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Article

Public Pensions, Trade Unions and Employment in Manufacturing

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Abstract

Demographic decline in many OECD countries is widely indorsed as the principal source of hurling public pension disbursements, whilst trade unions are often blames for staunch antagonism to any transformations that might alleviate the fiscal encumbrance. Building on the premise that financialization is state-acquiesced, with the state reckoned fundamental for market integration, and social regulation of markets against market failures. How then inter-generational equity should be addressed? This work tests the hypothesis that deindustrialization (measured as the tumbling proportion of manufacturing employment) and lower trade-union density are quintessential channels through which demographic change transmutes into ascending pension outlays. Using OECD data from 1960 to 2023, the study utilises longitudinal and panel quantile statistical methods to dissect these links across assorted pension-system clusters (total, mandatory private, mandatory public, mandatory public + voluntary, and mandatory public + private). The study highlights the mediating role of labour market structure to pension financing.

Keywords: pensions; trade unions; employment structure

JEL Codes: E24; J51; C23

1. Introduction

Augmented longevity and the abating ratio of employed contributors to retired beneficiaries have long threatened the financial sustainability of pay-as-you-go (PAYG) defined benefit (DB) public systems (Feldstein, 1996; Disney, 2000; Muller, 2000; Tanzi, 2002). To circumvent this unsustainable trajectory, countries have resorted to supplementary pensions schemes to cut down the pressure on public finances. Such reforms are intended to warrant the pension system remains viable, whilst endowing adequate pensions for the elderly (Adascalitei and Domonkos, 2015).

To ensure pension adequacy, policymakers usually live off privately funded pensions, which gives them the necessary leeway to instigate reforms that strengthen sustainability of public systems (Feldstein, 1996; Brooks, 2002). Within this landscape, the mounting task of defined contribution¹ (DC) pensions contrasts with defined benefits (DB) fully funded pensions, which propound a lifetime guaranteed formula-based benefit.

Pension systems promise financial security and adequate income for retirees, while remaining financially sustainable, ensuring individuals will not outlive their assets. In PAYG DB pension

¹ A fixed sum is capitalised and then becomes available at superannuation age.

arrangements, the state assumes this risk, whilst it is borne by the employer. Sheltering people from impecuniousness following stepping down is the overarching accountability of the state in most western systems (Boeri et al., 2001; Wiß, 2018). Realising this objective, entails on governments to balance out between financial and fiscal sustainability, catering for passable retirement proceeds, redistributing resources from high to low-income retirees, maximising coverage and preserving both inter- and intra-generational equity. By contrast, in DC plans, risks and rewards are shouldered by the individual and not by the sponsor (Cannon & Tonks, 2013).

In this setting, the manufacturing sector stands in for a fundamental contributor to public pension systems. This canvasses the first cardinal research question as to what magnitude do individuals working in the manufacturing sector, as well as those self-employed, financially burden public pension systems in terms of public disbursements on pension provision? Furthermore, it is quintessential to recognise that any inquiry on pensions must account for trade unions, an institution advocating for universal pension coverage.

Collective bargaining has recently confronted multiple and interlocking challenges driven by globalisation, such as the contraction of the manufacturing sector and population ageing. A critical empirical question is whether trade union density responds to shifts in the structure of employment (service, manufacturing, and self-employment sector)? Ultimately, these shifts feed back into the welfare state. Literature provides mixed evidence of social expenditure on union density (Hooghe and Oser, 2016).

Parlevliet’s (2017) scrutiny exhibited that the practice of collective learning can attenuate opposition to reforms, as individuals update expectancies and preferences in light of new information; cognisant individuals will likely indorse structural policy adjustments (Cukierman & Tommasi, 1998). The contemporary narrative seems to polarise around two stylized mechanisms. Top-down entrenchment often staged by governmental austerity, versus bottom-up resistance to reform guided by organised labour, often neglecting the underlying mechanisms that mediate these behaviours (Figure 1).

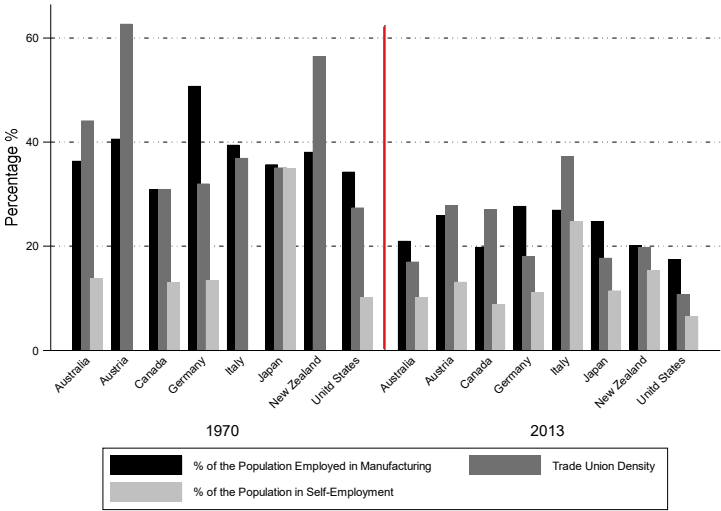


Figure 1. The 1970-2013 change of % of the population in manufacturing, in self-employed plus trade union density.

The paper chips into the literature on trade unions by bringing about a link (albeit not a causal one) between trade union density and employment in the manufacturing sector. It likewise adds to the public pensions literature by building a connection between employment in the manufacturing sector and public pension expenditure.

