Payroll Benefits, Couples Formality Choices, & Optimal Income Taxation

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Research Questions

Informal employment The employer does not contribute to the employee's health and retirement systems.

1. Does the formality status of one spouse influence the formality status of the other spouse?

   (i.e., does the transferability of payroll benefits, such as health insurance, affect spouses' incentives to seek formal employment?)

2. How do these dynamics affect the optimal taxation of income?

Roadmap

1. Develop a income taxation model with strategic informality adjustments in employment to identify sufficient statistics for optimal taxation.
2. Empirically estimate these statistics in a setting with potential strategic informality adjustments. **Setting: Chile**
    - Policy change in 2013: Introduction of a subsidy to promote formal employment among women.
    - Significant informal sector (30% of workers)
    - Allows payroll benefit transfers to legal partners without extra costs.

Motivation

Married women are more likely to be informally employed compared to single or cohabitating women, while married men are more likely to be formal

Table: Formality and Marital Status

	Informal Employees (% of employees)	
	Men	Women
Married	20.4%	30.3%
Cohabitant	22.7%**	27.6%**
Single	26.8%***	26.7%***

Note: * p$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01
for the t-test between married and other statuses.

- 30.3% of married women are informally employed compared to 26.7% of single women.
- **PF Framework:** An additional behavioral response may exist—when one spouse's tax rate increases, it could affect the other spouse's employment formality.

Model of Optimal Tax with Strategic Informality

Setup

- **Population**: Employed couples consisting of married men (m) and married women (f). Total number of couples normalized to 1.
- **Employment Choice**: Each individual selects to work formally or informally, based on the cost of informality (c):
  - c is uniformly distributed between 0 and $\bar{c}$, with pdf g and cdf G.
  - Higher c decreases the likelihood of choosing informal work.
  - Women have lower average informal work costs: $\bar{c}^f < \bar{c}^m$.
- **Tax System**:
  - An income (payroll) tax rate τ is imposed on all workers.
  - Payroll benefits (B) are transferable to spouses; formal employment by one spouse ensures benefits for the couple.

Model

Workers Choose Formality Status to Maximize Expected Utility

- **Utility in the Formal Sector**:
  - Worker i pays taxes and receives benefits B:

$$u_i^F = (1-\tau)y + B \tag{1}$$

- **Utility in the Informal Sector**:
  - Worker i avoids paying taxes but incurs a cost c. Receives benefits B only if spouse j is formally employed.

$$u_i^I = y - c + (1 - e_j)B \tag{2}$$

  where e_j takes the value of 1 if the spouse j works informally.

- **Choice:**
  - Worker i chooses to evade taxes if:

$$\begin{aligned} u_i^I &\geq u_i^F \\ c_i &\leq \tau y - (1-e_j)B = c^* \end{aligned} \tag{3}$$

  Thus, the gender-specific probability of being informal is:

$$\phi_g = G(c_g^*); \quad g \in \{m, f\} \tag{4}$$

Model

Household Utility

- After deciding on formal or informal employment, households fall into one of four states, each with distinct utilities:

Household State	**Utility (W^{mf})**
Both spouses work formally	$W^{FF} = 2\left((1-\tau)y + B\right)$
Men formal, women informal	$W^{FI} = (1-\tau)y + 2B + y - \mathbb{E}(c_f \mid c_f \leq c_f^*)$
Women formal, men informal	$W^{IF} = (1-\tau)y + 2B + y - \mathbb{E}(c_m \mid c_m \leq c_m^*)$
Both spouses work informally	$W^{II} = 2y - \mathbb{E}[c_f \mid c_f \leq c_f^*] - \mathbb{E}[c_m \mid c_m \leq c_m^*]$

- **Total Household Utility (W^{HH})**:

$$\begin{aligned} W^{HH} =& N^{FF} W^{FF} + N^{II} W^{II} + N^{FI} W^{FI} + N^{FF} W^{IF} \\ =& (1-\phi_m)(1-\phi_f) W^{FF} + \phi_m \phi_f W^{II} + \\ & (1-\phi_m)\phi_f W^{FI} + \phi_m (1-\phi_f) W^{IF} \end{aligned} \tag{5}$$

