Wage dispersion and pension funds: Financialisation of non-financial corporations in the USA

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Abstract:

 The paper argues that wage dispersion between white-collar and blue-collar workers has caused the rise and expansion of pension funds in a direct and long-run structural manner in the USA. Using data from the Saez-Zucman and the St. Louis Fed's FRED datasets, the argument is empirically analysed on yearly data for the period 1964-2012 in the USA. The results confirm the existence of a long-run relationship of causality from wage dispersion to the share of pension funds within US households' financial wealth. Applying a vector error correction model to the data it emerges that the variance in pension funds due to wage dispersion starts to rise after the fifth period, and reaches 69% in the tenth period.

"With a 'stock-minded' public, as in the United States today, a rising stock-market may be an almost essential condition of a satisfactory propensity to consume; and this circumstance, generally overlooked until lately, obviously serves to aggravate still further the depressing effect of a decline in the marginal efficiency of capital." (Keynes, 1936, p. 319).

Inflation in financial markets is reflected by the fact that the ratio of stock market capitalization to GDP in the United States has increased from 41.3% in 1980 to 146.2% in 2014.[1] Financial markets inflation has been backed up by institutional investors such as investment funds, hedge funds, retirement funds and insurance companies, which increased their weight in terms of assets on GDP, from 70.5% in 1980 to 182.9% in 2004 (Peralta and Garcia, 2008, p. 4). Correspondingly, "the ratio of profits in the financial sector relative to the

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[1] See https://fred.stlouisfed.org/series/DDDM01USA156NWDB

non-financial sector has more than doubled since the mid-1980s" (Jackson, 2010, p. 23) and the ratio of financial assets to non-financial assets held by US non-financial corporations (NFCs) has increased from 38.6% in 1980 to 91.4% in 2013 (see figure 3), which indicates a financialisation of NFCs.

The main purpose of this paper is to provide a contribution to understand the macroeconomic process behind the inflation of financial markets and the financialisation of NFCs, by way of the impact of the increase in the wage differential between white-collars and blue-collars (wage dispersion) on the rise of pension funds.[2] The hypothesis to be tested is as follows: rising wage dispersion between white-collar workers (ancillary overhead labour) and blue-collar workers (production labour)[3] has caused the rise and expansion of pension funds in a direct and long-run structural manner.[4]

My distinction between white-collar and blue-collar workers does not pertain to the skill-level of workers, unlike that proposed by the skill-biased technological change approach (see Acemoglu, 2003; Acemoglu and Autor, 2010; Autor, 2014). Rather, it is based on the tasks workers perform. The essential point is whether these tasks are ancillary, innovative tasks with the purpose of increasing the market share and/or market power of the firm (such as sales operations, advertising, marketing, design, R&D, business management, etc.) or tasks with the purpose of producing goods and services. The white-collar/blue-collar distinction might appear confusing, since some occupations might correspond to white-collar jobs despite they have nothing to do with increasing market power. Nonetheless, it represents the option that can be most readily employed when analysing available data. Calling innovative ancillary labour 'white-collar work' and manual labour 'blue-collar work' should not lead to crucial empirical and theoretical shortcomings, despite the existence of challenging examples such as cleaners, accountants, etc.

The argument relies on the assumptions that: higher income earners have a higher propensity to save (Kaldor, 1955-1956, p. 95), and that savings from salaries of white-collar workers are being channelled to financial markets through pension funds. It draws on the capital market inflation theory (hereafter CMIT) developed by Toporowski (2000), which highlights the relationship between financialisation[5] and pension funds, in that pension funds provide excess inflow into financial markets (ibid., 69). Within the financialisation literature, CMIT is distinguished by the fact that it provides a comprehensive explanation of how pension funds have inflated the financial markets. It further deals with how financial markets operate, and why expectations of boosting investment by channelling long-term savings into financial markets via pension funds (Bonizzi and Churchill, 2016; Toporowski, 2000, p. 51) might not be fulfilled.

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[2] I do not mean only private pension funds, discussion of which is very common in the literature. Private health insurance funds are also theoretically and empirically considered here, since such funds are also being channelled to financial markets.

[3] See Blanchflower and Oswald (1990) for similar definitions and a similar distinction.

[4] Other factors, such as institutional settings or an increase in the general income level, are outside the scope of this paper. I focus on the impact of wage dispersion as a form of income inequality.

[5] "Financialisation is broadly defined as the inflation of capital markets" (Toporowski, 2008b, p. 1). I prefer to define it as the increasing recourse of previously nonfinancial corporations to financial methods and instruments.

Figure 1 – *Wage dispersion and pension funds' share within US households' financial wealth*

Pension funds share within households' financial wealth (LH axis)
Wage dispersion (RH axis)
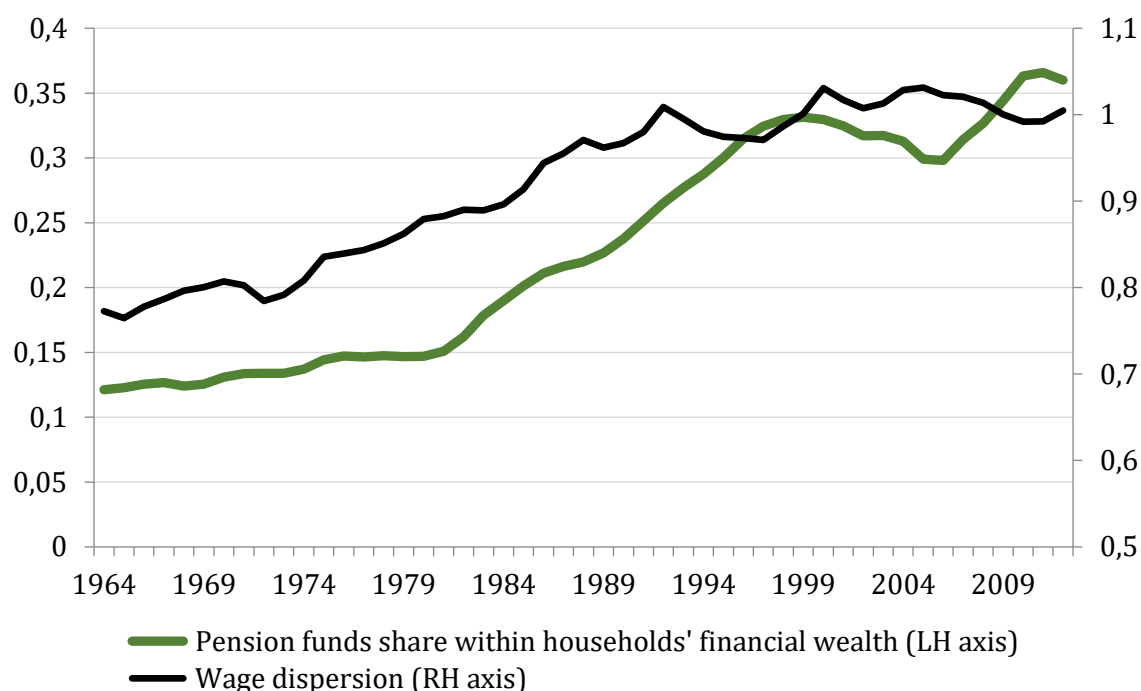
Notes: wage dispersion is computed as ratio of annual average hourly compensation of all employees in the NFC sector to the average hourly earnings of production workers in the private sector.
Source: for the share of pension funds, https://fred.stlouisfed.org; for wage dispersion, http://gabriel-zucman.eu/uswealth/, Table A3.

