Flexible Contracts and Differentiated Pension Systems

Fabrizio Culotta
Department of Economics and Management, University of Padua (Italy)
E-mail: fabrizio.culotta@phd.unipd.it

Abstract

This work analyses performances of pension systems in an OLG life cycle economy featuring frictional unemployment and flexible wage-tenure contracts. Performances of Defined-Benefit (DB) and Defined-Contribution (DC) pension regimes are compared in terms of financial sustainability and pension adequacy expressed as income maintenance, inequality and poverty among retirees. Differentiated designs of DC are also considered, where the contribution rate is differentiated by worker's age (DAC) and by the tenure of contract (DTC).
The model is able to produce relevant demographic, labour and pension statistics. It also reproduces some empirical patterns observed in Europe and Italy over the last two decades. Main results show that DB offers higher pensions but it is less sustainable than DC, with the latter delivering lower inequality and poverty. Differentiated pension regimes DAC and DTC outperforms the standard DC in all dimensions but not in inequality. A sensitivity analysis to model parameters and to alternative scenarios confirms these conclusions.

JEL Codes: C63, D31, E24, E61, H55, J64.

Keywords: Life Cycle, Unemployment, Wage-Tenure Contracts, Differentiated Taxation, Pension Systems, Adequacy.

MOTIVATION

- **EMPIRICAL RELEVANCE**
  - Temporary and part-time contracts are replacing the typical full-time permanent employment relation;
  - Temporary and part-time contracts are associated to lower wages and a weaker employment protection;
  - Flexible labour careers undermine the possibility of decent living also during retirement;
  - Main pension reforms just raise the retirement age, tighten eligibility conditions, curtail pensions.
- **LITERATURE GAP**
  - The Neoclassical framework, so far adopted to analyse pension systems, considers employment as an absorbing state thus disregarding unemployment [7];
  - Frictional models of labour market explicitly analyse workers and job flows [15]. Branches of this literature deal with:
    - *wage-tenure contracts* [3] and *contract duality* [2] ... but neglect the life cycle dimension;
    - *lifecycle* [5] and *retirement* [11] ... but neglect the bidimensional structure of wage-tenure contracts.

Overall, no frictional models feature life cycle unemployment and wage-tenure contracts ... and they do not study pension systems.

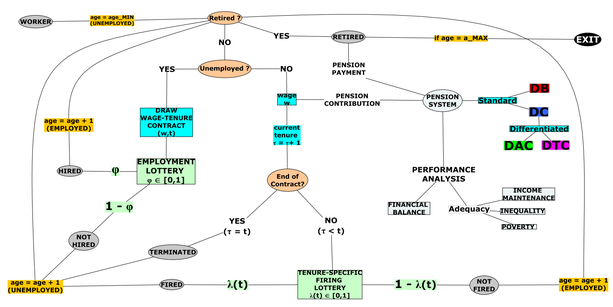
CONTRIBUTION

This work combines frictional unemployment and wage-tenure contracts in a OLG lifecycle framework to highlight the influence of labour market institutions on performances of pension systems. In doing so:

1. It stresses the influence of the *age-distance to retirement* [16, 10] on the maximal tenure of offered contracts, thus relating demography and job offers;
2. It adds *contract termination* to the dynamics of unemployment;
3. It relaxes the assumption of *stylised careers* when labour income patterns are simulated [8, 14, 1];
4. It analyses the property of *DC pension regime*, originally formulated by [4], in a context of unemployment and flexible contracts;
5. It applies the idea of *differentiated taxation* [9, 6, 13] on pension contributions.

MODEL

STRUCTURE



FLOW DIAGRAM

EQUATIONS

Offered Wage-Tenure Contract

$$(w,t)_{i,a} = \{w_{i,a+\tau}\}_{\tau=1}^{t_{i,a}} \tag{1}$$

for $i = 1, ..., I$ and $a = a_{min}, ..., a_{ret} - 1$ where $w_{i,a} = ... = w_{i,a+t_{i,a}}$ with $w \sim f_W(\cdot)$ and $t_a \sim f_{T,a}(\cdot)$.

