Macroeconomic Implications of Early Retirement in the Public Sector

The Case of Brazil

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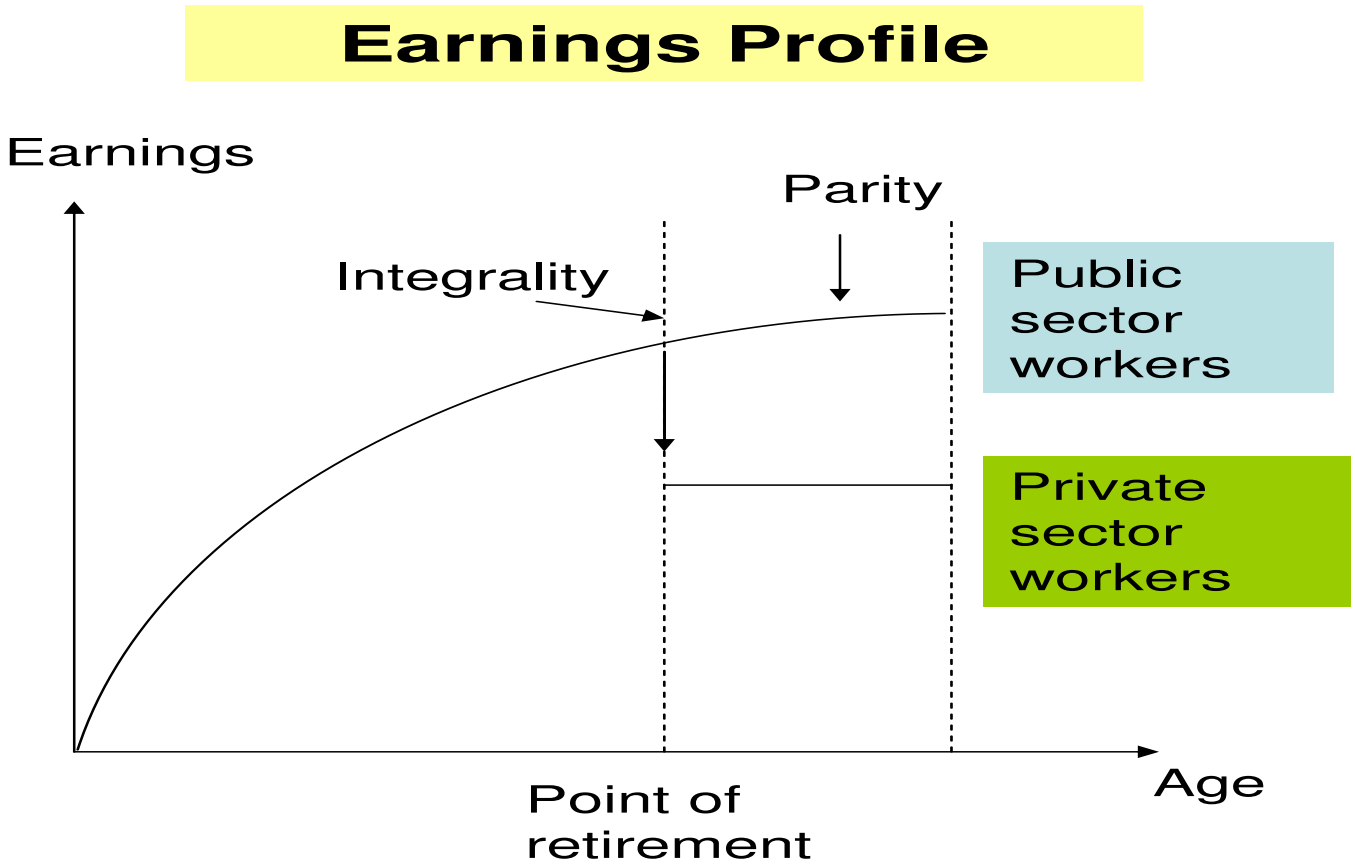
Generosity of Public Pensions for Public Servants

- " Integrality" and Parity".



Early Retirement in the Public Sector

- 64% of civil servants retire before age 55.

