Optimal Taxation in an Informal Economy

Rodrigo Azuero (IADB), Juan Hernandez (IADB), Daniel Wills (Universidad de los Andes)

Economics of Informality - Universidad del Rosario

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Introduction

Goals:

- Identify optimal tax policy with imperfect enforcement (informality).
  - Develop occupational choice model
  - Two dimensions of informality: informal workers and profit evasion
  - Quantify welfare gains from implementing such a policy.
    - Solve decentralized version of model and calibrate it to the Peruvian economy with actual tax system.
    - Solve planner’s problem to identify maximum welfare gains from optimal tax policy.
Outline

1. Data & Institutional Framework of Peru
2. Model
3. Next steps
Data & Institutional Framework of Peru

- SUNAT (Tax administration) administrative records.
  - Tax reports of all formal firms (2010-2017).
  - Revenue, costs, profits, employees, taxes payed.
  - Information of all (formal and informal) establishments.
  - All sectors except agriculture, mining, public administration, defense, and economic activities not performed in fixed establishments.
  - Taxes payed, prices and quantities sold, payroll, financial statements, among others.
- Household Survey (ENAHO).
  - Standard household survey. Demographics, income and expenses, education.
  - Work characteristics. (in)formal job, characteristics of work place (number of workers, formal firm).
Peruvian economy is characterized by high levels of informality

- 70% of workers are informal (ENAHO)
- 40% of businesses are not registered (Economic Census, 2008)

Five different tax regimes for businesses

- **RUS**: 2 categories (5 until 2017). Monthly fixed payments of (6USD-19USD), for firms with annual sales under (19,000USD).
- **RER**: Revenue tax of 1.5% for firms with annual sales under (165,000USD).
- **MYPE (Since 2017)**: Firms with annual sales under 200,000USD → Progressive marginal tax rates on profits up to 29.5%.

General regime

- Corporate profit tax rate 29.5%.
- 20+ employees → distribute between 5%-10% of after tax profits with workers.
We restrict our sample to Lima Metropolitan region to have a homogenous urban sample.

Table: Share of establishments/workers/capital/Value Added/taxes/informality by firm size (Economic Census)

<table>
<thead>
<tr>
<th>Employees</th>
<th>Establishments</th>
<th>Employees</th>
<th>Capital</th>
<th>Value Added</th>
<th>Taxes</th>
<th>Informal</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0 − 5]</td>
<td>0.9</td>
<td>0.3</td>
<td>0.06</td>
<td>0.11</td>
<td>0.16</td>
<td>0.97</td>
</tr>
<tr>
<td>[6 − 10]</td>
<td>0.05</td>
<td>0.07</td>
<td>0.04</td>
<td>0.05</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>[11 − 50]</td>
<td>0.04</td>
<td>0.13</td>
<td>0.13</td>
<td>0.17</td>
<td>0.09</td>
<td>0.01</td>
</tr>
<tr>
<td>[50+]</td>
<td>0.01</td>
<td>0.5</td>
<td>0.77</td>
<td>0.68</td>
<td>0.75</td>
<td>0</td>
</tr>
</tbody>
</table>

- Most firms are small and informal.
- Large firms are less prevalent. Explain large proportion of tax payment, value added, capital and employment.
Table: Distribution of occupational categories and informality (ENAHO-2008)

<table>
<thead>
<tr>
<th>Occupational Category</th>
<th>% in labor force</th>
<th>% who are informal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee</td>
<td>59.38</td>
<td>53.46</td>
</tr>
<tr>
<td>Employer</td>
<td>5.81</td>
<td>75.91</td>
</tr>
<tr>
<td>Non-remunerated</td>
<td>6.30</td>
<td>100.00</td>
</tr>
<tr>
<td>Other</td>
<td>0.14</td>
<td>100.00</td>
</tr>
<tr>
<td>Self-employed</td>
<td>28.36</td>
<td>92.38</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>68.80</td>
</tr>
</tbody>
</table>

- Majority of workers are employees. ≈ evenly distributed between informality and formality.
- Other occupational categories are largely informal.
Data & Institutional Framework - Peru

Tax regulation reveals firm behavior revealing information to identify parameters of the economic model.

