# 14.771 Development Economics: Microeconomic issues and Policy Models

Fall 2008

# 14.771: Public Finance Lecture 1

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# Outline

- Topics I will talk briefly about:
  - Tax (today)
  - Market failures (today)
    - Correcting externalities
    - Providing public goods
  - Redistribution (next lecture)
- Topics I won't talk about at all:
  - Social insurance
  - Regulation
  - Federalism, decentralization, and local public goods
  - (among many other things)
- Note: Very little work in this area. Good area for research!

# 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.

# Tax

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

# Developed and developing countries tax structure

| *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 |
| $746-2,975 | 16.7 | 31.5 | 49.1 | 51.8 | 9.3 | 15.7 | 24.9 | 29.5 |
| $2,976-9,205 | 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 |



from Gordon and Li (2005)

# Tax

- As a result of information and enforcement problems, tax the tax structure in developing countries looks very different than in developed countries, because you need to tax things with high information and low elasticites 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

# Explanation

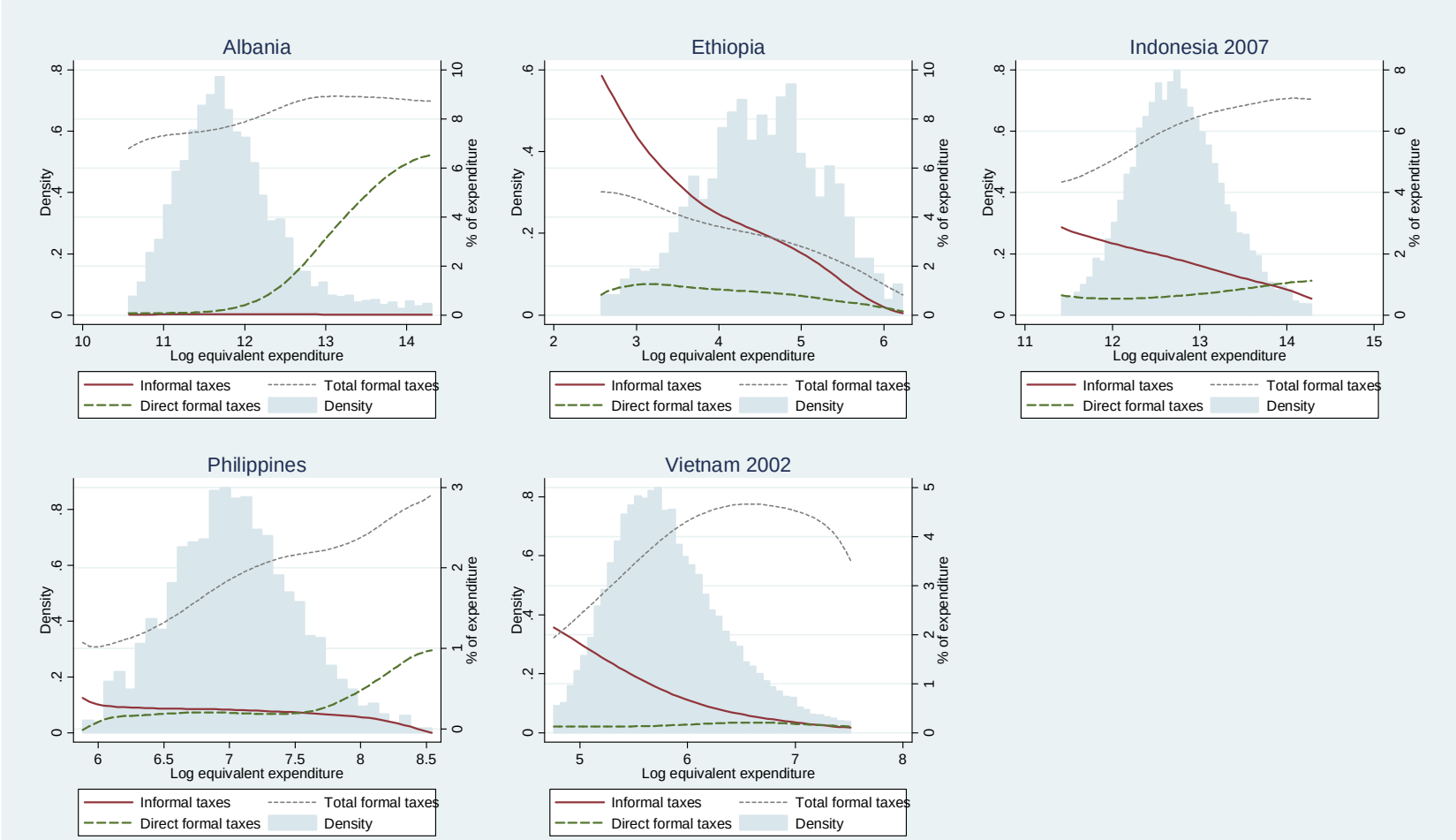
- One explanation: information (Gordon and Li 2005).
  - Using the financial sector generates information for the government.
  - Taxes focus on corporate because the large corporations are inelastic in their use of the formal banking system, so this is where taxes are focused.
  - Tariffs protect the taxed sector.
  - Inflation taxes the cash economy.
- Seems intuitive, but far from the last word on the subject.

