.
  - **Find**: Increase in corporate income tax payments alone is equivalent to raising tax rate on those firms by 23 pp (i.e. from 30 percent to 53 percent).

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- Study two separate major reforms in corporate tax policy in Indonesia using administrative tax data.
  - Taxpayer administration reform in 2007
  - Tax rate reforms in 2008-2009
- Benchmark improved administration effect to counterfactual tax rate increase using the ETI estimate.
- Suggest a possible explanation for why improved tax administration can raise so much revenue without massively distorting firm growth
  - **Find**: improved administration flattens firm size / enforcement relationship

Tax Administration Research Design

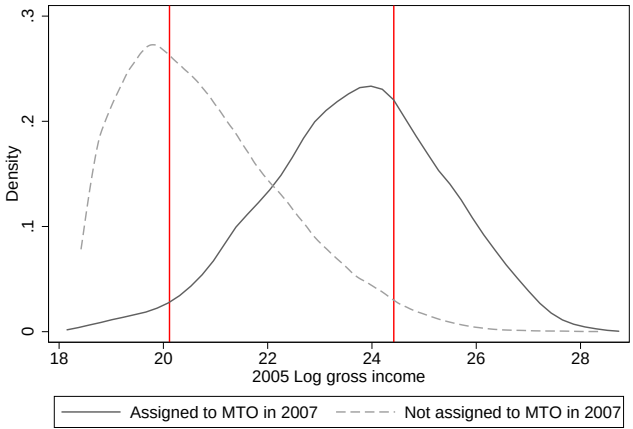
- Let's focus on the administrative reform (MTO).
- Typical differences-in-differences assumption: control group trends are on same trends as treatment group, other than treatment. Does that make sense in this context?
- Key challenge: MTO firms are generally larger than PTO firms. By definition. Why is that a problem?
- What would you do for a reseach design?
- RD would be the best case. Couldn't do that. Why?
  - Assignment based on on gross income, tax payments, and possibly other variables.
  - Excel sheets used for assignment not retained, so cannot reproduce formula exactly or do RD.
- Instead we use matched differences-in-differences.

Matching

- Key idea of matching: common-trends assumption in differenences-in-differences assumption more plausible if the firms look the same on observables. Is this always true? What does this depend on?
- How to do this in practice? Three steps:
  1. Restrict to common support (i.e. 97.5th / 2.5th percentiles; 99th / 1st percentile, etc). Why?

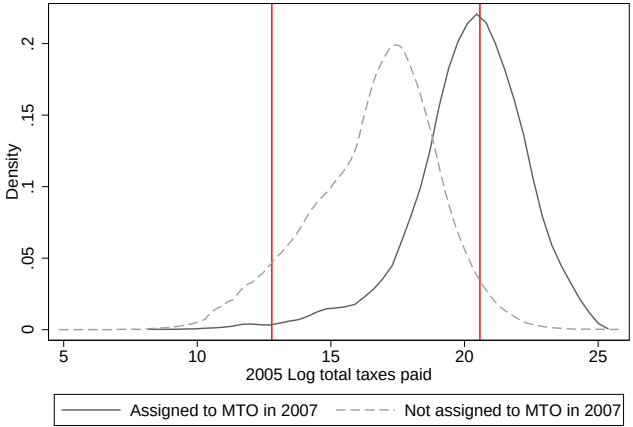
Common Support

Gross Income



Common Support

Total taxes paid



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  2. Use pre-period data to re-weight treatment and control groups so weighted distributions look similar

Matching

- How to compute the weights?
- *Propensity-score*. If you know the functional form of assignment rule (i.e. $X'\beta$, for some unknown β), estimate it, i.e. estimate probit/logit $Prob(t_i = 1) = F(X'\beta)$, predict p_i, and then use weights $\frac{1}{p_i}$ for treated units and $\frac{1}{1-p_i}$ for control units.
- *Balancing methods*. If you don't know the functional form, you can compute weights directly. E.g. Hainmuller 2012
  - Computes exact weights (for the untreated group) so that weighted sample matches pre-treatment characteristics of treated group.
  - Chooses the set of weights that achieves balance that minimally deviates from uniform weights.
  - These methods provide better balance than propensity score methods when propensity score isn't exact (Athey and Imbens 2017).