- Firms with 20+ employees distribute 5%-10% of profits with workers.

Median annual profits by number of employees (thousands of USD)

- Discontinuity in reported profits to tax administration but not in Census. Evidence suggestive of tax evasion.
Firms with annual sales under 133 UIT ($525,000 S/; $ US160,000) are eligible for the RER scheme.

Firms pay 1.5% tax on revenue rather than 29% on profits.
Firms can adapt to changes in tax rates by constraining size or evading.

Smaller firms are more prevalent, more likely to be informal (evade taxes), less productive.

Majority of self-employed or employers are informal.

Employees \(\approx\) evenly distributed between informality and formality. In large firms, less likely to be informal.
1 Data & Institutional Framework of Peru
2 Model
3 Next steps
Optimal Taxation in an Informal Economy Model

Primitives

- Continuum of individuals characterized by entrepreneurial and working skills $\Theta = [\theta_e, \theta_w]$ and a government.
- Individuals choose work for a wage or become entrepreneurs.
- Workers: Maximize consumption subject to budget constraint.
  - Chose working in formal and informal market (no personal income taxes).
  - Costly to provide work, costlier if informal.
- Entrepreneurs: Maximize profits choosing number of formal and informal workers, and evasion levels.
  - Informal workers $\rightarrow$ no payroll taxes. Convex hiring costs.
  - Evasion $\rightarrow$ no corporate profit taxes. Convex costs of evasion.
- Government: raise taxes to pay for transfers and expenses.
  - Trades off efficiency and redistribution.
  - Information frictions: informality and tax evasion.
Optimal Taxation in an Informal Economy

Model

Worker’s problem

\[ V(\theta_w \mid w_f, w_l) = \max_{l_f, l_i} \theta_w (w_f l_f + w_i l_i) - \chi \frac{(l_f + l_i)^{1+\psi}}{1+\psi} - \frac{\kappa (\theta_w l_i)^{1+\rho}}{1+\rho} - T (\theta w_f l_f) \]

- Formal and informal labor income
- Disutility from working
- Penalty from informal income
- Personal Income tax
Worker’s problem

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- Formal and informal labor income
- Disutility from working
- Penalty from informal income
- Personal Income tax
Entrepreneurs

Operating profits $\pi(\theta_e, n_i, n_f)$:

$$\pi(\theta_e, n_i, n_f) = \theta_e(n_i + n_f)^{\alpha} - w_i n_i - w_f n_f - T_n(n_f)$$

Total Profits

$$\Pi(\theta_e) = \max_{n_f, n_i, z} \pi(\theta_e, n_i, n_f) - T_c(\pi(\theta_e, n_i, n_f) - z)$$

$$- \frac{\delta}{1 + \gamma} n_i^{1+\gamma} - \frac{\beta}{1 + \sigma} z^{1+\sigma}$$

- Total production
- Formal and informal labor cost
- Payroll taxes
- Corporate profit taxes
- Reported profits. $Z \rightarrow$ evasion
- Informality cost
- Evasion cost
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- Total production
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Allocations

An allocation in this economy is defined by:

\[ \{ c(\theta), i(\theta), l_f(\theta), l_i(\theta), n_f(\theta), n_i(\theta), z(\theta) \}_{\theta \in \Theta}. \]

- Consumption
- Entrepreneurial decision
- Formal and informal labor supply
- Formal and informal labor demand
- Evasion levels

Allocation is feasible if clears the three markets.
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- Consumption
- Entrepreneurial decision
- Formal and informal labor supply
- Formal and informal labor demand
- Evasion levels

Allocation is feasible if clears the three markets.
An equilibrium with taxes consists of an allocation and wages $w_f$, $w_i$ such that

- $i(\theta) = 1$ whenever $\Pi(\theta_e) > W(\theta_w)$
- If $i(\theta) = 1$, the allocation for $\theta$ solves entrepreneur's problem, given taxes and prices.
- If $i(\theta) = 0$, the allocation for $\theta$ solves worker's problem, given taxes and prices.
- The allocation is feasible.
- The government budget is balanced

\[
G = \int_{\Theta} \left\{ \left( T_c(\pi(\theta_e)) + T_n(wn_f(\theta_e)) \right) i(\theta) + T_p(\theta \theta_w l(\theta)) \left(1 - i(\theta)\right) \right\} dF(\theta)
\]
Planner’s problem

