14.771: Public Finance Lecture 2

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Outline

- Two theories for why tax structure is different in developing countries
- Two ways to approach the problem of tax enforcement: through the *tax structure* and through *tax administration*. We'll examine both.
- Does this matter for the economy?
- Informal taxation

Tax

- There is a vast literature in PF on taxation. E.g., incidence, optimal income tax theory, capital taxation, consumption taxes, dynamic considerations, etc, etc.
- By comparison we know very little about tax – either theory or empirics – in developing countries.
- What we do know suggests that there is a fundamental difference between developing and developed countries:
  - *Information.* There is much less information available. How do you levy an income tax on people who are subsistence farmers? Or laborers in an all-cash economy?
  - *Enforcement.* Given the information problems there is substantial opportunity for corruption.
- Naturally, these two problems are related

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Tax

- As a result of information and enforcement problems, the tax structure in developing countries looks very different than in developed countries, because you need to tax things with high information and low elasticities of evasion (Gordon and Li 2005)

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Developed and developing countries tax structure
Gordon and Li 2009

Table 1
Sources of government revenue (1996–2001).

GDP per capita	Tax revenue (% of GDP)	Income taxes (% of revenue)	Corporate income tax (% of income taxes)	Consumption and production taxes (% of revenue)	Border taxes (% of revenue)	Inflation rate	Seignorage income (% of revenue)	Informal economy (% of GDP)
<$745	14.1	35.9	53.7	43.5	16.4	10.6	21.8	26.4
$746–2975	16.7	31.5	49.1	51.8	9.3	15.7	24.9	29.5
$2976–9205	20.2	29.4	30.3	53.1	5.4	7.4	6.0	32.5
All developing	17.6	31.2	42.3	51.2	8.6	11.8	16.3	30.1
>$9,206	25.0	54.3	17.8	32.9	0.7	2.2	1.7	14.0

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Tax

- As a result of information and enforcement problems, the tax structure in developing countries looks very different than in developed countries, because you need to tax things with high information and low elasticities of evasion (Gordon and Li 2005)
  - Smaller: 2/3 the size of tax revenue in rich countries as percentage of GDP
  - Income taxes focus on corporate, not individual.
  - Tariffs and seigniorage play non-trivial role much more important

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Why is taxation harder in developing countries?

- Basic answer: something about the structure of production enables government to better obtain information in developed countries
- Two specific theories:
  1. Gordon and Li (2009): financial sector generates information
  2. Kleven, Kreiner, and Saez (2009): third-party reporting generates information

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Explanation 1: Banking records
Gordon and Li (2009): Tax Structure in Developing Countries: Many Puzzles and a Possible Explanation

- One explanation: financial sector.
    - Using the financial sector generates information for the government.
    - Taxes focus on corporate taxes because the large corporations are inelastic in their use of the formal banking system, so this is where taxes are focused.
    - Tariffs protect the taxed sector.
    - Inflation taxes the cash economy.
    - And use of the financial sector grows as the economy matures
- Seems intuitive, but far from the last word on the subject.

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Explanation 2: Third-party reporting

Kleven, Kreiner and Saez (2009): Why Can Modern Governments Tax So Much? An Agency Model of Firms as Fiscal Intermediaries

- Basic idea:
  - Most taxes are collected through 3rd party firms [such as employers] which double report income to the government
  - Tax enforcement is good in the presence of 3rd party reporting
  - Tax enforcement is poor when there is no such 3rd party reporting (small informal businesses), even in modern economies
- Idea: third party reporting is easier in large firms, which become more important as the economy grows

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Model setup

- Firm has N employees with surplus W and wages $w = (w_1, .., w_N)$, $(W = \sum_n w_n)$.
- Third party reporting: Firm and employees jointly report $\bar{w} = (\bar{w}_1, .., \bar{w}_N)$ to government which applies flat tax rate τ.
- Business records create insider knowledge (widely used within firm), so firm and all employees know full vectors $(w, \bar{w})$.
- If $w \neq \bar{w}$, any employee can denounce tax cheating.
- If someone denounces, government applies fine θ for evaded taxes, plus collects back taxes

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Collusion

- With complete commitment, firm and all employees can collude to report $\bar{w} = (0, .., 0)$ and evade taxes entirely
- But collusive equilibrium is fragile as a single employee can reveal cheating. Can happen because of:
    1. Random Shocks: Work conflict, Moral Concerns, Mistake [trembling hand deviation]
    2. Rational whistleblowing if government offers reward for whistleblowing [deviation from perfect commitment]
- Either imply that the collusive equilibrium harder to sustain in large firms

