

Playing MP with MP

Tito Boeri

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Playing MP with MP

Two papers one model

- Common denominator is **M**ortensen-**P**issarides model. Playing with labour supply.
- with **M**ichael Burda: Inside the Unions Black Box
- with **P**ietro Garibaldi: Shadow Sorting
- Tinkering in the Dark
- Very flexible tool. So far 10% of potential, but already tens of papers. Google 995 papers referring to the model-match.

Shadow Sorting (with Pietro)

- Modern information technology: easier to detect shadow by cross-checks of administrative records
- Yet Informal Sector is Flourishing. Why?
- Surprisingly little theoretical work on shadow employment. Can the MP model shed light on i) shadow margins, ii) role of institutions, iii) institutional interactions?

Key results (theory)

- Shadow E and unemployment are two sides of the same coin. Similar reaction to the same macro shocks
- Blind eye of public authorities to shadow acknowledges this fact
- Sorting affects job creation
- Rather than repressing shadow, better (from a JC standpoint) to operate on entitlement rules (enforce minimum contribution records)

Key results (data)

- Unemployment and shadow rates positively correlated beyond statistical illusion
- Shadow wage gap is lower in depressed labour markets and years
- Based on macro, regional and micro (workers) data in Brazil and Italy

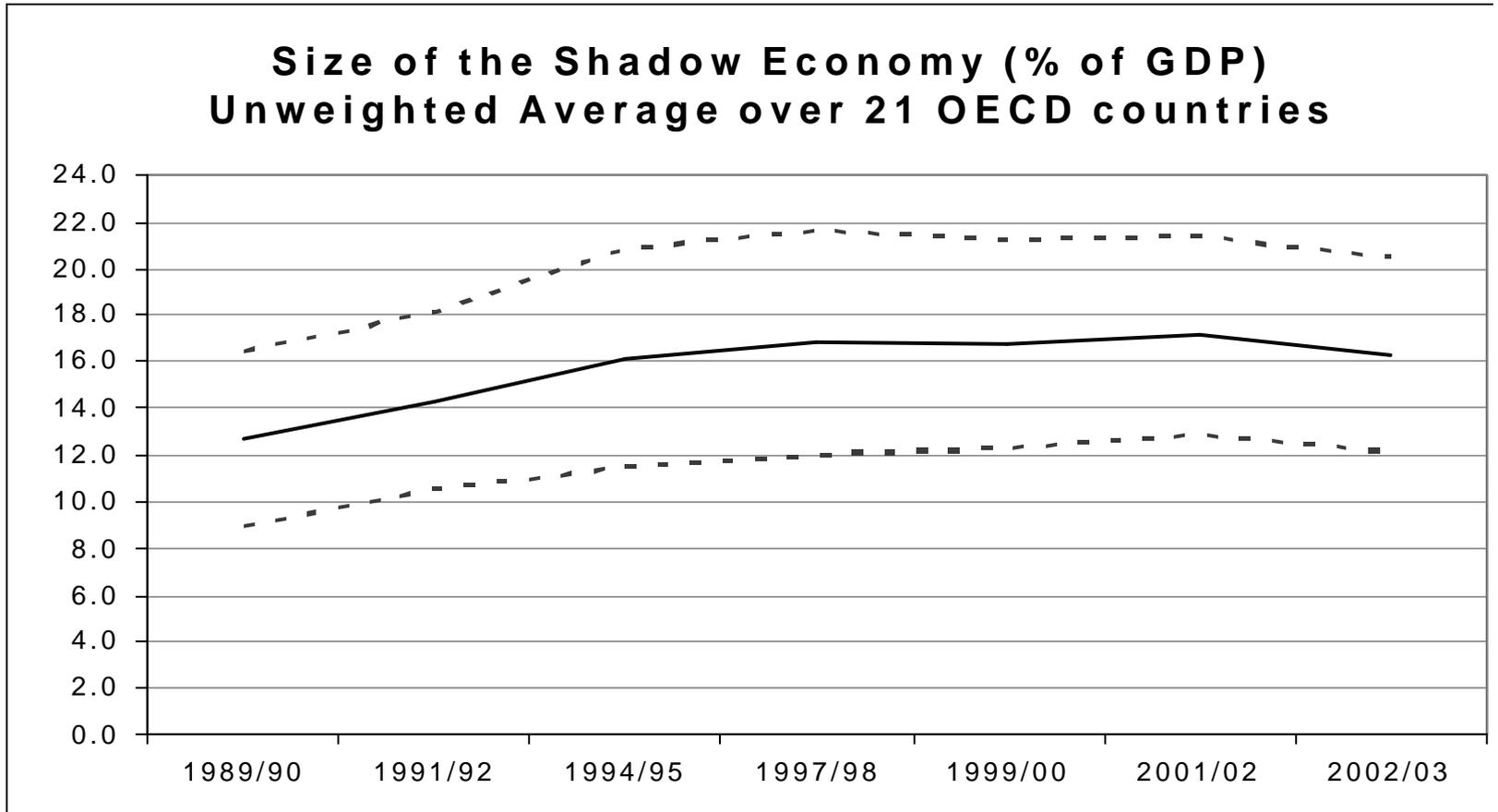
Outline

- Shadow Facts
- A two-sector model with sorting
- Simulations and comparative statics
- Back to the data
- Policy discussion

Shadow types

- Consensus definition: “all economic activities which contribute to GDP, but escape detection in the official estimates of GDP”
- Includes illegal activities (e.g., drug dealing)
- We focus on a subset of shadow: evasion from taxes, social security contributions and labour regulations. Not on crime.

Shadow Fact 1: increasing!



Countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, USA

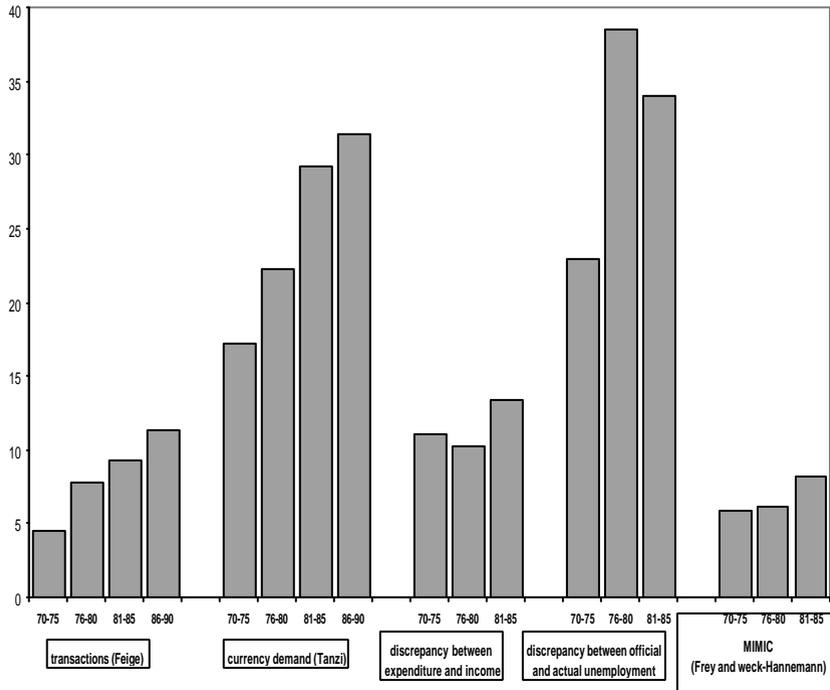
Sources: Currency demand approach, Friedrich Schneider

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Different measures, same trend

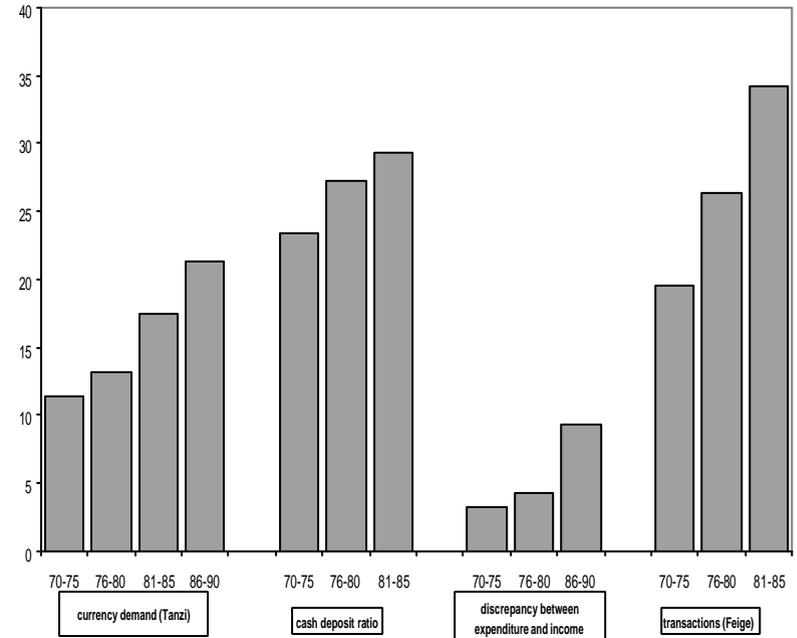
The Increasing Size of Shadow Economies

Germany



The Increasing Size of Shadow Economies

Italy



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Shadow Fact 2: shadow is low-edu

Shadow Employment by Educational Attainment of the Workforce

a) *Bank of Italy survey, average 1995-2002*

Education	Shadow (Def.1)	Shadow (Def. 2)	Control (Def.1 and 2)	Shadow (Def. 3)	Control (Def.3)
	? contrib=0	? contrib=0 + ? contrib <0	? contrib =2	No contribution at all	At least 1 year of contribution
Primary or lower	13.5	14.7	7.5	32.1	30.5
Lower secondary	35.4	33.6	27.8	31.5	27.7
Lower vocational (3 years)	6.8	6.5	9.1	4.0	6.3
Secondary school	33.8	32.0	40.8	23.9	26.4
Tertiary education	10.5	13.1	14.8	8.5	9.1

b) *LFS data, Italy average 1995-2002*

Education	Shadow	Regular employment
Primary or lower	38.4	15.0
Lower secondary	25.6	36.1
Lower vocational (3 years)	4.3	7.8
Secondary school	24.5	29.9
Tertiary education	7.2	11.2

c) *Istat-Fondazione Curella, Sicily 1995*

Education	Main job		Secondary job	
	Shadow	Regular employment	Shadow employment	Regular employment
Primary or lower	24.0	13.5	19.5	8.8
Lower secondary	27.3	26.1	20.7	17.6
Secondary school	40.3	41.9	39.0	44.1
Tertiary education	8.4	18.4	20.7	29.4

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The model

- Heterogeneous labour, indexed by x , drawn from $F(x)$ with support $[x_{\min}, x_{\max}]$.
- Two sectors with same production function.
- Regular sector pays production tax t every period in which they employ a worker.
- Shadow sector: tax is evaded, and instantaneous monitoring rate equal to θ .
Closed down if discovered

The model (...)

