

# Optimal Income Taxation and Formalization of the Informal Economy

Hirofumi Takikawa

Goethe University Frankfurt

EEA-ESEM

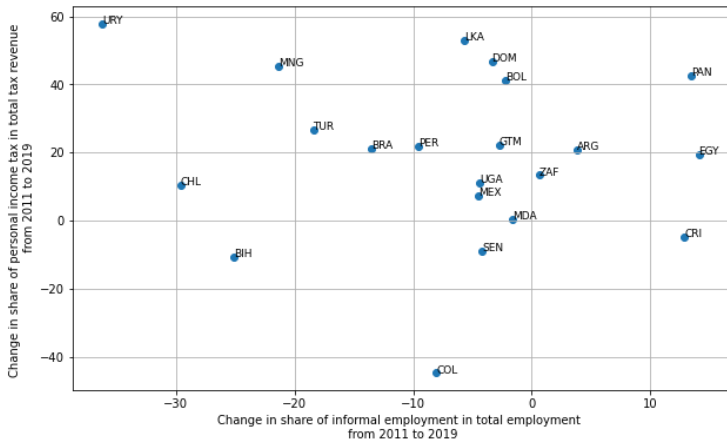
August 29, 2024

# Motivation

- Informal economy is outside the tax net, not illegal
  - Informal workers: lack of social protection through contracts
  - Example: day laborers, street vendors, family workers
- Informal employment rates exceed 80% in many developing countries (Gaspar et al., 2019).
- Personal income tax has the potential to increase tax revenue
  - Its share of total tax revenue is 12% in developing countries compared to 25% in advanced economies, relying on workers in the public sector and large firms (Benedek et al., 2022).
- Intuitively, formalizing the informal economy helps raise tax revenue, but not always.
  - No unanimous perspective on the impact of formalization on tax revenue (Schneider and Klinglmair, 2004; Schneider et al., 2010; Keen, 2012; OECD/ILO, 2019)

## Motivation Cont'd

Figure 1: Change in share of informal employment in total employment compared to that of personal income tax in total tax revenue



Source: IMF, ILO

## Motivation Cont'd

- The informal economy serves as a safety net for the poor
  - Need for redistributive incentives to facilitate a smooth transition to the formal economy (ILO, 2019)
- Welfare losses due to institutional constraints
  - No distinction between previously formal and informal workers
  - The burden of formalization can be concentrated on the poor
- Need to consider formalization and redistribution simultaneously

# This Paper

- Research questions
  - How does formalization characterize an optimal tax schedule?
  - Does formalization simultaneously increase tax revenue and redistribution without worsening social welfare?
- Theoretical framework: Mirrlees model
  - Informal economy (Doligalski & Rojas, 2023) + Formalization
- Formalization + optimized tax schedule
  - More U-shaped with 15% higher for the lowest income level
  - 1.35% more tax revenue and 70% more income transfer to the unemployed
- Formalization with fixed  $T'(\cdot)$  and  $T(\cdot)$ 
  - 1.01% more tax revenue but 1.23% less social welfare
- Formalization with fixed  $T'(\cdot)$  and adjusted  $T(\cdot)$ 
  - 0.76% less tax revenue to maintain the social welfare

## Related Literature

- Optimal income tax with the informal economy
  - Doligalski and Rojas (2023), da Costa and Lobel (2022), Beaudry et al. (2009)
- Optimal income tax with multidimensional heterogeneity (sectoral choices)
  - Rothschild and Scheuer (2013, 2016), Jacquet and Lehmann (2021), Bergstrom and Dodds(2021)
- Tax evasion
  - Allingham and Sandmo (1972), Slemrod and Yitzhki (2002), Chander and Wilde (1998)
- Tax revenue and informality
  - Schneider and Klinglmair (2004), Schneider et al. (2010), Keen (2012), OECD/ILO (2019)

# Model

- Government
  - Welfare-maximizing income tax  $T(\cdot)$
  - Observable formal income, others are unobservable (private information).
  - No information who is subject to formalization
  - Single income tax function regardless of formalization status
- Agents
  - Given  $T(\cdot)$ , utility-maximizing labor supply (formal/informal income).
  - Different income choices when their informal jobs are formalized and when they are not.