However, CMIT does not adequately explain the economic background of the rise and expansion of pension funds. Drawing on Steindl (1952, pp. 113-121; 1990), Toporowski (2008b, p. 10; 2000, p. 49) very briefly mentions the role of middle-class savings, but he does not elaborate upon the topic in detail. This paper strives to provide an explanation of the rise of pension funds via the savings out of the wages of white-collar workers ("professionals and big salary earners": ibid., p. 115) that have been made possible by the increase in wage dispersion.[6]

In the literature, it has been suggested that the emergence of private pension funds is a product of neoliberal institutional arrangements that delegate social welfare to financial markets.[7] To my knowledge, there are no studies that explain the rise of pension funds in economic terms and by its relationship to wage dispersion. Similarly, the impact of wage dispersion on financialisation has yet to be discussed, except in Fontana et al. (2016), Herr and Ruoff (2014), and Dünhaupt (2014). However, the latter argue that financialisation leads to

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[6] It could be argued that income and savings of capitalists should have been considered too. However, in the period considered here the number, income and saving of capitalists have not experienced a sharp shift, as is the case for white-collar workers, and hence do not demarcate a structural break. Wage dispersion between white-collar and blue-collar workers underwent a structural break in 1972 (see figure 1). Therefore, capitalist savings have been left out for the sake of simplicity.
[7] See Bonizzi (2017, p. 22), Toporowski (2008b, p. 13), Dixon (2008), and Ganßmann (2013).

wage dispersion between financial sector workers and non-financial sector workers, as well as between executive and non-executive compensation. Darcillon (2012) shows that, besides labour market deregulation, financial liberalization too amplifies wage inequality.

My argument does not concern the wage differential between workers employed in the financial and the non-financial sector, and rather proposes the opposite direction of causality: wage dispersion between white-collar workers and blue-collar workers (which has been driven by increased market concentration: see Dögüs, 2017) has led to financialisation of NFCs via the growth of private pension funds.

Similarly to what done here, Palley (2015) takes into account the composition of the workforce by distinguishing the different wage levels of top managers, middle managers and manual workers. But he does not connect the issue to financialisation or the channeling of savings towards financial markets.

1.   Pension funds and financialisation: The capital market inflation theory

The relationship between financialisation and pension funds has been widely discussed and examined in the literature by several empirical studies.[8] It has been argued that the inauguration of private pension schemes in the 1970s led capital markets to inflate (Toporowski, 2000, p. 50; Bonizzi, 2015, p. 124; Guðmundsson, 2016, p. 297) and financialisation to emerge (Lazonick and O'Sullivan, 2000). Since the last decades, "the majority of stocks and shares" started to be "owned by pension funds and insurance companies" (Toporowski, 2014, p. 104). McCarthy et al. (2016, pp. 755-756) report that after the 1970s, the asset allocation of pension funds in the USA underwent a tremendous shift towards corporate equities. Figure 2 shows how the share of pension funds in households' financial wealth has increased since 1980. Moreover, figure A6 of *saezzucman.eu* shows that the share of profits and interest paid to pensions within capital income in the United States has continuously increased since 1970. In 2014, 49.3% of pension funds invested in stocks and the value of pension funds represented 96% of GDP.[9]

This evidence is interpreted to confirm that pension funds have functioned to inflate financial markets. Thus, while collective pay-as-you-go pension schemes might serve to sustain the consumption of elderly retirees, since their retirement benefits are paid by the contributions of people who are currently working, private pension schemes serve to inflate financial markets.

Toporowski (2000) points out that the excess inflow into financial markets, "which is made up of the contributions to pension funds, plus the investment income which is not paid out as pensions" (ibid., p. 69), inflates the prices of financial assets (ibid., 75). Thereby, it stimulates the demand for financial assets by increasing the expected capital gains from them (Toporowski, 2008b, p. 8), as "changes in profits and trends in stock prices attract savings from other nonfinancial securities markets, such as bank deposits, gold and property, which also act as repositories for savings" (ibid., p. 32). This renders NFCs overcapitalized, by encouraging them to refinance "in excess of their current needs" (Toporowski, 1993, p. 29).

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[8] See Natali (2018), Braga et al. (2017), Guttmann (2017), McCarthy et al. (2016), Guðmundsson (2016), Dixon (2008), Dixon and Sorsa (2009), Bonizzi (2015), Engelen (2003), Ganßmann (2013), and Toporowski (2000).
[9] See https://www.oecd.org/finance/Pension-funds-pre-data-2015.pdf