# Informal taxation

- Olken and Singhal (2008) study phenomenon of 'voluntary' contributions to local public goods
  - *Harambee* in Kenya
  - *Gotong Royong* in Indonesia
- 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
  - Within communities, rich pay more, but less as a share of expenditure, so it is regressive
  - Social sanctions less potent in richer, urban areas so this is primarily a rural phenomenon
  - On net: makes tax system more regressive

# Informal taxation

- To examine who pays different types of taxes, we run Fan locally-weighted regressions of taxes as share of expenditure against expenditure per equivalent adult



# How big is evasion?

- Fisman and Wei (2004): what is the 'elasticity' of tax evasion with respect to tax rates?
- Empirical challenge: very hard to measure what the true tax assessment should be.
- Fisman and Wei's idea:
  - Look at both sides of the China - Hong Kong border, where China is the 'high evasion' side and Hong Kong is the 'low evasion side'
  - Denote the difference between what Hong Kong (low corruption) and China (high corruption) reports as evasion, i.e,

$$gap\_value = \log(\text{export\_value}) - \log(\text{import\_value})$$

- Key regressions:

$$gap\_value_k = \alpha + \beta_1 tax_k + \varepsilon_k$$

$$gap\_value_k = \alpha + \beta_1 tax_k + \beta_2 tax\_o_k + \varepsilon_k$$

# Results

**Effect of Tax Rates on Evasion (Measured in Value)**

| | *Regression* | | | | | | |
|---|---|---|---|---|---|---|---|
| | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* |
| Tax rate | 2.93<br>(.74) | 2.46<br>(.67) | 3.21<br>(.87) | 3.57<br>(.89) | 2.98<br>(.81) | 2.61<br>(.79) | 3.4<br>(.96) |
| Constant | -1.31<br>(.29) | -1.04<br>(.23) | -1.31<br>(.30) | -1.48<br>(.31) | -1.29<br>(.29) | -1.12<br>(.27) | -1.46<br>(.34) |
| Excluding outliers? | no | yes | no | no | yes | yes | yes |
| Excluding products lacking tax on similar products? | no | no | yes | no | no | yes | yes |
| Excluding products lacking observations on quantities? | no | no | no | yes | yes | no | yes |
| Observations | 1,663 | 1,639 | 1,470 | 1,102 | 1,087 | 1,450 | 968 |
| $R^2$ | .020 | .017 | .022 | .031 | .025 | .017 | .029 |

*Note: The dependent variable is log (value of exports from Hong Kong to China) - log (value of imports to China from Hong Kong). Robust standard errors are in parentheses, accounting for clustering of standard errors by four-digit HS.*



- $\beta_1 = 3$: One percentage point increase in taxes on your product increase evasion gap by 3%

# Results

**Incorporating the Average Tax on Similar Products**
Dependent Variable: Log (Value of Exports from Hong Kong to China) - Log (Value of Imports to China from Hong Kong)

| | *Regression* | | | | |
|---|---|---|---|---|---|
| | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* |
| Tax rate | | 6.07 | 5.31 | 8.32 | 7.46 |
| | | (1.37) | (1.25) | (1.56) | (1.42) |
| Tax on similar products | 2.62 | -3.16 | -2.98 | -4.65 | -4.45 |
| | (.90) | (1.39) | (1.33) | (1.58) | (1.53) |
| Constant | -1.09 | -1.20 | -1.02 | -1.56 | -1.33 |
| | (.034) | (.31) | (.28) | (.38) | (.35) |
| Excluding outliers? | no | no | yes | no | yes |
| Excluding products lacking observations on quantities? | no | no | no | yes | yes |
| Observations | 1,470 | 1,470 | 1,450 | 981 | 968 |
| $R^2$ | .014 | .025 | .020 | .041 | .035 |

*Note: Robust standard errors are in parentheses, accounting for clustering of standard errors by four-digit HS.*

Figure by MIT OpenCourseWare.