Aggregate Unemployment Dynamics and its Steady-state

$$\mu_{a+1} = \underbrace{\mu_a(1-\phi)}_{\text{U - No Hired}} + \underbrace{(1-\mu_a)[(1-\varepsilon_a)\lambda_a + \varepsilon_a]}_{\text{E - Fired and Terminated}} \Rightarrow \mu_a^* = \frac{(1-\varepsilon_a)\lambda_a + \varepsilon_a}{\phi_a + (1-\varepsilon_a)\lambda_a + \varepsilon_a} \tag{2}$$

for $a = a_{min} + 1, ..., a_{ret} - 1$ with $\mu_{a_{min}} = 1$ where $\phi_a = \phi\frac{\sum_i^I \mu_{i,a}}{I}$, $\varepsilon_a = \frac{\sum_i^I \varepsilon_{i,a}}{I} = \frac{\sum_{i=1}^{I}(1-\lambda_{i,a})^{t_{i,a}-1}}{I}$, $\lambda_a = \frac{\sum_i^I \lambda_{i,a}}{I}$ and $\lambda_{i,a} = \lambda^{t_{i,a}}$.

Pension System Balance

$$B_{ps} = \sum_{a=a_{min}}^{a_{ret}-1} \underbrace{\left(1 - \frac{(1-\varepsilon_a)\lambda_a + \varepsilon_a}{\phi_a + (1-\varepsilon_a)\lambda_a + \varepsilon_a}\right)}_{\text{Extensive Margin}} \underbrace{\left(r_{pc,ps} w_a\right)}_{\text{Intensive Margin}} - \sum_{a=a_{ret}}^{a_{max}-1} p_{a,ps} \tag{3}$$

where $r_{pc,ps} = \begin{cases} r_{pc}, & \text{if } ps = DB, DC \\ r_{pc}(1+\delta)^{a_{ret}-a}, & \text{if } ps = DAC \\ r_{pc}(1+\delta)^{t_{i,a}}, & \text{if } ps = DTC \end{cases}$

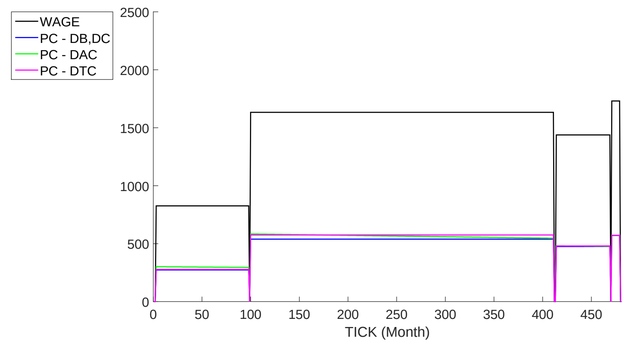
PARAMETERS

Symbol	Description	Value
	Time Frequency	Monthly
I	*Workers per Cohort*	100
a_{min}	*Entry Age* (years)	300 (25)
a_{ret}	*Retirement Age* (years)	780 (65)
a_{max}	*Exit Age* (years)	1020 (85)
ϕ	*Job Arrival probability*	0.9
λ	*Job Firing probability*	0.1
w_{min}	*Wage - Lower Bound*	500
w_{max}	*Wage - Upper Bound*	2500
$f_W(\cdot)$	*Wage - Pdf*	$\beta(2,2)$
$f_{T,a}(\cdot)$	*Tenure - Pdf*	$U_d(1, a_{ret} - a - 1)$
r_{pc}	*Pension Contribution Rate*	0.33
N	*DB - Pensionable Wage Time Window* (years)	240 (20)
r_{DB}	*DB - Accrual Rate* (yearly)	0.02
δ	*DAC/DTC - Differentiation Factor*	0.0025

CALIBRATION TABLE

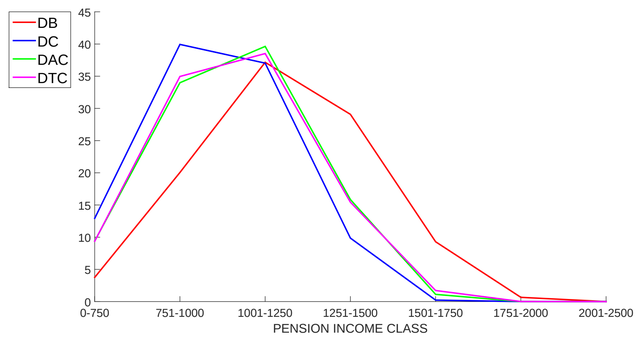
MAIN RESULTS

Labour Careers



Example of labour career and associated pension contribution profile across pension regimes.

