Informality, Family and Taxation: How Joint-Household Behavior Affects the Labor Market

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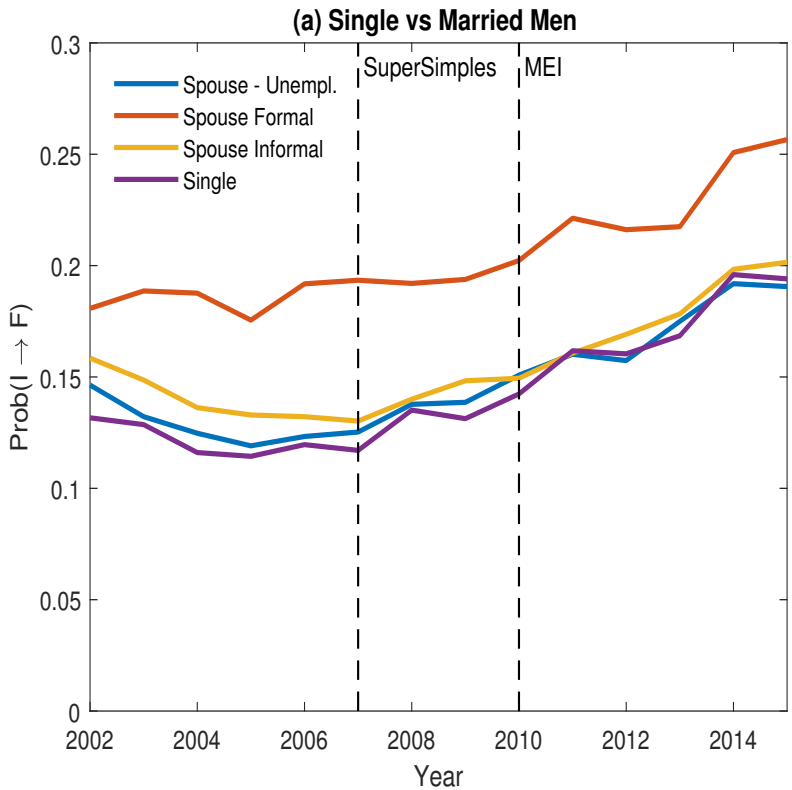
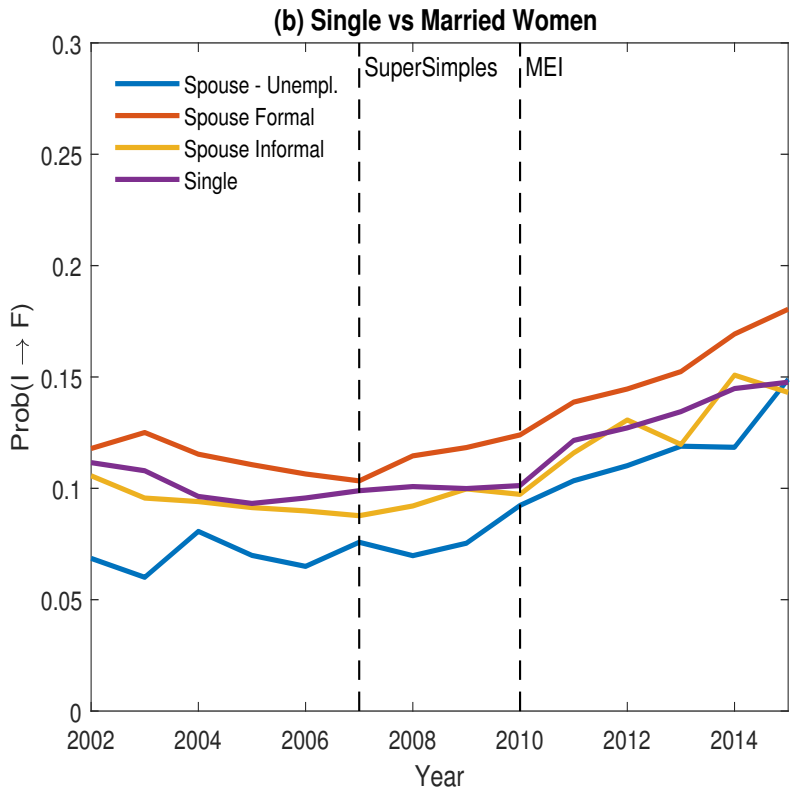
Motivation

- Informality rates in developing countries tend to be greater than 40% of the work-force.
- Persistence over time even after government efforts to encourage workers and firms to formalize.