Labour demand (vacancy)

Firms can freely post a vacancy in either sector, at costs k_i per period, $i=g,b$

Free entry of firms in both sectors. Hence asset value of a vacancy is zero. Jobs are destroyed at rate δ in each sector.

Labour supply (sorting)

Workers cannot simultaneously work and/or search in both sectors.

In the legal sector there is a specific unemployed income (b) which is not available in the shadow sector.

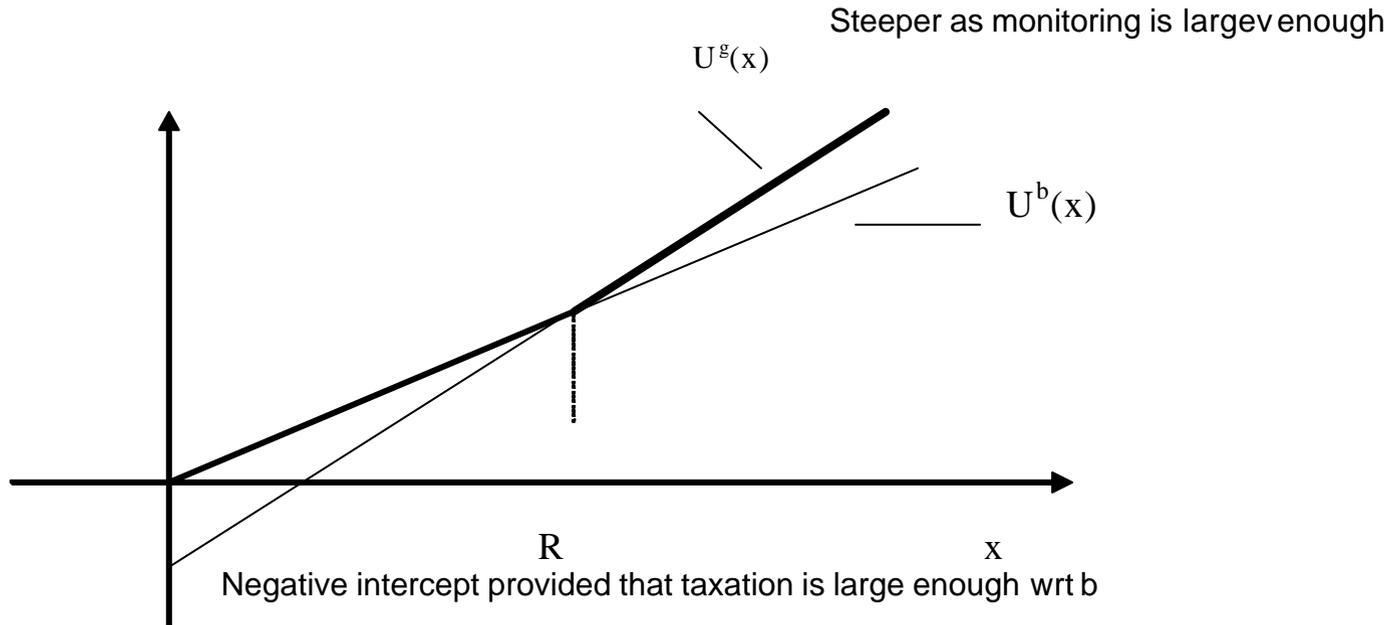
As in standard MP

- Matching frictions (CRS in both sectors)
- Nash-bargaining with beta
- Workers move between employment and unemployment
- Taxes and unemployment benefits independent of income
- Free entry conditions holding in both sectors

Adapting MP: labour supply dimension

- In addition to JC conditions in both sectors (JC^g, JC^b) determining market tightness θ^g and θ^b (exogenous job destruction), we have an equilibrium condition for **sorting**, namely
$$x = R \text{ is s.t. } U^g(R) = U^b(R)$$
- Endogenous variables: θ^g , θ^b and R , defining border between shadow and legal skills-jobs.

Partial equilibrium: labour supply (fixing τ^g and τ^b)



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Comparative statics of LS

- With single crossing
- As b ? R ? (entitlement effect)
- As taxes t ? R ? (usual over-regulation effect)
- As monitoring rate θ ? R ? (repression effect)

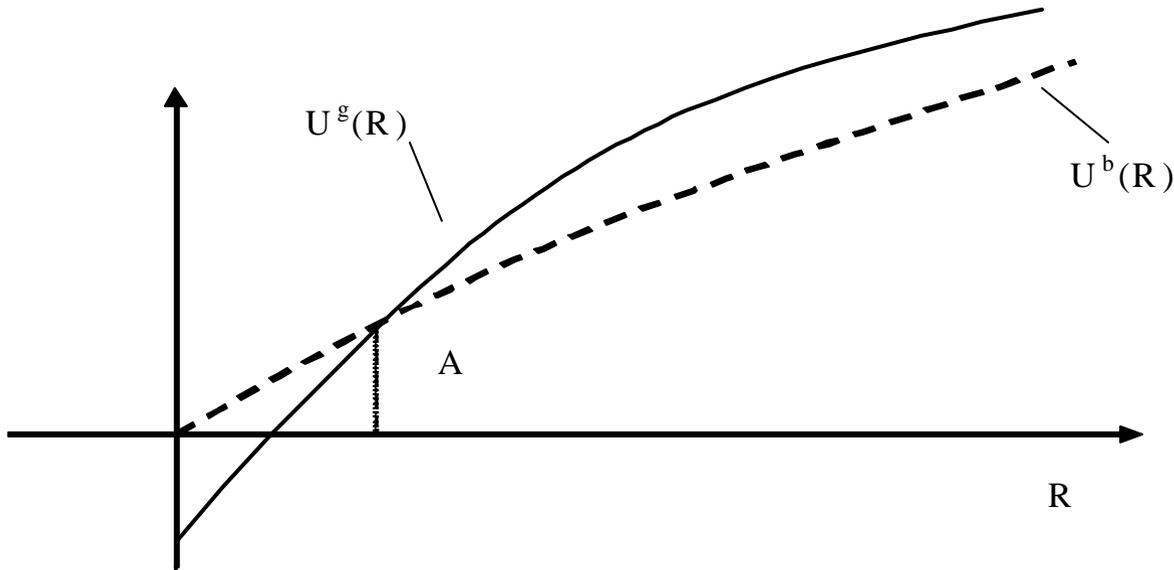
Comparative statics of LD

- With single crossing
- As R^g, R^b (selection effect; increase in the quality of workforce)
- As b^g, b^b (lower quality in both sectors)
- As taxes t^g (usual over-regulation effect)
- As monitoring rate θ^b (repression effect)

General Equilibrium

- There can be multiple equilibria
- Two effects on the value of unemployment reinforcing each other in non-linear fashion: *surplus effect* (increasing in R and larger in the legal sector) and *job finding rate effect* (increasing in R)
- In order to rule out multiple equilibria we need to specialize the distribution of productivity (Albrecht and Normann, 2002), e.g., exponential distribution.

GE with single crossing



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1. Calibration

	Notation	Legal	Shadow
Discount Rate	r	0.03	
Separation Rate	λ	0.15	0.15
Unemployed Income	b	0.10	0.00
Firing Tax	F	0.10	0.00
Matching Elasticity	η^i	0.50	0.50
Monitoring Rate	ρ	0.00	0.06
Production Tax	τ	0.16	0.00
Matching Function Constant	A^i	1.20	1.20
Workers' Surplus Share	β	0.50	0.50
Common Productivity	p	1.00	1.00
Search Costs	k^i	1.20	1.20
.....			
Sorting Productivity	R	0.23	
Market Tightness	θ^i	0.57	0.03
Job Finding Rate	α^i	0.90	0.19
.....			
Unemployment	u^i	11.36	8.83
Employment	n^i	68.41	11.40
Shadow Rate	s	14.29	
Average Wage	w^i	0.92	0.07
(a), Distribution is Exponential with parameter $B = 1.00$ Authors' calculation			

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Aggregate conditions

- Aggregate productivity shock: productivity in each job is $p x$ where p is an aggregate parameter and x is the idiosyncratic component
- *Two faces of the same coin.* Worse Aggregate condition induce an increase in both unemployment and in the shadow rate
- $p \uparrow \Rightarrow \theta_i \uparrow$ (job finding effect). However, as $p \uparrow \Rightarrow R \uparrow$ (sorting effect), so that average quality worsens in both sector, and $\theta_i \uparrow$. The first effect is more important in the legal sector, since the productivity is proportional to x .