Matching

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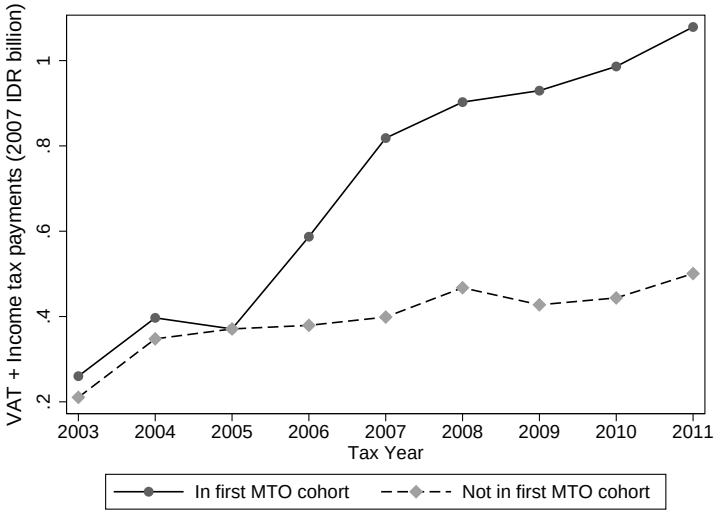
- How to do this in practice? Three steps:
  1. Restrict to common support (i.e. 97.5th / 2.5th percentiles; 99th / 1st percentile, etc). Why?
  2. Use pre-period data to re-weight treatment and control groups so weighted distributions look similar
  3. Estimate differences-in-differences model on reweighted data

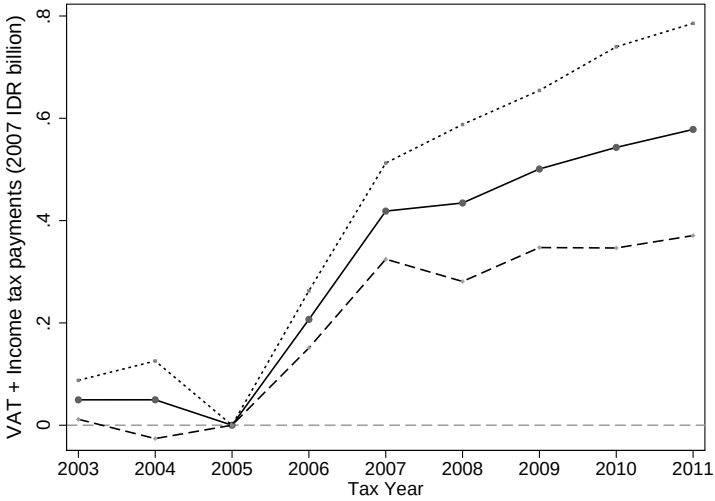
$$Y_{it} = \alpha + \beta^{RF} \left(M_{iFC} \times 1_{t>2005} \right) + \delta_t + \delta_i + \epsilon_{it}$$

- Can estimate same equation with coefficients β_t^{RF} to estimate event-study

Impacts on Tax Revenue



Impacts on Tax Revenue



Magnitudes

- Magnitudes are large:
  - For affected taxpayers, tax payments increase by 128%!
  - Extrapolating (in levels) to all MTO firms in Indonesia -¿ approx Rp. 40 trillion ($4.0 billion) over 6 years.
- Key parameter is net revenues:
  - IV estimate of increased tax revenue effect: IDR 525 million / year
  - Difference in administrative costs per taxpayer: IDR 3.36 million / year. Two orders of magnitude smaller!
  - So net revenues gain is IDR 521 million / year

Comparing tax rates to tax administration

- Counterfactual from theory in paper:
  1. How much would τ have to be raised to generate same amount of revenue as generated by tax administration increase?
  2. Put another way, how much could government lower τ to keep total revenue unchanged?
- To compute these, given estimates of ε and dR_{MTO}, we can compute:

$$\frac{d\tau}{d\alpha}|_R = -\frac{\overbrace{\tau\frac{dz}{d\alpha} - \frac{da}{d\alpha}}^{\text{Total MTO effect}}}{\underbrace{N\left(z^m - \bar{z}\right)}_{\text{Total income subject to raise}}\left[1 - \underbrace{\left(\frac{\tau}{1-\tau}\right)\varepsilon]\rho}_{\text{Behavioral effect}}\right]}$$