Figure 1: Transition Probability: Informal to Formal (Brazil 2002-2015)





This Paper

- **Research Question**: *How does within household behavior and changes in taxation impact the formal-informal sector composition in developing countries?*
- **Why?** Married and single individuals respond differently to policies and the subsequent effects on the labor market will be impacted by such responses.
- **Policy:** "*SuperSimples*" (July 2007) promotes the formalization of informal firms and workers by combining the primary taxes and contributions to the social security system into one tax rate.
- **Data:** *Brazilian Monthly Employment Survey (PME)*: March, 2002 - December, 2015. Ages 18 - 65 y/o.

Strategy

1. *Causal Inference*: Matching Difference in Difference: *SuperSimples*
   - Does the policy have an effect on the transition of informal workers to the formal sector? Who is this effect on?
   - Treatment and control groups defined by sector of activity.
   - Assumptions: parallel trends, conditional independence, common support.
   - **Matching:**
     - Propensity score: $P(X_i) = P(d_{it} = 1|X_i, t)$ (logit)
     - Kernel matching: create weights.

2. *Structural Model:* Household Search Model with Informal sector and Treatment.
   - Model builds on previous work by: Meghir, Narita and Robin (2015), Dey and Flinn (2008), Guler, Guvenen and Violante (2012), Flabbi and Mabli (2018), Fang and Shepard (2019).
   - Estimation of the model in a context of policy evaluation.
   - Specification tests. [Risk aversion]
   - Quantify and decompose 4 potential channels of the effect of the policy.

Empirical Strategy: Results

Table 1: Matching Difference in Difference: SuperSimples

Dependent Variable: Prob(I → F)	**Men**		**Women**	
	Single	Married	Single	Married
MDID = T * Dummy Treated	-0.0016		0.0381***	
	(0.0082)		(0.0090)	
MDID ($II_{t_0} \rightarrow FI_{t_1}$)		0.1124***		0.0733***
		(0.0121)		(0.0085)
MDID ($IF_{t_0} \rightarrow FU_{t_1}$)		0.1179**		-0.0766
		(0.0585)		(0.0545)
MDID ($IU_{t_0} \rightarrow IF_{t_1}$)		0.0000		-0.1354***
		(0.0000)		(0.0063)
MDID ($II_{t_0} \rightarrow FF_{t_1}$)		0.3454***		0.2328***
		(0.0301)		(0.0199)
MDID ($IU_{t_0} \rightarrow II_{t_1}$)		-0.1991***		-0.1354***
		(0.0096)		(0.0063)
MDID ($II_{t_0} \rightarrow IU_{t_1}$)		-0.0480*		0.0009
		(0.0270)		(0.0482)
MDID ($IF_{t_0} \rightarrow II_{t_1}$)		0.0157		0.0202
		(0.0321)		(0.0269)
MDID($IU_{t_0} \rightarrow IU_{t_1}$)		-0.1991***		-0.1354***
		(0.0096)		(0.0063)
Mean of Prob(I → F)	0.130	0.169	0.102	0.117
N	17,004	31,265	21,076	20,646

Bootstrap standard errors in parenthesis.