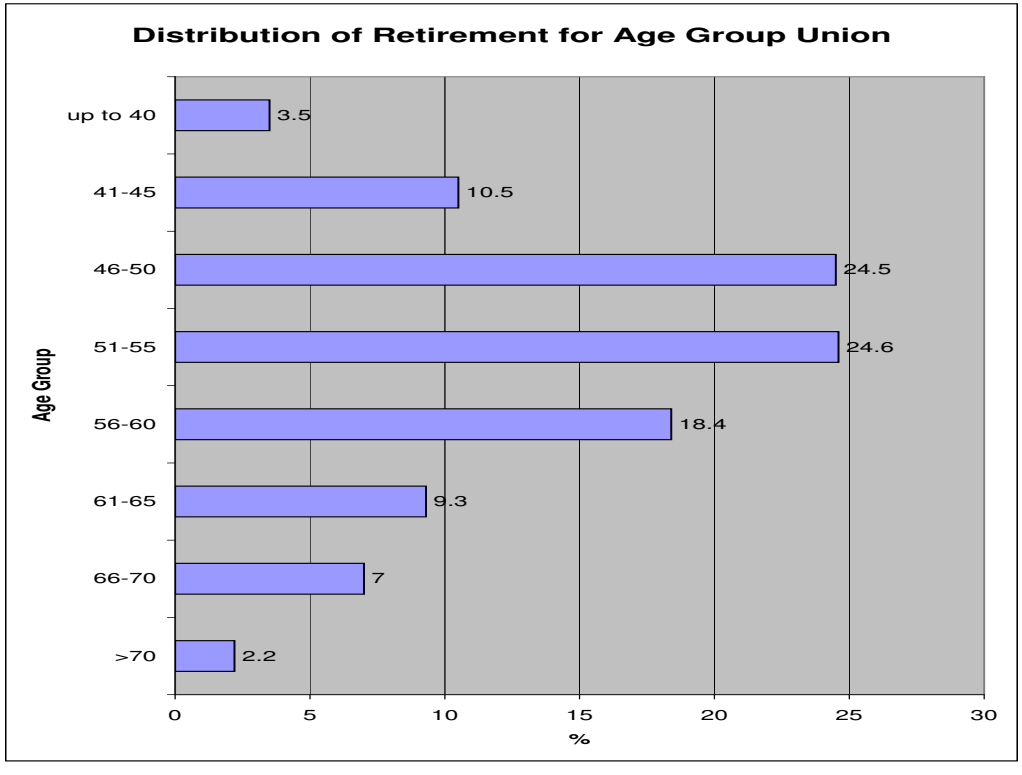


Table: Source: Ministry of the Budget and Administration 2002

Sustainability?

- Public sector retirees account for 5% of all retirees in Brazil, but receive 45% of all retirement payments.
- Souza et al. (2004) report that the deficit of the pension system is around 4.5% of GDP, 3.5% is caused by the public sector, the remaining 1% comes from the private sector.
- Sustainability?
- Lula Reform 2003.

Questions and Main Findings

Questions:

- How does pension policy affect individual retirement decisions in the public sector?
- Quantify the effects of decreasing the generosity of public sector pensions.

Main findings:

- Decreasing generosity, increases retirement age from 55 to 65 could raise long-run income by over 2 %.
- Welfare gains.
- Transitions are smooth and monotone.

Next Steps

The Model

- 12-period OLG model, 5 years per period.
- Born at age of 20, face lifetime uncertainty, and die for sure at age of 80.
- Private sector workers: work 9 periods until 65 and retire.
- Public sector workers: decide when to retire: 50, 55, 60 or 65 (depending on generosity of public pensions).
- Public sector retirees can work in the private sector.
- Population growth.
- Accidental bequests are redistributed to newborn generation.