- Calibrate with $\bar{z} =$ Rp 100 million. $N = 1\{z > \bar{z}\}$, z reported 2006 taxable income, $z^m = E[z|z > \bar{z}]$, $\rho = \left(\frac{z^m}{z^m - \bar{z}}\right)$ and $\tau = 30\%$

Results

Table 4: Counterfactual CIT income tax increases to match MTO effects

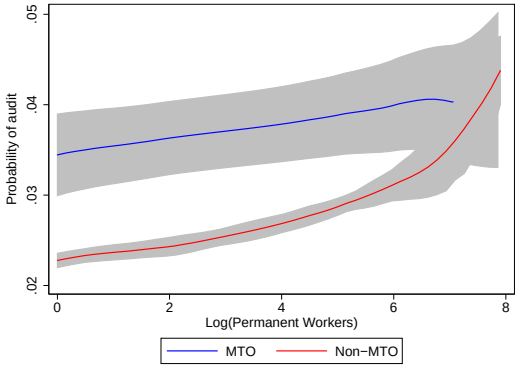
		MTR raise needed to generate MTO effect on total revenue	
	MTO IV treatment effect (IDR billion)	Taxing MTO taxpayers	Taxing all taxpayers
	(1)	(2)	(3)
Corporate Income Tax	0.064	23 pp	6 pp
Total Income Taxes	0.180	xx	17 pp

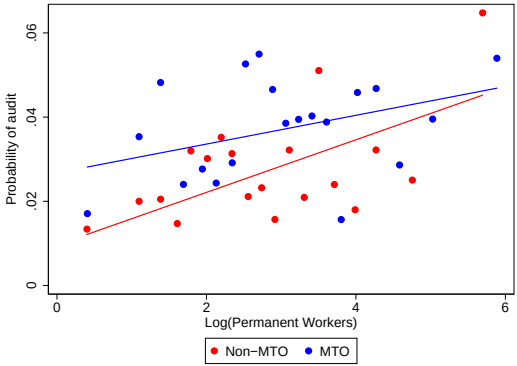
Size-dependent enforcement

- Simple setup:
  - Firm solves
$$\max_{l,e} (1-\tau)\left(Af(l) - \gamma w l - e\right) - (1-\gamma)\, wl - c\left(e, \alpha\right) + e$$
  - So firm's production given by
$$Af'(l) = \gamma w + \frac{(1-\gamma)w}{1-\tau}$$
  - Note first-best is $Af'(l) = \gamma w$, but taxes distortionary if $\gamma < 1$.
- Now suppose cost of evasion is $c(e, \alpha(l))$, i.e. a functionof firm size
  - Then firm decision is
$$Af'(l) = \gamma w + \underbrace{\frac{(1-\gamma)w}{1-\tau}}_{\text{distortionary effects of taxation}} + \underbrace{\frac{1}{1-\tau}\frac{dc}{d\alpha}\alpha'(l)}_{\text{enforcement tax}}$$
  - Additional 'enforcement tax' generated by slope of $a(l)$ function
  - Suggests impact of increasing α depends both on level and *derivative* of $\alpha(l)$