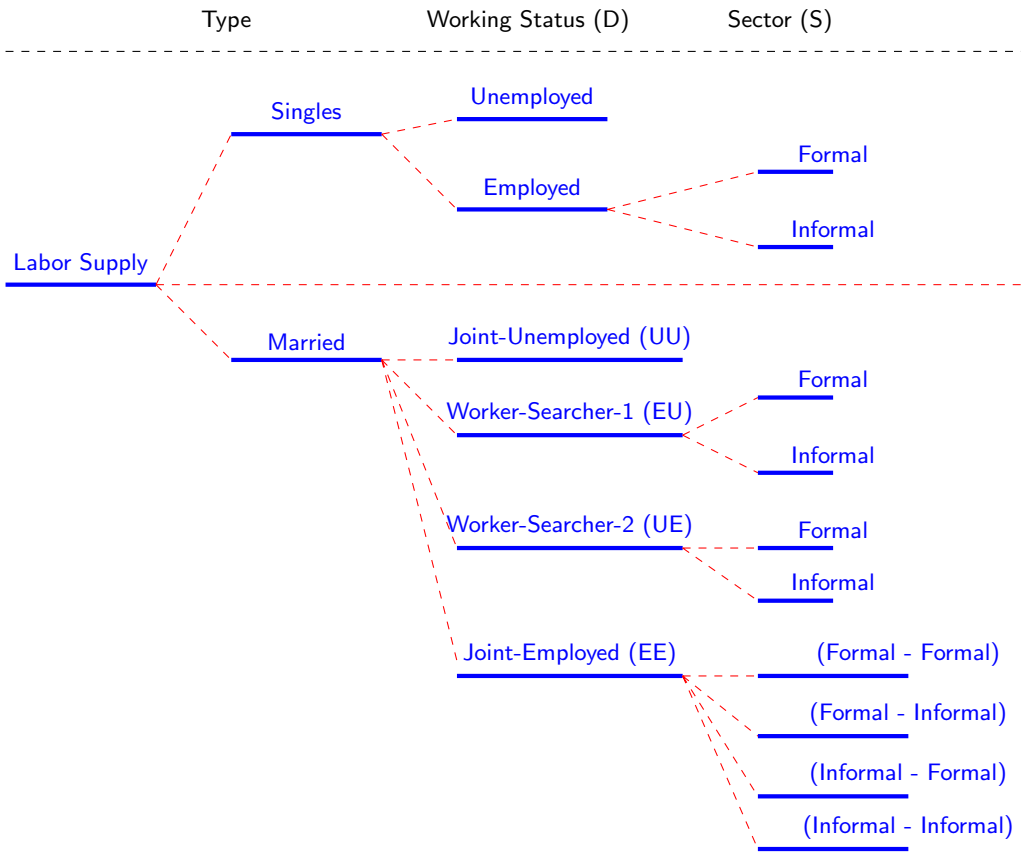
- We see insurance motive and assortative matching at the household level.

Structural Model: Environment

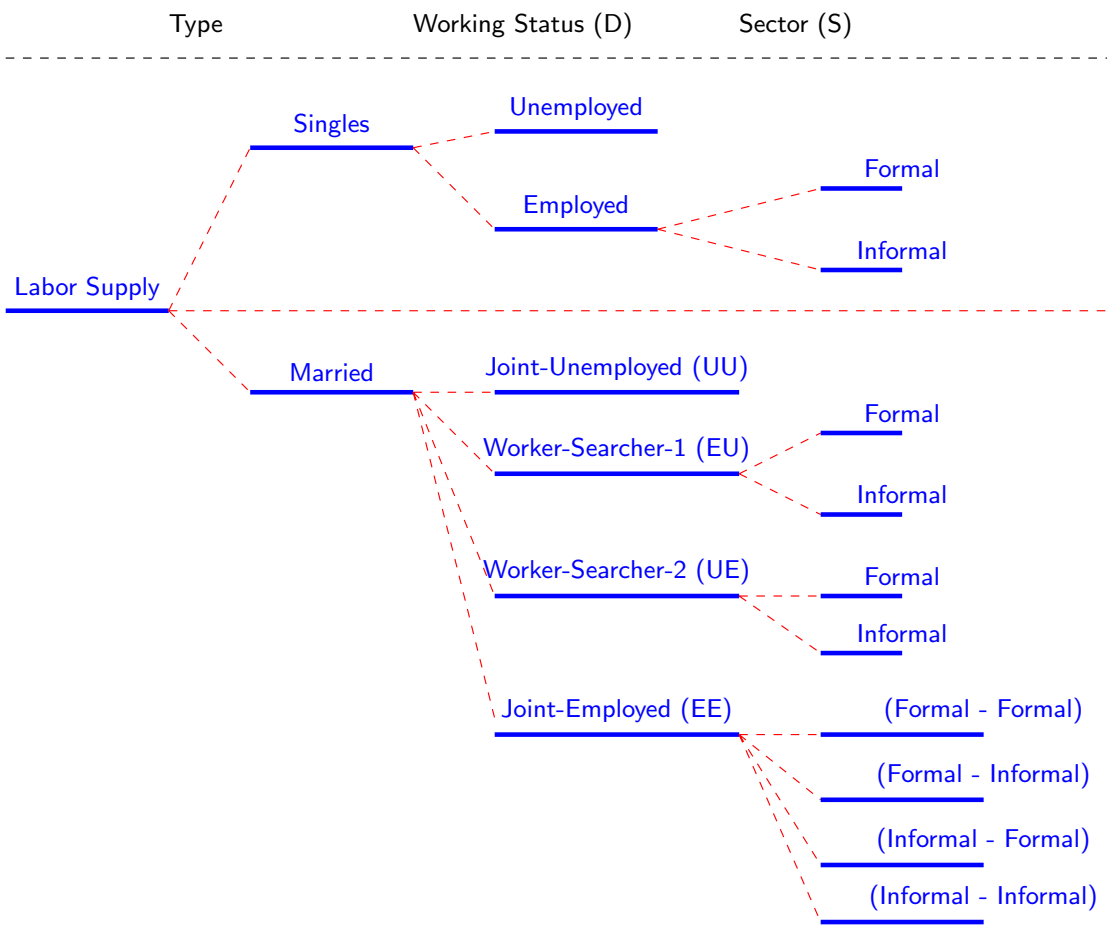
- The joint-household behavior in the labor supply side adds dynamics that are being missed when we assume married individuals optimal decisions are the same as in a single-agent framework.
- On-the-job search (between sectors)
- Exogenous job destruction
- Wage offer distribution ($F(w|D_{sp}(w))$ - lognormal. [affected by the policy]
- Taxes for the formal sector: Payroll taxes (Income and social security), severance pay and unemployment insurance.
- Discount factor (ρ): 0.995.
- Treatment probabilities conditional on sector and gender.
- Preference parameters: Risk Aversion (ψ) and Value of Leisure (β). [Not affected by policy].
- Utility:

$$u(c;\psi,\beta_1,\beta_2) = \begin{cases} \frac{c^{1-\psi}-1}{1-\psi} & \text{if both spouses employed} \\ \frac{c^{1-\psi}-1}{1-\psi} + \beta_2 & \text{if husband employed and wife unemployed} \\ \frac{c^{1-\psi}-1}{1-\psi} + \beta_1 & \text{if husband unemployed and wife employed} \\ \beta_1 + \beta_2 & \text{if both spouses unemployed} \end{cases} \quad (1)$$

Model: Household



Model: Household



- Now we have sector-treatment employment, i.e. Formal Non-Treated (FNT), Formal Treated (FT), Informal Non-Treated (INT), Informal Treated (IT)

Identification and Estimation

Three sets of parameters (moments and parameters 1 and 2 are done for before and after, treated and non-treated):

1. **Step 1: Wages parameters**
   - Functional form assumption: log-normal (recoverability)
   - Accepted wages distribution + reservation wage $\rightarrow \mu_1(x), \sigma_1(x), \mu_2(x), \sigma_2(x)$, i.e.

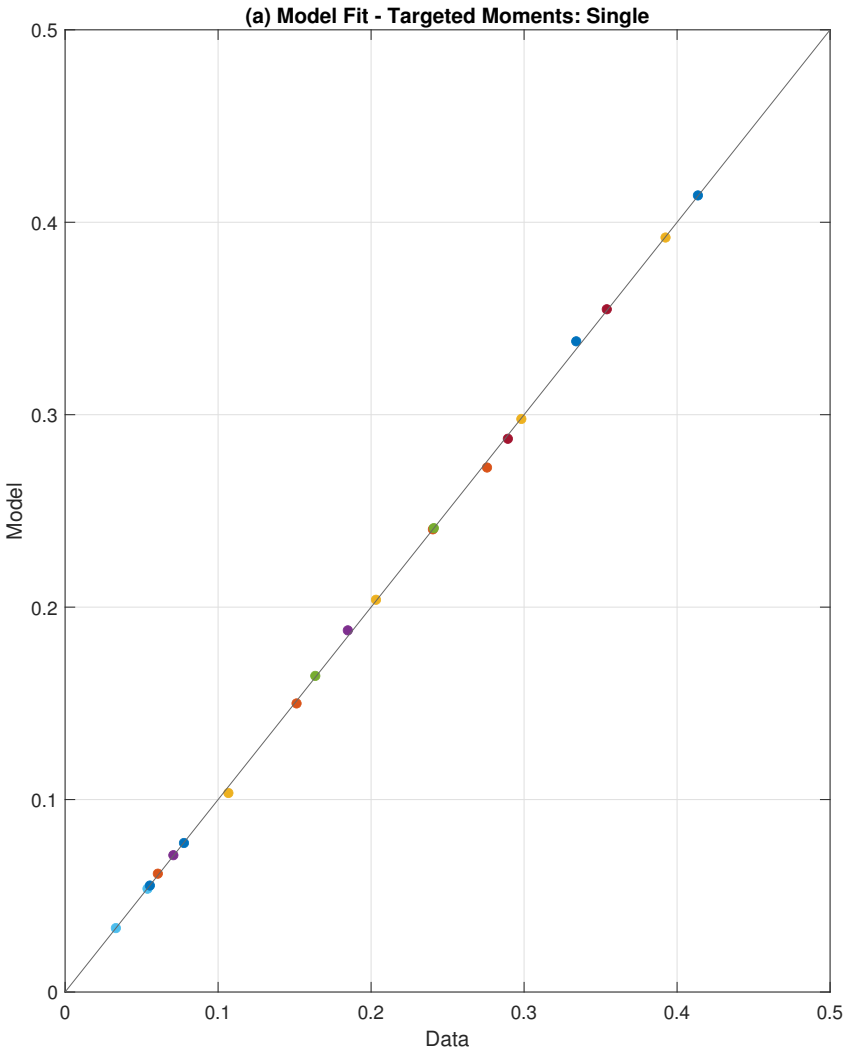
$$f_A(w|w \geq \phi; \mu_A, \sigma_A) = \frac{f(w; \mu, \sigma)}{1 - F(\phi; \mu, \sigma)} \tag{2}$$