Our paper pursues three foremost goals: First, it examines the effect of population employed in manufacturing on public pension provisions in OECD countries. Second, it evaluates how variations

in employment structure affect trade union coverage. Third, it investigates whether trade union coverage shapes public pension expenditure or whether this is solely an outcome of shifting employment patterns.

[WE ALSO NEED TO EXPLICITLY STATE THE NOVELTIES OF THE PAPER HERE]

[HERE WE MUST MENTION RELATIVELY BRIEFLY WHAT THE ANALYSIS DOES: SAMPLE, TIME SPAN, METHODS AND RESULTS]

[WHAT IS THE SOURCE OF THE DATA? IF IT IS FROM OECD, MAKE SURE IT IS INDEED FIRST PILLAR PAYG PUBLIC PENSIONS. I THINK WHAT OECD OFFERS IS THIRD PILLAR FUNDED PENSION SCHEMES].

The paper advances as follows. We embark on with the literature review on the transition from DB to DC pensions, followed by a discussion of trade unions and their sway in pension reforms. We then cast the research design, the data utilised, the empirical strategy, and the results alongside robustness checks. The subsequent section contextualises the findings within a broader setting. The work concludes with a summary of contributions and implications.

2. Literature Review

2.1. The Pensions Landscape

The 2008 financial crisis and the COVID-19 has revived attention on the importance of public pensions. Many countries have embarked on reforms aiming at strengthening individual savings accounts (Adascalitei & Domonkos, 2015) and expanded investments in private pension schemes (Reece & Sam, 2012). Brooks (2002) believes that structural pension reforms are the product of demographic pressures and financial restraints, predominantly intergenerational risk and income. The looming retirement of baby-boomer generation presaged the fiscal shortfalls of public pension systems, while sluggish economic growth and industrial restructuring carry on straining social budgets. To bolster funding of public social security programmes, governments incrementally adjusted pension parameters, including raising statutory retirement age, raising contribution rates, and benefits. At the same time, the formation of a third pillar of private pensions seeks to mitigate the state's long-term unfunded liabilities, which rise steadily as populations age (Feldstein, 1996). Yet, in the short-to-medium term, the transition from a public to private provision exacts a high financial toll on governments as payroll contributions from public coffers to private funds. Despite these pressures, the first pillar systems continue to enjoy broad public support worldwide (Boeri et al., 2001).

The transition from the first towards the third pillar has been linked with financialisation. [WHAT ABOUT THE ROLE OF THE SECOND PILLAR, i.e., OCCUPATIONAL PENSION FUNDS/SCHEMES?] Financialization refers to the expansion of finance into social life, framed around the notion of individual self-empowerment (Van der Zwan, 2014). The shift from DB to DC schemes reflect employers' unwillingness to absorb deficits or pay for automatic indexation during inflationary periods (De Deken, 2013). Financialisation urges trade unions to utilise collective bargaining to address members' concerns (Johnston et al., 2011), rather than acting as partisans for insiders (Rueda, 2005). Interestingly, the DB-to-DC shift has been embraced by trade unions, employers' association, social advocacy groups, and the finance sector (Ebbinghaus, 2019). [NOT ALWAYS WITHOUT COMPLICATIONS/REACTIONS. THE GFC HELPED. HENCE, GFC COULD BE A DUMMY VARIABLE] Privatisation shifts responsibility from government to private actors, whilst marketisation implies a stronger actuarial link between contributions and an increased dependency on private savings (Ebbinghaus, 2015). However, trade unions are not solely concerned with the second pillar of occupational pensions (e.g., negotiating plans without minimum return guarantees). Instead, their primary concern remains on defending the first pillar of public pensions, which may face retrenchment as supplementary pillars expand (Wiß, 2018). As Grech (2013) notes, demographic ageing has been central behind the shift from PAYG towards pre-funded pensions[WHAT ARE THESE?] and organised labour is expected to resist any cutbacks. Ultimately,

the more the state or collective regulation intervenes, the broader the coverage of supplementary pensions and the greater the scope for pooling risks and guarantee rights (Bridgen & Meyer, 2009).

The sensitivity of pension systems to financial market turbulences depends primarily on the scope and composition of asset portfolios. Retrenchment does not imply that the state withdraws entirely from pension provision; rather, its role increasingly takes the form of regulation. Trade unions and employers' associations continue playing an important role alongside the state (Ebbinghaus & Wiß, 2011); this role has not regressed even after the 2008 financial crisis (Wiß, 2019). Governments, nevertheless, have the incentive to promote pension financialisation to reduce public expenditures and simultaneously strengthen the financial sector (Naczyk & Hassel, 2019). This shift is often justified by the expectations of job creation and economic growth (Boyer, 2000) as the old model of growth based on consumption and wage expansion has become less sustainable (Baccaro & Pontusson, 2016). Matsaganis (2007) argues that opposition to pension reforms from trade unions reflects a concern with embedded inegalitarian tendencies. One common strategy of addressing pension sustainability is raising the statutory retirement age (Cremer et al., 2008), while a second one is about reducing the amount of PAYG transfers (Cristea & Thalassinou, 2016).