2.Changes in Aggregate Conditions

p	R	θ_b	θ_g	u_b	u_g	n_b	n_g	s	x_g	x_b	\bar{w}_g	\bar{w}_b
1.00	0.23	0.03	0.57	8.83	11.36	11.40	68.41	14.29	1.23	0.11	0.92	0.07
1.08	0.21	0.03	0.62	8.30	11.08	10.81	69.81	13.41	1.21	0.10	0.99	0.07
1.15	0.20	0.03	0.67	7.83	10.82	10.27	71.08	12.63	1.20	0.10	1.05	0.07
1.22	0.19	0.03	0.73	7.41	10.58	9.78	72.23	11.93	1.19	0.09	1.11	0.07
1.30	0.18	0.03	0.78	7.03	10.36	9.33	73.28	11.30	1.18	0.09	1.18	0.07

u_g and u_b are the unemployment rates respectively in the legal and shadow sector

n_g, E_{n_b} , are respectively legal and shadow employment.

x_g and x_b are the average idyosincratic productivity in the legal and shadow employment

\bar{w}_g and \bar{w}_b are the average wages legal and shadow employment

..... Authors' calculation

The Shadow wage gap

- Wage differentials between the legal and the shadow sector are quantitatively more important when aggregate business conditions are good.
- *Wage differentials should be larger in less depressed regions*

3.Changes in Total Taxation Conditions

τ	R	θ_b	θ_g	u_b	u_g	n_b	n_g	s	x_g	x_b	\bar{w}_g	\bar{w}_b
0.160	0.23	0.03	0.57	8.83	11.36	11.40	68.41	14.29	1.23	0.11	0.921	0.070
0.164	0.24	0.03	0.57	9.02	11.20	12.06	67.72	15.12	1.24	0.11	0.927	0.074
0.168	0.25	0.03	0.58	9.21	11.04	12.73	67.02	15.97	1.25	0.12	0.933	0.077
0.172	0.26	0.03	0.58	9.40	10.87	13.42	66.31	16.83	1.26	0.12	0.940	0.081
0.176	0.27	0.03	0.59	9.58	10.70	14.13	65.59	17.72	1.27	0.13	0.947	0.085

u_g and u_b are the unemployment rates respectively in the legal and shadow sector
 n_g, E_{n_b} , are respectively legal and shadow employment.
 \bar{w}_g and \bar{w}_b are the average wages legal and shadow employment
 Authors' calculation

Taxation increases the shadow sector, and reduces legal employment. Job finding effect dominates.

4.Changes in Monitoring Intensity

ρ	R	θ_b	θ_g	u_b	u_g	n_b	n_g	s	x_g	x_b	\bar{w}_g	\bar{w}_b
0.06	0.23	0.03	0.57	8.83	11.36	11.40	68.41	14.29	1.23	0.11	0.92	0.07
0.07	0.21	0.02	0.56	8.73	11.59	10.44	69.24	13.10	1.21	0.10	0.91	0.06
0.09	0.20	0.02	0.55	8.66	11.78	9.66	69.90	12.14	1.20	0.10	0.90	0.06
0.10	0.19	0.02	0.54	8.62	11.93	9.01	70.44	11.34	1.19	0.09	0.89	0.06
0.11	0.19	0.02	0.54	8.59	12.06	8.47	70.88	10.67	1.19	0.09	0.89	0.05

u_g and u_b are the unemployment rates respectively in the legal and shadow sector
 n_g, E_{n_b} , are respectively legal and shadow employment.
 \bar{w}_g and \bar{w}_b are the average wages legal and shadow employment
 Authors' calculation

Reduces the shadow rate, but increases unemployment.
 Reluctance to repress shadow, albeit employment increases.

5.Changes in Unemployed Income

b	R	θ_b	θ_g	u_b	u_g	n_b	n_g	s	x_g	x_b	\bar{w}_g	\bar{w}_b
0.100	0.23	0.03	0.57	8.83	11.36	11.40	68.41	14.29	1.23	0.11	0.921	0.070
0.104	0.22	0.03	0.56	8.75	11.45	11.16	68.64	13.98	1.22	0.11	0.918	0.069
0.108	0.22	0.02	0.56	8.68	11.55	10.91	68.87	13.67	1.22	0.11	0.914	0.067
0.111	0.21	0.02	0.55	8.60	11.64	10.65	69.10	13.36	1.21	0.10	0.911	0.066
0.115	0.21	0.02	0.54	8.52	11.74	10.40	69.34	13.04	1.21	0.10	0.907	0.065

u_g and u_b are the unemployment rates respectively in the legal and shadow sector
 n_g, E_{n_b} , are respectively legal and shadow employment.
 \bar{w}_g and \bar{w}_b are the average wages legal and shadow employment
 Authors' calculation

Reduces the shadow rate, but increases unemployment
 Better job creation properties than policy of repression.

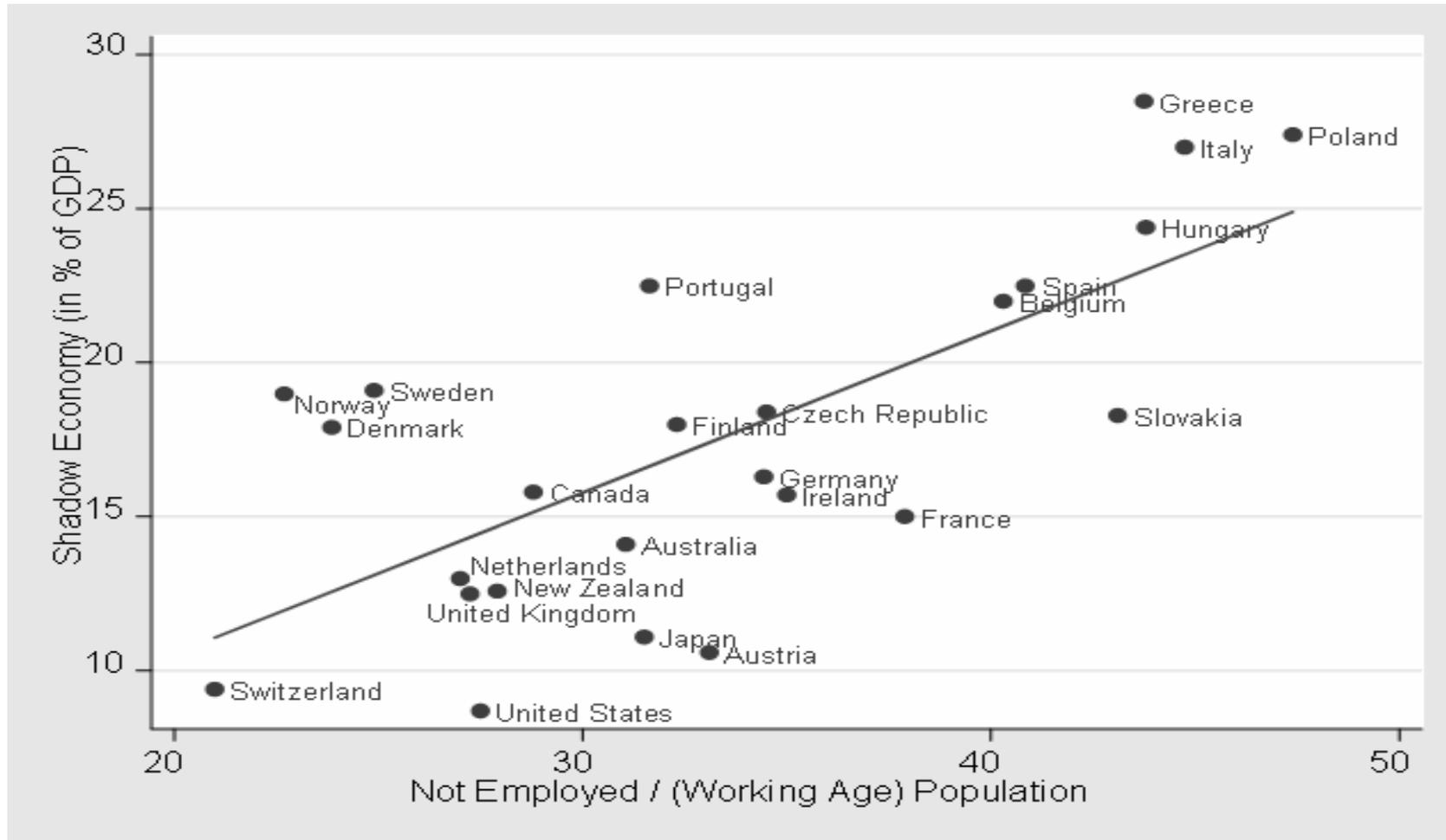
Difficulties in reality: required larger taxes and good monitoring

Summarizing empirical iMPlications

1. positive cross-sectional and time-series correlations between the size of the shadow sector, and unemployment
2. the "shadow wage gap" should be larger in countries-regions and years in which unemployment is lower
3. shadow employment should be increasing in taxation and labor market regulations
4. tighter monitoring increases non-employment.