Figure 2 – *Composition of households' wealth as a share of GDP*
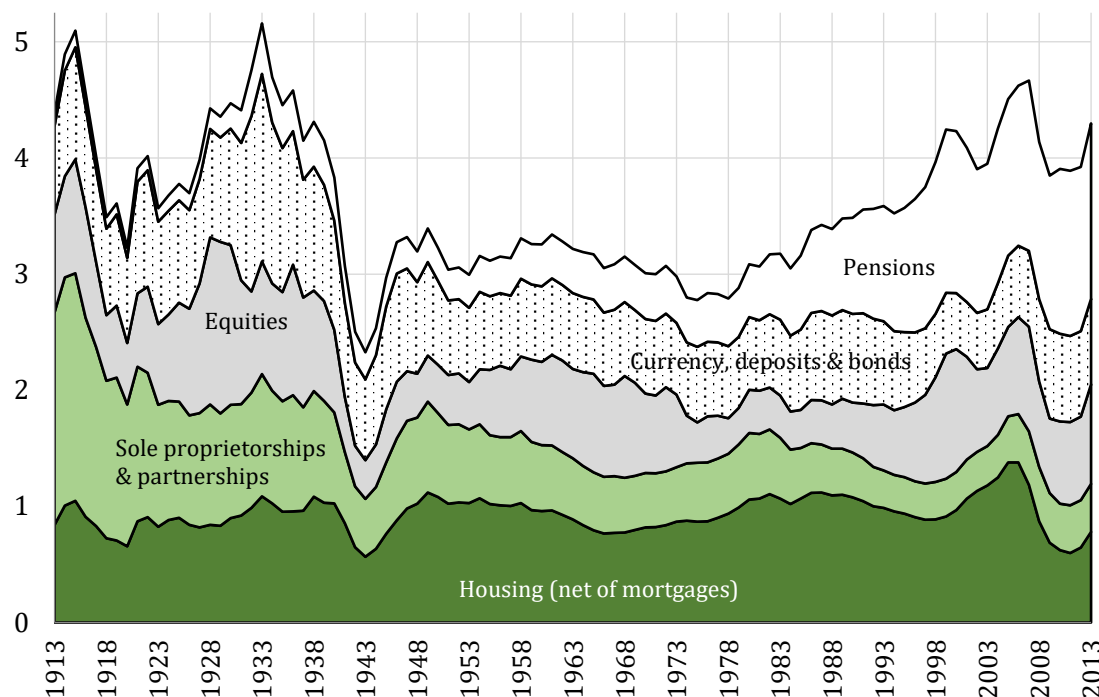
Toporowski (2008b, p. 9) defines excess capital – which "has been used to replace bank borrowing with cheaper long-term capital"[10] or "to buy short-term financial assets" – as the excess of liabilities held in financial assets over productive capital, i.e., the plant, equipment, materials, and stocks of unsold products and semi-fabricates (ibid., chapter 3). For the sake of greater clarity, I would define it as the quantitative difference between capital (in terms of accounting, owners' equity) and nonfinancial assets, corresponding to the quantitative difference between financial assets and financial liabilities. In other words, it is the capital employed not for real investment but rather for financial operations: "for managing the liquidity" (ibid., p. 7) "in search for speculative returns" (ibid., p. 6) in "inflated highly liquid financial markets" (ibid., p. 4).

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[10] The increasing prices of securities reduce interest and dividends, and hence make the issuance of stocks cheaper and more attractive (Toporowski, 2000, p. 50). However, the reduction in market yield is offset by the additional return on capital gains that such inflation introduces into the capital market (ibid., p. 28).

Figure 3 – *Financialisation Index and pension funds' share within households' financial wealth*
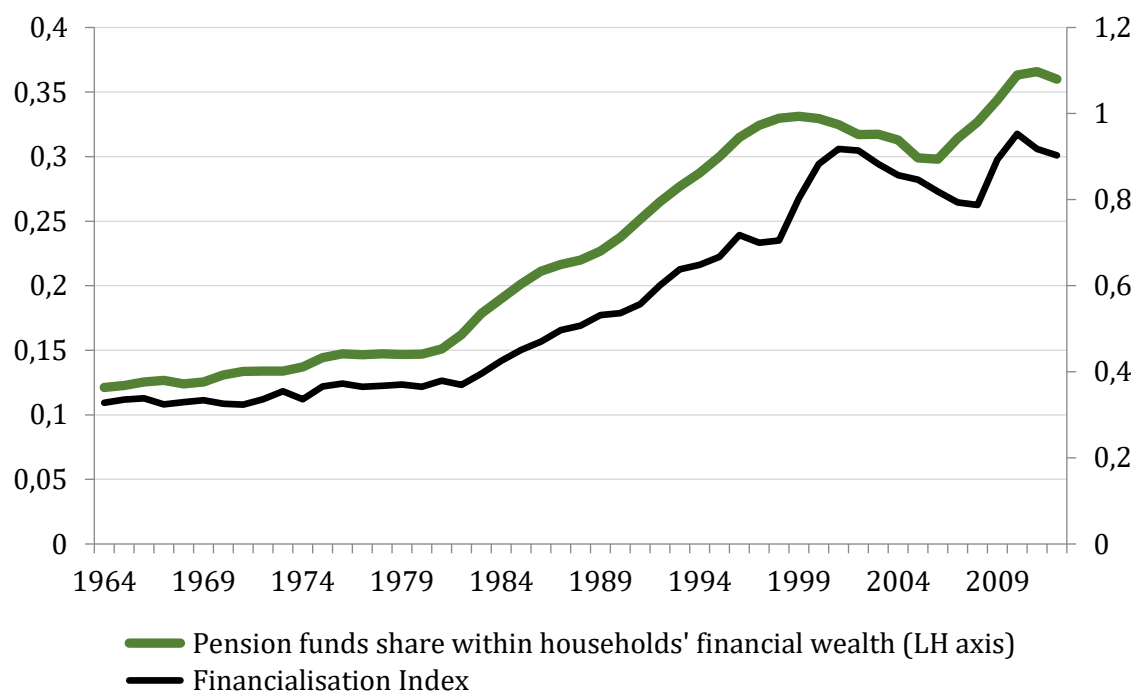
Notes: the Financialisation Index is defined as the ratio of financial assets to non-financial assets held by NFCs
Source: *saezzucman.eu*, Table A3; and www.research.stlouisfed.org

Concerning the financialisation of NFCs (i.e. their preference for holding liquid financial assets over non-financial assets) due to capital market inflation, Toporowski (2000, p. 46)states that "capital market inflation has adverse consequences for listed companies and the economy as a whole because the resulting excessive gearing discourages investment" in real capital assets.[11]

Concerning the decrease in investment due to savings out of the salaries of white-collar workers that flow into financial markets,[12] the following statement by Minsky is useful:

> a high savings ratio out of wages diminishes and a low ratio increases business profits: the behaviour of saving out of wages amplifies the effect on profits of increases and decreases in investment (Minsky, 1986, p. 170).

