Cooperative and Conflictual Growth Regimes in Italy: A Non-linear Approach

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The paper tests two of the main intuitions of the Bhaduri and Marglin (1990) model, namely, the possible non-linear relationship between growth and functional distribution of income and the distinction between cooperative and conflictual growth regimes. On the one hand, while the literature has mainly estimated a linear effect of functional income distribution on growth, we make the case that linearity is unlikely to hold all the times because the growth-distribution relationship depends on variables that can very well change magnitude over time, even within the same country. On the other hand, the distinction between cooperative and conflictual growth regimes has been overlooked by empirical research. Hence, the second contribution of this paper is the study of the macroeconomic conditions that are essential to achieve cooperation between social classes – wage and profit earners – rather than conflict. Using a variety of econometric tools – included Two Stages Least Squares estimators, structural breaks, Structural VAR, rolling regression and rolling correlation analysis – we show that the Italian economy moved from a cooperative profit led growth regime to a conflictual wage led one over the period 1960-2007. Therefore, the results confirm the intuitions of the models regarding the possible non-linear nature of the growth regimes.

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1. Introduction

The so-called "wage led" literature is growing rapidly. For over a decade, using the Bhaduri and Marglin's (1990) model as main theoretical foundation, post-Keynesian scholars have tried to determine the effect of functional distribution of income on economic growth. While initially - starting from Bowles and Boyer (1995) - the main goal was to find a robust methodology to establish how income distribution affects aggregate demand[1], more recently the focus switched on the factors that could influence this relationship such as debt (Stockhammer and Wildauer (2014), trade (Onaran and Galanis 2014) and financialization (Onaran et al 2011).

This paper contributes to this branch of literature by exploring the dynamics between cooperative and conflictual growth regimes. According to Bhaduri and Marglin, a demand regime is defined as cooperative if a change in the functional distribution of income is favourable to both social classes or conflictual otherwise. In particular, a wage led cooperative regime is one in which an increase in the wage *share* stimulates enough growth to allow for an increase in *total* profit, in spite of a decrease in the profit *share.* On the other hand, a profit led regime is cooperative if the increase in the profit *share* causes an increase in growth that is large enough to cause, in spite of a decrease in the wage *share*, an increase in the wage *bill* – through higher employment for example. Symmetrically, a conflictual regime is one in which an increase in the profit (wage) *share* does not stimulate the economy enough to allow the *total* level of wages (profits) to grow.

Our work analyses the evolution of the macroeconomic conditions that are necessary to achieve cooperation between social classes – wage and profit earners – rather than conflict. These conditions, following the intuition of the Bahduri and Marglin model (1990 a, b), depend on whether the growth regime is wage led or profit led. However, as originally highlighted in the model[2], regimes *can* switch over time and as they change, the requirements to achieve cooperation will also change. The main argument is that relationship between functional income distribution and growth depends on determinants that can vary over time even within the same country. Some of these variables, as we will discuss in section 3, are the sensitivity of investments to profits, the sensitivity of investment to capacity utilization, the level of capacity utilization and profits and the elasticity of capacity utilization respect to the profit share. Consequently, in different periods the profit share can either be positively or negatively related to demand depending on the evolution of the above variables.

The analysis of the non-linearity of the growth regimes and the dynamics between cooperative and conflictual regimes is carried out on Italy (1960 – 2007) because the shift from cooperative to conflictual regime during the 1980s has been particularly pronounced there. Moreover, Italy is one the countries, among the large OECDs, that experienced the largest variation in the wage share from 1960 to the financial crisis to 2007 and if non-linearity exists it should be easier to

[1] Most scholars estimate the effect of functional income distribution on the components of aggregate demand and then sum them up. However, other methods have been proposed in the past such as the structural vector autoregressive models and panel analysis of firm level data. Lavoie and Stockammer (2012) and Blecker (2014) survey the literature on "wage led growth".

[2] Tailor (1990) and Palley (2013) propose a similar non-linear relationship between functional distribution of income and capacity utilization.

detect for large changes of the variables of interest. The choice of the country is, however, by the very nature of the study, secondary because the aim of the paper is to study the *possibility* that a non-linear relationship exists and that the demand regimes are not stable over time.

The structure of the paper is as follows. Section 2 describes the evolution from cooperative to conflictual growth regime and section 3 outlines in some detail the model as presented by Bhaduri and Marglin in 1990. Section 4 discusses the evolution of the growth regime from profit led to wage led that is a necessary step to understand the conditions which have to hold to have a cooperative regime. Section 6 describes the result of the empirical analysis of the determinants of cooperative regimes and Section 7 concludes and highlights some elements for future research.