Results

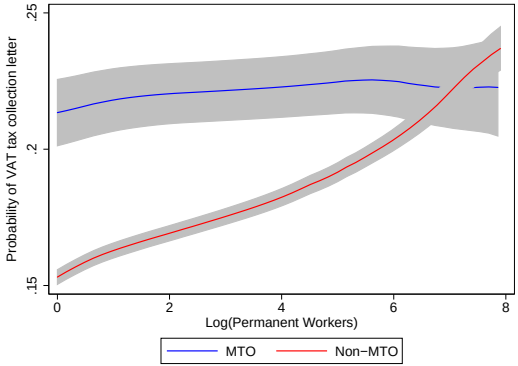
Probability of audit

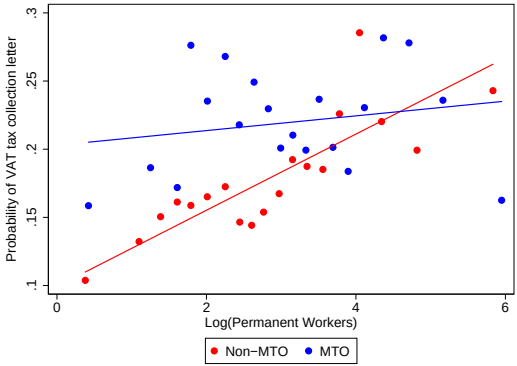




Results

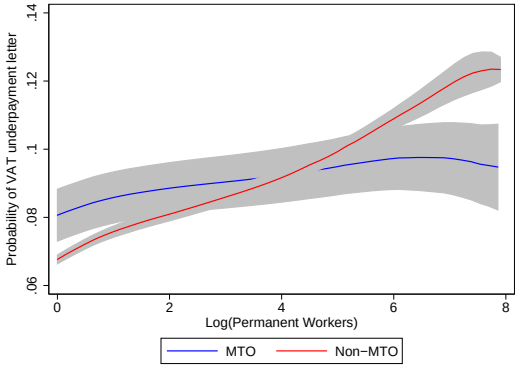
Probability of VAT underpayment letter

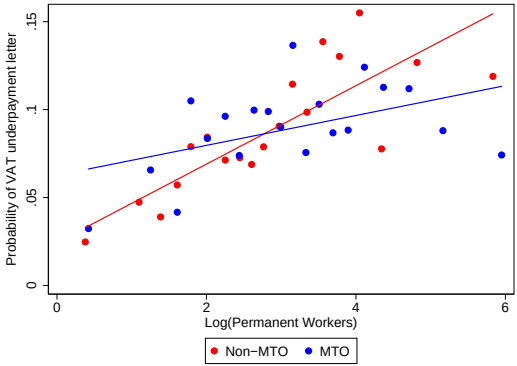




Results

Probability of VAT tax collection letter





Incentives for tax officials

Khan, Khwaja, and Olken (2016): "Tax Farming Redux: Experimental Evidence on Performance Pay for Tax Collectors"

- Giving high powered incentives to tax collectors is one of the oldest ideas of how to improve tax collections.
  - For example, Roman empire, French ancient regime appointed "tax farmers" who paid a fix fee to the king and kept the remainder for themselves
  - But this was very unpopular (tax farmers were beheaded during the French Revolution).
  - Can this work in modern contexts?
- Randomized experiment on incentives for property tax collectors in Pakistan
  - Tax officers in treatment group (team of three staff) receive 20-40% of all revenue collected above a historical benchmark (On average each person faces a 10% incentive on the margin)
  - Many staff get close to doubling their base wages
- What do you expect will happen?

Model

- Nash bargaining (assume equal weights) between Taxpayer (P) and Tax Collector (C) to collude and reduce official tax liability
- τ^*: true amount of tax, same for everyone. Can instead negotiate to pay bribe (b) and report less tax τ ($\leq \tau^*$).
- Taxpayer's utility:

$$u_p(\tau, b) = -\tau - \alpha(\tau^* - \tau) - b$$

  where $\alpha(\tau^* - \tau)$ is cost of under-paying: α is heterogeneous among taxpayers
- Tax collector's utility:

$$r\tau - \beta(\tau^* - \tau) + b$$

  r: proportional incentive,$\beta(\tau^* - \tau)$ is cost of under-taxing
- Possibility of getting caught/penalty embedded in $\alpha(\tau^* - \tau)$ and $\beta(\tau^* - \tau)$.

Model

- Nash bargaining: Maximize (net of outside options) joint surplus from agreement

$$[-\tau - \alpha(\tau^* - \tau) - b + \tau^*] + [r\tau - \beta(\tau^* - \tau) + b - r\tau^*]$$

Rewrite as:

$$-\tau(1 - r - \alpha - \beta) + (1 - r - \alpha - \beta)\tau^*$$

- Solving yields (corner solutions; γ is bargaining weight of taxpayer):

$$(\tau, b) = \begin{cases} (0, [(1-\gamma)(\beta + r) + \gamma(1-\alpha)]\tau^* & \text{if } r + \alpha + \beta < 1 \\ (\tau^*, 0) & o/w \end{cases}$$

Model

- Comparative statics: As r increases (performance pay introduced) - two effects:
  - Equilibrium Selection: LESS likely to get collusive equilibrium
    - Recall Need: $r + \alpha + \beta < 1$ for collusion
    - Intuition: "Outside" option (fully collect taxes) of collector has gone up
  - Equilibrium Bribe Amount:
    - Recall (conditional on collusion) bribe $= [(1-\gamma)(\beta + r) + \gamma(1-\alpha)]\tau^*$
    - Intuition: Increased outside option of collector means he requires larger bribe
- Overall:
  - total amount of tax collected increases.
  - total amount of bribe can either increase or decrease (depends on distribution of α).
  - total amount of money paid by the taxpayers (tax + bribe) increases.