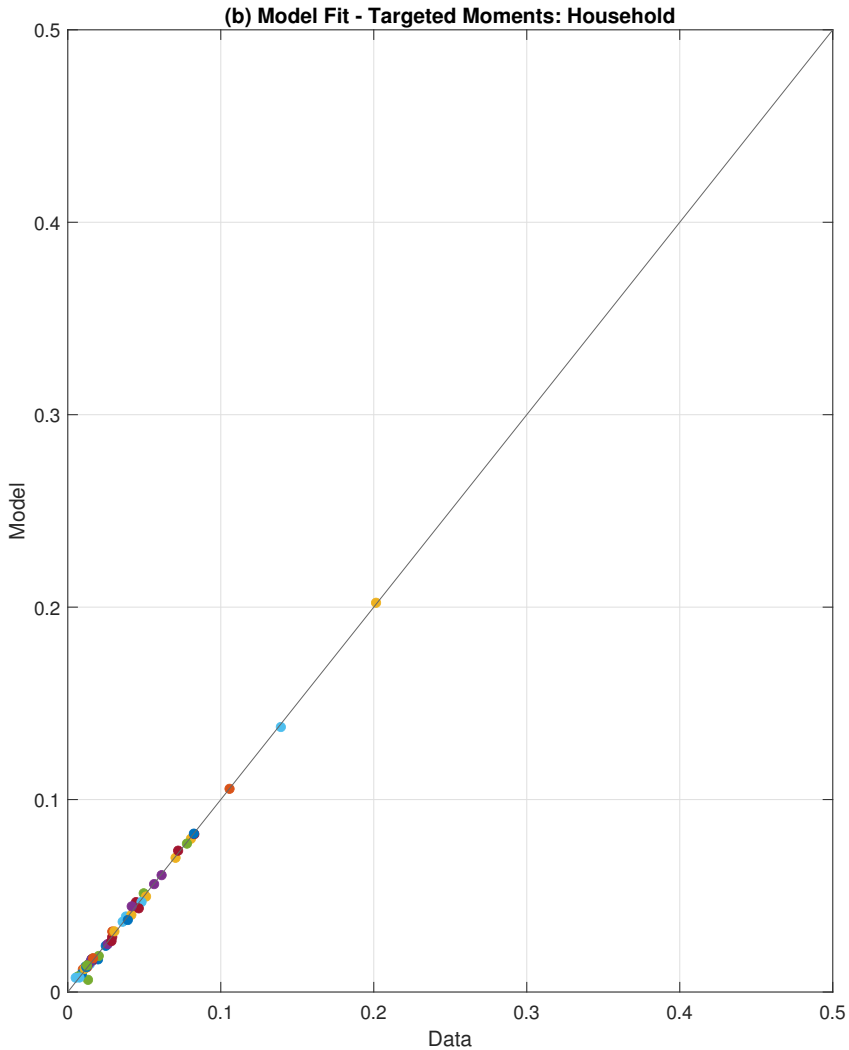
   - *Estimation method:* GMM
2. **Step 2: Mobility parameters**
   - Transition probabilities (0 = non-employed, 1 = formal, 2 = informal).
   - Recover the arrival rates from the hazard rate equations:

$$h_{UE} = \lambda_u(s) \times [1 - F(\phi)] \qquad h_{EU} = \delta(s) \qquad h_{EE} = \lambda_e(s)[1 - F(w)] \tag{3}$$