Preferences and Technology

- Preferences:

$$V = \sum_{j=1}^{12} \beta^{j-1} \left(\prod_{i=1}^{j} \pi_i \right) \left[\frac{(c_{j,t+j-1})^{1-\sigma}}{1-\sigma} \right] + \sum_{k=J_1-J_e}^{J_1} \beta^{k-1} \left(\prod_{i=1}^{k} \pi_i \right) \theta L_{k,t+k-1}$$

- Technology:

$$Y_t = A G_t^{\alpha_1} K_t^{\alpha_2} \left(H_t^p \right)^{\alpha_3},$$

- Public goods production:

$$G_t = Y_t^G = Z \left[\left(K_t^G \right)^{\eta} + \chi \left(H_t^g \right)^{\eta} \right]^{1/\eta}$$

- Law of motion for public capital:

$$K_{t+1}^{G} = (1 - \delta_{KG}) K_t^G + I_t^G.$$

- Human capital production:

$$h_{j,t}^{\kappa} = e^{\beta_0^{\kappa} + \beta_1^{\kappa} j + \beta_2^{\kappa} j^2}, \ \kappa = \{p, g\},$$

where $\beta_0^{\kappa}, \beta_2^{\kappa} < 0$ and $\beta_1^{\kappa} > 0$.

- Share of public sector workers: $n^g = \frac{N^g}{\sum_{i=1}^{J_1 - Je} \mu_i}$
- Private sector human capital: $H_t^p = n^p \sum_{j=1}^{J_1} \mu_j h_{j,t}^p$
- Public sector human capital: $H_t^g = n^g \sum_{j=1}^{J_1} \mu_j h_{j,t}^p$

- Government Budget Constraint

$$\Delta_{C_{G,t}} Y_t + \Delta_{G,t} Y_t + \overbrace{n^g \sum_{j=1}^{J_1-J_e} w_t^g h_{j,t}^g \mu_j}^{\text{public wages}} + \overbrace{n^p \sum_{j=J_1+1}^{12} (1-\tau_{R,t}) \Psi^p w_t^p h_{J_1}^p \mu_j}^{\text{private pensions}}$$

$$+ n^g (1-\tau_{R,t}) \left[\overbrace{\sum_{j=J_1-J_e+1}^{J_1} \Psi_1^g w_t^g h_{J_1-J_e}^g \mu_j}^{\text{public pension early retirement}} + \overbrace{\sum_{j=J_1+1}^{12} \Psi_2^g w_t^g h_{J_1-J_e}^g \mu_j}^{\text{public pension standard retirement}} \right]$$

$$= \tau_{L,t}^g n^g \sum_{j=1}^{J_1-J_e} w_t^g h_{j,t}^g \mu_j + \tau_{L,t}^p n^p \sum_{j=1}^{J_1} w_t^p h_{j,t}^p \mu_j + \tau_{B,t} \sum_{j=1}^{J} s_{j,t} v_j + \tau_{K,t} q_t K_t$$

$$+ \underbrace{\tau_{L,t}^g n^g \sum_{j=J_1-J_e+1}^{J_1} w_t^p h_{j,t}^p \mu_j}_{\text{retirees working in private sector}}$$

Firm and Private Household Problems

- Firm: $\max_{\left(H_t^p, K_t\right)} F\left(G_t, K_t, H_t^p\right) - w_t^p H_t^p - q_t^k K_t$
- Private household:

$$\max_{\left\{c_{1,t+j-1}^p\right\}} V(c_{j,t+j-1}^p) = \sum_{j=1}^{12} \beta^{j-1} \left(\prod_{i=1}^{j} \pi_i\right) \frac{\left(c_{j,t+j-1}^p\right)^{1-\sigma}}{1-\sigma} \; s.t.$$

$$\sum_{j=1}^{12} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) c_{j,t+j-1}^p = \underbrace{\left[\begin{array}{c} \left(1-\tau_{B,t}\right) T_{B,1} \\ + \sum_{j=1}^{J_1} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) \left(1-\tau_{L,t+j-1}^p\right) w_{t+j-1}^p h_t^p \\ + \sum_{j=J_1+1}^{12} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) \left(1-\tau_{R,t+j-1}\right) \Psi^p w_{t+j-1}^p h_{J_1}^p \end{array}\right]}_{\mathcal{I}_t^p}$$