## Environment

- Continuum of agents with productivity  $\theta \sim F(\theta)$ 
  - Formal wage  $w^f(\theta)$  and informal wage  $w^s(\theta)$ .
  - Single-crossing condition;  $\frac{w^s(\theta)}{w^f(\theta)}$  is decreasing in  $\theta$

- Quasilinear utility function

$$U(c, n) = c - v(n) \tag{1}$$

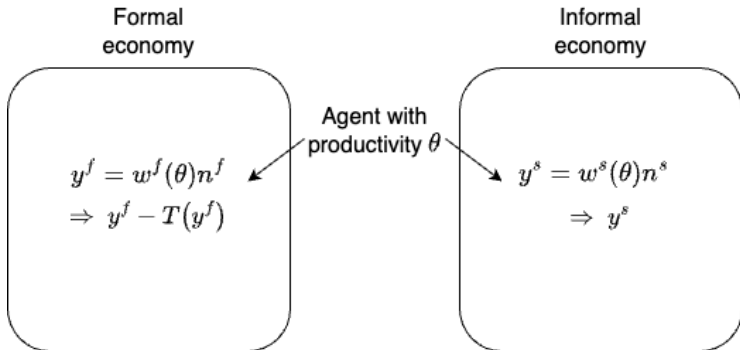
with  $v'(n) > 0$ ,  $v''(n) < 0$  and  $v'''(n) > 0$

- Labor supply is decomposed to formal and informal,  
 $n = n^f + n^s$
- Nonlinear, continuously differentiable income tax  $T(\cdot)$



# Labor Market Choice

Figure 2: Image of formal and informal income



## Cost Type

- Another heterogeneity in participation cost in the informal economy  $\kappa \sim G_{\theta}(\kappa)$ .
  - Technological constraint for tax avoidance
  - Causing disutility of taking a job in the informal economy
- 2 cost types among workers when the informal economy is not taxed
  - High-cost worker if  $\kappa \geq \tilde{\kappa}(\theta)$ 
    - Always work in the formal economy
  - Low-cost worker if  $\kappa < \tilde{\kappa}(\theta)$ 
    - have the option of working in the informal economy

## Income Choices without Formalization

- Indirect utility of an agent with  $(\theta, \kappa)$

$$V_1(\theta, \kappa) = \max_{y^f \geq 0, y^s \geq 0} U(c_1(\theta, \kappa), n_1(\theta, \kappa)) - \kappa \mathbb{1}_{y^s > 0} \quad (2)$$

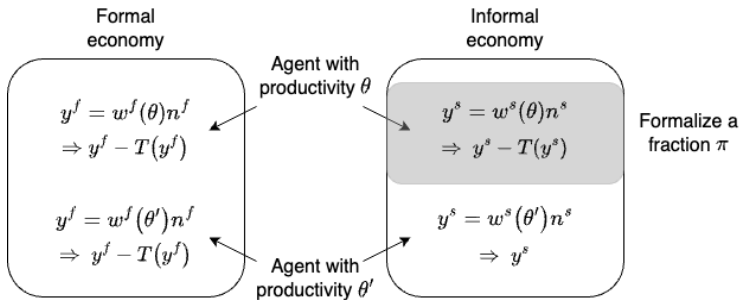
- Consumption:  $c_1 = y_1^f + y_1^s - T(y_1^f)$
- Threshold:  $\tilde{\kappa}(\theta) = V_1(\theta, 0) - V_1(\theta, \infty)$

- Income choices of an agent with  $(\theta, \kappa)$

$$(y_1^f(\theta, \kappa), y_1^s(\theta, \kappa)) = \begin{cases} (\bar{y}_1^f(\theta), 0) & \text{if } \kappa \geq \tilde{\kappa}_1(\theta) \\ (\underline{y}_1^f(\theta), y_1^s(\theta)) & \text{otherwise} \end{cases} \quad (3)$$

# Formalization

Figure 3: Image of formal and informal income and formalization



- Assumption:
  - Formalize a fraction  $\pi$  of the informal economy at no cost
  - $w^f(\theta)$  and  $w^s(\theta)$  are independent of formalization.

## Income Choices with formalization

- Indirect utility of an agent with  $(\theta, \kappa)$

$$V_2(\theta, \kappa) = \max_{y^f \geq 0, y^s \geq 0} U(c_2(\theta, \kappa), n_2(\theta, \kappa)) \quad (4)$$

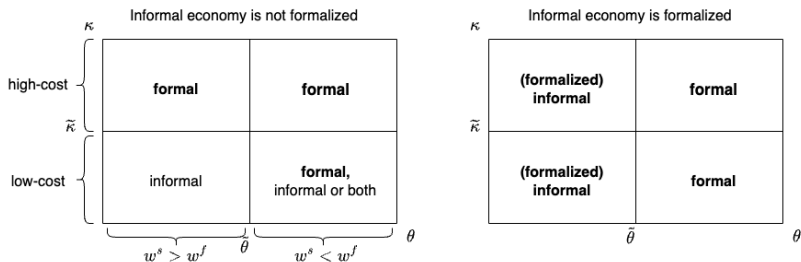
- Consumption:  $c_2 = y_2^f + y_2^s - T(y_2^f + y_2^s)$

