Unemployment, Growth and Welfare Effects of Labor Market Reforms

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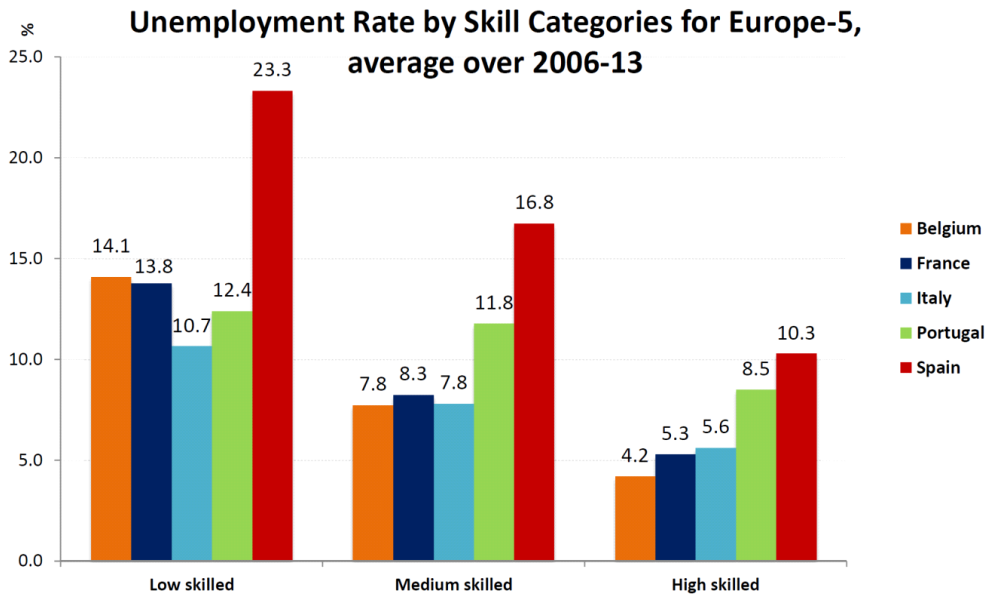
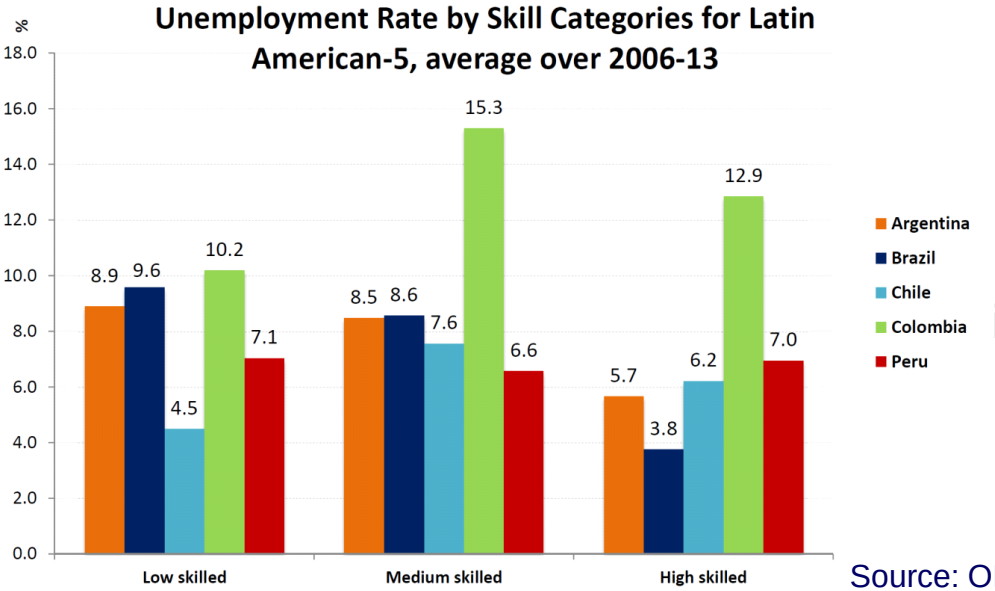
Long-term Structural Unemployment





- Global Unemployment: **204** millions in 2016; **5.6%**.
- If they formed their own country, the unemployed would be the **5th largest country** in the world.
- High rates of **long-term structural unemployment**;
- Example: Europe-5 (**52.8%** in 2015, compared to OECD-average of 33.8%).