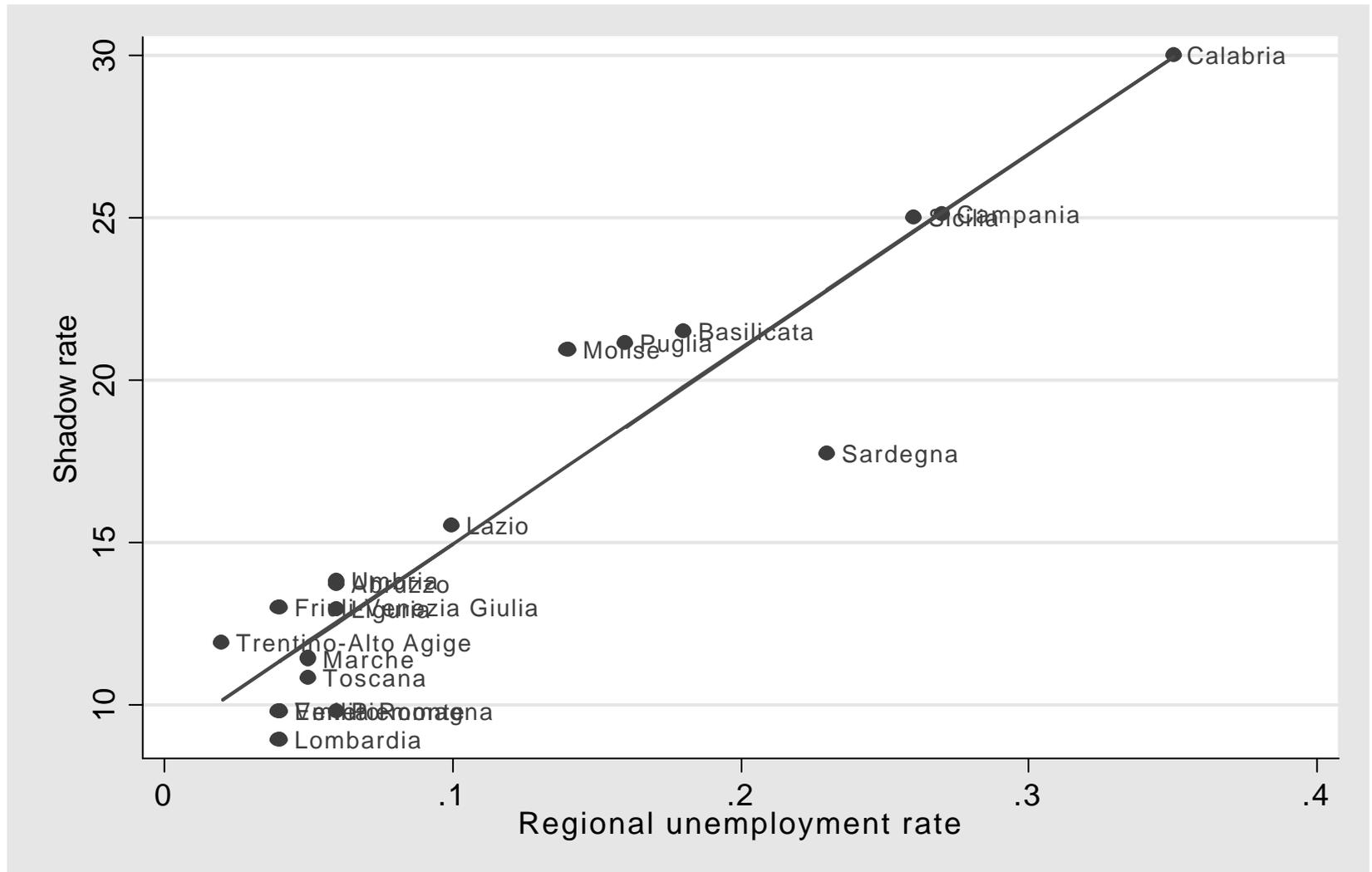
We evaluate the empirical relevance of 1) and 2). 3) is standard and holds in many cross-sectional studies, Schneider (2002). 4) is very difficult to evaluate

Two faces of the same coin



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Due facce della stessa medaglia

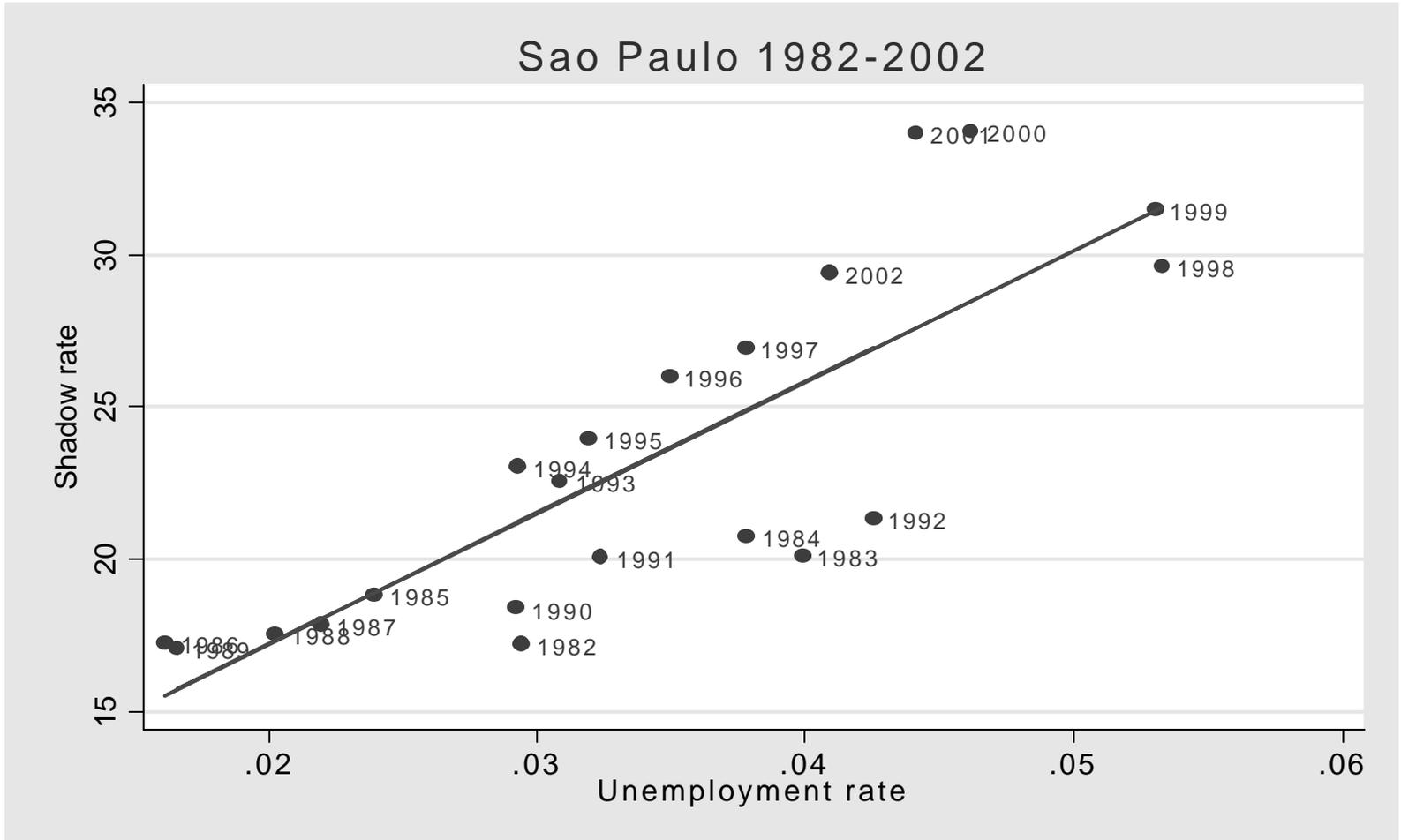


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A statistical artifact?

- Where are recorded the shadow employees in the LFS? Are they considered employed or non-employed? Unemployed or inactive?
- Spurious correlation induced if shadow employment is within unemployment measured in Labour Force Surveys.

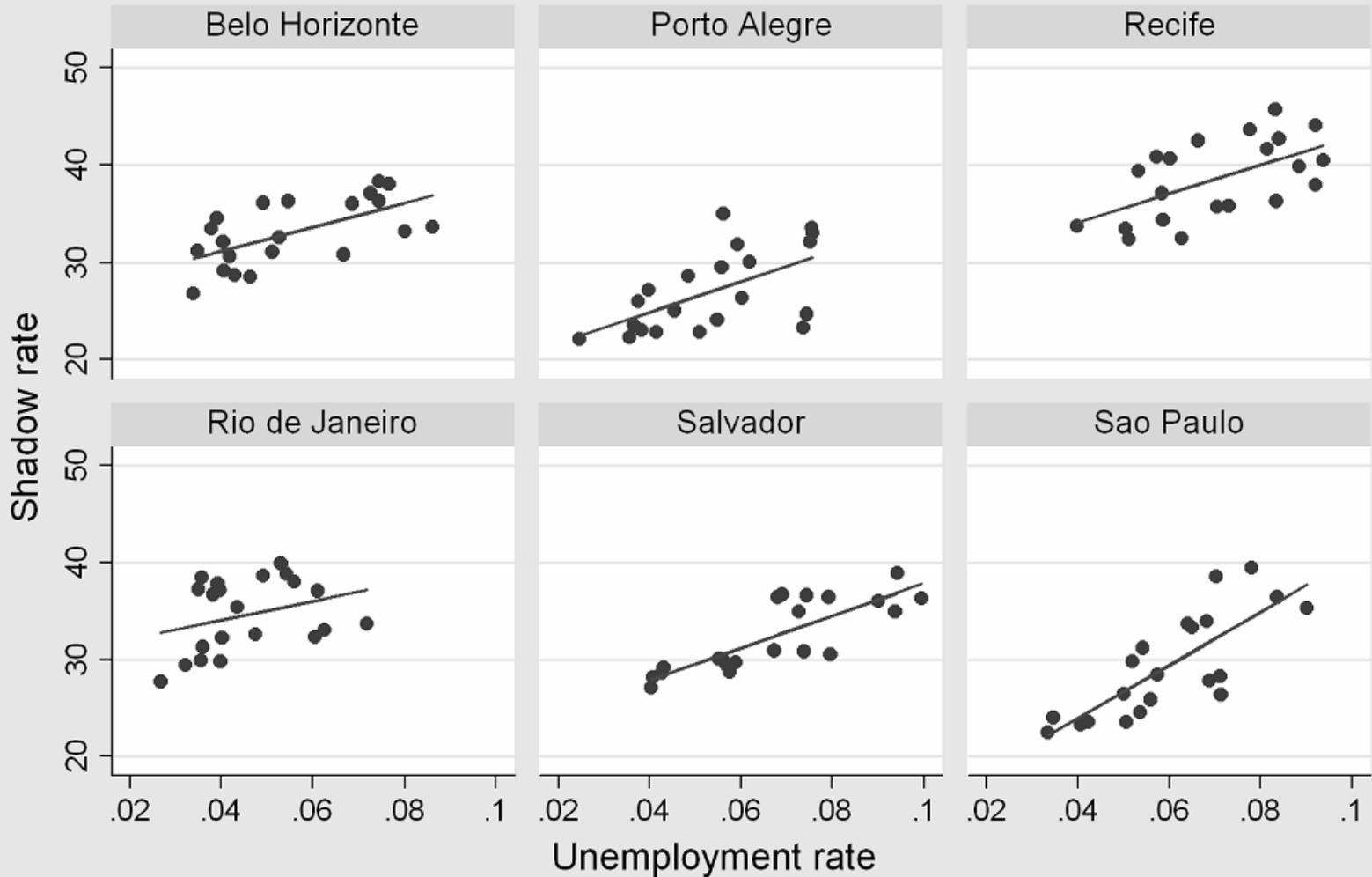
Brazilian data



Correlation .81; t-statistics 6.02

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Six Brazilian cities (1982-2002)