Similar observations were put forward by Steindl (1952, pp. 113-121).

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[11] Whether the ability of firms to hedge their illiquid real investments with liquid assets might make real investment easier is debatable and calls for further research, since the main drivers of investment are the expected profits sustained by aggregate demand. Stated differently, if firms perceive that real investment would generate higher profits due to strong demand, then they might borrow or sell financial assets, in order to finance investment in excess of internal funds (Minsky, 1986, p. 212). If non-financial assets increase due to real investment, then either financial liabilities increase (due to borrowing) or financial assets decrease (since they have been sold). If owner equity has not increased by the same amount, excess capital decreases as a result. After all, by definition excess capital is capital that is not employed for the acquisition of non-financial assets, but rather for the management and acquisition of financial assets.

[12] For the sake of simplicity, the savings invested in housing and real estate have been left out of the analysis.

By way of this process – namely, overcapitalization – the "entrepreneur corporation" has become the "rentier corporation" (Toporowski, 1993, pp. 36-43) with "a higher liquidity preference" (ibid, p. 42). Due to higher liquidity preference, the ratio of liquid financial assets to non-financial assets held by NFCs in the USA has increased in the last three decades (see figure 3). This development has been driven mainly by depressed demand for consumption goods (Dögüs, 2018). In line with accounting principles, the higher ratio of financial assets to non-financial assets corresponds to an increase in excess capital (ibid, pp. 23-24).

Finally, it is worth mentioning that large NFCs have "access to capital markets" and "can afford to issue securities to replenish their liquid reserves" (Toporowski, 2000, p. 56). Not surprisingly, they have excess capital and engage more in financial operations,[13] i.e. "balance sheet restructuring" (Toporowski, 2008b, p. 9). Within an empirical investigation of NFCs in the USA between 1971 and 2011, Davis (2013) found that most large NFCs have engaged in financial transactions.

2.   Wage dispersion and pensions funds

I cannot explain here the various factors behind changes in savings (of white-collar workers), such as inflation, real interest rate, changes in income level (Keynes, 1960), income distribution, institutional arrangements, expectations, future or past income, etc. These have already been discussed in the relevant literature. I rather focus on the impact that a relative increase in the income and share in employment of white-collar workers has on the pension savings that are channelled to financial markets via private pension funds. I choose not to focus on the impact of an increase in general income on pension savings because: (*i*) it is not the increase in the general income level, but rather wage dispersion that has been one of the distinguishing features of the last decades;[14] (*ii*) pension savings do not simply correspond to ordinary 'non-spending savings' or, so to say, 'residual', but rather they are induced by capital gains expectations;[15] and (*iii*) as the rise in inequality indicates, the real income of lower-income earners, such as blue-collar workers, has declined or at least stagnated, and so they are

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[13] See Dögüs (2018) for a critique of the financial constraint approach (FCA) to financialisation, which argues that investment and capital accumulation have fallen due to financial constraints that have been exacerbated by distributed profits, i.e. rising dividend and interest payments and buybacks (Hein, 2010). A major drawback of FCA is that it does not consider the role of firm size in the financialisation of NFCs.

[14] Had (wage) inequality not increased after 1980, the savings of high-income earners might not have been stimulated so much, due to higher price levels that were caused both by an increase in labour costs and by a consumption cascade that would be driven by the increase in income, especially, of low-income-earning blue-collar workers who have a lower propensity to save. This represents the opposite of debt-deflation. In this sense, Herr and Ruoff (2014) assert that "the living standard of the middle class, including skilled workers, will be slightly negatively affected by the increase of wages in the low-wage sector, whereas the living standard of the workers earning low wages will increase" (Herr and Ruoff, 2014, pp. 35-36). For example, Cynamon and Fazzari (2013, p. 8) show that the demand of the top 5% of income-earners had a negative trend during the period 1989-2009.

[15] Capital gains are mostly used for "extraordinary liabilities for health care, holidays, school fees, the purchase of housing, or the repayment of inconvenient debt" (Toporowski, 2010). A simple calculation based on the Consumer Expenditure Survey (CES; available at http://www.bls.gov/cex/csxstnd.htm#2011) for the period from 1984 to 2011 supports this argumentation: the share of expenditures for personal insurance and pensions, owned dwelling, mortgage, and education in white-collar workers' expenditures is higher by around 3% than the share for the same items in blue-collar workers' expenditures. The relationship between the consumption pattern of white-collar workers and market concentration calls for further research.

not able to save much, whereas high-income earners, such as white-collar workers, have earned more.[16]

Let us consider how wages (incomes) and savings of white-collar workers are higher and have increased in the past decades,[17] and how pension funds' and health insurance coverage rates, which inflate capital markets, are higher for white-collar workers.

Figure 4 shows that college-graduates (who are mostly employed as white-collar workers[18]) have a higher propensity to save than high-school graduates (blue-collar workers), most likely because they earn more (see figure 1).

Figure 4 – *Average saving rates of blue-collar and white-collar workers*
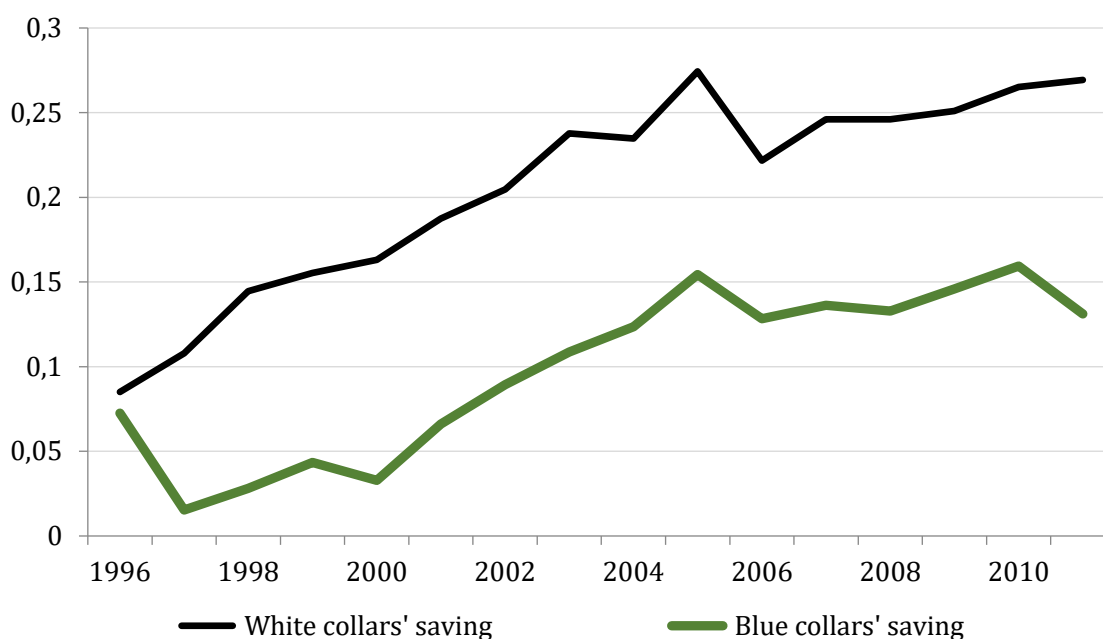
Notes: average saving rates are defined as (1 – real consumption expenditure)/real income after taxes.
Source: Consumer Expenditure Survey (CES), available at http://www.bls.gov/cex/csxstnd.htm#2011