Pension Income Distributions



Comparison of the distribution of pension income across pension regimes.

Pension Systems Performances

	Balance	*Income Maintenance*	*Inequality*	*Poverty*
DB	-5.0535	79.16	1.826	2.48
DC	-0.4122	66.15	1.8243	2.3
DAC	-0.4157	69.59	1.8321	2.35
DTC	-0.412	69.57	1.8376	2.12

Comparison of performances across pension regimes: *Balance* (B_{ps}, mln), *Income Maintenance* (replacement rate, %), *Inequality* (income-quintile ratio) and *Poverty* (head-count ratio, %).

WHAT ELSE?

- **Empirical Validation** of:
  - *Demographic module*:
    - age structure of population;
    - median age, old-age dependency ratio, population in working age;
    - life expectancy at retirement, i.e. age 65;
  - *Labour Market module*:
    - participation, unemployment and employment rate by age;
    - average employed wage and average wage age-gap;
    - employment share and employed tenure by age and tenure classes;
    - in-work inequality and poverty;
    - effective retirement age;
- **Sensitivity Analysis** to:
  - *Parameters*;
  - *Alternative Scenarios*, among which a Neoclassical-like;
  - *Alternative Functional Specifications* for λ_i, $a(\lambda, t_{i,a})$;
- **Tenure-dependent Reservation Wages** [12].

References

[1] Bravo, J. M. V. and Herce, J. A. On the influence of employment-breaks on pension benefits. **BBVA Working Paper**, 19.

[2] Berton, F. and Garibaldi, P. (2012). Workers and firms sorting into temporary jobs. **Economic Journal**, 122(562), F125-F154.

[3] Burdett, K. and Coles, M. (2003). Equilibrium wage-tenure contracts. **Econometrica**, 71(5), 1377-1404.

[4] Castellino, O. (1969). Un sistema di pensioni per la vecchiaia commisurate ai versamenti contributivi effettuati e alla dinamica dei redditi medi di lavoro. **Giornale degli Economisti e Annali di Economia**, 1-23

[5] Chèron, A., Hairault, J. O. and Langot, F. (2013). Life-cycle equilibrium unemployment. **Journal of Labor Economics**, 31(4), 843-882.

[6] Chèron, A., Hairault, J. O. and Langot, F. (2011). Age-dependent employment protection. **Economic Journal**, 121(557), 1477-1504.

[7] De La Croix, D., Pierrard, O. and Sneessens, H. R. (2013). Aging and pensions in general equilibrium: Labor market imperfections matter. **Journal of Economic Dynamics and Control**, 37(1), 104-124.

[8] De Freitas, N. E. M., Duc, C., Briard, K., Mage, S. and Legendre, B. (2011). Career Interruptions: how do they impact pension rights?. **Geneva Papers on Risk and Insurance**, 36(3), 440-457.

[9] Erosa, A. and Gervais, M. (2002). Optimal taxation in life-cycle economies. **Journal of Economic Theory**, 105(2), 338-369.

[10] Hairault, J. O., Sopraseuth, T. and Langot, F. (2010). Distance to retirement and older workers' employment. The case for delaying the retirement age. **Journal of European Economic Association**, 8(5), 1034-1076.

[11] Hairault, J. O., Langot, F. and Zylberberg, A. (2015). Equilibrium unemployment and retirement. **European Economic Review**, 79, 37-58.

[12] Mc Call, J. (1970). Economics of information and job search. **Quartely Journal of Economics**, 113-126.

[13] Michelacci, C. and Ruffo, H. (2015). Optimal life cycle unemployment insurance. **American Economic Review**, 105(2), 816-59.

[14] Nistićo, S. and Bevilacqua, M. (2013). Notional defined contribution (NDC) pension schemes and income patterns. **Economics**, 7, 1-24.

[15] Pissarides, C. A. (2000). Equilibrium unemployment theory. **MIT press**.

[16] Saint-Paul, G. (2009). Does the welfare state make older workers unemployable?. **IZA Discussion Paper**, no. 4440.