Graphs by area

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Decomposing the shadow wage gap

Oaxaca Decomposition of the Shadow Wage Gap

		Shadow wage gap	Explained	Unexplained
<i>All sample</i>	1995	0.94	0.24	0.70
	1998	0.79	0.40	0.39
	2000	0.92	0.26	0.66
	2002	1.04	0.23	0.81
<i>North</i>	all years	0.95	0.30	0.65
<i>South</i>	all years	0.78	0.31	0.48

Notes: Controls include age, gender, family status and educational attainments

Source: Bank of Italy SHIW various years

Policy iMPlications

- Shadow puzzle: two faces of the same coin. Employment moves with unemployment.
- Policies: if regulations cannot be removed, to reduce shadow employment, it is necessary to reduce unemployment. Muscular approach (increase in monitoring) dangerous since it may increase unemployment.
- Incentives to emerge (entitlement to UBs or training) may be more profitable.

Inside the Unions (Preferences for Rigid Wages with the MP model)

Tito Boeri and Michael Burda

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Outline

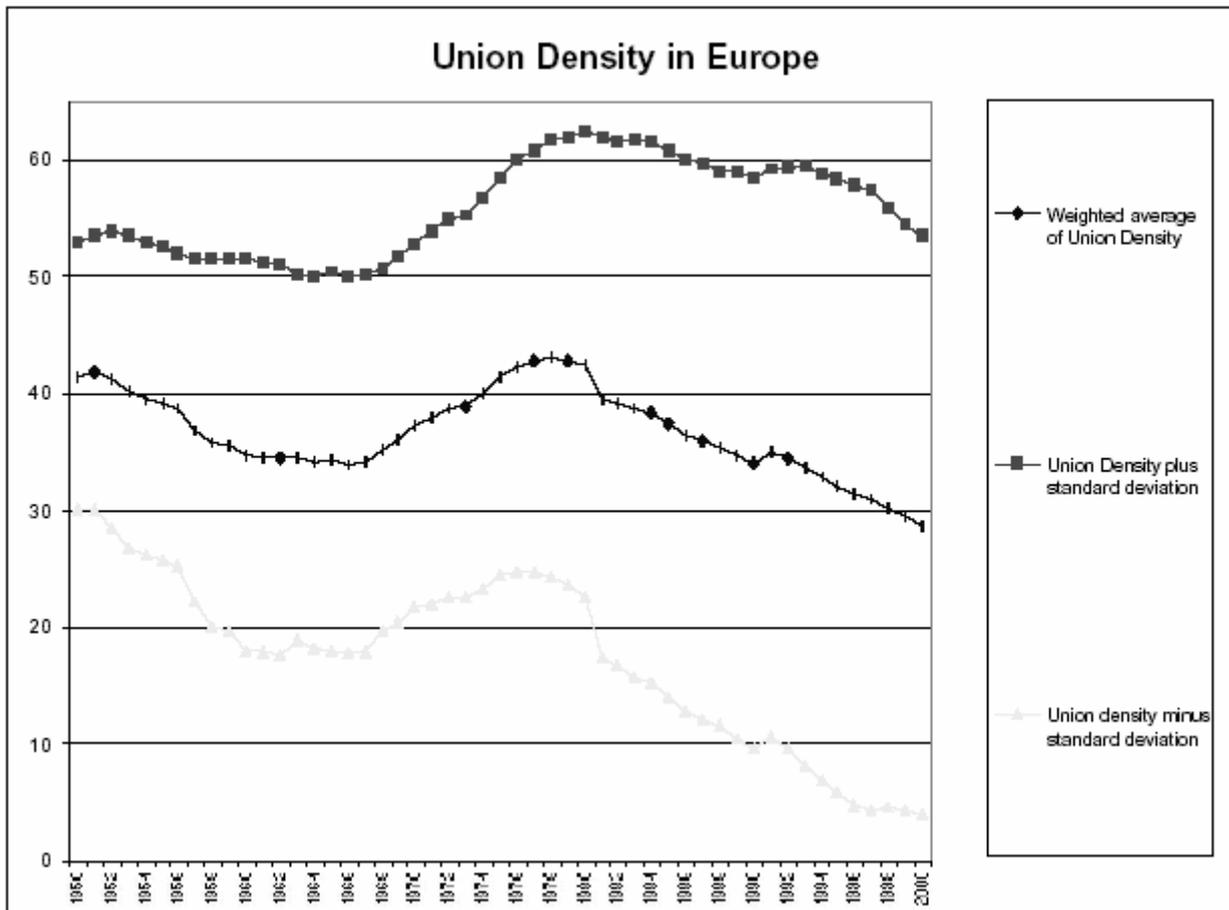
- Facts and Puzzles: Documenting excess coverage
- Introducing rigid-wages in the MP-model
- Worker preferences for the two regimes by skill per given rigidities
- Inside the blackbox: a model of union decisionmaking. Endogenising rigidities
- Conclusions

Main Results

- MP model yields insights into preferences over collective vs. individual bargaining systems
- With firing frictions and high turbulence, rigid wage regimes can be preferred by significant fractions of employed
- In calibrations, the political support for rigid labor markets is significant beyond membership, can explain excess coverage

Puzzle: Excess Coverage

- Union density is falling in many (not all!) EU countries...



Quelle: Ebbinghaus/Visser (2000)

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Puzzle: Excess Coverage

- Union density is falling...
- ...yet coverage of collective bargaining is stable
- „Excess coverage" or free-riding is on the rise

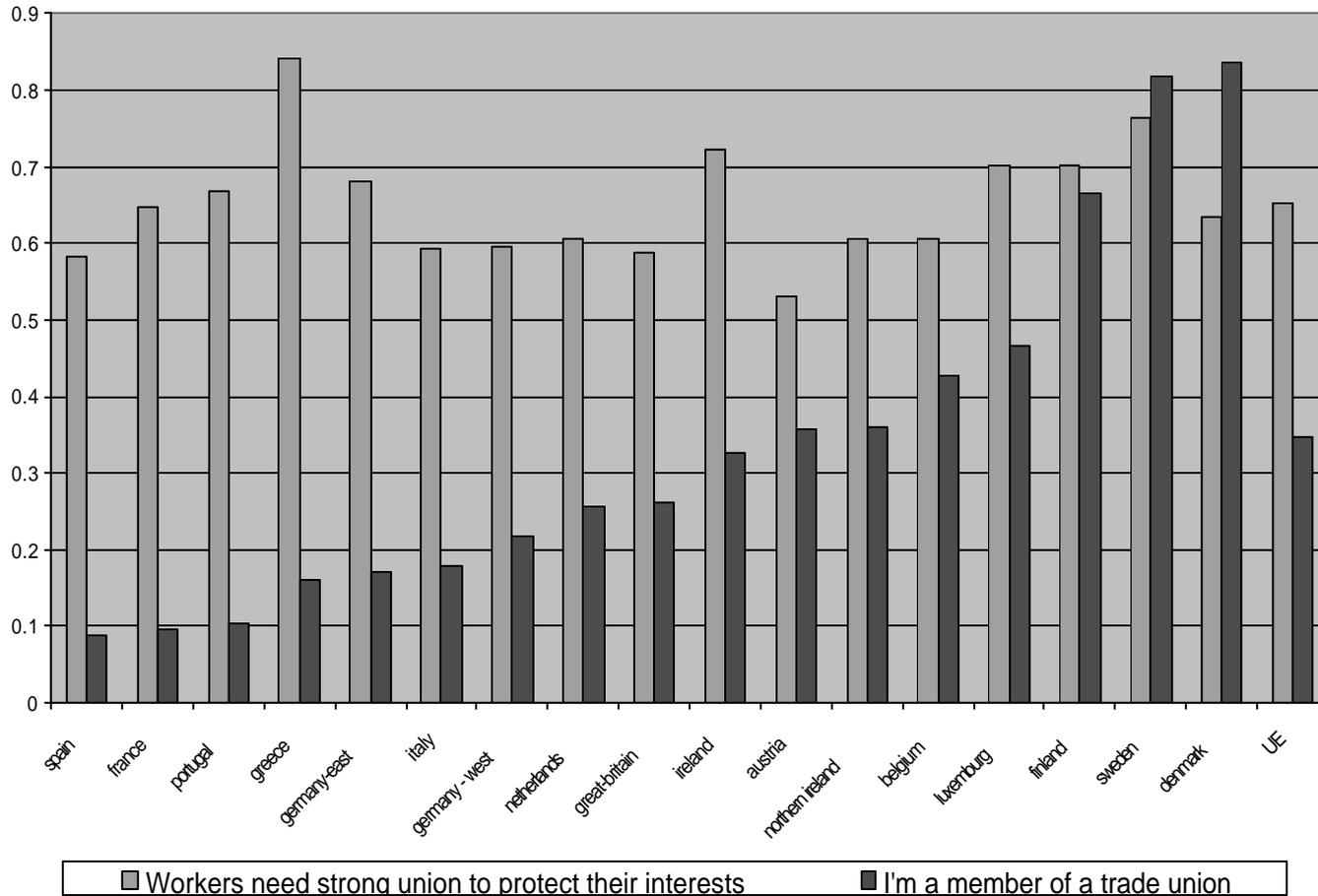
Measures of “excess coverage”