Find **implementable** allocations to maximize a social welfare function:

\[
\int \Theta \ W(U(\theta)) f(\theta) d\theta
\]

\[
U(\theta) = c(\theta) - (1 - i(\theta)) \frac{\chi}{1 + \psi} (l_i + l_f)^{1+\psi}
\]

- **Implementable**: If there exists set of \( T_n(\cdot) \), \( T_c(\cdot) \), \( T_p() \), \( w_f \), \( w_i \) such that allocations + tax functions + wages \( \to \) equilibrium.

- Planner proposes allocation but does not observe informality \( n_i, l_i \) nor tax evasion \( z_i \). Should satisfy incentive compatibility constraint.

- Once optimal allocations found, back-up tax functions to solve for optimal tax policy.
1. Data & Institutional Framework of Peru

2. Model

3. Next steps
Next steps

- Find set of parameters $\phi$ to minimize distance between empirical and theoretical moments in the decentralized economy.
  - $\hat{\phi} \in \arg\min_{\phi} Q(m - \hat{m}(\phi))$
  - $m$ Vector of empirical moments
  - $\hat{m}(\phi)$ vector of model-moments
- Informality costs: distribution of informal workers.
- Discontinuities in reported profits and differences in reports to tax administration and economic census.

With $\hat{\phi}$ compare welfare in decentralized economy and optimal tax policy.

Characterization of optimal policy and quantify how much can be gained from implementing it.
Appendix
Distribution of firms by size
Feasible allocation

\[ \int_\Theta c(\theta) \, dF(\theta) + G = \]

\[ \int_\Theta \left\{ \theta_e q(n(\theta_e)) - k_n(n_i(\theta_e)) - k_c(z(\theta_e)) \right\} i(\theta) - k_l(\theta_w l_i(\theta_w)) \right\} dF(\theta) \quad (1) \]

\[ \int_\Theta n_f(\theta_e)i(\theta) \, dF(\theta) = \int_\Theta \theta_w l_f(\theta) (1 - i(\theta)) \, dF(\theta) \quad (2) \]

\[ \int_\Theta n_i(\theta_e)i(\theta) \, dF(\theta) = \int_\Theta \theta_w l_i(\theta) (1 - i(\theta)) \, dF(\theta) \quad (3) \]

- **Goods (G: Government expenses)**
- **Formal labor**
- **Informal labor**
Feasible allocation

\[ \int_{\Theta} c(\theta) \, dF(\theta) + G = \]

\[ \int_{\Theta} \left\{ \left[ \theta_e q(n(\theta_e)) - k_n(n_i(\theta_e)) - k_c(z(\theta_e)) \right] i(\theta) - k_l(\theta_w l_i(\theta_w))(1 - i(\theta)) \right\} dF(\theta) \quad (1) \]

\[ \int_{\Theta} n_f(\theta_e) i(\theta) \, dF(\theta) = \int_{\Theta} \theta_w l_f(\theta)(1 - i(\theta)) \, dF(\theta) \quad (2) \]

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- **Goods (G: Government expenses)**
- **Formal labor**
- **Informal labor**
Details of Planner problem

- Planner’s proposed allocation constitutes a direct mechanism
- Individual of type $\theta$ must weakly prefer proposed allocation to any alternative
- Information frictions: observable choices are formal labor supply, demand, and reported profits.
- Workers hide informal labor, entrepreneurs evade profits and hide part of their labor force.
- Mechanism prescribing $\hat{l}_i, \hat{l}_f$ to individual who is worker of type $\theta$ must satisfy

$$\hat{l}_i \in \arg \max_{l_i} w_i \theta_w l_i - \frac{\chi}{1 + \psi} \left( \hat{l}_f + l_i \right)^{1+\psi} - \kappa \frac{(\theta_w l_i)^{1+\rho}}{1 + \rho}$$

- Similarly, prescribing $\hat{n}_f, \hat{n}_i, \hat{z}$ for type $\theta$, should satisfy that $\hat{n}_i, \hat{z}$ solve entrepreneur’s problem given $\hat{n}_f$
Prescribe $n_f(\theta')$, $n_i(\theta')$, $z(\theta')$.