Public Household Problem

$$max_{\left\{c^g_{1,t+j-1}, J_e\right\}} \sum_{j=1}^{12} \beta^{j-1} \left(\prod_{i=1}^{j} \pi_i\right) \left[\frac{\left(c^g_{j,t+j-1}\right)^{1-\sigma}}{1-\sigma}\right] + \sum_{k=J_1-J_e}^{J_1} \beta^{k-1} \left(\prod_{i=1}^{k} \pi_i\right) \theta L_{k,t+k-1}$$

s.t.

$$\sum_{j=1}^{12} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) c^g_{j,t+j-1} = \underbrace{\left[\begin{array}{c} \left(1-\tau_{B,t}\right) T_{B,1} \\ + \sum_{j=1}^{J_1-J_e} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) \left(1-\tau^p_{L,t+j-1}\right) w^g_{t+j-1} h^g_j \\ + \sum_{j=J_1-J_e+1}^{J_1} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) \left(1-\tau_{R,t+j-1}\right) \Psi^g_1 w^g_{t+j-1} h^g_{J_1-J_e} \\ + \sum_{j=J_1+1}^{12} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) \left(1-\tau_{R,t+j-1}\right) \Psi^g_2 w^g_{t+j-1} h^g_{J_1-J_e} \\ + \sum_{j=J_1-J_e+1}^{J_1} \left(\prod_{k=1}^{j} \frac{1}{R_{t+k-1}}\right) \left(1-L^g_{j,t}\right) \left(1-\tau^g_{L,t}\right) w^p_t h^p_j \end{array}\right]}_{\mathcal{I}^g_t}$$

Deep Parameters

	Parameters	
Preferences		
	discount factor	$\beta = 0.995^5 = 0.9752$
	leisure	$\theta = 0.01$
	fraction of leisure	$L = 0.6$
Technology		
	Consumption Good:	$A = 18.38$
		$\alpha_1 = 0.1$
		$\alpha_2 = 0.4$
		$\alpha_3 = 0.6$
		$\delta = 1 - .94^5 = 0.2661$
	Public Good:	$Z = 1$
		$\chi = 1$
	public capital and labor are substitutes:	$\eta = 0.5$
		$\delta_{KG} = 1 - 0.96^5 = 0.1846$
	Human Capital:	$\beta_0 = -0.2314$
		$\beta_1 = 0.0529$
		$\beta_2 = -0.00093$