Source: OECD; ILO

Addressing Shortcomings in LMR Literature

Large LMRs literature: *Efficiency wages*, *U.Benefits*, *Min wages*, *C.Bargaining*, *Search* [van Schaik & de Groot (2000), Meckl (2004), Zagler (2009; 2011), Bhattacharyya & Gupta (2015), Cacciatore & Fiori (2016), Chang & Hung (2016)]

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Shortcomings that we attempt to address:

1. Key Issue: Simultaneous LMRs - In Practice, LMRs often implemented in Packages. Ignoring *Policy Externalities*: a potential source of bias.
2. *Welfare effects* and trade-offs with growth;
3. *Transitional dynamics* (hence, dynamic trade-offs of LMRs) often neglected due to limited attention to supply side of workforce composition;

Model Overview

Issues addressed in the following settings:

- Innovation driven OLG growth model, with heterogeneous labor force (**untrained & specialized**), LM rigidities-generated structural unemployment in equilibrium;
- 2-period individuals with different innate abilities; In old age, time is allocated to leisure;
- 4 production sectors: **manufacturing** (homogeneous final good); **intermediate goods** (IGs); **innovation** (designs for producing IGs); **education** (allows skills acquisition);
- Impact of LMRs is assessed not only in terms of unemployment, growth, and welfare, but also **misallocation of talent.**

Individuals

Utility function

$$V_t^{h,j} = \eta_C \ln c_{t|t}^{h,j} + \frac{\ln c_{t|t+1}^{h,j}}{1+\rho}, \quad h = U, SY, SR, \quad j = E, L$$

Budget constraints

$$c_{t|t}^{U,j} + s_t^{Uj} = \begin{cases} (1-\tau) w_t^U & \text{if } j = Y \\ b_t^U & \text{if } j = L \end{cases},$$

$$c_{t|t}^{h,j} + s_t^h = \begin{cases} (1-\varepsilon)(1-\tau)(w_t^h - tc_t) & \text{if } j = E, \ h = SY, SR \\ (1-\varepsilon)(b_t^S - tc_t) & \text{if } j = L \end{cases}$$

$$c_{t|t+1}^{h,j} = (1 + r_{t+1}) s_t^h, \quad h = U, SY, SR, \quad j = E, L$$

Skills Acquisition - depends on Expected S-U wage

Threshold level of ability, a_t^C, above which individuals choose to undergo training depends on