Overall, members of individual DC pension plans are exposed to multiple risks than participants in DB plans. That heightened exposure happens because individual DC arrangements directly link retirement income to the value of accumulated assets. [THE ADVANTAGE IS THOUGH THAT WITH PRUDENT MANAGEMENT THEY CAN OFFER HIGHER RETURNS COMPARED TO PAYG DB.] By contrast, collectively funded PAYG arrangements allow an enormous scope for risk pooling and burden sharing, through they remain vulnerable to periods of reduced contributions, low returns on assets, and unexpectedly high claims. Based on the above, the following hypothesis is operationalised:

H₁: *a declining share of manufacturing employment in total employment exhibits higher public pension spending (as a share of GDP).*

2.2. The Link with Trade Unions?

The engrossment of trade unions in welfare reforms, intensely in reshaping public pension systems, has charmed increasing scholarly attention (Tasdemir, 2016). Ebbinghaus (2011) makes a discrepancy between the forms and mechanisms through which trade unions exert influence on pension reforms. Baccaro & Simoni (2008) note that governments' keenness to implicate unions depends chiefly on the comparative political strength, while Culpepper and Reagan (2014) ascribe the debility of trade union power to the erosion of social pact. Trade unions are not inherently detrimental to employment (Checchi & Nunziata, 2011; Bassanini & Duval, 2009). Whereas some have advocated that trade unions enact as a form of insurance against unemployment risk (Burda, 1990), this perspective does not explain the persistent decline in trade union density.

Trade unions have been reported to contribute to welfare through occupational health and safety improvement (Donado & Walde, 2012). This facilitates risk allocation of risk between firms and employees (Malcomson, 1983), stipulate workforce training (Acemoglu & Pischke, 1999), and mould broader social policy (Pontusson, 2013). Trade unions representing highly skilled workers, particularly those in the manufacturing industries, have historically defended generous public pensions. Confronted with governments' increasing commitment to pension retrenchment and privatisation, trade unions have attempted to counter the expansion of individual retirement savings plans managed by commercial providers and sought to expand not-for-profit occupational pension plans negotiated through industry-level collective agreements. Based on the erstwhile discussion, the following hypothesis is operationalised:

H₂: *An increase of trade-union members as percentage of labour force exhibits higher public pension spending (as a share of GDP).*

3. Data

To scrutinise our enquiries, we make use of the OECD dataset for the period 1960–2023. We extricate data on trade union density, the percentage of the populace employed in the manufacturing sector, the percentage of the populace employed in the services sector, the percentage of the populace employed in self-employment, and percentage of the GDP allotted to social security fund expenditure. These variables are applied for 29 countries as depicted in Figure 2. Granting the OECD entails 36 member countries, while our analysis is kerbed to 29 countries due to the consistent readiness of comparable data across the study period. The data is merged to present a longitudinal dataset.

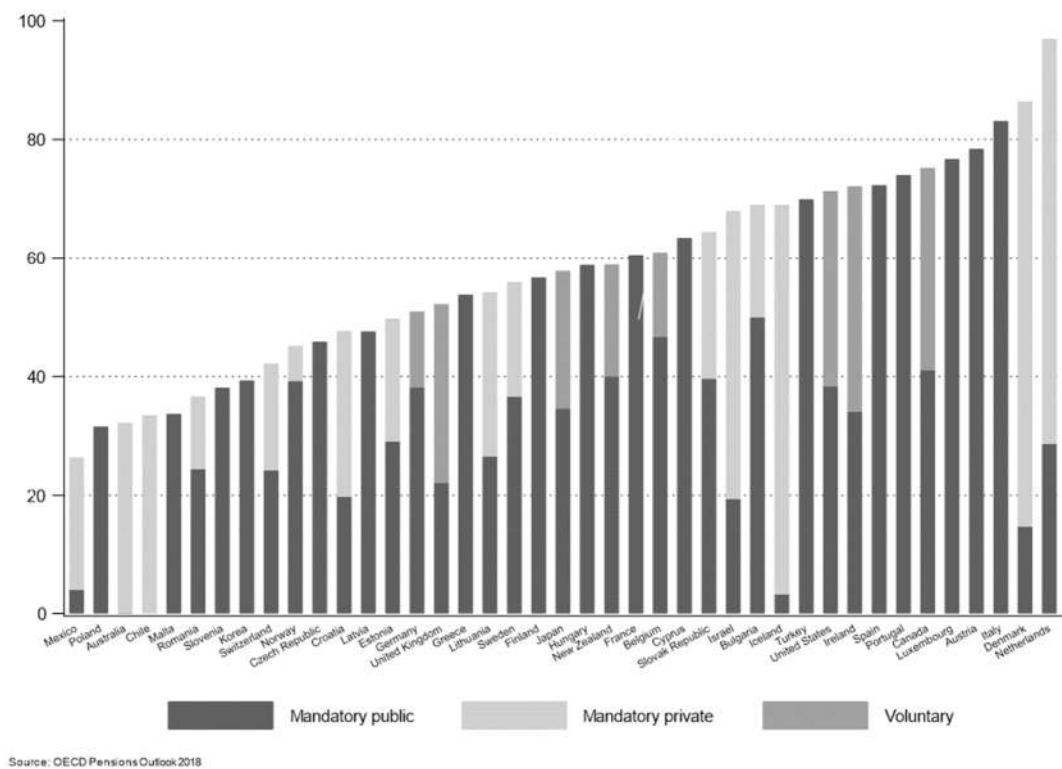


Figure 2. Gross pension replacement rates from the mandatory public, voluntary and private schemes.

4. Methodology

This work endeavors to examine the impact of the employment rate percentage for the population that is employed in the manufacturing sectors in OECD countries on public pension provisions, to encapsulate the changing structure impact of the population in services, in manufacturing and unemployment on trade union coverage and pinpoint whether trade union density influences public pension expenditure. To this end, we expound on the following model:

$$TUD_{it} = f(DIND_{it}, DSER_{it}, DEMR_{it}, \alpha_{it}) \tag{1}$$

where *TUD*, *DIND*, *DSER*, and *DEMR* represent trade union density, the change of percentage of employment in manufacturing, the change of percentage of employment in the services, and the change of the rate of unemployment. *α_{it}* denotes individual country fixed effects, with the subscripts *i* and *t* denoting country and year, respectively. Equation (1) implies that the trade union coverage depends on the labor market conditions of the real economy.