If we consider figure 4 in light of the fact that the share of college graduates in total employment has increased from 14.7% in 1973 to 36.3% in 2016,[19] we can infer that the total saving out of the wages of white-collar workers must have tremendously increased, due both

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[16] Elucidation of the relationship between savings and income distribution requires further research, e.g. based on "Duesenberry's and Veblen's ideas on relative consumption and conspicuous consumption" (Palley, 2008, p. 3). Green (1991), Wildauer (2016), Nikiforos (2016), Perugini et. al. (2016), and Cynamon and Fazzari (2013) are some of the studies dealing with the relationship between income distribution and saving.

[17] Despite stability or even an increase in the saving of white-collar workers, total saving has decreased (see https://fred.stlouisfed.org/series/PSAVERT), since low-income earners, whose savings have fallen (due to increased debt due to a fall in their real income), constitute the majority of society.

[18] In 2011 underemployment of college graduates (i.e. their employment in jobs that do not require college degrees) was around 28% (see *stateofworkingamerica.org*, Figure 4AK.)

[19] See http://www.epi.org/data/#?preset=wage-education

to the rise in the employment share of white-collar workers and increased wage dispersion. Figure 5 makes this point especially clear.

Figure 5 – *Saving rate and employment share*

Source: Consumer Expenditure Survey (CES), available at http://www.bls.gov/cex/csxstnd.htm#2011
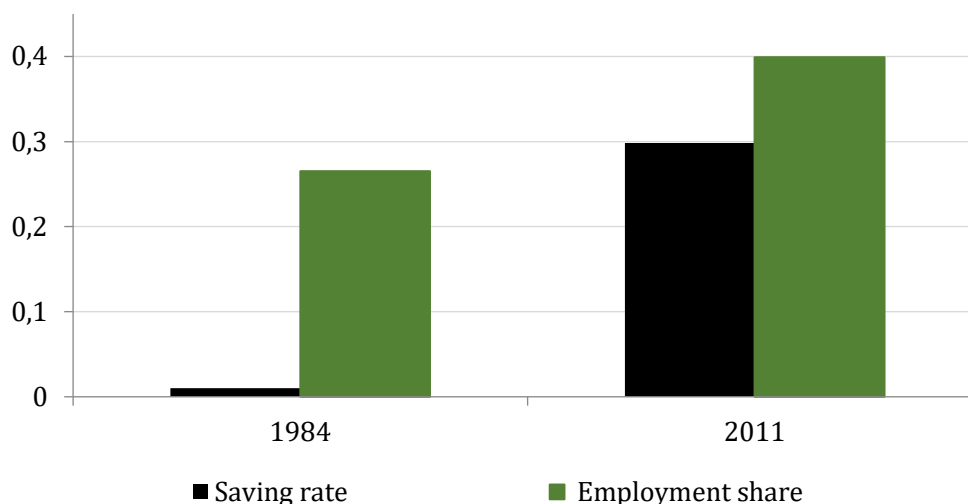
The increase in the employment share and saving rate of white-collar workers from 1984 to 2011 accounts for 35% of the total fall in real consumption expenditure by all wage and salary earners. Stated differently, if the employment share and savings rate of white-collar workers were the same in 2011 as they were in 1984, the total real consumption expenditure of workers would be 35% higher. As Minsky points out, this amount of total savings out of the salaries of white-collar workers, that has not flowed into the goods markets but rather into financial markets, depresses demand and discourages real investment:

> The greater the income of the managerial, technical, and professional labor force – and the greater their savings – the lower the cash flows [internal funds] available for capitalist and rentier income. (Minsky, 1986, p. 174).

The inflow of these augmented saving into financial markets have mainly occurred by way of private pension funds. Green (1991) emphasizes that the introduction of private pension funds had a role in raising the savings of high income-earners as "contractual savings" (Toporowski, 2000, p. 49). Excess inflow into financial markets by way of pension and health insurance funds depends on the fact that, once the contract has been concluded, a certain amount is periodically withdrawn from the bank account of the holder and, as long as the contract is not cancelled before retirement, the capital gains are reinvested period after period. This means that the rate of saving to be transferred to pension funds does not change discretionally, rather it is fixed by contract. Furthermore, it indicates that pension savings that have flowed into financial markets feed back upon themselves, being affected by their lagged values.

As a proxy of this trend, figure 6 highlights the assumption that white-collar workers constitute the greater part of private pension plans and insurance plans holders.[20] It should be noted that even if both groups of workers had the same coverage rate, white-collar workers would still have been able to contribute a higher amount to pension funds, and hence to inflation in financial markets, due to wage inequality between the two categories of workers. Skott underscores this point as follows:

> The poor have few financial assets and their portfolio is skewed towards fixed-income assets. The rich, by contrast, hold a large proportion of their wealth in stocks. Thus, an increase in inequality tends to raise the demand for stocks. (Skott, 2011, p. 2).