$$(1-\zeta_t^{UL})w_t^U + \zeta_t^{UL} b_t^U \ ,$$

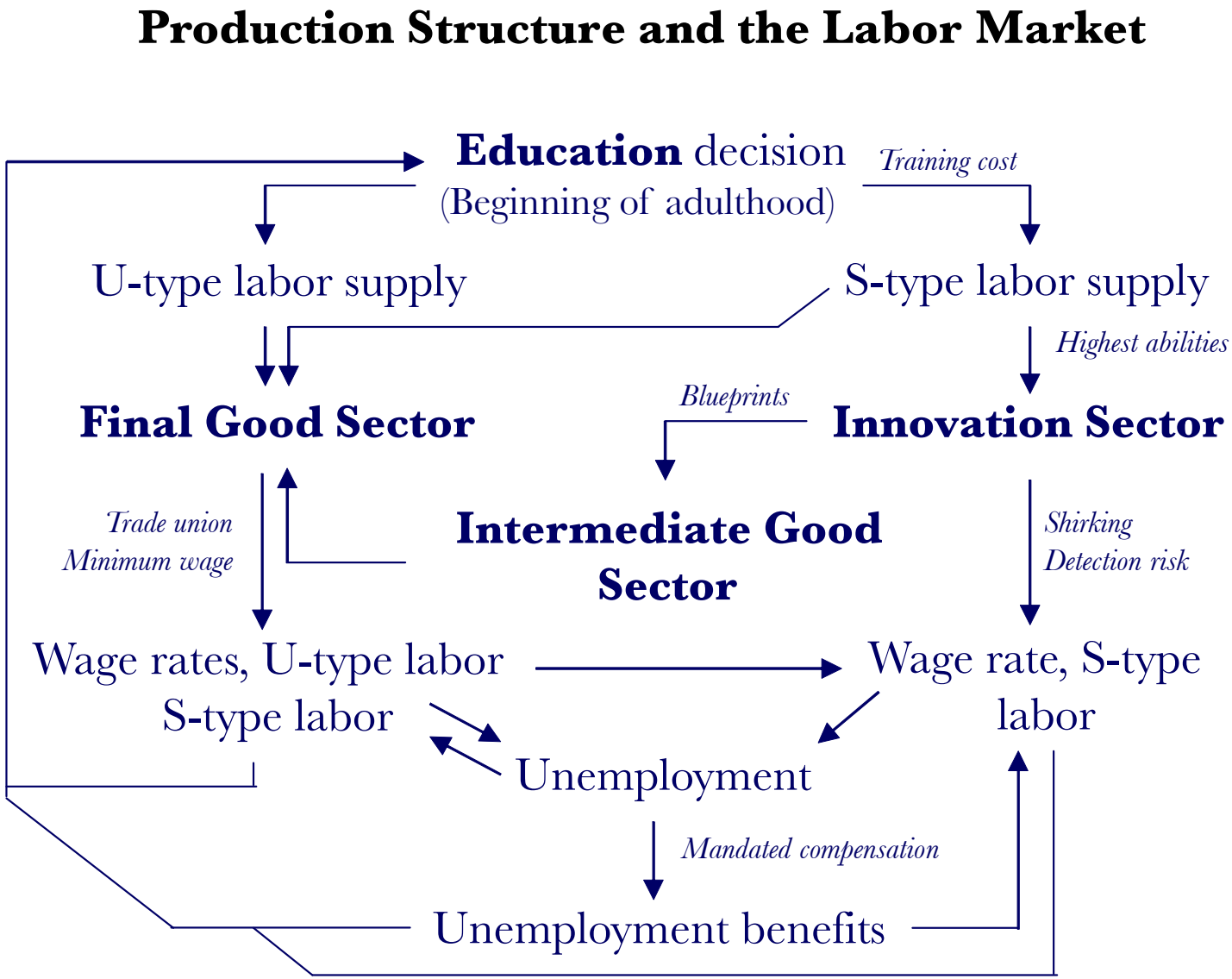
$$(1-\varepsilon)(\zeta_t^{SY} w_t^{SY} + \zeta_t^{SR} w_t^{SR} + \zeta_t^{SL} b_t^S) - tc_t,$$

where ζ_t^j, $j = SY, SR, SL, UL$ are respective probabilities.

Training cost proportional to expected S-wage & inversely related to ability.

Key channel through which unemployment/public policy affect supply side of labor market.

Overview of Production Sectors



LMR Feature 1 (T.Union and Minimum Wage)

- FG: Wages set through a *right-to-manage* bargaining process between a centralized trade union & firms.
- Union maximizes, for $h = U, SY$:

$$\mathfrak{V}_t^h = (w_t^h - w_t^{hT})^{\xi^h} (N_t^h)^{1-\xi^h},$$

subject to labor demand functions. Solution:

$$w_t^h = (\frac{1-\xi^h}{1-2\xi^h}) w_t^{hT},$$

where $w_t^{UT} = w_t^{UM} (\theta_t^{UL})^{-\varkappa^U}$, $w_t^{UM} = w_0^U (\frac{Y_t}{\bar{N}})$.

- Similar specification SY-workers.
- In a growth setting: minimum wage, target wages, and benefit rates must rise at same rate as (average) income.

LMR Feature 2 (U.Insurance, Endogenous Payroll Taxes)

- Gov. operates u.insurance fund (financed by payroll contribution of firms), in addition to general budget.

$$(b_t^U\theta_t^{UL}+b_t^S\theta_t^{SL})\bar{N}=\varsigma_t\{w_t^U\theta_t^{UY}+(1-\varepsilon)(w_t^{SY}\theta_t^{SY}+w_t^{SR}\theta_t^{SR})\}\bar{N},$$

which implies

$$\varsigma_t=\frac{b_t^U\theta_t^{UL}+b_t^S\theta_t^{SL}}{w_t^U\theta_t^{UY}+(1-\varepsilon)(w_t^{SY}\theta_t^{SY}+w_t^{SR}\theta_t^{SR})}.$$

- **Implication**:higher unemployment may raise the payroll tax if wages do not fall enough; may further depress unemployment.
- To ensure nondegenerate solution, UI set as a linear function of level of per capita income: $b_t^h=\kappa^h\frac{Y_t}{\bar{N}}$, $h=U,S$.