2. Cooperative and Conflictual regimes

A cooperative regime implies balanced growth because independently from which class is increasing its share of income, both the total amount of profits and the wage bill rise.

Table 1 reports the level and growth rate (between decades) of the profit share (h) and of the income divided between total profits (aR) and wage bill (aW)[3] in Italy (1960 – 2007). Figure 1 instead shows graphically the difference between the growth rate of the wage bill and of total profit from one decade to the next.

As we can see, during the 1960s and the 1970s, the growth of the wage bill and the total profits has been balanced: total wages and total profits improved at similar rates during the first two decades independently of whether the wage share (1960s) or the profit share (1970s) was increasing. The demand regime was cooperative.

Table 1: *Adjusted wage bill and total profit and profit share at the beginning of each decade.*

Year	aW	aR	h	ΔaW/aW	ΔaR/aR	Δh/h
1960	244	120	32.9%			
1970	414	219	34.6%	0.70	0.82	0.05
1980	612	307	33.4%	0.48	0.40	-0.03
1990	722	445	38.1%	0.18	0.45	0.14
2000	728	639	46.7%	0.008	0.44	0.23
2007	801	692	46.3%	0.01	0.08	-0.01

Note: aWS and aRS are in billions.

[3] aW is the adjusted wage bill and aR is the adjusted gross operating surplus at constant prices. The adjustment refers to the self-employed workers whose income is included in the wage bill (this is done by assuming that the average wage of self-employed workers is equal to the one of employed workers).

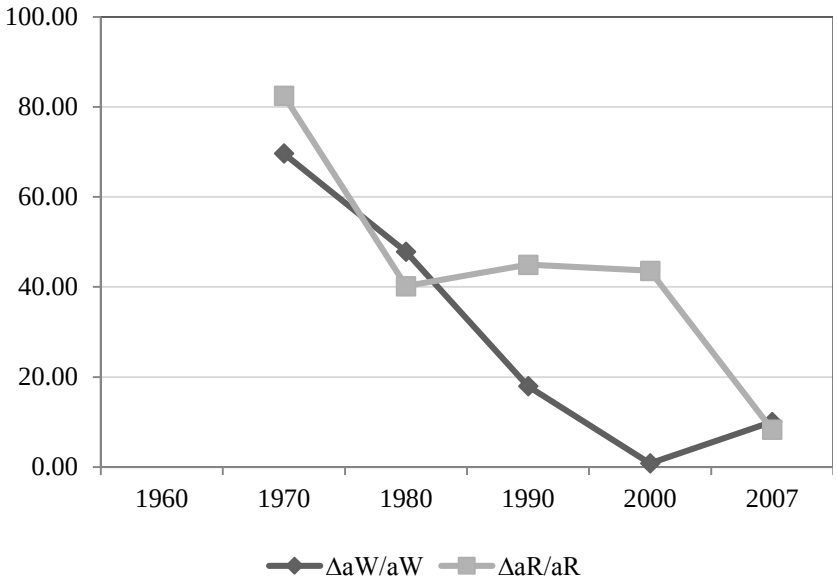

Fig. 1: *Percentage change in the adjusted wage bill and adjusted total profits from the previous decade*

On the other hand, from the 1980s, while the profit share increased continuously, the wage bill started to lag behind the growth rate of profits to the point that in the 1990s the regime was conflictual. In fact, while the profit share soared by 14% in the 1980s and 23% in the 1990s, the growth rate of the wage bill decreased by approximately two thirds in the 1980s and in the 1990s it did not grow at all. Finally, the first seven years of the new millennium were characterised by stagnation and the functional distribution of income remain substantially stable.

3. The model

In this section, we present the main features of the closed economy model[4] developed by Bhaduri's and Marglin. Their aim was to develop a Keynesian framework of analysis in which aggregate demand was expressed as a function of the functional distribution of income. They do this by presenting both the saving and investment functions as depending from the profit share and then equating them to find the IS curve.