Figure 6 – *Pension fund and health insurance share of blue-collar and white-collar workers*
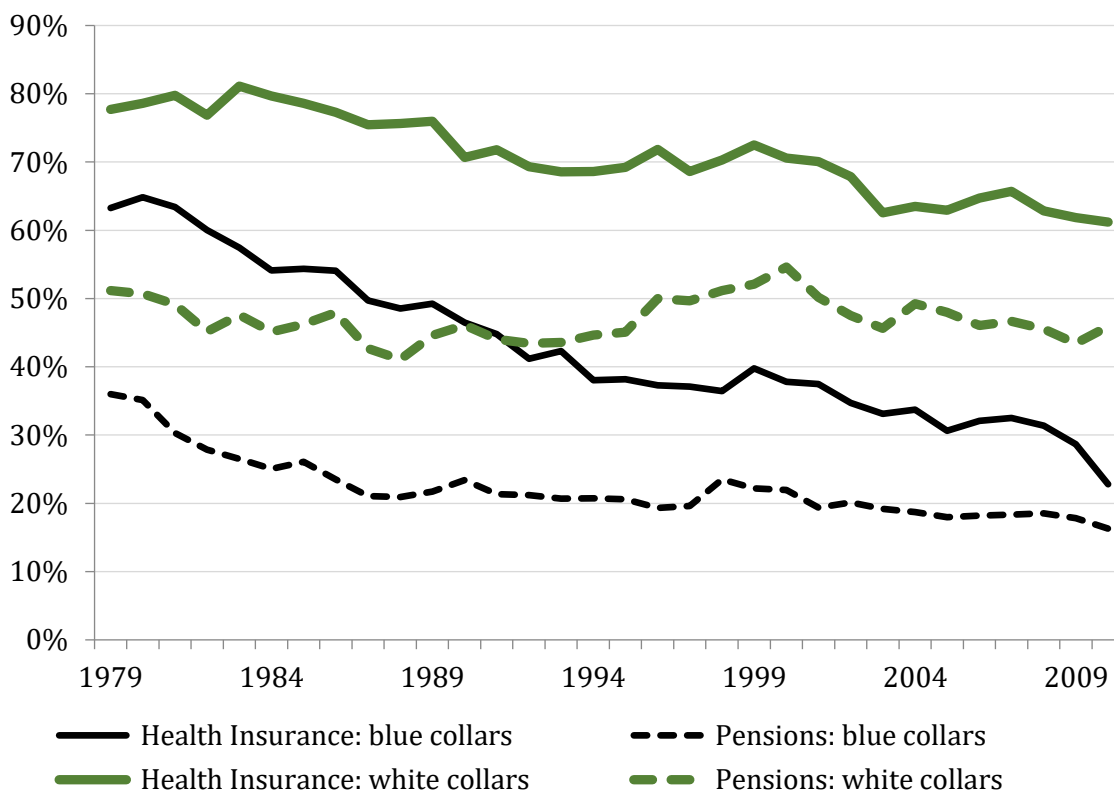
Note: share of blue-collar and white-collar workers who received health insurance from their job for which their employer paid for at least some of the health insurance coverage, and who are included in an employer-provided pension plan for which the employer paid for at least some of the pension coverage.
Source: http://www.epi.org/data/#?subject=healthcov&e=*; and http://www.epi.org/data/#?subject=pensioncov&e=*

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[20] The declining trend is not relevant, because the graph shows the provision rate by employers. More importantly, the main point that the figure illustrates is that more white-collar workers participate in private pension and health insurance funds than blue-collar workers. Declining provision of the employers' contribution and a rising trend in the volume of pension and health insurance funds indicates that employees are contributing by way of their net salary.

3.   Empirical evidence

The empirical test of the main argument, that is, that rising wage dispersion between white-collar and blue-collar workers has led to the rise and expansion of pension funds, is carried out here by analysing yearly data for the USA over the period between 1964 and 2012.[21] The reason for using the 49-year time span and examining macro data is to demonstrate and to capture the long-run structural tendency during the decades in which the dramatic changes in question have mostly taken place. As already mentioned, in the analysis I consider both pension funds and health and life insurance funds, but for simplicity throughout this section we will refer to the former only to imply both.

3.1.   Data description and the model

A simple ordinary least square (OLS) would present only the average coefficient across the time span, which indicates the explanatory power of independent variables (here wage dispersion) on the dependent variable (pension funds' share in household wealth). Indeed, this coefficient of the dependent variable might variate across time and does not indicate any relationship of causality, rather it points out that they are associated. As far as the relationship of causality is concerned, it is more beneficial to reveal to what extent the variance of the dependent variable is explained by the independent variable(s) and how the former reacts to one-unit-shock in the latter. Also, it is important to reveal how they behave across time. A vector autoregressive (VAR) model with impulse response function (IRF) and variance decomposition analysis (VDA) is one of the best options for examining the issue at hand,[22] because the main argument of the paper is that there is a long-run structural and direct causal relationship between pension funds and wage dispersion.

In VAR modelling, each endogenous variable is assumed to depend on lagged values of itself and of all other endogenous variables (Dées and Güntner, 2016, p. 5). However, as this paper deals merely with the causality running from wage dispersion to pension funds, the flipside of the relationship (i.e. causality running from pension funds to wage dispersion) is neglected and left for further research – this despite the fact that VAR modelling assumes that the relationship is bi-directional. The impulse response function reveals whether the causality between variables is direct or not, and the variance decomposition analysis "provides valuable supplementary information about the interlinkages among the variables in the model" (Greenwood-Nimmo and Tarassow, 2013, p. 12). Both analyses are useful to provide structural clarification of how strong and how long-lasting the effects are. Moreover, the impulse response function has an advantage inasmuch as it reveals that the power of the effects is not stable, but rather might fluctuate and might even turn in the opposite direction (from positive to negative and vice-versa) after a certain time.

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[21] The relationship between financialisation and pension funds will not be tested here, since this relationship has already been noted and examined in the literature on financialisation (see introduction, and section 1).
[22] I do not opt for any endogenous or exogenous control variable(s) in the model because what is being tested is merely whether the causality is direct or not. Tarassow (2010) describes what is being analysed by way of the impulse response function and variance decomposition as follows: the "impulse-response function [...] computes the propagation over time of a shock on the variable of interest. The variance decomposition analyzes the relative impact of a shock in one variable on the total variance of the variable of interest – it measures the relative impact of a structural shock for the explanation of the total variance of the dependent variable" (Tarassow, 2010, pp. 14-15).