LMR Feature 3 (Innovation - Efficiency wage framework)

- Sub-utility function:

$$U^R(w_t^{SR}, 1 - e_t^R) = \ln[(w_t^{SR})^{\delta_R}(1 - e_t^R)^{1-\delta_R}]$$

- In equilibrium, we can derive:

$$e_t^R = 1-(1-e_m^R)(\frac{\zeta_t^{SY} w_t^{SY} + \zeta_t^{SL} b_t^S}{w_t^{SR}})^{\psi}, \text{ with } \psi = \pi\delta_R/(1-\delta_R),$$

and, wage in innovation:

$$w_t^{SR} = \kappa^R(\zeta_t^{SY} w_t^{SY} + \zeta_t^{SL} b_t^S),$$

with $\kappa^R > 1$ a function of π, a choice variable at the level of firms. π 1-to-1 to monitoring intensity (Shapiro-Stiglitz, 1984), which in turn varies inversely with unit monitoring cost (exogenous) (van Schaik & de Groot (2000)).

- *Solow condition* satisfied.

Labor Supply

- Supply functions:

$$N_t^U = \bar{N} \int_0^{a_t^C} f(a)da = a_t^C \bar{N}, \quad \text{and} \quad N_t^S = \frac{1-(a_t^C)^2}{2}\bar{N}.$$

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- Supply of S-workers in innovation ($a^R > a^C$)

$$N_t^R = \frac{(1-a^R)(a^R+1)}{2}\bar{N} = \frac{1-(a^R)^2}{2}\bar{N}.$$

- Supply of S-labor to manufacturing: $N^S - N^{SR}$ where $N^{SR} \leq N^R$ is actual employment in innovation.

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- Index of talent misallocation:

$$\max[0, (N_t^R - N_t^{SR})/N_t^{SY}].$$

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- Equilibrium:

$$N_t^S = N_t^{SY} + N_t^{SR} + N_t^{SL}, \quad \text{and} \quad N_t^U = N_t^{UL} + N_t^{UY}.$$

Social Welfare Function

$$\mathcal{W}_t = 0.2 \sum_{h=0}^{\infty} \Lambda^h (V_{t+s}^{U,E} + V_{t+h}^{U,L} + V_{t+h}^{SY,E} + V_{t+h}^{SR,E} + V_{t+h}^{S,L}),$$

with Λ: social discount rate.

- Equal weight to each group; accounts for welfare of all current and future generations;
- Approximation along the BGE (see paper).
- Alternative: varying weights; but rather arbitrary in such a model without explicit modelling of insider-outsider.