   - *Estimation method:* Non-parametrically
3. **Step 3: Preferences parameters**
   - Use transition probabilities between sectors to identify risk aversion (alternative, correlation between spouses LMS);
   - Proportions of workers in each labor market status to identify value of leisure.
   - Decisions rules from the model. (Taxes and discount rate are exogenous).
   - *Estimation method:* GMM
   - *Standard Errors:* Corrected for multi-step estimator.

Model Fit


(a) Model Fit - Targeted Moments: Single
Model
Data
0
0.1
0.2
0.3
0.4
0.5


(b) Model Fit - Targeted Moments: Household
Model
Data
0
0.1
0.2
0.3
0.4
0.5

Results

1. **Estimates - preference parameters**:

	Preference Parameters			
	Value of Leisure		Risk Aversion	
	Parameter	S.E.	Parameter	S.E.
Single Men	1.3895	0.0005	0.9859	0.0013
Single Women	1.0762	0.0092	1.2960	0.0030
Household (Joint Search)				
Married Men	1.3661	0.0004	0.5555	0.0002
Married Women	1.4579	0.0028		

2. **Specification tests:**
   - Risk averse parameter is significantly different to risk neutrality. ($H_0 : \psi = 0$).
   - Correlation of labor market status of spouses is not zero. In the case of zero, would be consistent with risk neutrality. ($H_0 : corr(d_1, d_2) = 0$)
   - Both null hypothesis are rejected with a P-value of 0.0000.
3. **Policy evaluation:** What would had happened if the policy did not change [channel] ?

Policy Evaluation - Women: Transition Informal to Formal Treated

			Decomposition Policy Effect: 4 Channels			
	Data	Baseline	Payroll Tax	Social Security	Wage Distr	Arrival Rate
Transition Informal to Formal Treated (Policy Effect)						
Single Women	0.0070	0.0070	0.0012	0.0036	-0.0141	0.0079
Married Women: Husband Unemployed	0.0114	0.0114	0.0083	0.0105	0.0024	0.0034
Married Women: Husband Formal Non-Treated	0.0077	0.0077	0.0046	0.0060	-0.0036	0.0049
Married Women: Husband Formal Treated	0.0148	0.0148	0.0095	0.0132	0.0043	0.0088
Married Women: Husband Informal Non-Treated	0.0034	0.0034	0.0003	0.0015	0.0002	0.0032
Married Women: Husband Informal Treated	0.0035	0.0035	0.0023	0.0036	0.0029	0.0026
Transition Informal to Formal Treated (%Δ)						
Single Women			-82.744	-48.731	-301.456	12.790
Married Women: Husband Unemployed			-27.376	-8.118	-79.175	-70.636
Married Women: Husband Formal Non-Treated			-39.671	-22.654	-146.440	-37.022
Married Women: Husband Formal Treated			-36.143	-11.075	-71.165	-40.613
Married Women: Husband Informal Non-Treated			-91.808	-54.757	-93.389	-6.168
Married Women: Husband Informal Treated			-35.903	0.730	-18.503	-26.057

- Policy effect decomposition magnitude varies across household composition.
- Policy effect is mainly coming from changes in payroll taxes (PT) and wage distributions (WD).
- Single Women and married women with husband in INT are affected the most when we cancel the PT channel of the policy. This also happens with WD but we add married women with husband FNT.
- Through the PT we find our insurance motive. Through WD we also see sorting.
- ** For formal/informal sector proportions, the arrival rates (AR) channel is significant for the policy effect. [Not enough jobs for women? or Not enough jobs for women that adjusts to their everyday life (flexibility)?]