	% workers joining trade unions (1)	% workers in firm joining employer association (2)	% workers covered by collective agreements (3)	Excess coverage (3) - (1)
Austria	34	96	97	63
Belgium	44	72	82	38
Denmark	68	48	52	-16
Finland	65	58	67	2
France	10	74	75	65
Germany	25	72	80	55
Italy	36	40	81	45
Netherlands	19	79	79	60
Portugal	30	34	80	50
Spain	16	72	67	51
Sweden	77	56	72	-5
UK	19	54	35	16
Australia	35	-	80	45
Canada	36	-	35	-1
Norway	44	54	62	18
Switzerland	22	37	50	28
USA	10	-	13	

Source: Visser (1999); Boeri, Brugiavini, Calmfors (2001)

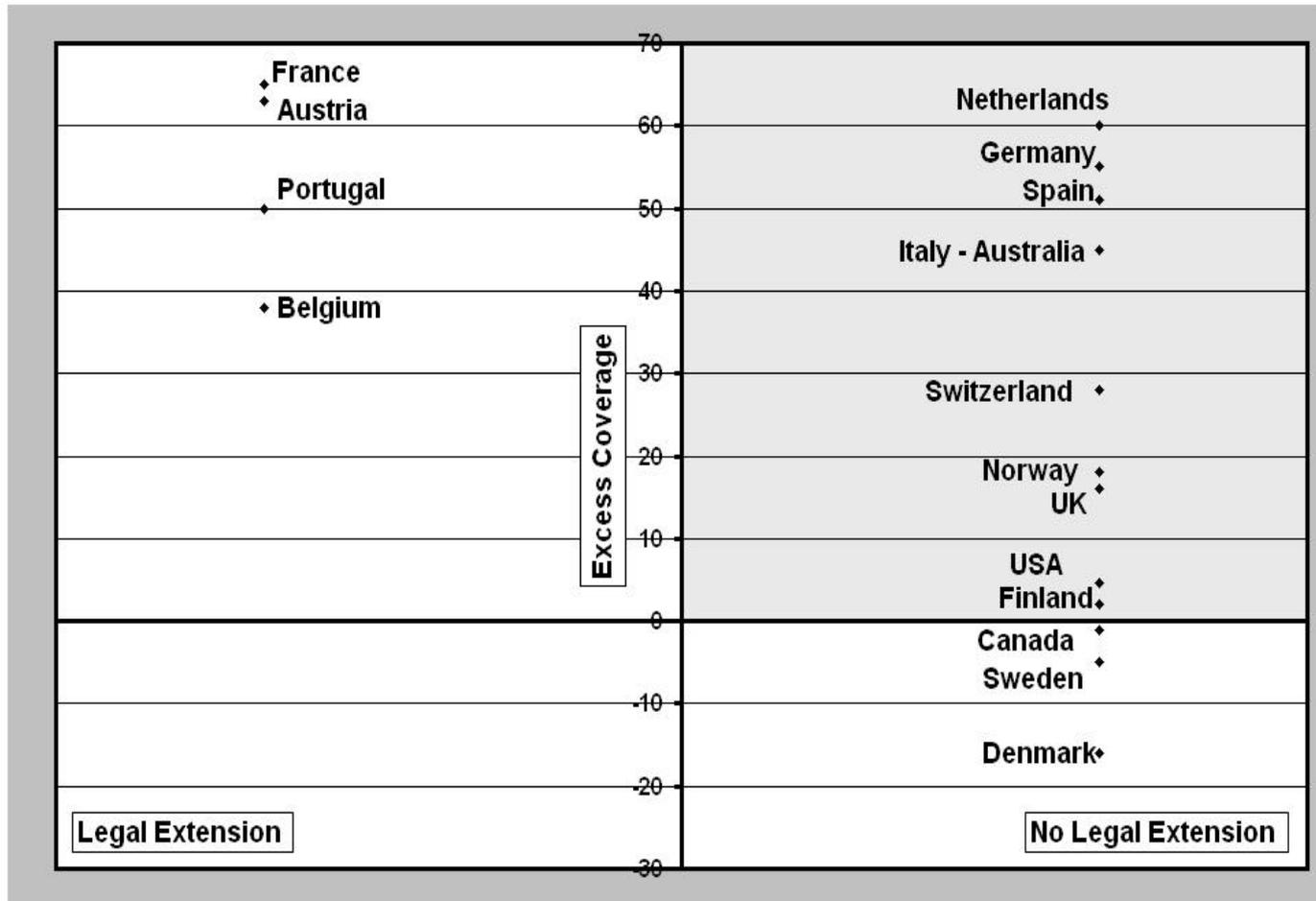
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Membership and support to unions (2001)



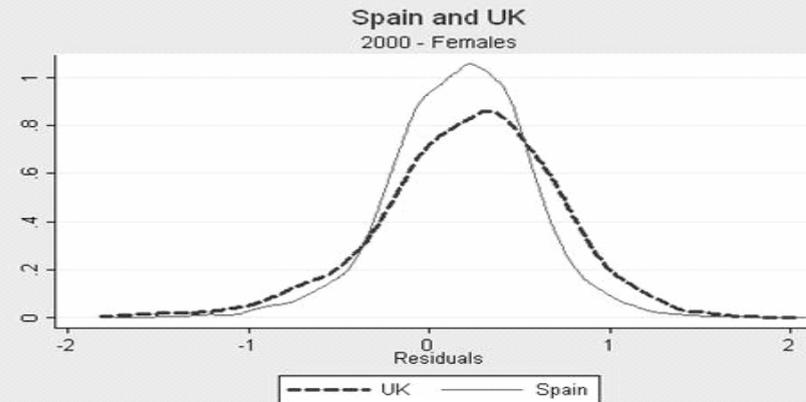
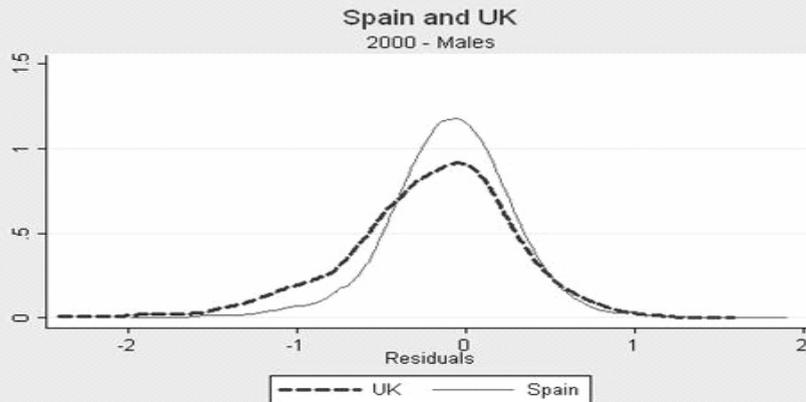
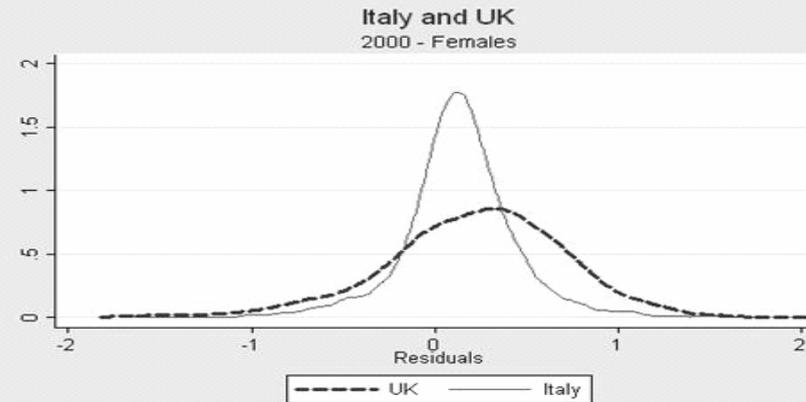
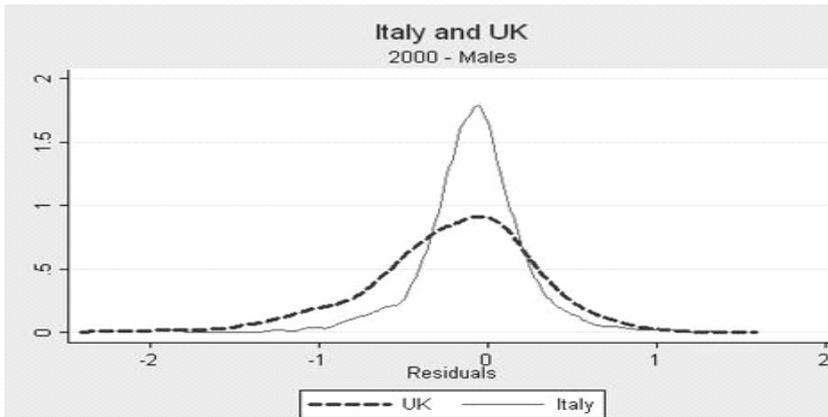
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Just free-riding?



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Is Coverage Relevant per Se?