As I am directly dealing with the difference between wages of production workers and salaries of overhead labour, and I have argued that the dispersion between them determines the pension funds' share within financial wealth, I employ the ratio of annual average hourly compensation of all employees in the NFC sector to the average hourly wages of production workers in the private sector, to measure aggregate wage dispersion at the macro level. Accordingly, wage dispersion (*wd*), the ratio of the salaries of ancillary white-collar non-production workers to the wages of blue-collar production workers, is computed as follows:

$$wd = \frac{c}{p}$$

In the equation, *c* stands for the annual average hourly compensation of all employees in the NFC sector,[23] and *p* for the annual average hourly earnings paid to production workers in the private sector.[24] As data for the hourly compensation of all employees is available only as an index with base 1964 = 100, I express the wages of production workers too indexed to their 1964 value. The ratio gives the reverse of the share of production workers within all labour earnings. I prefer not to use $(c - p)/p$ in order to avoid negative values due to indexing. In short, I assume that the declining share of production workers wages within all compensations implies an increasing share of white-collar workers wages, and thus rising wage dispersion.

The correlation of my index of wage dispersion (shown in figure 1) with the wage ratio between the 90th and the 10th percentiles is of 0.86, and that with the college wage premium of 0.9 (see figure 7), confirming that the index provides a robust measure of wage dispersion.
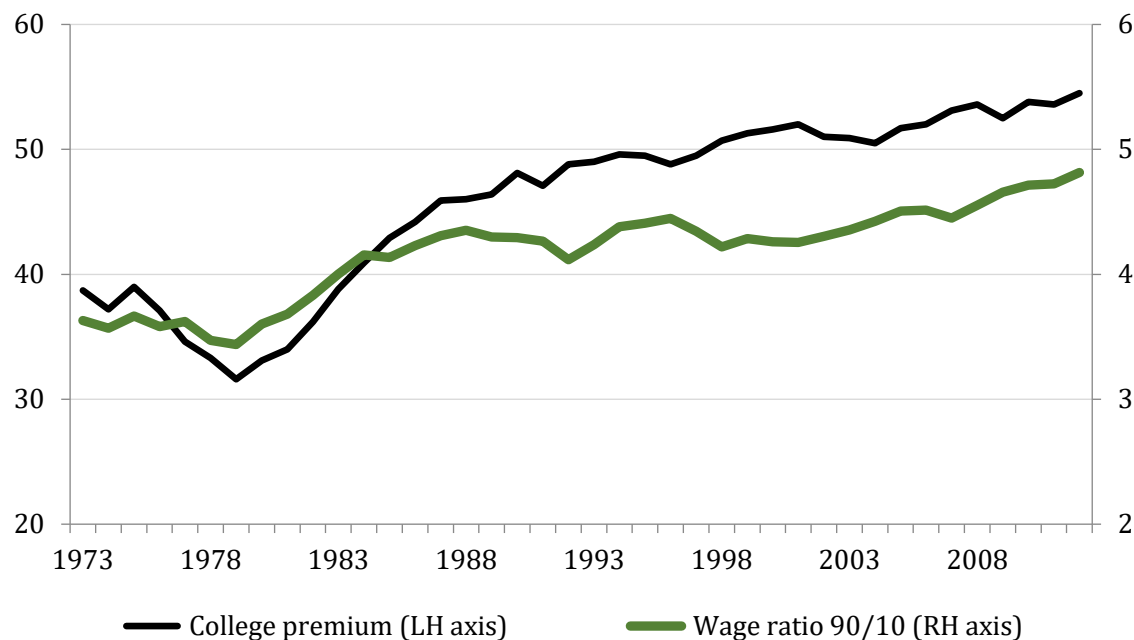
The share of pension funds in households' wealth is calculated as the ratio of the total value of pension funds held by US households to their total financial wealth. The data was retrieved from Table A3 of *saezzucman.eu*. In the model, it is preferable to employ pension funds' share in households' wealth, instead of total liabilities of private pension fund institutions in the market, in order to show whether the pension saving channelled into financial markets have realized gains and validated themselves.[25]

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[23] Obtained from https://fred.stlouisfed.org/series/PRS88003103

[24] Obtained from https://fred.stlouisfed.org/series/CEU0500000008#0. The analysis would be more consistent by employing hourly wages paid to production workers in the NFC sector. However, the series was not available and it was thus necessary to employ the hourly wages of production workers in the whole private sector instead. I assume the two series should not be too different, because changes in private sector wages affect the wages in the NFC sector, and vice versa (spread effect).

[25] Since the available dataset was not disaggregated, I did not have the possibility of extracting capitalists' share from households'. However, I do not expect that this would lead to empirical or theoretical shortcomings, because "pension savings are deferred wage" (Engelen, 2003, p. 1364).

Figure 7 – *Wage ratio between 90th and 10th percentiles and college premium, 1973-2016, USA*

Source: http://www.epi.org/data/#?subject=wage-ratios; and http://www.epi.org/data/#?subject=wagegap-coll

Table 1 – *Unit root test results, intercept and trend, t-statistic*

	Augmented Dickey-Fuller test
Pension funds' share in households' wealth	−2.815 (critical value at 5%: -3,51)
Wage dispersion	−0.949 (critical value at 5%: -3,50)
Residuals	−3.155 (critical value at 5%: -3.50)

Notes: both variables are considered to be $I(1)$ and residuals $I(0)$ at 0.05 significance level.

As the variables are non-stationary and co-integrated (see table 1), since the residuals of a simple OLS are $I(0)$ (Brooks, 2008, p. 340), I employ a vector error correction (VEC) model, which is a VAR model for co-integrated variables. The Schwarz Information Criterion suggests a 2-period lag length, as shown in table 2.

Table 2. *VAR lag order selection criterion*

Lag	Schwarz Information Criterion
0	-6.087
1	-12.588
2	-13.385*
3	-13.217
4	-13.218

* indicates lag order selected by the criterion.