Policy Evaluation - Men: Transition Informal to Formal Treated

	Data	Baseline	Decomposition Policy Effect: 4 Channels Payroll Tax	Social Security	Wage Distr	Arrival Rate
Transition Informal to Formal Treated (Policy Effect)						
Single Men	-0.0032	-0.0032	-0.0080	-0.0037	-0.0129	0.0029
Married Men: Wife Unemployed	0.0115	0.0115	0.0058	0.0082	-0.0109	0.0039
Married Men: Wife Formal Non-Treated	0.0078	0.0078	0.0025	0.0045	-0.0178	0.0068
Married Men: Wife Formal Treated	0.0116	0.0116	0.0040	0.0095	-0.0114	0.0052
Married Men: Wife Informal Non-Treated	0.0142	0.0142	0.0086	0.0135	-0.0124	0.0057
Married Men: Wife Informal Treated	0.0063	0.0063	0.0017	0.0037	-0.0190	0.0077
Transition Informal to Formal Treated (%Δ)						
Single Men			152.214	15.57	303.31	-189.55
Married Men: Wife Unemployed			-49.02	-28.46	-195.32	-66.15
Married Men: Wife Formal Non-Treated			-67.52	-42.31	-328.54	-12.90
Married Men: Wife Formal Treated			-65.65	-18.18	-198.39	-54.91
Married Men: Wife Informal Non-Treated			-39.56	-4.39	-187.50	-59.91
Married Men: Wife Informal Treated			-73.33	-41.34	-399.68	21.35

- Policy effect decomposition magnitude varies across household composition and mainly coming from changes in payroll taxes (PT) and wage distributions (WD).
- Single men and married men with wife in IT are affected the most through the PT channel (insurance motive). This also happens with WD but we add married men with wife FNT (where we have both, insurance and sorting). Stands out that married men react more than married women through WD.

▸ PEP-M

Conclusion and Discussion

- Household behavior does matter! (and behave as risk averse agents)
- Policy evaluation shows bigger impact through payroll tax (LS) and wage distribution (LD). The latter being stronger for men than women. For proportions the channel of the arrival rates for women is significant to explain changes in the composition of the labor market due to the policy.
- In the paper, I also estimate the married sample with the single-agent search model and discuss previous suggestions in the literature vs the actual effect of the policy estimated.
- Targeted policies. [Second policy goes in this route]
- In progress: policy effects on lifetime earnings and inequality (sector, gender, income).
- Some extensions in consideration: fertility process, intensive and extensive margin labor decisions (hours (PT/FT), Participation), observed heterogeneity (education level, children, regions).
- **Limitations and issues:**
  - Not possible to assign treatment to those unemployed (however, the transition prob I to F increase significantly after the policy).
  - Not possible to talk about general equilibrium effects and do counterfactuals with components as UI, severance pay, corporate tax, firm cost for evasion.
  - Standby: Adding firm side (wage-posting). Need of firm data. Possible access to RAIS (employer-employee formal sector data), however, for the informal sector there is only one cross-section survey in 2003 (before the policy).
  - Eventually, add optimal taxation.
  - Working on speeding up the standard errors code.

Appendix

Policy Evaluation - Women: Proportions

	Data	Baseline	Payroll Tax	Social Security	Wage Distr	Arrival Rate
			Decomposition Policy Effect: 4 Channels			
Proportion Formal Sector (Policy Effect)						
Single Women	-0.0396	-0.0396	-0.0420	-0.0411	-0.0417	-0.0458
Married Women: Husband Unemployed	0.0030	0.0030	0.0030	0.0030	0.0031	0.0022
Married Women: Husband Formal Non-Treated	0.0093	0.0093	0.0089	0.0091	0.0097	0.0089
Married Women: Husband Formal Treated	0.0361	0.0361	0.0346	0.0356	0.0335	0.0354
Married Women: Husband Informal Non-Treated	0.0021	0.0021	0.0021	0.0021	0.0019	0.0016
Married Women: Husband Informal Treated	0.0055	0.0055	0.0057	0.0055	0.0067	0.0069
Proportion Formal Sector (%Δ)						
Single Women			5.856	3.785	5.096	15.584
Married Women: Husband Unemployed			-0.440	-0.220	3.526	-24.699
Married Women: Husband Formal Non-Treated			-3.740	-1.504	4.886	-4.298
Married Women: Husband Formal Treated			-4.253	-1.288	-7.131	-2.040
Married Women: Husband Informal Non-Treated			-2.738	-1.957	-10.949	-22.814
Married Women: Husband Informal Treated			3.356	-0.950	22.584	25.559