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Random shock model

- Trembling hand deviation: If $w \neq \bar{w}$, each employee denounces firm with probability ε (iid)
- This implies that the firm successfully evades with prob. $(1 - \varepsilon)^N$
- Payoff of employee n is:

$$y_n = w_n - \tau \cdot \bar{w}_n - (1 - (1 - \varepsilon)^N) \cdot \tau \cdot (1 + \theta) \cdot (w_n - \bar{w}_n)$$

- Firm and employees cooperatively set $(w, \bar{w})$ to maximize ex-ante expected surplus $Y = \sum_n y_n$ subject to $\sum_n w_n = W$

$$\partial Y / \partial \bar{w}_n = \tau \cdot [-1 + (1 + \theta)(1 - (1 - \varepsilon)^N)]$$

- Main result: Firm/workers evade iff $(1 - \varepsilon)^N > \theta / (1 + \theta)$
- Implication: Large firms do not evade even for small ε and θ

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Extensions

- Rational whistleblower:
    - If a single whistleblower gets a share of all the surplus from reporting, then as firms get larger, whistleblowing much more likely and firms evade less
- Embed in macro model of development:
    - Assume that as economy grows, optimal firm size N grows
    - Then taxes increase with economic growth
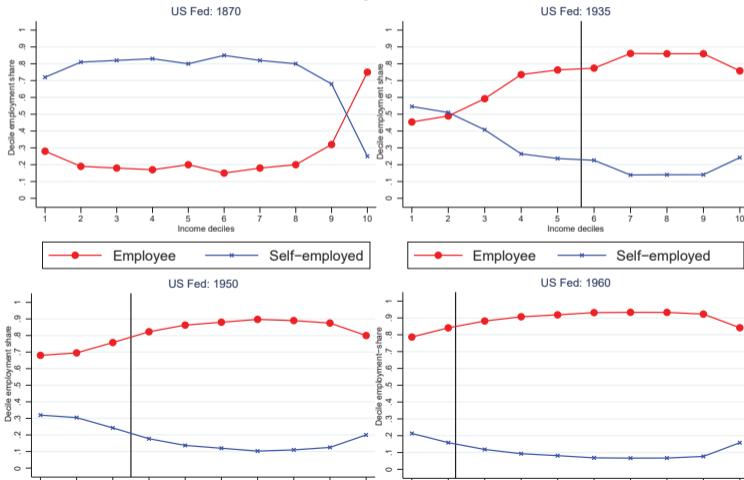
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Empirical evidence
Jensen 2016: Employment Structure and the Rise of the Modern Tax System

- Jensen takes seriously the idea that individual income taxation only works in formal employment relationships.
- He postulates that:
  - Countries realize that when the employment share in a given income decile is too low, they give up on taxing those people and just make them exempt from income tax.
  - He then argues that as countries develop, the share of people who are employees in a given income decile rises, and they become taxed.
- Has an empirical test within the US, but I want to focus on the cross-country facts for now.

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Panel B: within country over time US 1870-1960

Panel A: cross country

India [$1034 per capita]

Indonesia [$1569 per capita]
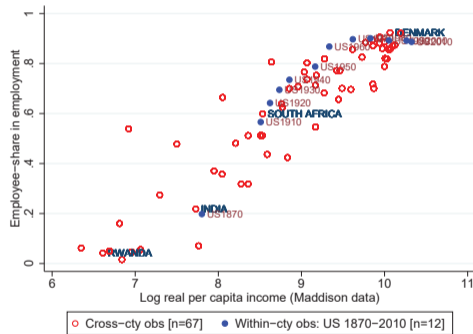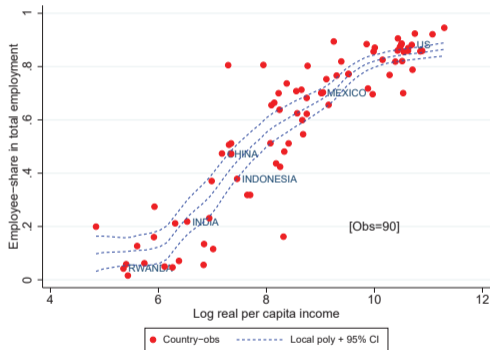
Mexico [$7834 per capita]

US [$42000 per capita]

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Employee Share and the Income Tax Exemption
Cross-country, all countries