- $\beta_1 = 6, \beta_2 = -3$: Less evasion when nearby products also have higher tax rates implies reclassification is an important mechanism

# Empirical issues to think about

- Are tax rates endogenous?
  - They should be: governments should understand that there is differential elasticities and set lower tax rates on more elastic (easier to evade) items.
  - This paper assumes government is naiive.
  - How would sophisticated government bias results?
- Is spillover model mis-specificied?
  - Recall they include all products in category, but products vary in size.
  - Suppose in a category you have one very large product and very small product.
  - Small shift out of large product is a large proportional shift into small product.
  - Might have been better to include only one product per category? Or model this explicitly?

# Tax

- That's it!
- (Not quite, but you get the point)

# Correcting externalities

- Basic public finance theory: use taxes and subsidies to correct externalities.
  - These taxes and subsidies are permanent: as long as the externality remains, you need the tax/subsidy in place to correct it.
  - Optimal tax/subsidy depends on degree of externality, elasticity of supplying externality, and marginal cost of public funds
- Many in development design policies for 'sustainability.'
  - Idea is that there are multiple equilibria, so a one time intervention can lead to a 'sustainable' outcome.
- Is this plausible?

# The Illusion of Sustainability

- Kremer and Miguel (2007)
- Setting:
  - Deworming in Kenya.
  - Disease transmission implies very large positive externalities from deworming
- Research design: randomized experiment to
  - Test elasticity of demand for deworming drugs by introducing cost-sharing (at approx. 20% of actual average cost)
  - Test whether social adoption spillovers are positive (this could help generate multiple equilibria)

# Experimental Design

- Kremer and Miguel (2007) experimental design:

Kremer and Miguel (2007) basic experimental design

| | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| Group 1 (25 schools) | Free Treatment | Free Treatment | Free Treatment | Free Treatment |
| | | | | Cost-Sharing |
| Group 2 (25 schools) | Control | Free Treatment | Free Treatment | Free Treatment |
| | | | | Cost-Sharing |
| Group 3 (25 schools) | Control | Control | Control | Free Treatment |

- Examine Groups 2 and 3 in 2001. Collect data on usage and average number of links to households in different experimental treatments
- Estimate Probit model with errors clustered by school:

$$P\left(T_{ij}=1\right)=\Phi\left(N_{ij}^{E}a+N_{ij}^{\prime}b_{1}+b_{2}COST_{j}+Z_{ij}^{\prime}b_{3}\right)$$

# Results on cost sharing

TABLE VII
THE IMPACT OF COST-SHARING

| | Dependent variable: Child took deworming drugs in 2001 | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Explanatory variables: | | | |
| Cost-sharing school indicator | −0.580*** | −0.459*** | −0.572*** |
| | (0.054) | (0.122) | (0.080) |
| Cost-sharing *Respondent years of education | | 0.002 | |
| | | (0.007) | |
| Cost-sharing *Community group member | | 0.021 | |
| | | (0.072) | |
| Cost-sharing *Total number of children | | −0.021 | |
| | | (0.016) | |
| Cost-sharing *Iron roof at home | | −0.047 | |
| | | (0.064) | |
| Effective price of deworming per child(= cost/# household children in that school) | | | −0.001 |
| | | | (0.002) |
| 1/(# household children in that school) | | | −0.348*** |
| | | | (0.066) |
| Social links, other controls | Yes | Yes | Yes |
| Number of observations (parents) | 1,678 | 1,678 | 1,678 |
| Mean of dependent variable | 0.61 | 0.61 | 0.61 |

# Cost calculation

- Cost per-pupil under full subsidy: US $1.478
- Cost per-pupil under cost sharing US $1.374
  - Assumes $15 per school fixed cost, US$0.03 marginal cost to collect funds, and US$0.30 cost sharing
- Assume fixed budget $B$
- Extra students treated with cost-sharing:

$$\frac{B}{1.374} - \frac{B}{1.478} = B * 0.0512$$

- Extra revenue collected from cost-sharing:

$$\frac{B * US\$0.30}{1.374} = B * 0.2183$$

- Marginal social cost of additional student treated:

$$\frac{B * 0.2183}{B * 0.0512} = US\$4.26$$

- Marginal cost of public funds would need to be greater than 4.26!