We also aim to explore the impact of the employment rate and trade union coverage on social security funds expenditure by applying the following specification:

$$DSSFE_{it} = f(DIND_{it}, SEE_{it}, TUD_{it}, \alpha_{it}) \tag{2}$$

where DSSFE is the change of social security funds expenditure and SEE is the percentage of the population in self-employment rate. For the model in Equation (2), to be more precise, we needed to rerun it for different pension regimes. The best possible separation can be extracted from the gross replacement rates. These are different for mandatory public regimes, mandatory private, mandatory public plus voluntary, mandatory public plus private; gross replacement rates[WHAT IS THIS? EVEN THOUGH YOU EXPLAIN IT BELOW, YOU MAY NEED TO PROVIDE SOME DEFINITIONS, POTENTIALLY AS GIVEN IN THE DATA SOURCES - e.g., MANDATORY PRIVATE, PUBLIC, etc.] from the mandatory public, mandatory private and some voluntary pension schemes are shown in Figure 2. The gross replacement rate depicts the level of pensions in retirement relative to earnings when working.

There is significant cross-country variation. For 2018 data, the average is 57.5%. At the bottom of the range, Mexico offers future replacement rates of 26.4% to individuals starting work today. The Netherlands is at the top of the range, offering replacement rates of 96.9%, making it almost 100%. Other countries with high projected replacement rates are Denmark with 86.4% and Italy at 83.1%. What is interesting to note is that Denmark, Netherlands and Iceland have the higher gross private pension replacement rates at 71.6%, 68.2% and 65.8% respectively, while for mandatory public pensions Italy, is ranked at the top with 83.1%, followed by Austria with 78.4%, Luxembourg with 76.7%, Portugal with 74%, Spain with 72.3% and Turkey with 69.9%. Several countries have fully PAYG public systems with gross replacement rates of 31.6% in Poland to 83.1% in Italy. Chile offers only a mandatory fully private pension with 33.5% gross replacement rates. Voluntary[ARE THESE SECOND OR THIRD PILLAR OR BOTH? IT WOULD HELP TO PROVIDE SOME DEFINITIONS HERE AS WELL: VOLUNTARY, HYBRID, etc.] schemes provide for half of the gross replacement rates in Ireland with 38%, in Canada with 34.2%, the United States with 33%, the United Kingdom with 30% and Japan with 23.1%. Mixed (or hybrid) systems we have in Slovak Republic with 39.6% public and 24.8% private, in Estonia with 29.1% public and 20.6% private replacement rate, in Lithuania with 26.6% public and 27.5% private, in Switzerland with 24.2% public and 17.9% private and Croatia with 19.8% public and 27.8% private replacement rates (Figure 2). [CHECK THE SYNTAX]

The above classification will assist in providing more than one column for our model in order to investigate the behaviour of the percentage of the population in manufacturing and its effect on social security fund expenditures.

Variables are measured in time and tend to exhibit strong trend, thus making them nonstationary. Stationarity in our case is achieved by differencing the variables that report trend stationarity. In this subsection, the order of integration of the variables is determined by panel unit root tests for the appropriate modelling strategy in the subsequent empirical model. Therefore, we apply five versions of panel unit root tests, namely Breitung test (Breitung, 2002), PP (Phillips & Perron, 1988), LLC (Levin et al., 2002), the IPS (Im et al., 2003) and the ADF (Maddala & Wu, 1999; Choi, 2001). [THESE TESTS ARE NO LONGER USED-TRY THE PESARAN CIPS TEST-2007] Broadly speaking, we want our long-term variables to be stationary with their mean and variance being constant over time and the value of covariance between two time periods depending only upon the distance between the two periods.

Next to the unit root test analysis, we difference the variables that are nonstationary and maintain the levels for those variables that our unit root tests did not report any stochastic trend. Stochastic trends could result in our variables related to a problem known as generating spurious results and this is something we wanted to avoid. We estimate the equations above by implementing the fixed-effects estimators, and the choice of fixed-effect estimation is based on both theoretical and practical concerns. Unlike fixed effects, a random effect does not remove any omitted variables bias; and it is more “efficient” assuming no omitted variables bias.² The critical assumption of a random

² We aware that failure to reject the null of Hausman test does not imply that there is no bias in random effect estimator.

effect is that fixed unobservable effects are uncorrelated with our independent variables and almost always implausible.

One concern is that panel estimation might not have captured heterogeneous impacts and non-linearity between labor market conditions and labor union coverage. Therefore, quantile regression analysis was also used to gain a better understanding of the underlying relationship between labor market conditions and labor union coverage. Another advantage of quantile regression analysis is that it takes into account the entire conditional distribution of the dependent variable, rather than focusing on its mean (Coad & Rao, 2008; Koenker & Bassett, 1978). Quantile regression analysis also does not assume that the error terms are identically distributed at all points of the conditional distribution. Relaxing this assumption permits firm heterogeneity to be taken into account and allows for the likelihood that estimated slope parameters may change at different quantiles of the conditional productivity distribution (Coad & Rao, 2008). To this end, usually, analysis employs the τ – *th quantile* ($0 < \tau < 1$) of the conditional distribution for the dependent variable y (e.g., trade union density), given a set of control drivers x : $y_{it} = x_{it}\beta_{\tau} + \varepsilon_{it}$ with $Quant_{\tau}\left(\frac{y_{it}}{x_{it}}\right) = x_{it}\beta_{\tau}$, where β is the vector of parameters to be estimated and ε the vector of residuals.