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Summarising facts and puzzles

- Union density is falling.....yet coverage of collective bargaining is stable
- „Excess coverage" is on the rise ...and matters. Despite high unemployment in Europe, „labor market rigidities“ continue to enjoy political support ...and employers accept that unions influence spans much beyond their presence at the workplace

Endogenous preferences for rigid wages

- Rather than appealing to preferences, we ask *under which conditions* workers and firms might *prefer* wage determination rules other than Nash bargaining (we first deal with *coverage*, later with *membership*)
- Using the MP model

Adapting MP

- We add an exogenous dimension of heterogeneity to the match, namely *skill* $s \in (0, 1]$ indexing a labour sub-market.
- Derive the M-P state valuation (Bellman-like) equations for the worker (W,U) and the firm (J,V) under these conditions.
- Allow s-types to opt for either the individual bargaining or the collective-rigid bargaining regime.
- We then also include membership decisions.

Collective-Rigid Wage Regime

- Linear rigid wage policy: $w^r = \bar{w} + fs$
- Firing tax given by sT
- Hence inefficient severance results and matches are abandoned by firms whenever $J(x) < -sT$
- This condition determines reservation productivity, R^r . *Workers become unemployed involuntarily* in this segment.

Valuation equations for the Rigid Wage (RW) Regime

$$rW^r = \bar{w} + \phi s + \lambda F(R^r)(U^r - W^r)$$

$$rJ^r(x) = sx - (\bar{w} + \phi s) + \lambda \int_{R^r}^1 ((J^r(z) - J^r(x)) dF(z) + \lambda F(R^r)(V - J^r(x) - sT$$

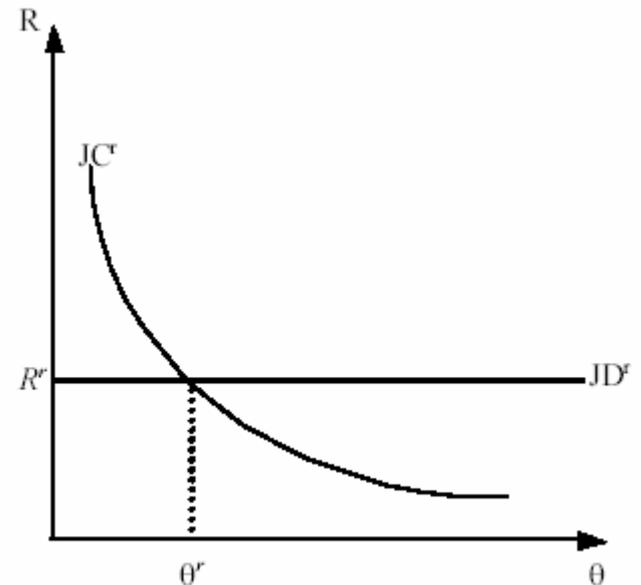
$$rU = b + \theta q(\theta) [W(1) - U]$$

$$rV = -sk + q(\theta) [J(1) - V]$$

Equilibrium in RW Regime

$$\frac{1 - R^r}{r + \lambda} - T = \frac{k}{q(\theta^r)}$$

$$sR^r + \frac{\lambda s}{r + \lambda} \int_{R^r}^1 (x - R^r) dF(x) = \bar{w} + \phi s - r s T$$



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Closed markets

- Due to the presence of costs of posting vacancies and flat-rate unemployment income, for some low-skill types a labour market may not exist in both the competitive and the rigid-wage regimes
- We show that there are more labour markets shut down in the collective-rigid regime than in the competitive regime

Closed markets (continue)...

- Notice that the lower bound in the skill distribution is greater than b when there are firing taxes or renegotiation costs
- Even if workers have a productivity greater than the value of leisure, there won't be a labor market for them.

Which Regime is Preferred?

- Worker valuation of regime depends on s
- Each worker-skill type allowed to choose its regime. Which ones opt for rigidity?
- How do *firms* value rigid wage regimes?
- Need to calibrate the model
- We use a standard calibration (uniform shock distribution, isoelastic matching), impose Hosios condition (absent EPL)

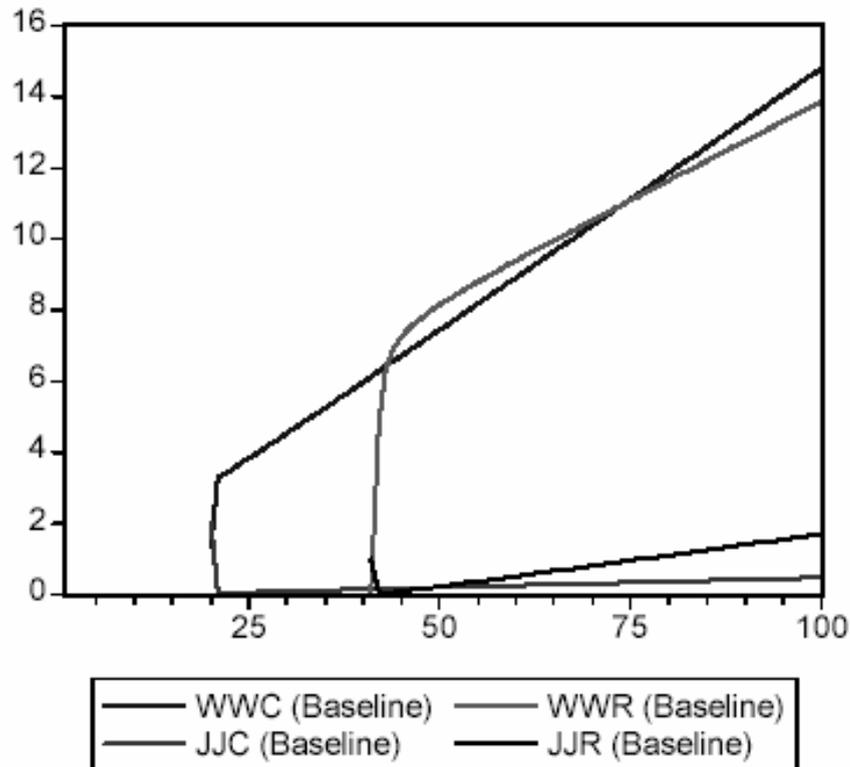
Baseline Calibration

TABLE 6. PARAMETER VALUES FOR BASELINE CALIBRATION

A (matching function effectiveness)	0.60
$\alpha = \beta$ (elasticity of $q(\theta)$ and labor bargaining power)	0.50
b (income in unemployment)	0.15
λ (frequency of the match-specific shock)	0.10
r (real interest rate per quarter)	0.05
ρ (renegotiation or match maintenance costs)	0.20
k (recruitment costs, proportional to productivity)	0.15
\bar{w} (base or minimum wage)	0.15
ϕ (pay scale parameter)	0.55
T (firing tax, proportional to productivity)	1.00

Baseline Calibration (with uniform skill distribution)