▸ PET-W

Policy Evaluation - Women: Proportions

	Data	Baseline	Payroll Tax	Social Security	Wage Distr	Arrival Rate
			Decomposition Policy Effect: 4 Channels			
Proportion Informal Sector (Policy Effect)						
Single Women	-0.0248	-0.0248	-0.0237	-0.0242	-0.0240	-0.0214
Married Women: Husband Unemployed	0.0007	0.0007	0.0008	0.0007	0.0002	0.0001
Married Women: Husband Formal Non-Treated	-0.0016	-0.0016	-0.0013	-0.0015	-0.0014	-0.0012
Married Women: Husband Formal Treated	-0.0087	-0.0087	-0.0080	-0.0085	-0.0088	-0.0066
Married Women: Husband Informal Non-Treated	-0.0024	-0.0024	-0.0025	-0.0025	-0.0025	-0.0016
Married Women: Husband Informal Treated	-0.0050	-0.0050	-0.0046	-0.0048	-0.0042	-0.0049
Proportion Informal Sector (%Δ)						
Single Women			-4.54	-2.52	-2.93	-13.66
Married Women: Husband Unemployed			4.43	2.64	-77.87	-84.46
Married Women: Husband Formal Non-Treated			-13.32	-4.95	-8.76	-20.80
Married Women: Husband Formal Treated			-7.41	-1.78	1.85	-23.78
Married Women: Husband Informal Non-Treated			2.92	1.83	0.26	-35.65
Married Women: Husband Informal Treated			-7.91	-4.75	-16.91	-3.68

▸ PET-W

Policy Evaluation - Men: Proportions

	Data	Baseline	Payroll Tax	Social Security	Wage Distr	Arrival Rate
			Decomposition Policy Effect: 4 Channels			
Proportion Formal Sector (Policy Effect)						
Single Men	-0.0250	-0.0250	-0.0288	-0.0260	-0.0250	-0.0297
Married Men: Wife Unemployed	0.0015	0.0015	0.0013	0.0014	0.0004	0.0026
Married Men: Wife Formal Non-Treated	0.0162	0.0162	0.0156	0.0157	0.0150	0.0156
Married Men: Wife Formal Treated	0.0430	0.0430	0.0412	0.0423	0.0388	0.0421
Married Men: Wife Informal Non-Treated	0.0062	0.0062	0.0060	0.0061	0.0071	0.0044
Married Men: Wife Informal Treated	-0.0009	-0.0009	-0.0007	-0.0009	-0.0003	-0.0010
Proportion Formal Sector (%Δ)						
Single Men			15.06	3.92	0.00	18.78
Married Men: Wife Unemployed			-11.01	-6.80	-75.46	76.36
Married Men: Wife Formal Non-Treated			-3.49	-2.60	-7.34	-3.22
Married Men: Wife Formal Treated			-4.08	-1.73	-9.80	-2.00
Married Men: Wife Informal Non-Treated			-4.74	-1.77	13.25	-29.88
Married Men: Wife Informal Treated			-15.97	3.70	-60.65	14.41

▸ PET-M

Policy Evaluation - Men: Proportions

	Data	Baseline	Payroll Tax	Social Security	Wage Distr	Arrival Rate
			Decomposition Policy Effect: 4 Channels			
Proportion Informal Sector (Policy Effect)						
Single Men	-0.0285	-0.0285	-0.0261	-0.0278	-0.0285	-0.0272
Married Men: Wife Unemployed	-0.0136	-0.0136	-0.0135	-0.0135	-0.0133	-0.0145
Married Men: Wife Formal Non-Treated	-0.0058	-0.0058	-0.0055	-0.0055	-0.0051	-0.0062
Married Men: Wife Formal Treated	-0.0025	-0.0025	-0.0018	-0.0022	-0.0002	-0.0010
Married Men: Wife Informal Non-Treated	-0.0107	-0.0107	-0.0105	-0.0107	-0.0084	-0.0109
Married Men: Wife Informal Treated	-0.0133	-0.0133	-0.0127	-0.0130	-0.0101	-0.0142
Proportion Informal Sector (%Δ)						
Single Men			-8.32	-2.38	0.00	-4.45
Married Men: Wife Unemployed			-0.98	-0.57	-2.27	6.59
Married Men: Wife Formal Non-Treated			-6.74	-5.21	-12.80	6.82
Married Men: Wife Formal Treated			-25.75	-11.88	-89.94	-60.44
Married Men: Wife Informal Non-Treated			-1.25	0.20	-21.30	2.44
Married Men: Wife Informal Treated			-4.56	-1.98	-23.60	7.14

▸ PET-M