Parameterization and Policy Experiments

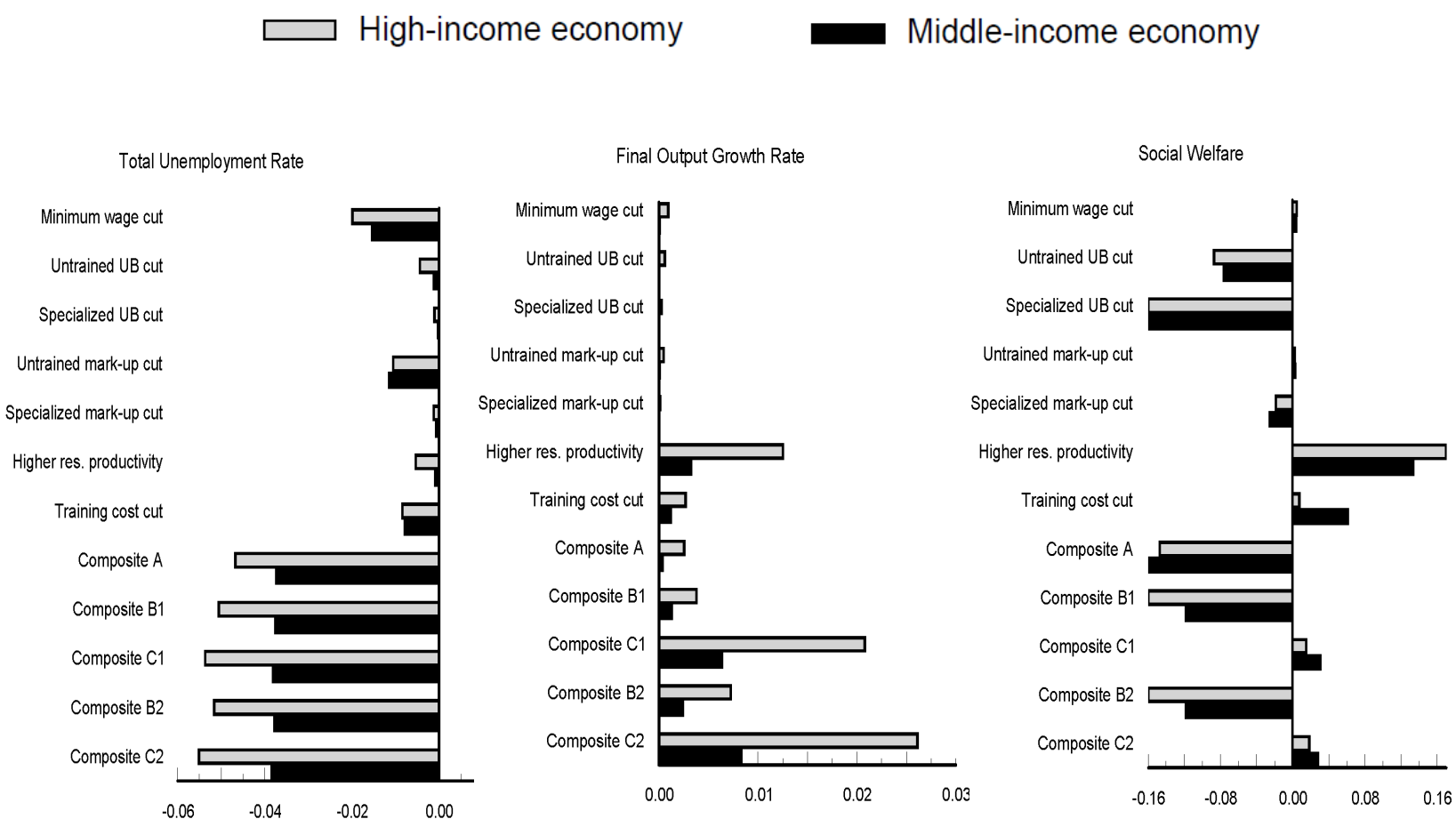
- Parameterize 2 sets & compare systematically between a **HIC benchmark** (Europe-5) and **MIC benchmark** (Latin America-5).
- Partial analysis of individual **LMR Policies** (min wage, UB rates, cut in union wage mark-ups, training cost cut).
- Examining for *policy externalities* - **Sum of Parts vs LT effect of Composite Reform Programmes**.

Main Results 1

- **Key Results**: LMRs entail a **two-way causality** between growth and unemployment: *dynamic trade-offs* between growth, unemployment, & welfare.
- Individual reforms may generate **conflicting effects** on growth and welfare.
- Reaffirms literature that growth & unemployment has **weak** relationship. . .
- . . . but policies promoting growth via direct skills expansion tend to result in **absorption problem/oversupply** of qualified labour (specialized unemployment rate going up).

Steady-state Growth and Welfare Effects in a Snapshot

Individual and Composite Experiments: Steady-State Effects



Main Results 2

- Popular recommendations/implementation of simultaneous ambitious LM composite reforms can be costly due to **inadequate Policy Externalities**.

- In MICs, where efficiency level is lower in both public & private sectors, *public investment* in infrastructure, through its supply-side effects, may help: (i) **mitigate the growth-welfare tradeoff**, and (ii) **relieve the absorption problem of specialized labor**.