Self-Employment Variable

The stylised image of a distinctive worker progressing to retirement often does not encompass an abrupt cessation of employment; sundry workers take bridge-jobs. Whilst several workers retire following the culmination of career employment, this is frequently not the norm (Ruhm, 1990; 1991; Cahill et al., 2011). Seldom, superannuated workers re-enter the labour force, and non-covered workers march into bridge employment such as entrepreneurship (Kerr & Armstrong-Strassen, 2011). An early study that appraised the phenomenon of self-employment once retired, demonstrated an expectancy of not receiving a satisfactory annuity (Fuchs, 1982). Without an adequate pension, budget constraints pose a significant problem on household income after retirement, thus forcing a period of labour transition from retirement³ to self-employment (Zissimopoulos & Karoly, 2009). Entrepreneurship assuages unemployment (Copeland & Daly, 2012), succouring⁴ the welfare state via taxation (Stenkula, 2012) as senior entrepreneurs disburse taxes on their earnings, which in turn lifts the public state up, whilst they hire employees and aid job creation (Halvorsen & Morrow-Howell, 2016).

[THIS GOES TO THE DATA SECTION]

5. Empirical Results

5.1. Results of Panel Unit Root Tests

The results of related five unit-root tests on the level and the first difference data series are shown in Table 1. All panel unit root tests have been estimated by including constant and trend variables. The results are somewhat mixed. The LLC test indicates that all variables are stationary except EMR and SSFE. The Breitung test, however, indicates that all variables are non-stationary except SSFE. IPS test and ADF test indicate that all variables are stationary. The PP test indicates that all variables are stationary except SER, EMR, and SSFE.

Table 1. Panel unit root tests (Statistic and probabilities in parentheses).

Method	TUD	IND	SER	EMR	SSFE	SEE
Level						
Null: Unit roots (assumes common unit root process)						

³ Provided the cash-out is enough to finance the new business.
⁴ Henrekson (2005) suggests the opposite, that the welfare state must facilitate entrepreneurship.

LLC test	-6.029** (0.000)	-1.801*** (0.036)	-1.270* (0.102)	0.282 (0.6109)	0.927 (0.823)	-3.885*** (0.000)
Breitung test	1.974 (0.975)	1.190 (0.883)	3.239 (0.999)	-1.041 (0.149)	-4.637*** (0.000)	3.149 (0.999)
Null: Unit roots (assumes individual unit root process)						
IPS test	-3.271*** (0.000)	-2.597*** (0.005)	-0.837 (0.201)	-2.637*** (0.004)	-1.370* (0.085)	-1.4722* (0.071)
ADF test	123.919***	103.948*** (0.003)	84.965* (0.080)	99.727*** (0.007)	80.041* (0.151)	104.271*** (0.001)
PP test	137.532***	64.135*** (0.610)	55.609 (0.859)	46.311 (0.979)	47.820 (0.970)	89.221*** (0.013)
CIPS	0.234 (0.593)	1.387 (0.919)	0.241 (0.595)	1.340 (0.910)	-0.889 (0.187)	2.382 (0.991)
NADF	-2.216***	-1.817	-1.823	-1.176	-1.446	-2.761***
First difference						
Null: Unit roots (assumes common unit root process)						
LLC test	-17.953*** (0.000)	-15.304*** (0.000)	-15.843*** (0.000)	-9.638*** (0.000)	-16.066*** (0.000)	-11.866*** (0.000)
Breitung test	10.344*** (0.000)	-10.618*** (0.000)	-13.157*** (0.000)	-7.490*** (0.000)	-10.256*** (0.000)	-8.078*** (0.000)
Null: Unit roots (assumes individual unit root process)						
IPS test	-16.514*** (0.000)	-11.582*** (0.000)	-12.529*** (0.000)	-6.886*** (0.000)	-17.062*** (0.000)	-12.117*** (0.000)
ADF test	400.878*** (0.000)	317.25*** (0.000)	329.66*** (0.000)	210.782*** (0.000)	401.754*** (0.000)	351.077*** (0.000)
PP test	491.656*** (0.000)	344.67*** (0.000)	456.762 (0.000)	248.436*** (0.000)	564.418*** (0.000)	864.474*** (0.000)
CIPS	-10.425*** (0.000)	-10.425*** (0.000)	-4.786*** (0.000)	-2.492*** (0.006)	-6.606*** (0.000)	-8.653*** (0.000)
NADF	-4.377*** (0.000)	-4.377*** (0.000)	-3.622*** (0.000)	-2.565*** (0.000)	-4.215*** (0.000)	-3.963*** (0.000)

*Notes: ***, ** & * indicate the rejection of the null hypothesis of a unit root at the 1%, 5% and 10% significance levels, respectively; the panel unit root tests were estimated by incorporating constant and trend variables in the models; the lag length was selected automatically based on AIC lag length selection criteria.*

[KEEP ONLY THE CIPS TEST]

Further investigation indicates cross-sectional dependence exists for all variables; and therefore, we adopt the second-generation panel unit root test that takes into account of cross-sectional dependence. The CIPS test of Pesaran (2007) indicates that all variables are nonstationary. However, the CIPS test ignores the nonlinearity structure in the data generating process (DGP), and therefore we apply the nonlinear version of CIPS of Cerrato et al. (2013). We found that all variables are nonstationary except TUD and SEE, which are the ones we did not transform into first differences.