# Results on social spillovers

| | | |
|---|---|---|
| Explanatory variables: | | |
| # parent links with children in early treatment schools (Groups 1 and 2, not own school) | −0.031** | −0.040** |
| | (0.014) | (0.017) |
| # parent links with children in early treatment schools | | 0.017 |
| * Group 2 school indicator | | (0.029) |
| Proportion direct (first-order) parent links with children in early treatment schools | | |
| # parent links with children in early treatment schools, with whom respondent speaks at least twice/week | | |
| # parent links with children in early treatment schools, with whom respondent speaks less than twice/week | | |
| # parent links with children in Group 1, 2, or 3 schools, not own school, with whom respondent speaks at least twice/week | | |
| # parent links with children in Group 1, 2, or 3 schools, not own school, with whom respondent speaks less than twice/week | | |
| # parent links with children in early treatment schools | | |
| * Respondent years of education | | |
| # parent links with children in Group 1, 2, or 3 schools, not own school | 0.013 | 0.012 |
| | (0.011) | (0.017) |

# Implications

- Very price elastic: introducing cost sharing dramatically reduces take-up
  - Suggests probably more effectively financed out of general public funds than out of user fees
  - Social spillovers (in this case) are negative, which leads in direction of single equilibrium
- Consistent with many other findings of very high price-elasticity for health (including those discussed by Esther):
  - Cohen and Dupas (2007)
  - Banerjee et al. (2008)

# Public goods

- Public good definition: non-rival, non-excludable goods
- In practice, government also provides other types of goods with large fixed costs:
  - Dams
  - Electric power
  - Airports
- Issues to think about in developing countries:
  - Return and willingness to pay – does social return exceed social cost?
  - Distributional impacts?
  - What level of government should provide? Does Tiebout sorting model apply in developing countries?
  - Corruption?

# Dams

- Duflo and Pande (2007)
- Setting:
  - Irrigation dams provide irrigation downstream, impose costs upstream.
- Key questions:
  - What is overall effect of the dams?
  - Do transfers happen?
- Empirical idea:
  - Gradient of river determines whether a site is a good candidate for a dam. Intermediate slope best for irrigation dams,
  - Use national trends in dam construction, times initial share of dams in state, to estimate number of new dams built in state in a year.
  - Instrument is the interaction of predicted dams built in state with river gradient in district to get 'predicted new dams in district'
  - Is exclusion restriction valid?

# Results

| | Per-capita expenditure |
|---|---|
| | (1) |
| *Dams* | |
| Own district | −0.289 |
| | (0.115) |
| Upstream | 0.093 |
| | (0.057) |
| *Dams* | |
| Own district | −0.457 |
| | (0.467) |
| Upstream | 0.142 |
| | (0.084) |
| *N* | 1,799 |
| First stage *F*-statistic (own district) | 7.71 |

Courtesy of MIT Press. Used with permission. From Table 7, Dams and Rural Welfare, in Duflo, Esther, and Rohini Pande. "Dams." *Quarterly Journal of Economics* 122, no. 2 (2007): 601-646.

# Results

- Positive effects on agriculture in downstream districts, (potentially) negative effects in district with dam
- Reductions in poverty in downstream districts, increases in poverty in district with dam
  - So transfers are not happening
- In fact, increases in poverty in district with dam exceed reductions in poverty in downstream districts
  - Reductions in log per-capita expenditure are 0.289 OLS, 0.457 IV
  - Increases only 0.093 OLS, 0.142 IV. 1.75 times as many downstream as upstream, so average log per-capita expenditure goes down.
  - Also note log dependent variable makes 'adding up' hard to do, so transfers might still be possible.
- Note: are these estimates too large?