Income-Age Profiles

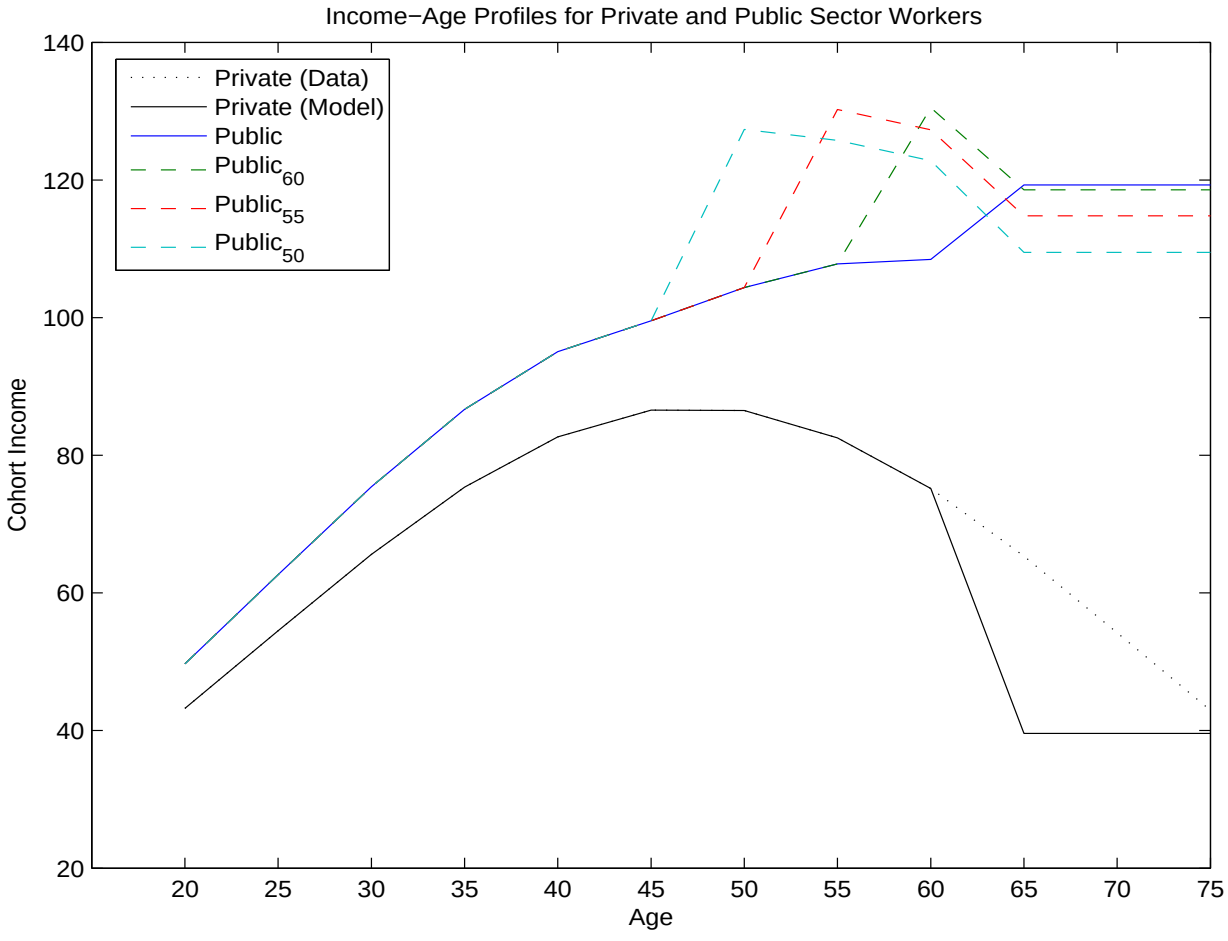


Table: Income-age profiles of private and public sector workers when public sector early retirees are working 40% of their time in the private sector. Source for dashed line: Ferreira (2005)

Government Policy Parameters

	Variables for Benchmark Case $J^e = 2$	
Policies:		
Δ_G	Investment in public good (in % of private sector output)	2.5%
Δ_{Cg}	Government consumption (in % of private sector output)	20%
Ψ^p	indexation parameter (generosity of private pensions)	0.5
ξ	public wages as a fraction of private wages	1.15
Ψ_2^g	indexation parameter (generosity of public pensions)	1.10
Ψ_1^g	generosity of early public retirement (benchmark)	.94
Expenditures:		
$n^g \sum_{j=1}^{J_1-J_e} w_t^g h_{j,t} N_j$	wage bill public sector workers (in % of output)	5.1%
$\frac{T_1^g + T_2^g}{Y}$	public pensions (in % of private sector output)	2.9%
$\frac{T^p}{Y}$	private pensions (in % of private sector output)	6.3%
Taxes:		
τ_L	labor tax rate	40%
τ_K	capital tax rate	16.3%
Population:		
n	population growth rate	1.5%
n^g	fraction of civil servants	7%
n^p	fraction of private sector employees	93%