5.2. Results of Panel Data Estimations with Quantile Robustness Checks

Findings from baseline (fixed effects) regressions for the impact of labour market condition on the labour union density are reported in Table 2. [FIX THIS TABLE AS A NORMAL TABLE, NOT LIKE THIS]

Table 2. Fixed effects estimation.

Variables	TUD
D.IND	2.078* (1.175)
D.SER	2.381*** (0.776)
D.EMR	0.820** (0.367)

Constant	32.84*** (3.871)
Observations	647
Number of ID	29

*Note: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1, and D.: is referring to first differences.*

Table 2 reports the findings of a direct impact of labour market conditions on the labour union coverage. The direction of the relationship is all positive and significant, and a high level of change in labor market conditions yields to a higher level of labor union coverage. Specifically, the influence from the percentage of the population working in manufacturing is 2.078 (p-value < 0.10) on trade union density. Similarly, the effect is also positive for the percentage of the population working in the services sector (2.381, p-value < 0.01), which effectively answers our Hypothesis 2. [HYPOTHESIS 1 IS CONFIRMED?] For robustness reasons, we decided to follow a panel regression approach in order to observe how the coefficient changes under different quantiles. The quantile results, as presented in Figure 3, indicate the influence of regressors on trade union density across different quantiles⁵. Results are reported for the 10, 50, 70 and 95 per cent quantiles. More specifically, Figure 3 indicates that labor market conditions positively affect labor union coverage in every quantile.

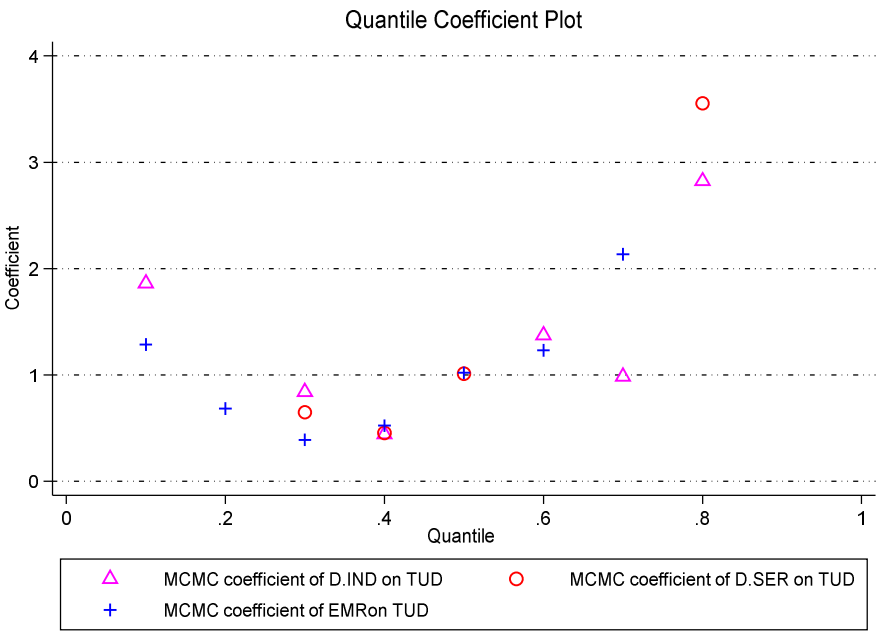


Figure 3.

The findings from baseline (fixed effects) regressions for the impact of labor market conditions and trade union coverage on the change of social security fund expenditure are reported in Table 3. For the labor market condition, we have included the percentage of the population working in the manufacturing sector and the percentage of the population in self-employment. The results indicate a negative relationship (-0.351, p-value < 0.01) between the percentage of the population working in manufacturing and the percentage of the social security funds expenditure as a percentage of GDP. There was not any statistically meaningful relationship to report for the percentage of the population in self-employment and trade union density. To further test Hypothesis 1, we decided to cluster our country sample into four groups. The pension groups we have introduced are mandatory private, mandatory public, mandatory public plus voluntary and finally mandatory public plus private pension schemes. The results support the negative relationship between the percentage of the population working in the manufacturing sector and the social security fund expenditure. In specific,

⁵ We use the method developed by Machado & Silva (2019) for estimation purpose.

the decline in the population working in the manufacturing sector had elevated the costs in countries under the mandatory public pension regime (-0.436, p-value < 0.01), under the mandatory public and voluntary regime (-0.411, p-value < 0.01) and under the regime in which countries allow mandatory public and private pensions (-0.368, p-value < 0.01). The results did not indicate any influence from the self-employment sector. Enhancing our argument further we checked how the variables behaved in different quantiles. The results reported in Figure 4 indicate that our variable of percentage of population in manufacturing sector is negative in every quantile (red circle, red star, red triangle and blue rhombus). Thus, the results demonstrated that the employment rate of the manufacturing sector has negative impact on the change of social security fund expenditure, except for the mandatory private country.

[WHERE IS FIGURE 5?]
[THE QUANTILE RESULTS ARE NOT DISCUSSED-THE DISCUSSION IS ACORE PART OF THE PAPER]
[IT WOULD HAVE BEEN VERY INTERESTING IF THE QUANTILE RESULTS ARE DIFFERENT ACROSS DOWN OR UP SEGMENTS OF THE DISTRUBITION]

Table 3. Fixed effects estimation.