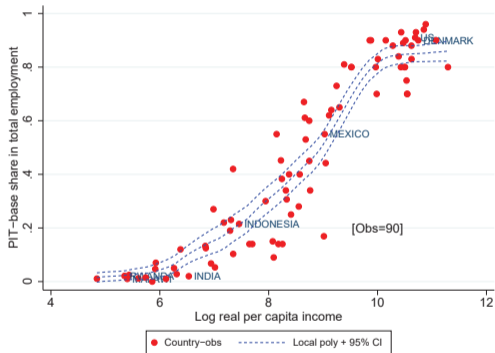
Panel A: employee share across development

Panel B: expansion of personal income tax base base across development

Panel C: constant employee share on income tax base across development

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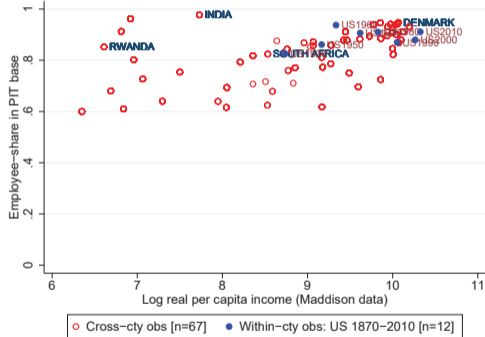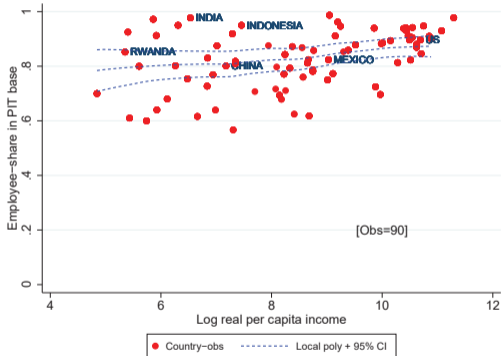
Can you improve firm reports on their workers?

Frias, Kumler, and Verhoogen (2015): "Enlisting Workers in Monitoring Firms: Payroll Tax Compliance in Mexico"

- Empirical setting:
  - Under Mexico's old pension system, workers' pensions were essentially a flat function of how much of their wages were reported (more a function of years of work)
  - Under the new pension system, what you get is much more related to how much of your wages are reported and taxes paid
  - Nominal tax incidence on firms
  - Existing workers get to choose the max of the two systems
- Implication:
  - After the reform, young workers (many years of earnings to come) have a greater incentive to make sure firms report wages honestly than before the reform.
  - Find indeed better match in wages after than before
- Empirics not a slam-dunk - this remains a good topic.

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Combating information problems through the tax structure
The VAT

- The VAT is an example of designing the tax structure itself to make sure every item in the tax formula is reported by two parties
- What is the VAT?
  - Firms taxed on output, but receive tax credit for taxes already paid on inputs
  - Imports taxed, exports not
- Why VAT?
  - If everyone participates, this is equivalent to a consumption tax
  - But it has much better enforcement properties:
    - Firms higher up on the chain want the credit that comes from their input-firms having paid VAT
    - Thus firms have an incentive to get other firms to pay taxes
  - This it is particularly useful in low-compliance places like developing countries, and has rapidly diffused across the world

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Empirical evidence on chains
Pomeranz 2015: "No Taxation without Information: Deterrence and Self Enforcement in the Value Added Tax"

- Setting: VAT in Chile
- Two types of tax evasion:
  - *Collusive evasion*. Omit certain transactions entirely.
  - *Unilateral evasion*. Mis-report value of transactions (overstate inputs, understate sales).
- Suppose that there are three firms:
  1. Supplier of raw materials (sells to 2)
  2. Intermediate producer (buys from 1, sells to 3)
  3. Final retailer (buys from 2, sells to general public)
- Where is there double reporting?
- What is the impact of auditing firm #2?

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Intuition for detecting VAT spillovers

TABLE 1—RESPONSES TO INCREASE IN AUDIT PROBABILITY:
COLLUSIVE AND UNILATERAL EVASION

Position in supply chain	Collusive evasion		Unilateral evasion	
Supplier	Sales ↑	VAT ↑	Sales ↑	VAT ↑
Treated firm	Inputs ↑ Sales ↑	VAT (↑)	Inputs ↓ Sales ↑	VAT ↑
Client	Inputs ↑	VAT ↓	Inputs ↓	VAT ↑

Notes: "Collusive evasion" stands for the type of evasion where a transaction is omitted from the books of both the seller and the buyer firm. "Unilateral evasion" stands for the type of evasion where the books of the seller and the buyer reveal discrepancies. Buyers, for whom inputs represent a tax deduction, will tend to overstate the value of the transaction, while sellers, for whom the transaction represents a tax liability, will tend to understate its value. The arrows indicate the expected direction of change for the line item in question resulting from an increase in audit probability on the treated firm.