Model

Government Welfare

- **Government Revenue (R_i)**:

$$R_i = \tau y(1 - \phi_i) \tag{6}$$

- **Government Welfare (W_g)**:

$$W_g = \lambda(R_m + R_f) = \lambda\tau Y(2 - \phi_m - \phi_f) \tag{7}$$

where λ is the marginal cost of public funds (MCPF)
(i.e., raising an \$1 of public funds costs more \$$\lambda$)

Model

Optimal Tax Rate (τ^*)

- **Maximizing Total Welfare ($W = W^{HH} + W_g$)**:

$$\frac{dW}{d\tau} = \frac{dW^{HH}}{d\tau} + \frac{dW_g}{d\tau} = 0 \tag{8}$$

- **Solution for τ^***:

$$\tau^* = \underbrace{\frac{1}{D_m + D_f}\left(\phi_m + \phi_f - \frac{2(\lambda - 1)}{\lambda - \frac{1}{2}}\right)}_{\text{No Strategic Adjustment Term, but Different } D} + \underbrace{\frac{B}{2y(\lambda - \frac{1}{2})}}_{\text{Strategic Adjustment Term}} \tag{9}$$

  - The value of formality increases with B, leading to a higher τ^*.
  - The $D_i = \frac{d\phi_i}{d\tau}$ is smaller, resulting in a higher τ^*.

Model

Relevant Elasticities

- Derivative of probability of informal employment (D_i):

$$D_i = \frac{d\phi_i}{d\tau} = \frac{\partial \phi_i}{\partial \tau} + \frac{\partial \phi_i}{\partial \phi_j}\frac{d\phi_j}{d\tau} \tag{10}$$

- Elasticities of evasion:

$$\epsilon_i = \frac{\partial \ln \phi_i}{\partial \ln \tau} = \frac{\tau}{\phi_i}\frac{\partial \phi_i}{\partial \tau}$$

$$\eta_i = \frac{\partial \ln \phi_i}{\partial \ln \phi_j} = \frac{\phi_j}{\phi_i}\frac{\partial \phi_i}{\partial \phi_j} \tag{11}$$

- Rewriting D_i using elasticities:

$$D_i = \epsilon_i \frac{\phi_i}{\tau} + \underbrace{\eta_i \frac{\phi_i}{\phi_j} D_j}_{\text{Strategic Adjustment Term}} \tag{12}$$

  - Elasticity of evasion ($\epsilon > 0$):The higher the tax, the higher the informality.
  - Cross-Elasticity (η_i): Negative in the presence of strategic adjustments. Zero if no strategic adjustment.

Empirical Estimation

The Chilean Case

- Women's Labor Subsidy (**BTM**, Spanish initials) introduced in 2013.
- **BTM Overview**:
  - Objective: Promote the entry and retention of women in formal employment.
  - Eligibility Criteria:
    1. Age: Women aged between 25 and 59 years.
    2. Employment: Formally employed in non-governmental firms (employers contribute to health and retirement systems).
    3. Vulnerability Segment: lowest 30% of vulnerability in 2013, lowest 35% in 2014 and lowest 40% in 2016
- Strategy:
  - Use the staggered introduction of the BTM as exogenous variation to estimate the elasticities ϵ_f and η_m.
  - Divide the population into three groups based on vulnerability segments:
    - Lowest 30% of the vulnerability segment
    - 30-35% of the vulnerability segment
    - 35-40% of the vulnerability segment

Empirical Estimation

Identification

- Estimate the following difference-in-difference IV system:

$$\phi^m_{\kappa t} = \beta \phi^f_{\kappa t} + X'_{\kappa t}\rho + v_\kappa \tag{13}$$

$$\phi^f_{\kappa t} = \sum_t \alpha_t Z_\kappa T_t + \gamma T_t + X'_{\kappa t}\theta + \omega_\kappa \tag{14}$$

- where
  - $\phi^m_{\kappa t}$: prob. of the male spouse in household κ being informal at time t.
  - Z_κ: eligibility indicator based on the household's vulnerability segment
  - T_t: rime fixed effects.
  - $X_{\kappa t}$: vector of control variables including education, age, number of children, firm size, and firm industry
- Parameters of Interest: interaction of β and α_t
  - β: influence of the female spouse's informality on the male's informality.
  - α_t: effect of the BTM treatment at time t.
- Assumptions: Parallel trends and validity of the instrument.