- Income choices of an agent with  $(\theta, \kappa)$

$$(y_2^f(\theta, \kappa), y_2^s(\theta, \kappa)) = \begin{cases} (\bar{y}_2^f(\theta), 0) & \text{if } w^f(\theta) \geq w^s(\theta) \\ (0, \bar{y}_2^s(\theta)) & \text{otherwise} \end{cases} \quad (5)$$

# Summary of Income Choices

Figure 4: Image of income choices



- When the informal economy is not formalized
  - High-cost workers always choose the formal economy
  - Low-cost workers have the option of working fully or partially informally
- When the informal economy is formalized,
  - Agents work in one of the economy with higher wage

# Social Planner Problem

- Social welfare function

$$\int_{\underline{\theta}}^{\bar{\theta}} \int_0^{\infty} \underbrace{\lambda(\theta, \kappa)}_{\text{Pareto weight}} W(\theta, \kappa) dG_{\theta}(\kappa) dF(\theta) \quad (6)$$

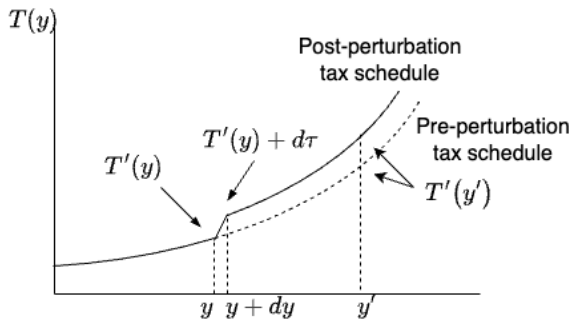
$$- W(\theta, \kappa) = \underbrace{(1 - \pi)V_1(\theta, \kappa)}_{\text{utility without formalization}} + \underbrace{\pi V_2(\theta, \kappa)}_{\text{utility with formalization}}$$

- Government budget constraint

$$\int_{\underline{\theta}}^{\bar{\theta}} \int_0^{\infty} \left[ \underbrace{(1 - \pi)T(y_1^f(\theta, \kappa))}_{\text{Tax revenue without formalization}} + \underbrace{\pi T(y_2^f(\theta, \kappa) + y_2^s(\theta, \kappa))}_{\text{Tax revenue with formalization}} \right] dG_{\theta}(\kappa) dF(\theta) \geq \underbrace{E}_{\text{govt spending}} \quad (7)$$

# Tax Perturbation Approach

Figure 5: Image of tax perturbation



- Consider a small increase in the marginal tax rate by  $d\tau$  within a small range  $[y, y + dy]$



## Mechanism Design Approach, Cont'd

- An optimal tax formula: Offsetting positive/negative effects
  - Intensive margin responses + extensive margin responses  
+ mechanical/welfare effects = 0
- Intensive margin responses
  - Labor supply adjustment within the same labor market, e.g. the formal labor supply change
- Extensive margin responses
  - Shifting labor supply to the other economy, e.g. switch to the informal economy from the formal economy
- Mechanical and welfare effects
  - Net effects of tax revenue increase and net income decrease due to a marginally change in a tax rate

## Optimal Tax Formula

- The optimal tax rate at income  $y$  corresponding to  $\bar{y}^f(\theta)$  satisfies

$$\frac{T'(y)}{1 - T'(y)} = [A^h(\theta)B^h(\theta) + A^\ell(\theta)B^\ell(\theta)] C(\theta) \quad (8)$$

where

$A$  :Elasticity and efficiency term

$$A^h(\theta) = [(1 - \pi)\rho^f(\theta) + \pi\rho(t(\theta))] \left(1 + \frac{1}{\varepsilon}\right) \quad (9)$$

$$A^\ell(\theta) = [(1 - \pi)\Delta\rho(s(\theta)) + \pi\rho(t(\theta))] \left(1 + \frac{1}{\varepsilon}\right) \quad (10)$$

$B$  :Thickness of the right tale of the distribution

$$B^h(\theta) = \frac{1 - F(\theta)}{(1 - \pi)[1 - G_\theta(\tilde{\kappa}(\theta))] f(\theta) + \pi[1 - G_{t(\theta)}(\tilde{\kappa}(t(\theta)))] f(t(\theta))} \quad (11)$$

$$B^\ell(\theta) = \frac{1 - F(\theta)}{(1 - \pi)G_{s(\theta)}(\tilde{\kappa}(s(\theta))) f(s(\theta)) + \pi G_{t(\theta)}(\tilde{\kappa}(t(\theta))) f(t(\theta))} \quad (12)$$