TABLE III

IMPACTS ON REVENUE COLLECTED

	(1)	(2)	(3)	(4)	(5)	(6)
	Year 1			Year 2		
	Total	Current	Arrears	Total	Current	Arrears
Panel A: Main treatment						
Any treatment	0.091***	0.073***	0.152**	0.094***	0.091***	0.113
	(0.028)	(0.027)	(0.069)	(0.031)	(0.032)	(0.083)

TABLE VI

IMPACTS ON TAX PAYMENTS AND CORRUPTION, BY REASSESSED STATUS

	(1) Self-reported tax payment	(2) Bribe payment	(3) Frequency of bribe payment	(4) Perception of corruption
Panel A: General population sample only				
Treatment	−62.81	594.1*	0.2021**	0.0113
	(264.7)	(341.7)	(0.0951)	(0.0254)
N	11,586	5,993	4,802	6,050
Mean of control group	4,069.425	1,874.542	0.683	0.644
Panel B: Reassessed and general population sample				
Reassessed * treatment	1,884*	−557.4	−0.1592*	−0.0031
	(1,083)	(380.1)	(0.0942)	(0.0221)
Reassessed	2,763***	−66.38	0.0137	−0.0191*
	(572.9)	(177.5)	(0.0403)	(0.0107)
N	16,353	8,207	6,993	8,268
Sample	Full	Phase 1	Phase 1	Phase 1
Mean of control group in gen. pop. sample	3928.252	1874.542	0.683	0.644

TABLE VII

IMPACTS ON SATISFACTION AND ACCURACY, BY REASSESSED STATUS

	(1) Quality	(2) Satisfaction	(3) Inaccuracy	(4) Tax gap
Reassessed * treatment	0.009	0.005	0.001	−0.005
	(0.024)	(0.024)	(0.017)	(0.028)
Reassessed	0.049***	0.044***	−0.061***	0.122***
	(0.013)	(0.013)	(0.009)	(0.015)
N	8,268	8,268	14,173	14,173
Sample	Phase 1	Phase 1	Full	Full
Mean of control group in gen. pop. sample	0.538	0.555	0.339	−0.103

Notes. This table examines whether nonrevenue-based outcomes differ for reassessed properties. The unit of observation is a property. Specification follows equation (12) of the main text, and controls for whether the response came from the short version of the survey. Columns (1) and (2) restrict the sample to circles from the first phase of the survey (see Online Appendix B for details). The information treatment is included in the control group. Robust standard errors are in parentheses. Standard errors are clustered by robust partition, that is, the group of circles such that all circles that merged or split with each other are included within the same partition. * $p<.10$, ** $p<.05$, *** $p<.01$.

Informal taxation

Olken and Singhal (2011): "Informal Taxation"

- Olken and Singhal (2011) study phenomenon of 'voluntary' contributions to local public goods
  - *Harambee* in Kenya
  - *Gotong Royong* in Indonesia
  - and see Ostrom (1991) for more
- Idea: taxation analogue of informal insurance
  - Specifically, local communities have good information about incomes, but face enforcement constraints
  - They can therefore enforce 'voluntary' contributions to public goods – what we call informal taxation – through social sanctions
- Use micro data from 10 countries to establish some stylized facts

Stylized facts

Magnitude

- Participation rates are 20% or higher in all surveyed countries (except Albania) and exceed 50% in Ethiopia, Indonesia, and Vietnam
- Participation rates are always higher in rural areas
  - Between 27% and 183% higher, depending on country
- A substantial share of households (10-76%) make in-kind payments in labor
  - Average labor payments range from 0.2 days per year (Albania) to 14.1 days per year (Ethiopia)