Empirical Estimation

Data

Data Source: National Socioeconomic Characterization Survey (**CASEN**)

- Conducted by the Chilean Ministry of Social Development.
- Survey Years: 2013, 2015, and 2017.
- Examines demographic characteristics, health profiles, educational attainments, living circumstances, employment, and income.
  - Occupational and formality status of both spouses (using the BMT definition)
  - Actual beneficiaries of the Women's Labor Subsidy.
  - Vulnerability index for the BTM with household income each year
- Sample Sizes: 66,724 households (161,670 individuals) in 2013, 83,886 households (200,507) in 2015, and 69,816 households (219,439) in 2017

Empirical Estimation

Results: Regression of Informality between Spouses

	Dep. Variable: ϕ^m			
	Married		Married & Cohab	
	OLS (1)	IV (2)	OLS (3)	IV (4)
ϕ^f	0.162***	0.265***	0.174***	0.238***
	(0.014)	(0.029)	(0.012)	(0.022)
$\phi^f * T_{2015}$	-0.017	-0.116***	-0.000	-0.069***
	(0.021)	(0.027)	(0.017)	(0.020)
$\phi^f * T_{2017}$	0.021	-0.061**	0.022	-0.014
	(0.019)	(0.026)	(0.016)	(0.020)
Observations	8,790	8,790	13,663	13,663
R-squared	0.374	0.369	0.379	0.377

Robust standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

There is a diminishing correlation between spousal informality in 2015 and 2017: women are more formal (due to the subsidy), men face less incentive to align with informality.

Empirical Estimation

Results: First Stage of Regression of Informality between Spouses

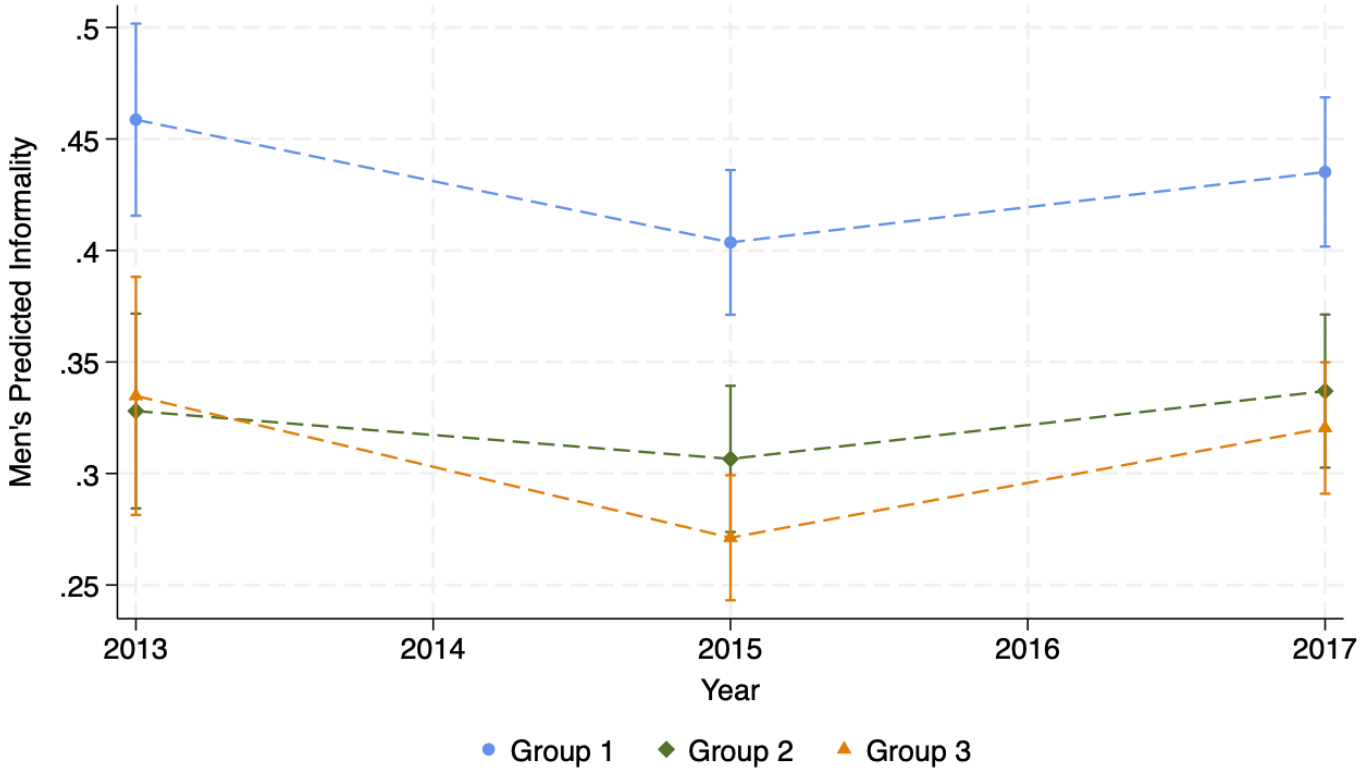
	Dep. Variable: ϕ^f	
	Married	Married & Cohab
	(1)	(2)
Z	0.160***	0.170***
	(0.030)	(0.023)
$Z * T_{2015}$	-0.057*	-0.059**
	(0.032)	(0.024)
$Z * T_{2017}$	-0.063**	-0.081***
	(0.031)	(0.023)
Observations	8,790	13,663
R-squared	0.081	0.070
F-statistic	26.450	34.810