$C$  :Desire for redistribution incl. extensive margin responses

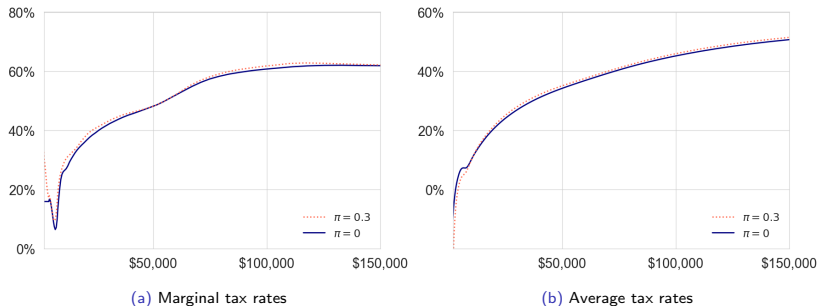
$$C(\theta) = \frac{ME}{1 - F(\theta)} \quad (13)$$

# Parameters

- Use the parameters of Doligalski and Rojas (2023)
  - Colombian Household survey in 2013 by DANE
  - Individuals aged 24-50 without children (34000 observations)
- Wage functions
  - Formal wage for normalized  $\theta = [0, 1]$ :  
$$\log(w^f(\theta)) = \log(w^f(0)) + \rho^f \theta = \log(0.004) + 4.29\theta$$
  - Informal wage:  
$$\log(w^s(\theta)) = \log(w^s(0)) + \rho^s \theta = \log(0.007) + 2.68\theta$$
- Disutility of labor supply  $v(n) = \Gamma \frac{n^{1+1/\varepsilon}}{1 + 1/\varepsilon}$  with  $\varepsilon = 0.33$  and  $\Gamma = 0.032$
- Pareto weights  $\lambda(\theta, \kappa) = r(1 - F(\theta))^{r-1}$  with  $r = 1.4$

# Optimal Tax Schedule

Figure 6: Equilibrium tax rates



- 30% formalization imposes a 15% higher marginal tax rate on the lowest income level due to fiscal capacity.
- Income transfer for the lowest level,  $T(0)$ , increases by 70.3% with 30% formalization

## Impact of Formalization with tax schedule adjustment

Table 1: Percentage change due to 30% formalization

| <b>Tax revenue</b> | <b>Income transfer</b> | <b>Social welfare</b> |
|--------------------|------------------------|-----------------------|
| 1.35%              | 29.3%                  | 0.02%                 |

- When the tax schedule is optimized along with formalization, 30% formalization increases total tax revenue and income transfer.
- Sufficient redistribution offsets the negative impact of formalization on social welfare.
- 1.35% more tax revenue = cost of 30% formalization while maintaining social welfare

## Impact of Formalization without any adjustment

Table 2: Percentage change due to 30% formalization

| <b>Tax revenue</b> | <b>Income transfer</b> | <b>Social welfare</b> |
|--------------------|------------------------|-----------------------|
| 1.01%              | -29.9%                 | -1.23%                |

- When 30% of the informal economy is formalized, but the actual tax payment  $T(\cdot)$  as well as the marginal tax rate  $T'(\cdot)$  are fixed, the burden of formalization is concentrated on low income people who are subject to formalization.
- Total tax revenue increases, but fewer people are eligible to receive income transfers. Social welfare also deteriorates.

## Impact of Formalization with fixed MTR

Table 3: Percentage change due to 30% formalization

| <b>Tax revenue</b> | <b>Income transfer</b> | <b>Social welfare</b> |
|--------------------|------------------------|-----------------------|
| -0.76%             | -16.6%                 | -0.03%                |

- When 30% of the informal economy is formalized but the marginal tax rate  $T'(\cdot)$  is fixed, social welfare can be maintained at the same level by adjusting the average tax rates.
- Lowering the average tax rates reduces total tax revenues and income transfers but offsets the negative impact of formalization on social welfare.

## Conclusion

- In the equilibrium, formalization requires increasing income transfers to low income people and imposing higher marginal tax rates on them instead.
- As long as the tax schedule is adjusted for formalization, formalization has positive effects on tax revenue and income transfers.
- With fixed marginal tax rates (and fixed actual tax payments), formalization has a negative effect on tax revenue (or social welfare), contrary to expectations.
- To achieve formalization without negative effects on tax revenue or social welfare, the government must optimize the tax schedule corresponding to a level of formalization.