Figure 4: EQUILIBRIUM VALUATIONS IN THE TWO REGIMES, BASELINE CALIBRATION



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Baseline

*Individualized
bargaining segment*

Mean $u = 6.4$

mean duration $u = 1.2$ q

median duration $u = 1$ q

Labour markets open
for 81% of skill
classes

*Collective-rigid
bargaining segment*

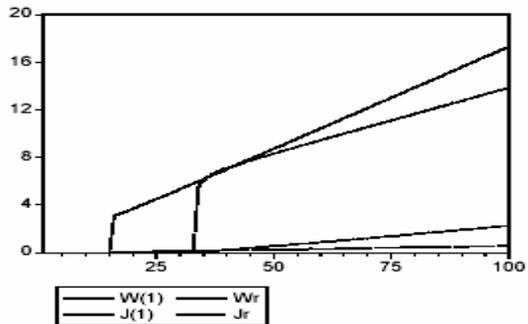
Mean $u = 6.2$

mean duration $u = 3.3$

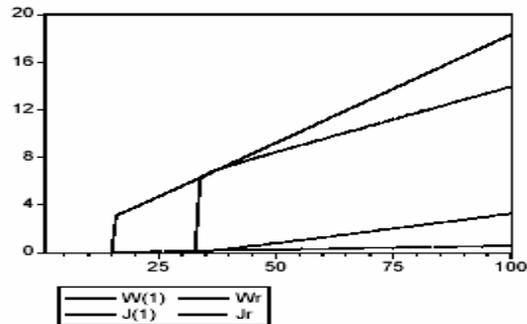
median duration $u = 0.4$

Labor markets open for
60% of s

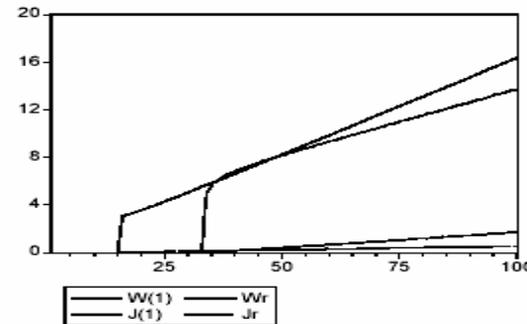
T=0.0, $\lambda=0.05$



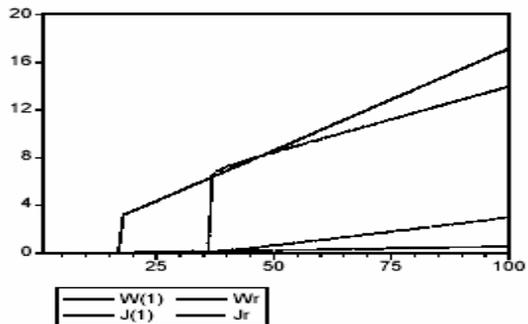
T=0.0, $\lambda=0.10$



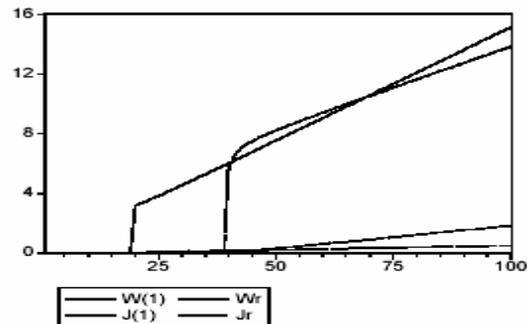
T=0.0, $\lambda=0.15$



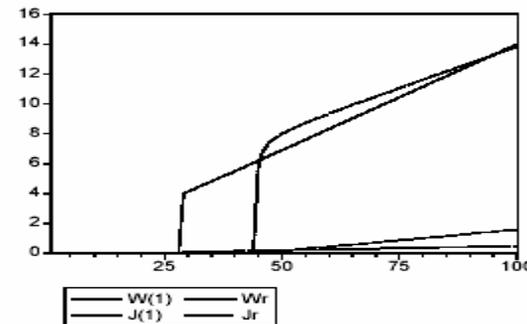
T=0.75, $\lambda=0.05$



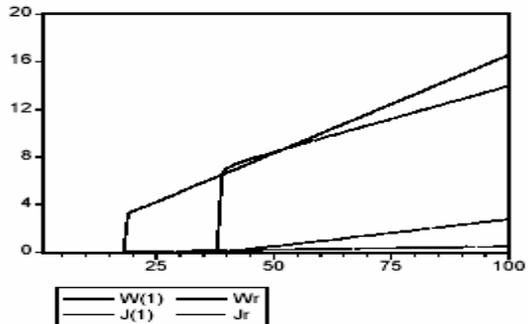
T=0.75, $\lambda=0.10$



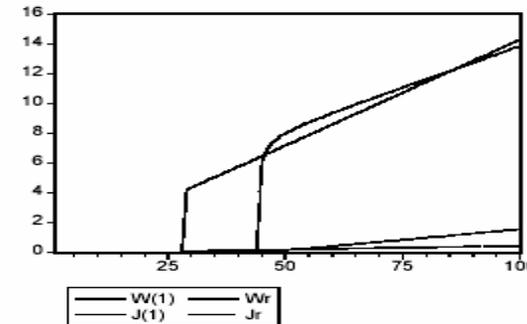
T=0.75, $\lambda=0.15$



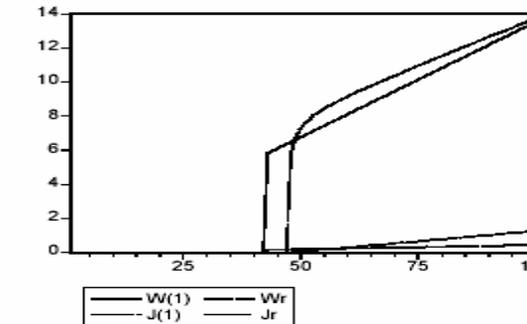
T=1.25, $\lambda=0.05$



T=1.25, $\lambda=0.10$

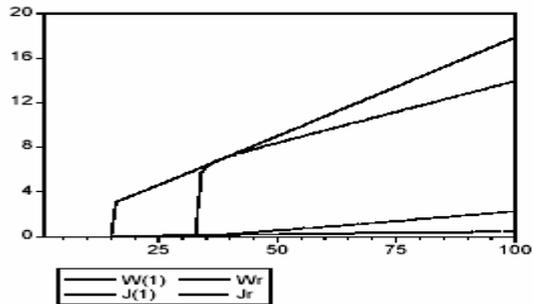


T=1.25, $\lambda=0.12^*$

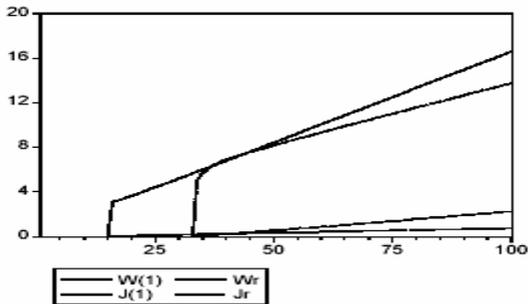


Playing MP with MP

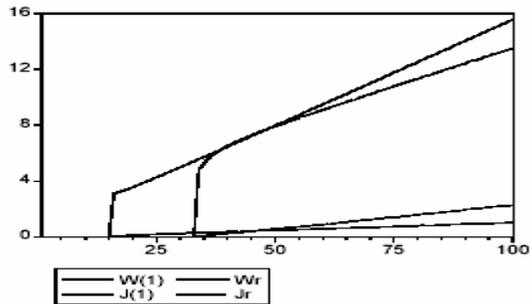
T=0.0, k=0.10



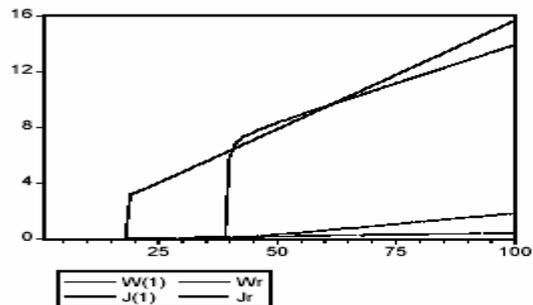
T=0.0, k=0.30



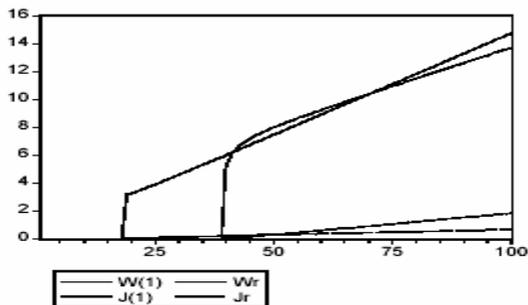
T=0.0, k=0.60



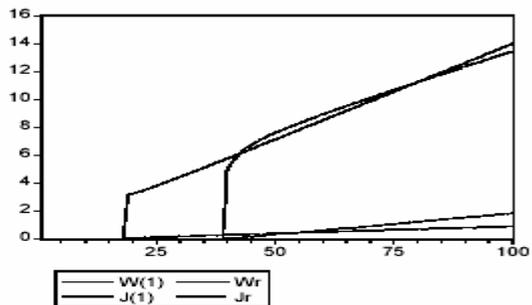
T=0.75, k=0.10



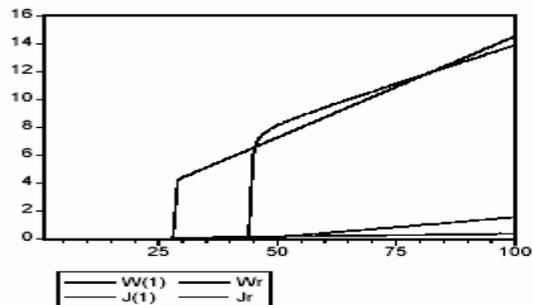
T=0.75, k=0.30



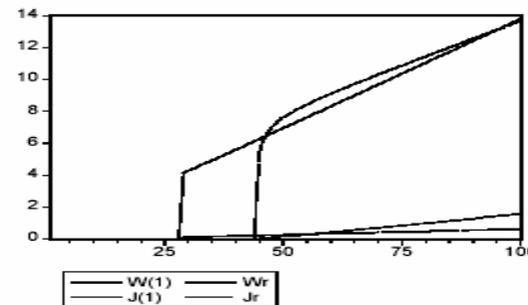
T=0.75, k=0.60



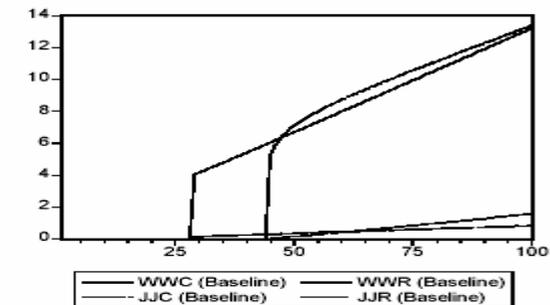
T=1.25, k=0.10



T=1.25, k=0.30



T=1.25, k=0.60



Playing MP with MP

Institutional clusters

- Coverage in the middle of the skill distribution when high turbulence and frictions (firing costs more than renegotiation costs)
- Complementarity also between setup/vacancy costs and support for rigid wages when frictions are present
- Frictions essential for institutional complementarities, clusters of rigidities

Endogenizing excess coverage

- Now each skill class decides on whether 1) to join a union 2) to adopt/accept labor market rigidities proposed by that union
- Per given union dues, d joining requires that willingness to pay exceeds dues:

$$d < r (W^*(1) - W^r) / w^r.$$

Endogenizing wage rigidities

- Membership allows to choose leaders-egalitarianism (ϕ only, so single-peakedness holds)
- Iterating on the calibrations of the model. Given some level of membership dues, will the resulting voluntary membership result in the same outcome (most preferred ϕ)? Find the level of open labor markets, employment, and worker welfare such that ϕ remains the chosen policy (fixed point)
- Median voter in the unionised segment

Skill distribution and dues

- Underlying distribution of “abilities” drawn from IALS literacy scores (1995)
- Converted in productivity equivalents (s) via estimates of Mincer-type wage equations for Canadian males natives (including tenure and education)
- Union dues: 3%. Consistent with one activist every 300 members.

Endogenizing wage rigidities :

A first attempt

- For $w = b=0.15$, $d=0.03$, $\rho=0$, $T=1$, German skill distribution (IALS):
 - 62% of markets (skill classes) are open
 - Decisive worker is skill class $s=0.58$, and $\phi^*=0.68$
 - Membership rate=36%
 - 65% of workers accept rigidities
 - Excess coverage is 30%

Conclusions

- Significant support for rigid wage regimes, if a severance tax applies in *both* regimes and much turbulence
- The model predicts support coming from firms
- Democratically determined wage policies are consistent with large excess coverage
- **MP is useful also for endogenizing rigid wages and sheds light inside the unions blackbox**

Playing MP with MP