Robust standard errors in parentheses.

- In years when the subsidy was introduced, womens likelihood of working informally decreased.
- F-statistics are above the typical threshold of 10, suggesting strong instruments and providing confidence in the IV approach.

Empirical Estimation

Results: Men's Predicted Informality



- **Group 1: 0-30% of vulnerability** Always treated. Baseline trend in male inf.
- **Group 2: 30-35%** Treated in 2015. Male informality shows a plateau in 2015, while informality is decreasing for other groups.
- **Group 3: 35-40%** Treated in 2017. Displays a slight increase in male informality in 2017, higher than other groups.

Empirical Estimation

Optimal Tax Formula

Returning to the optimal tax formula:

$$\tau^* = \frac{1}{D_m + D_f}\left(\phi_m + \phi_f - \frac{2(\lambda - 1)}{\lambda - \frac{1}{2}}\right) + \frac{B}{2y(\lambda - \frac{1}{2})} \tag{15}$$

$$D_m = \epsilon_m \frac{\phi_m}{\tau} + \eta_m \frac{\phi_m}{\phi_f} D_f$$

$$D_f = \epsilon_f \frac{\phi_f}{\tau} + \eta_f \frac{\phi_f}{\phi_m} D_m$$

- The Chilean setting allows us to estimate η_m and ϵ_f
- Assumption: $\eta_m = \eta_m = \eta$ and $\epsilon_m = \epsilon_m = \epsilon$. Equation (17) becomes:

$$\tau^* = \frac{1}{D}\left[\phi - \frac{(\lambda - 1)}{(\lambda - \frac{1}{2})}\right] + \frac{B}{2y(\lambda - \frac{1}{2})} \tag{16}$$

$$D = \frac{\epsilon}{1 - \eta}\frac{\phi}{\tau}$$

Conclusion & Next Steps

- Result: When a subsidy encourages women to formalize their employment, men in the same household may strategically remain in informal work.
- The model suggests that in this scenario, the optimal tax should be higher because formality becomes more attractive.
    - A formal worker is less likely to switch to informal employment if their spouse is also benefiting from formality.