Thank You

Appendix

Key differences between MIC and HIC

- Higher efficiency and lower cost of training in HIC.
- Lower degree of substitution between intermediate goods in MIC.
- Higher elasticities of output and innovation activity with respect to public capital in MIC.
- Higher share of S-workers in innovation in HIC.
- Higher efficiency and lower cost of training in HIC.
- Lower degree of substitution between intermediate goods in MIC.

Key differences between MIC and HIC

- Higher elasticities of output and innovation activity w.r.t public capital in MIC.
- Higher share of S-workers in innovation in HIC.
- Higher open unemployment rate for U-workers (S-workers) in HIC (MIC).
- Higher payroll tax rate in HIC.
- Higher degree of talent misallocation in MIC.
- Note: other important structural differences are **quality of governance** and share of **spending on R&D** in output.

Benchmark Parameters

Calibrated Parameter Values: Benchmark Case

Parameter	Description	High Income	Middle Income
Households			
ρ	Intergenerational discount rate	0.375	0.375
σ	Household savings rate	0.109	0.138
χ	Productivity parameter (efficiency of training)	0.9	0.5
μ	Advanced education cost	0.08	0.12
ε	Time allocated to schooling activity	0.115	0.123
Final goods			
ω	Elasticity wrt public-private capital ratio	0.17	0.24
β^S	Elasticity wrt specialized workers	0.3	0.35
β^U	Elasticity wrt untrained workers	0.3	0.2
α	Elasticity wrt private capital	0.3	0.35
γ	Elasticity wrt intermediate input	0.1	0.1
Intermediate goods			
η	Substitution parameter, intermediate goods	0.61	0.25

Benchmark Parameters

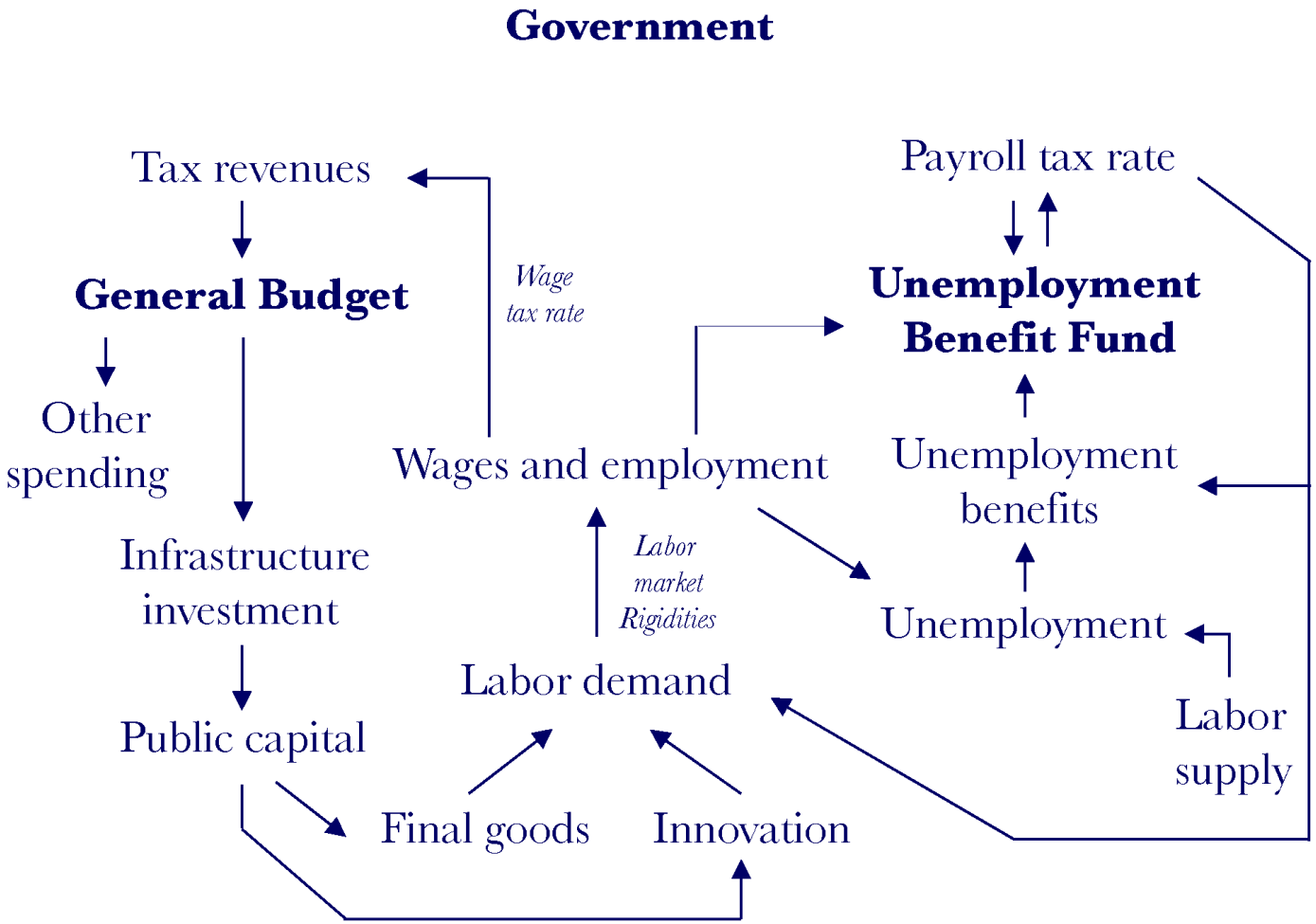
Innovation sector			
ϕ_1^R	Elasticity wrt public infrastructure	0.186	0.300
π	Probability of being caught shirking	0.078	0.048
δ_R	Elasticity wrt wage for innovation	0.9	0.9
λ	Elasticity of production wrt labor input	0.6	0.6
ψ	Elasticity of effort wrt relative wages	0.70	0.43
Government			
τ	Tax rate on total wages	0.198	0.123
υ_I	Share of spending on infrastructure	0.050	0.069
φ	Efficiency parameter, public investment	0.5	0.4
Labor market			
κ^S	Specialized labor, unemp. benefit indexation	0.4	0.4
κ^U	Untrained labor, unemp. benefit indexation	0.4	0.4
ξ^U	Relative weight, untrained workers	0.06	0.08
ξ^{SY}	Relative weight, specialized workers	0.06	0.08
w_0^U	Minimum wage indexation, untrained workers	0.522	0.546
w_0^{SY}	Minimum wage indexation, specialized workers	0.740	0.699
$\varkappa^U$	Elasticity wrt unemployment, untrained wage	0.12	0.12
$\varkappa^S$	Elasticity wrt unemployment, specialized wage	0.12	0.12