Planner observes formal labor demand $n_f(\theta')$ and reported sales $\theta_e(n_f(\theta') + n_i(\theta'))^\alpha - z(\theta')$

For a given level of informal labor demand $\check{n}_i$, the corresponding level of profit hiding ins

$$\check{z}(\check{n}_i, \theta'; \theta) = z(\theta') - \theta_e(n_f(\theta') + n_i(\theta'))^\alpha + \theta_e(n_f(\theta') + \check{n}_i)^\alpha$$

Problem of agent type $\theta$ pretending to be type $\theta'$ is

$$\check{\Pi}(\theta'; \theta) = \max_{\check{n}_i} \theta(n_f(\theta') + \check{n}_i)^\alpha - w_i \check{n}_i - \frac{\delta \check{n}_i^{1+\gamma}}{1 + \gamma} - \beta \frac{\check{z}(\check{n}_i, \theta'; \theta)^{1+\sigma}}{1 + \sigma}$$

Informal labor demand prescribed to type $\theta$ should solve this problem.
Firms with $\geq 20$ workers distribute between 5%-10% of profits with workers. Eligibility for RER regime also includes having $\leq 10$ workers.
Data Analysis – Some Evidence from Peru

Transition from “Régimen Especial de Impuesto a la Renta” (RER) to Régimen General (RG)

RER: 1.5% tax rate on net income

General Regime: Tax rate of 28% on profits

Firms with more than 20 are required to distribute between 5% to 10% of profits with their workers

Source: LMK, FMM joint work with SUNAT (2017) data
Optimal Taxation in an Informal Economy

Next steps

MYPE regime

Predicted Profits of Firm according to Labor and Tax Regime

1 UIT = 3,950 S/. 1 S/ = 0.31 US$

MYPE: 10% corporate tax on first 15 UIT. 29% for each additional UIT beyond 15.
<table>
<thead>
<tr>
<th>Special Tax Regime</th>
<th>Requirements</th>
<th>Income or Profit Tax</th>
</tr>
</thead>
</table>
| Régimen Único Simplificado (RUS)   | Gross annual income < S/360,000  
All activities should be done in only one establishment  
Assets value < S/ 70,000  
Acquisitions of goods and services < S/ 360,000 | Monthly payment depending on value of sales. From S./20 until S./600. |
| Régimen Especial Impuesto a la Renta (RER) | Net annual income < S/. 525,000  
Assets </. 126,000  
Workers < 10 | 1.5% over net monthly incomes |
| Régimen General                    |                                                                              | 29.5% tax rate over profits                               |
| Régimen MYPE*                      | Annual sales < 6’885,000                                                     | Profit tax rate of 10% until 10 UIT**  
Profit tax rate of 29.5% for each UIT exceeding 10 UIT** |

*Regime introduced in 2017
** 1 UIT=4,050 in 2017
<table>
<thead>
<tr>
<th>Concept / Regime</th>
<th>General</th>
<th>Pequeña</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holidays</td>
<td>30 calendar days</td>
<td>15 calendar days</td>
<td>15 calendar days</td>
</tr>
<tr>
<td>Extra-hours</td>
<td>Extra 35% 10:00pm - 6:00am</td>
<td>Extra 35% 10:00pm - 6:00am</td>
<td>No</td>
</tr>
<tr>
<td>Gratificaciones</td>
<td>Two extra wages a year</td>
<td>Two extra wages a year</td>
<td>No</td>
</tr>
<tr>
<td>Health Insurance</td>
<td>9% payed by employer</td>
<td>9% payed by employer</td>
<td>No</td>
</tr>
<tr>
<td>Firing cost</td>
<td>Up to one year of compensation</td>
<td>Up to 0.5 years of compensation</td>
<td>Up to 90 days of compensation</td>
</tr>
<tr>
<td>Asignacion Familiar</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Optimal Taxation in an Informal Economy

Next steps

Distribution of total firms by annual sales

- Sales (UIT)
  - RUS - 240 S/
  - RUS - 600 S/
  - RUS - 2400 S/
  - RUS - 4800 S/
  - RUS - 7200 S/

Number of firms

Sales (UIT)