In line with the theoretical framework outlined above, that wage dispersion leads to the rise of pension funds, I use the growth rate of pension funds' share within households' financial wealth (p) and that of wage dispersion (wd). Therefore, the VEC model equation has the following form:

$$\Delta p = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta p_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta wd_{t-i} + \beta_3 EC_{t-1} + \varepsilon_t \tag{2}$$

$$EC_{t-1} = p_{t-1} - a - \beta_4 wd_{t-1} \tag{3}$$

where β_{2i} is the short-term coefficient and shows the effect of the independent variables on the dependent variable; coefficient β_{3i} is the error-correction coefficient, which is tested by analysing whether it is significantly different from zero, and measures long-term causality; β_{4i} is the long-term coefficient that shows the effect of the independent variables on the dependent variable (Deleidi, 2017, p. 10).

3.2.   Results

The *t*-statistic of the coefficient of the error-correction term ($\beta_3 = -0.111$) and of the long-run coefficient ($\beta_4 = -0.898$) in the VEC model are both significant at 95% confidence level, as shown in table 3. They indicate that there is a long-run positive relation from wage dispersion to pension funds' share within US households' financial wealth.

The response of pension funds' share in households' wealth to a one-unit shock in wage dispersion is positive after the fifth period, as shown in figure 8. This result does not falsify and rather supports the main argument of this paper, that wage dispersion has a direct causal relationship with the growth of pension funds.

Table 3 – *Vector error correction model, VEC(2) estimation*

	Cointegrating equation
Pension funds ($t - 1$)	1.000
Wage dispersion ($t - 1$)	−0.898 (−13.388)
Constant	0.600
Error Correction:	**Δ Pension funds**
Cointegrating equation	−0.111 (−4.162)
Δ Pension funds ($t - 1$)	0.786 (5.783)
Δ Pension funds ($t - 2$)	−0.137 (−0.999)
Δ Wage dispersion ($t - 1$)	−0.157 (−2.827)
Δ Wage dispersion ($t - 2$)	−0.121 (−1.902)
Constant	0.003 (0.0009)

Note: *t*-statistics in parentheses.

Figure 8 – *Accumulated impulse responses of pension funds' share in US households' wealth to a one unit shock in wage dispersion for the period 1964-2012*
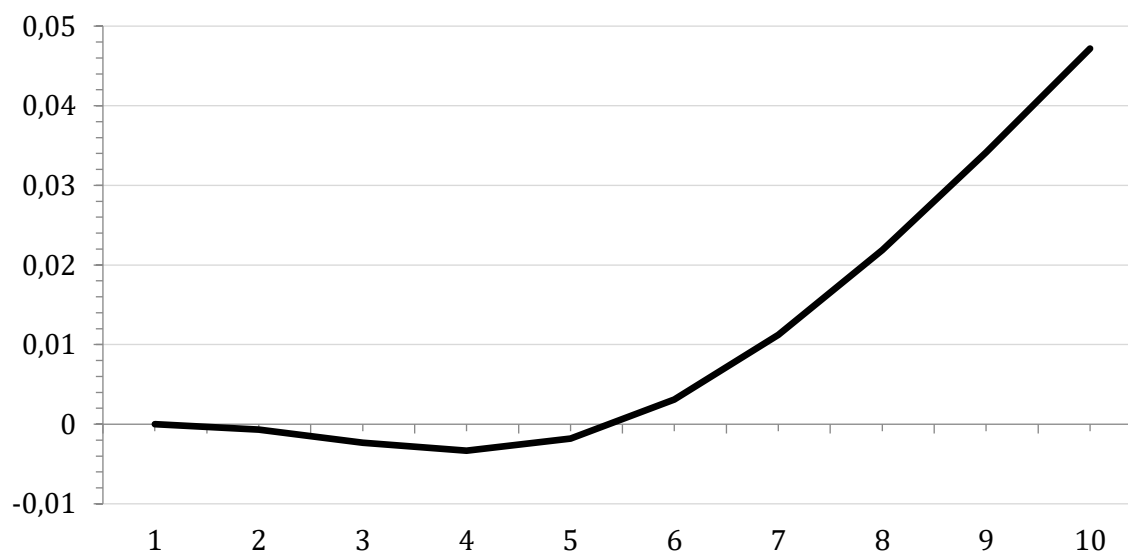
Figure 9 –*Variance decomposition analysis of pension funds' share within US households' financial wealth, for the period 1964-2012*

In accordance with the IRF, the variance decomposition analysis shown in figure 9 implies that the variance in pension funds due to a shock in wage dispersion starts rising after the fifth period, and reaches 69% in the tenth period. This increasing effect, which becomes positive and stronger with time, can be explained as follows. Once white-collars have realized that their relative income has increased, they first attempt to improve their living conditions, i.e. they increase their consumption expenditures and the share of housing (mortgages) increases in short-term. Then, after they have started to save, inflation of financial markets and realisation of capital gains earned by pension funds require longer time.

The significance of these results is supported by Granger causality tests results, reported in table 4. As the *p*-value of the Granger-causality test on the VEC coefficient is less than 5%, we can reject the hypothesis that the change in wage dispersion does not Granger-cause a change in pension funds.

Table 4. *VEC Granger causality/block exogeneity tests*

H₀	χ^2	Degrees of freedom	*p*-value
Changes in pension funds do not Granger-cause changes in wage dispersion	0.118242	2	0.9426
Changes in wage dispersion do not Granger-cause changes in pension funds	12.5883	2	0.0018

4.   Conclusions

Pension funds, which have inflated financial markets, are affected in a direct and long run structural manner by rising wage dispersion between white-collar and blue-collar workers, since their relative higher income enables white-collar workers to save more.

The results of a VEC analysis for the USA between 1964 and 2012 show that such hypothesis cannot been rejected at least at a 95% confidence level. Furthermore, the findings show that the responses of the share of pension funds in US households' financial wealth to a one-unit shock in wage dispersion are positive and significant after the fifth year. Furthermore, their variance due to wage dispersion rises after the fifth year, to reach 69% in the tenth year.

Therefore, we can conclude that the inflation of financial markets by pension funds depends significantly on increased wage dispersion between white-collar and blue-collar workers. Further research is needed to make comparisons with other countries as for example Finland or the Netherlands, which have experienced wage dispersion but only a limited expansion of pension funds and financialisation (or vice versa: McCarthy et al., 2016).

Concerning the policy implications of this research, it should be underscored that policies to replace the current unstable financialised capitalism with an egalitarian and stable social welfare economy should focus on reducing wage inequality. This could be achieved for example by means of public investments and public employment programs.

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