Initial Steady State Values

Initial Steady-State Values of Key Variables

Variable	Description	High Income	Middle Income
θ^U	Share of untrained workers in population	0.732	0.795
θ^S	Share of effective specialized workers in population	0.232	0.184
θ^{SR}	Share of effective specialized workers in innovation sector	0.019	0.004
θ^{SY}	Share of effective specialized workers in final good sector	0.145	0.109
θ^{UY}	Share of untrained workers in final good sector	0.606	0.708
θ^{UL}	Untrained unemployment rate	0.126	0.087
θ^{SL}	Specialized unemployment rate	0.068	0.071
$(\theta^R - \theta^{SR})/\theta^{SY}$	Index of misallocation of talent	0.189	0.392
ζ^{SL}	Probability of specialized workers getting unemployed	0.293	0.385
ζ^{SY}	Prob. of specialized workers employed in final good sector	0.623	0.593
ζ^{SR}	Prob. of specialized workers employed in innovation sector	0.084	0.022
ζ^{UL}	Prob. of untrained workers getting unemployed	0.172	0.110
ζ^{UY}	Prob. of untrained workers getting employed	0.828	0.890
ς	Firms' payroll contribution rate	0.126	0.052
$w^U/w^S_{weighted}$	Relative wage ratio	0.550	0.750
k^G	Public-private capital ratio	0.189	0.147
Y/K^P	Final output-private capital ratio	0.286	0.429
m	Stock of innovation-private capital ratio	0.100	0.100

Government


Government
Tax revenues
General Budget
Other spending
Infrastructure investment
Public capital
Wage tax rate
Wages and employment
Labor market Rigidities
Labor demand
Final goods
Innovation
Payroll tax rate
Unemployment Benefit Fund
Unemployment benefits
Unemployment
Labor supply