Welfare Maximizing Early Retirement Period

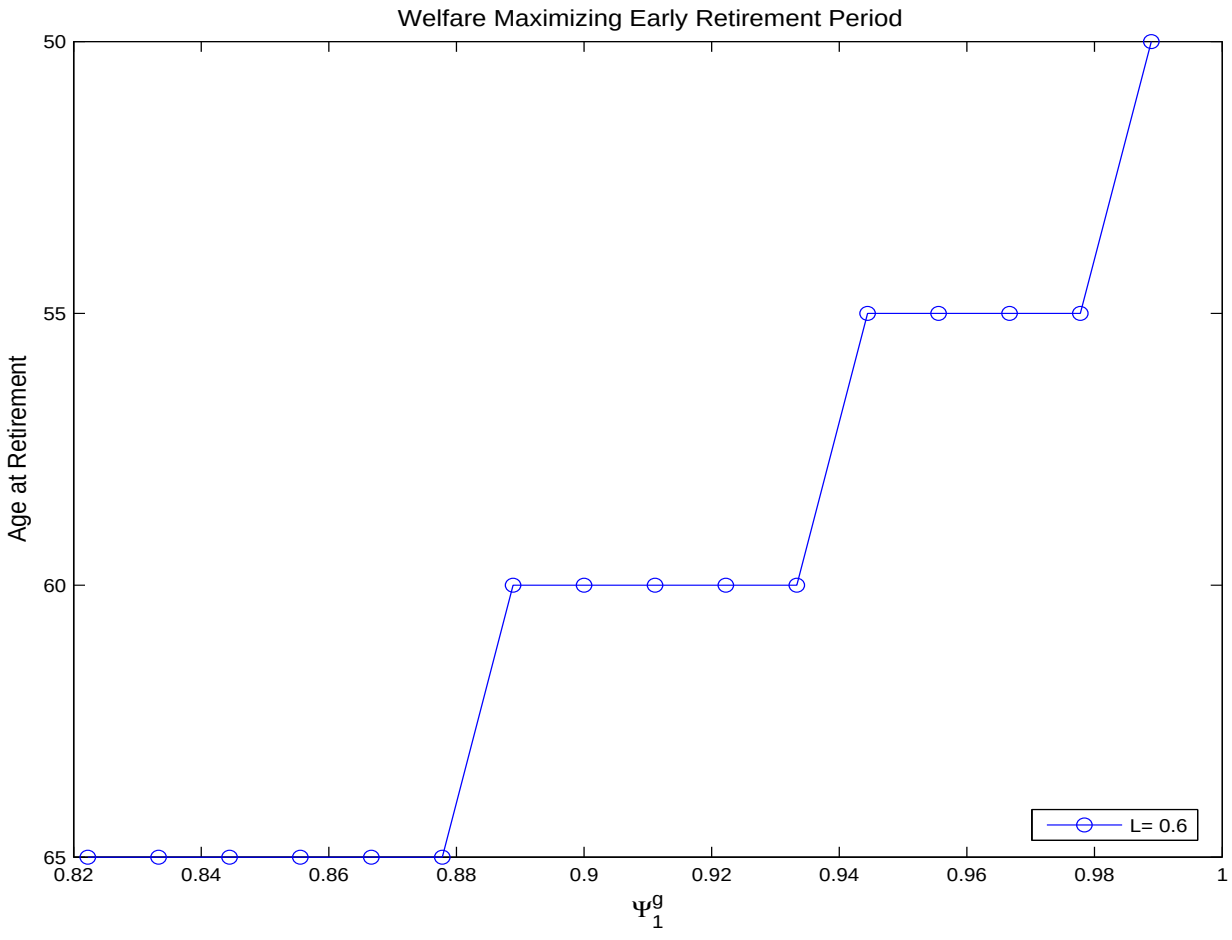


Table: Public agent retirement age as function of public pension generosity Ψ_1^g when capital tax adjusts

Policy Experiments and Sensitivity Analysis

	J^e: 0 (age 65)	1 (age 60)	2 (age 55)	3 (age 50)
L:				
0.60	**102.130**	**101.182**	**100.000**	**98.469**
0.80	102.811	101.597	100.000	97.842
1	103.503	102.018	100.000	97.203
σ:				
0.50	102.303	101.317	100.000	98.156
1	102.192	101.233	100.000	98.342
1.50	**102.130**	**101.182**	**100.000**	**98.46**9
2	101.893	101.063	100.000	98.636
α_1:				
0	101.694	100.933	100.000	98.800
0.05	101.888	101.047	100.000	98.641
0.1	**102.130**	**101.182**	**100.000**	**98.469**
0.15	102.436	101.358	100.000	98.255
0.2	102.817	101.561	100.000	97.947
η:				
-2	102.252	101.357	100.000	98.070
-1	102.251	101.356	100.000	98.072
0	102.200	101.282	100.000	98.266
0.50	**102.130**	**101.182**	**100.000**	**98.469**
0.80	102.126	101.175	100.000	98.505

3 Channels

Decrease in generosity of public pensions increases private sector output via three channels:

- Human capital effect
- Income effect due to lower pensions when old
- Tax effect

These effects increase output directly or work via increases in savings.