Empirical evidence on VAT chains

- Key ideas for testing VAT chains:
  - Suppose you audit firm 2. What should be the impact on firms 1 and 3?
  - Suppose you audit some of firm type 1, some of type 2, and some of type 3 (in different chains). Where should response be highest?
- Two experiments:
  1. *Spillovers.* Consider subsample of 5,600 firms suspected of tax evasion. Half of them were given pre-announcement of an audit. Examine what happens to them and their trading partners at time of audit.
  2. *Deterrence.* Letter sent to around 102,000 randomly chosen firms to make them think they were more likely to be audited.

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Spillover results
Pomeranz 2015: Table 7

Table 7—Spillover Effects on Trading Partners' VAT Payments

	Percent VAT > previous year (1)	Percent VAT > predicted (2)	Percent VAT > previous year (3)	Percent VAT > predicted (4)	Percent VAT > previous year (5)	Percent VAT > predicted (6)
Audit announcement × post	2.41** (1.14)	2.03* (1.11)				
Audit announcement × supplier × post			4.28*** (1.54)	3.92*** (1.50)	4.14*** (1.52)	3.83*** (1.52)
Audit announcement × client × post			−0.26 (1.64)	−0.28 (1.51)	−0.14 (1.67)	−0.28 (1.55)
Supplier × post			−0.64 (1.62)	0.34 (1.59)	−1.11 (1.67)	0.60 (1.64)
Constant	52.07*** (0.95)	49.06*** (0.94)	52.07*** (0.95)	49.06*** (0.94)	52.75*** (0.96)	50.11*** (0.96)
Controls × post	No	No	No	No	Yes	Yes
Controls × audit announcement × post	No	No	No	No	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45,264	45,264	45,264	45,264	44,288	44,288
Number of firms	2,829	2,829	2,829	2,829	2,768	2,768
Adjusted R^2	0.05	0.11	0.05	0.11	0.05	0.10

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Deterrence results

TABLE 6—INTERACTION OF FIRM SIZE AND SHARE OF SALES TO FINAL CONSUMERS

	Percent VAT > previous year				
	(1)	(2)	(3)	(4)	(5)
Panel A					
Deterrence letter × final sales share	1.61***			1.48***	1.43***
	(0.26)			(0.27)	(0.26)
Deterrence letter × size category		−0.17***		−0.10***	
		(0.04)		(0.04)	
Deterrence letter × log employees			−0.45***		−0.29**
			(0.11)		(0.12)
Deterrence letter	0.68***	2.63***	1.66***	1.49***	0.92***
	(0.16)	(0.29)	(0.13)	(0.35)	(0.19)
Constant	47.53***	48.87***	47.50***	48.89***	47.53***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Final sales share × post	Yes	No	No	Yes	Yes
Size measure × post	No	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	7,308,631	7,116,590	7,340,994	7,084,823	7,308,631
Number of firms	406,834	396,135	408,636	394,367	406,834
Adjusted R^2	0.14	0.14	0.14	0.14	0.14
	Percent VAT > predicted				
	(1)	(2)	(3)	(4)	(5)
Panel B					
Deterrence letter × final sales share	1.51***			1.51***	1.44***
	(0.23)			(0.25)	(0.24)
Deterrence letter × size category		−0.10***		−0.03	
		(0.03)		(0.04)	
Deterrence letter × log employees			−0.28***		−0.11
			(0.10)		(0.11)
Deterrence letter	0.74***	2.15***	1.57***	1.00***	0.83***
	(0.14)	(0.26)	(0.12)	(0.32)	(0.16)
Constant	48.48***	49.79***	48.26***	50.01***	48.48***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Final sales share × post	Yes	No	No	Yes	Yes
Size measure × post	No	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	7,308,631	7,116,590	7,340,994	7,084,823	7,308,631

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VAT data

- A side-effect of the VAT is that governments collect the full network of trading relationships
- Several teams of researchers currently using this data from various countries to test theories of firms, networks, trade, etc
- Stay tuned...

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