Variables	D.SSFE	D.SSFE (mandatory private)	D.SSFE (mandatory public)	D.SSFE (mandatory public + voluntary)	D.SSFE (mandatory public + private)
D.IND	-0.351*** (0.09)	-0.0741 (0.243)	-0.436*** (0.089)	-0.411*** (0.117)	-0.368*** (0.101)
SEE	0.003 (0.005)	-0.090 (0.269)	0.001 (0.005)	0.005 (0.005)	0.003 (0.005)
TUD	-0.002 (0.003)	0.024 (0.035)	-0.000 (0.003)	0.002 (0.003)	-0.002 (0.003)
Constant	-0.047 (0.156)	0.718 (2.725)	-0.077 (0.174)	-0.196 (0.154)	-0.069 (0.160)
Observations	496	30	187	374	452
Number of ID	28	2	12	20	26

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, and D.: is referring to first differences.

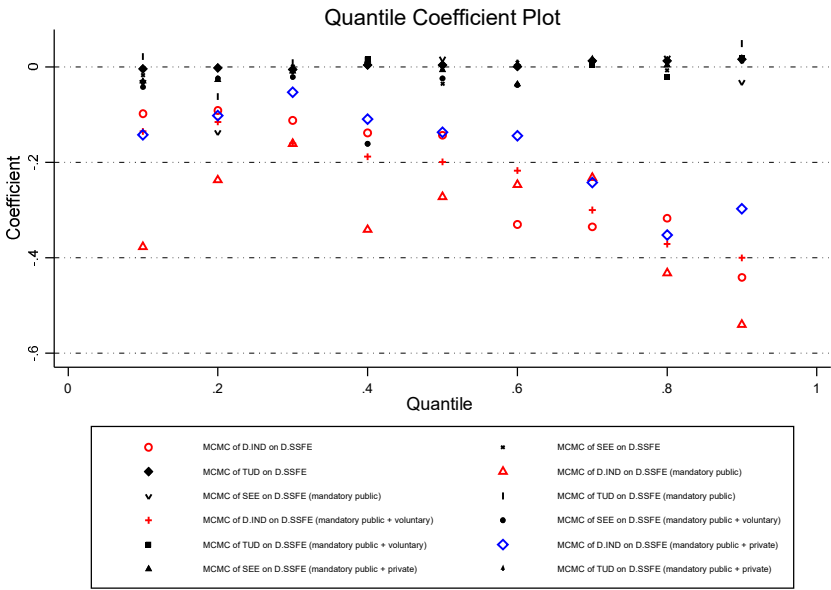


Figure 6.

For the robustness check, Equation (2) is estimated while controlling endogeneity of the variable trade union density.⁶ The two-stage least square estimates of Baltagi and Chang (2000) are reported in Table 4. The results indicate that a change in manufacturing sector employment is negatively significant between the percentage of employment in the manufacturing sector and the social security fund expenditure as a percentage to GDP for countries under a mandatory public pension scheme (-0.485, p-value < 0.01). The negative relationship is further supported by the quantile coefficient plot, where we applied the panel quantile regression (red triangles).

Table 4. Fixed effects estimation (IV).

Variables	D.SSFE	D.SSFE (mandatory private)	D.SSFE (mandatory public)	D.SSFE (mandatory public + voluntary)	D.SSFE (mandatory public + private)
D.IND	-0.029 (0.369)	0.901 (1.501)	-0.485*** (0.119)	-0.130 (0.392)	-0.120 (0.331)
SEE	-0.216 (0.149)	-3.344 (4.554)	-0.092 (0.062)	-0.150 (0.097)	-0.163* (0.093)
TUD	0.235 (0.155)	0.508 (0.676)	0.171 (0.136)	0.205 (0.150)	0.212 (0.135)
Constant	-3.213 (2.344)	30.790 (42.170)	-1.896 (2.229)	-2.492 (2.139)	-3.369 (2.439)
Observations	471	30	162	349	427
Number of ID	28	2	12	20	26

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1, and D.: is referring to first differences.

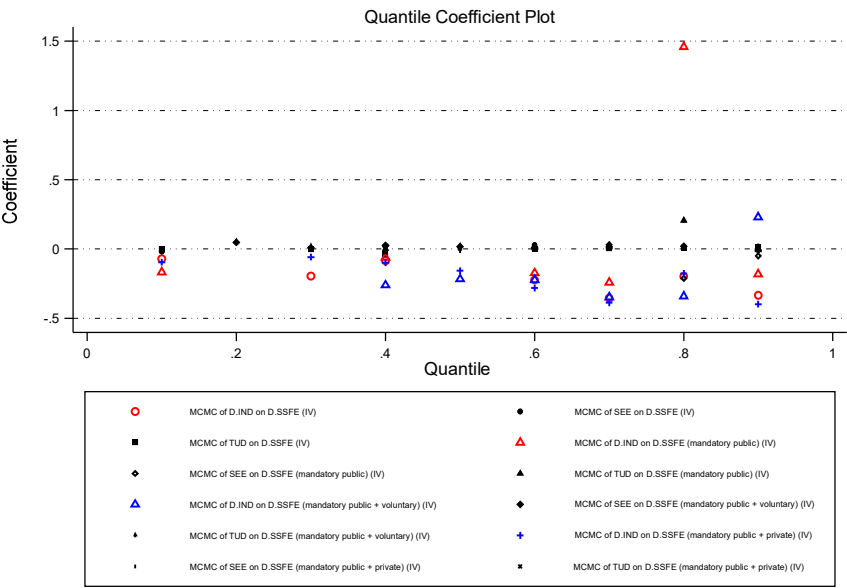


Figure 7.

[HERE THE TABLE WITH THE QUANTILE ESTIMATES WOULD HAVE BEEN MORE VALUABLE]

6. Discussion

⁶ The instrumental variables for trade union density are change of employment rate in manufacturing, change of employment rate in services, and the rate of unemployment.

Employment in the manufacturing sector falls between 20% and 30% (Table 5) to sustain pension systems. Countries below 20% are those exporting welfare to other countries, while countries above 30% are living at the expense of other countries.