Transition Paths after Policy Reform

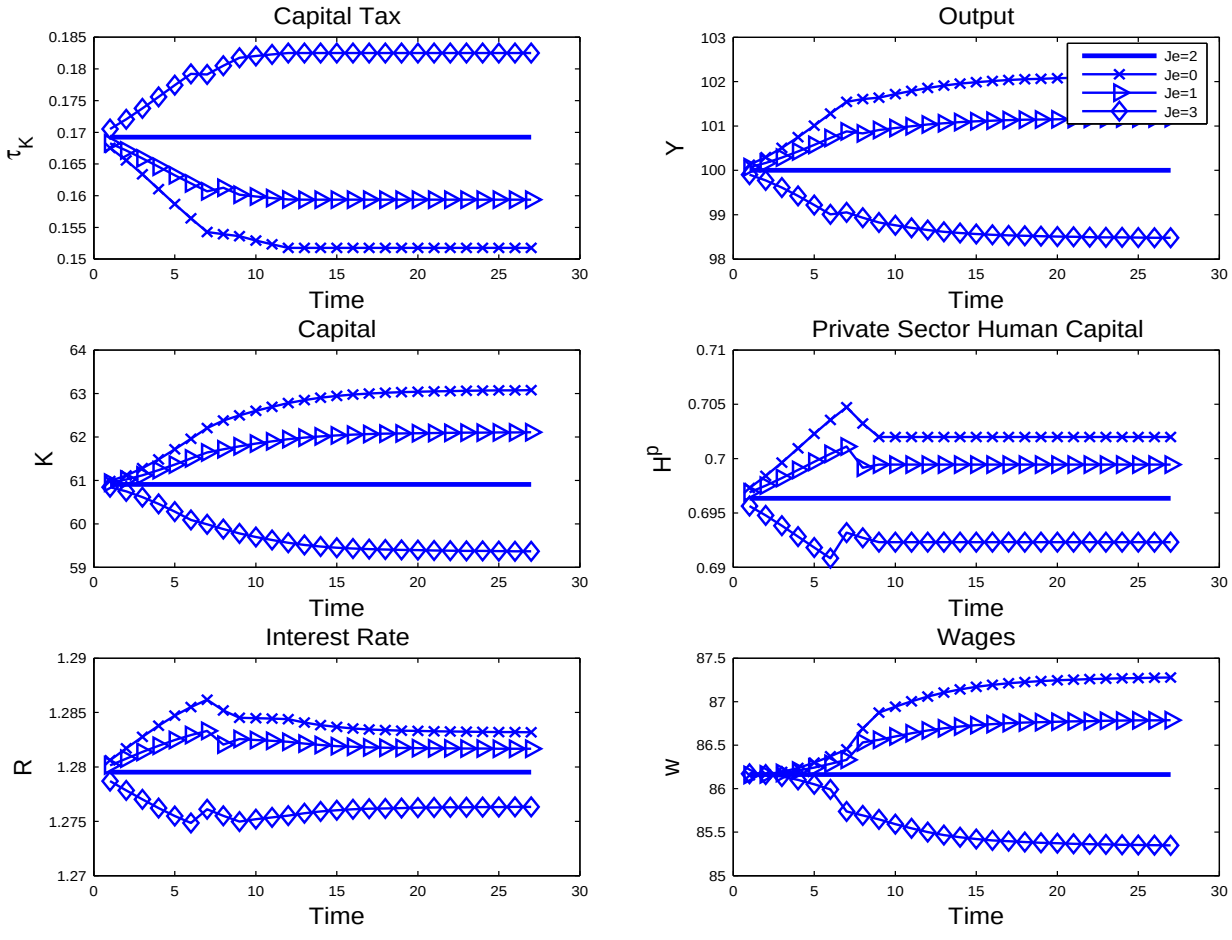


Table: Transition from retiring early at 50, 55 and 60 to 65 with early retirees working on average 40% of their time in the private sector. Capital tax τ_K adjusts to clear the government budget constraint.