Comparison to Local Budgets

Olken and Singhal (2011): Table 5

TABLE 5—COMPARISON TO OTHER LOCAL BUDGETS IN INDONESIA

Per household value of:	Mean	Informal taxes as percent of. …
From Indonesia household survey		
Informal taxes	49.86	
Direct formal taxes	29.16	171%
Indirect formal taxes	158.88	31%
From village budget data		
Total annual village budget	117.64	42.4%
Village revenue from inter-governmental transfers	86.20	57.8%
Village revenue from local taxes/fees (including informal tax)	31.44	158.6%
From district budget data		
Total annual district budget	1138.45	4.4%
Expenditures on salaries	474.89	10.5%
Expenditures on goods and services	224.70	22.2%
Capital expenditures	396.90	12.6%
District revenue from central government transfers	933.07	5.3%
District revenue from local formal taxes/fees	43.41	114.9%

Who pays?

- Key question: who pays informal taxes within communities?
- Focus primarily on within-community results, since:
  - This is the level the tax is levied at, so this is the key parameter from a modeling perspective
  - Public goods are at the local level, so there is unobserved heterogeneity in public goods across locations
- Define a community as the smallest geographic unit observed in the data (i.e., a village)
- Examine relationship between informal taxation and equivalence-scale adjusted expenditure
- Where quantity data available estimate fixed effects QMLE Poisson such that:

$$\mathbf{E}\left(PAYMENTAMOUNT_{hc}\right) = \alpha_c \exp\left(\chi LN\left(EXPEN\right)_{hc}\right)$$

Who pays

Olken and Singhal (2011): Table 7 Panels a&b

TABLE 7—FORMAL TAXES VERSUS HOUSEHOLD EXPENDITURE: QUANTITIES ($H_0 : \chi = 0$)

	Philippines	Albania	Ethiopia	Indonesia	Vietnam
Panel A. Informal taxes, with community fixed effects					
Total payments	0.395*	0.334***	0.127***	0.387***	0.080***
	(0.213)	(0.053)	(0.054)	(0.041)	(0.025)
Observations	2,143	1,784	1,062	10,840	26,899
Panel B. Direct formal taxes, with community fixed effects					
Total payments	1.526***	1.433***	0.418***	1.372***	0.691***
	(0.198)	(0.083)	(0.134)	(0.075)	(0.114)
Observations	2,073	3,358	1,197	11,591	20,407
Panel C. Informal taxes, without community fixed effects					
Total payments	0.323*	0.384***	0.119	0.438***	−0.156***
	(0.170)	(0.049)	(0.112)	(0.035)	(0.049)
Observations	2,200	2,923	1,062	11,015	28,858
Panel D. Direct formal taxes, without community fixed effects					
Total payments	1.483***	1.421***	0.587**	1.467***	0.998***
	(0.211)	(0.056)	(0.257)	(0.135)	(0.067)
Observations	2,259	3,838	1,197	11,674	29,422

Money vs. In-Kind

- Slopes on monetary payments is much greater than on labor payments for both participation and quantity gradients
  - For example, within community elasticity of labor payments in Indonesia is 0.26, while elasticity of monetary payments is 1.45
- Monetary payments are particularly concentrated at higher income levels

Is it voluntary?

- In Indonesia survey, asked questions about:
  - Who decides whether a household should pay
  - Who decides amount each household should pay
  - Formal sanctions (if any) for failure to pay specified amount
- Results:
  - Only 8% of households report that they decide whether to pay; 84% say village/neighborhood head decides
  - Only 20% of households report that they decide how much to pay; 69% say village/neighborhood head decides
  - 38% report an official sanction for failing to pay – typically replace with someone else, give materials instead, or pay a fine.
    - Higher income people have higher probability of reporting sanctions for failure to pay
- Suggests important area of finance in developing countries – needs more work to understand it

Concluding thoughts

- Other recent work on tax:
  - Kleven and Waseem (2012): looks at bunching in Pakistani tax code.
  - Khan, Khwaja, and Olken (forthcoming): looks at using *where* people are posted as an incentive device.
- Much more to be done...
- Some other broad topics to think about:
  - Public-private partnerships and other non-traditional sources of public finance. Infrastructure for resources. Increasingly a big deal. How do we think about these?
  - IT and the role of technology. Can technology help solve the information problem?
- More generally:
  - Tax and development is a critical area, where there are many more questions than answers
  - Great area for new research

14.771: Development Economics
Fall 2021