Regulations, tax expenditures, and public spending provide social protection in the established and industrialised countries, and the impact of globalisation effects the government’s ability to keep providing such protection (Tanzi, 2002).[ARE THESE VARIABLES TO BE CONSIDERED AS CONTROL VARIABLES TOO?-IF YOU HAVE NOT USED THEM IN THE EMPIRICAL ANALYSI, THEN THERE IS NO POINT FOR DISCUSS THEM] This is aggravated by the aging populations in many established economies, which are found also in some emerging economies, such as China, but in contrast not in India, Brazil or Mexico, where there is a rise in population growth (Fourné et al., 2014).

Potential reforms in public policy aimed at countering the pension crisis are in Table 5. Based on our results, we argue that heavier emphasis should be given to personal empowerment in financial matters (Lusardi and Mitchell, 2014). Financial complexity can be daunting regarding retirement savings and often discourages employees from a timely enrolment in employer-sponsored saving plans (Beshears et al., 2013). Benartzi and Thaler (2007) argue that the majority of employees have little to no training to make saving decisions. Rather, they are passive investors, and they are slow to join advantageous plans, often making infrequent changes, and therefore adopt naïve diversification strategies when trading⁷ in the stock market. Active savers instead, can derive more advantages from their pension (Chetty et al., 2014).

Table 5. Pension crisis countermeasures.

Addressing the worker-retiree ratio	Raising the retirement age, open borders immigration policy, self-employment promotion during post-retirement, subsidies to increase human fertility
Reducing Obligations	Swapping from defined benefit to defined contribution pension schemes, reducing the level of periodic payments by adjusting the formula in DB pensions, placing a ceiling to top pensions (golden pensions).
Increasing resources to fund pensions	Increasing contribution rates, raising taxes
Tackling undeclared work	Reducing the number of companies hiring workers without paying them social security
Increase employment in the industrial sector	Redefining “normality” at a percentage of employment in the industrial sector around 25% with countries below 20% ⁸ exporting their welfare at their own expense, while countries above 30% ⁹ freeriding welfare at other countries’ welfare.

Institutions, increasingly, for example, find that national treatment of pension savings and their stakeholders, by middle-class voters or organised labour market unions as formidable hurdles to the European integration of pension provisions. The increasing prevalence and emergence of large and long-lasting public deficits has developed broad and deep financial markets that have called for a

⁷ These inconsistent financial strategies are often characterised by investment biases such as lack of diversification, excessive trading and dispositional effect (Cronqvist & Siegel, 2014).

⁸ Such as US, UK and Greece

⁹ Such as Germany, Russia, China and Turkey

liberalisation of international savings. Consequently, it may be erroneous to attribute exclusively to finance all the interdependent and complementary transformations which take place in the hierarchy of institutional forms.

[WOULD IT WOULD IT MAKE SENSE TO CONSIDER THE GFC AS A DUMMY VARIABLE TO CHECK FOR ROBUSTNESS? WHAT ABOUT THE EFFECT OF QE? IF YOU MANAGE TO ACCESS DATA POST 2022, THEN EVEN COVID19 THAT IS MENTIONED IN THE INTRO COULD BE A DUMMY!!!!!!].

7. Conclusions

The fallouts of our enquiry shed light on two questions. Manufacturing is linear positive and strong predictors to trade union density a result implying the decline in trade union density has transpired alongside tumbling rates in manufacturing as depicted in the general framework Figure 8.

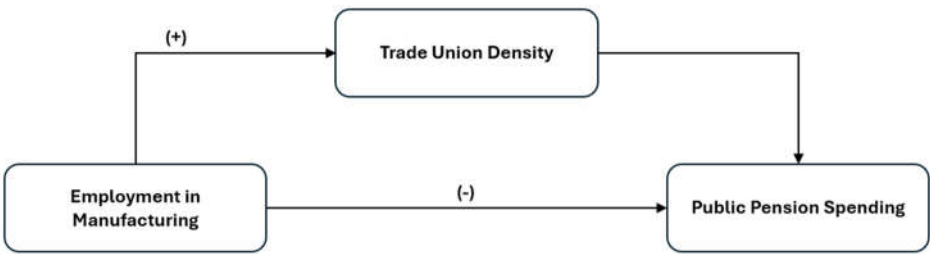


Figure 8. Depicts the final theoretical framework with the accepted hypotheses.

When we examine the drivers of rising public pensions, we found that higher manufacturing employment is coupled with relatively more favourable public pension finances. The relationship held consistently across country groups that follow legally mandatory public pensions, mandatory public plus voluntary pension, and combined mandatory public-private pension regimes; but does not hold when operating under mandatory private pension regimes.

Over-specifying our model to account for potential endogeneity of manufacturing employment with respect to trade union density, we fail in finding any statistically significant effect of trade union density on public pension finances. Instead, the manufacturing employment share remains the lone direct predictor of public pension fiscal outcomes in our specifications.

The has article attempted to link trade union density with the decline of employment in the manufacturing sector and argue that this decline is significantly responsible for rising public pension expenditures. The results demonstrate that trade unions did not exert any influence on public pension finance, while the percentage of the population working in the manufacturing sector did. It is worth mentioning that the percentage of the population working in self-employment showed a positive influence on public pension expenditures but not as strong as the strength from the percentage of the population working in the manufacturing sector. To achieve this empirical result, a longitudinal statistical analysis was performed, and longitudinal quantile regression plots were generated to enhance the robustness of the argument.

Conflicts of Interest: The authors verify that there is no conflict of interest derived from this research.

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