Welfare Analysis

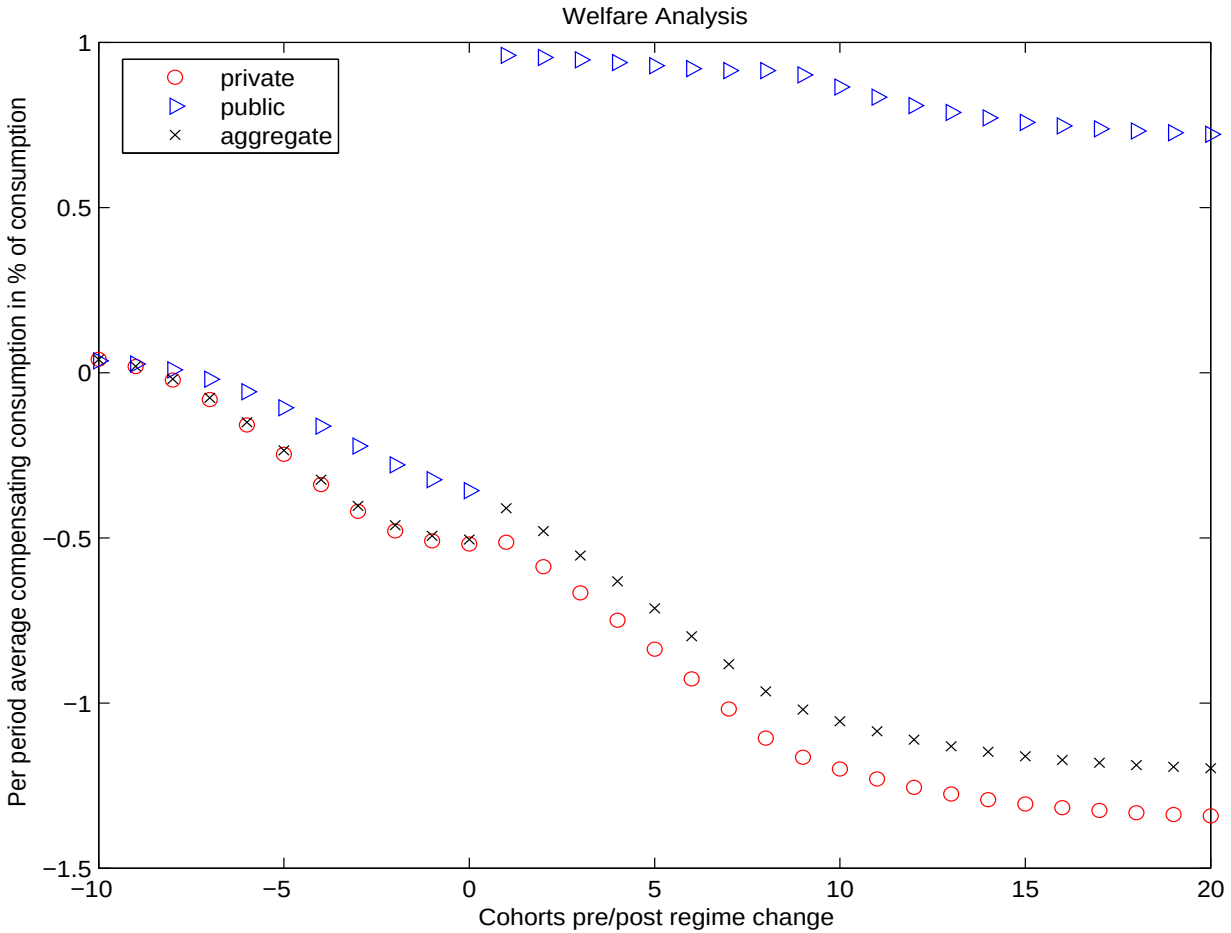


Table: Compensating consumption given to individuals to offset the policy change that induces civil servants to postpone their retirement from age 55 to 65 in terms of life-time welfare per age cohort,

Conclusion

We have studied the effects of generous early retirement for civil servants on capital accumulation and long-run level of income.

- Decreasing early retirement benefits sharply, increases public sector retirement years from 55 to 65 and raises steady state income by over 2%.
- The transition lasts about 15 periods or 75 years.
- Extensions
  - Introduce intra generational heterogeneity to address distributional issues.
  - Introduce population aging.