We denote output by Y and potential output by Y^*. The profit rate (r) is defined as the ratio of total profit (R) over capital stock (K). By multiplying by Y/Y and Y^*/Y^*, this can be rearranged into the product of profit share ($h = R/Y$), capacity utilization ($z = Y/Y^*$) and the inverse of capital/output ratio at full capacity ($a^{-1} = Y^*/K$)

[4] In the original article, the authors extend these results to an open economy by expressing the profit share as a function of the exchange rate and adding export and import to equation 4. The conclusion are similar to the closed economy model and for the purpose of this study, the closed economy model is sufficient to highlight the relationship between the main variables.

$$r = \frac{R}{K} = \frac{R}{Y}\frac{Y}{Y^*}\frac{Y^*}{K} = hza^{-1} \quad (1)$$

Since there are only two social classes in the model and workers are assumed to consume all their income, savings (S) are simply equal to a proportion (s) of total profits. Therefore, using the decomposition of the profit rate and normalising by the potential level of output to one, savings can be rearranged as the product of saving rate, profit share and level of capacity utilization.

$$S = sR = s\frac{R}{Y}\frac{Y}{Y^*}Y^* = shz. \quad (2)$$

Moreover, assuming constant capital productivity (a^{-1}), investment (I) is a function of the profit rate that in the short run depends on the profit share and capacity utilization

$$I = I(h; z). \quad (3)$$

Therefore, by equating saving and investment, S=I, we obtain

$$shz = I(h; z). \quad (4)$$

By taking the total derivative respect to capacity utilization and profit share and rearranging, we get the slope of the IS function in the (z,h) space

$$\frac{\partial z}{\partial h} = \frac{(I_h - sz)}{(sh - I_z)}, \quad (5)$$

With $I_h = \partial I/\partial h$ and $I_z = \partial I/\partial z$. Hence, whether the profit share has a positive effect on capacity utilization depends on the sensitivity of investment to the profit share (I_h), the sensitivity of investment to capacity utilization (I_z), the saving rate and the level of profit share and capacity utilization. The slope of the IS determines whether the economy is in a wage led or profit led regime. A negative slope indicates that the regime is wage led because a higher profit share is associated with a lower level of economic activity. Symmetrically, a positive slope indicates that the regime is profit led because a higher profit share is associated with a higher level of economic activity.

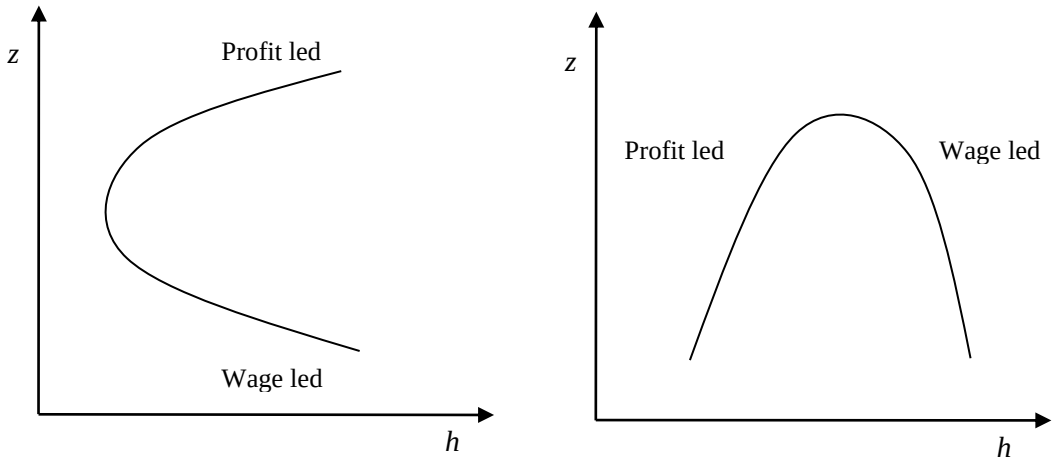

Fig. 2: *Different shapes of the IS curves in the (h, z) space*

Figure 2 shows two possible shapes of the IS curve. On the left, the curve is C shaped: for high levels of capacity utilization, the regime is profit led while at low levels of capacity utilization (and demand) the regime becomes wage led. On the right, instead, the curve has an inverted U shape: when the profit share is low, the regime is profit led while the economy becomes wage led when the profit share is high.

We now explain under wich condition a profit or wage led regime can be cooperative. A wage led regime is said to be cooperative if a decrease in the profit share is associated with an increase in the total level of profit caused by a larger increase in capacity utilization. Therefore, a wage led regime is cooperative if the negative elasticity of capacity utilization respect to the profit share is larger than one

$$-\frac{dz}{dh}\frac{h}{z} > 1. \tag{6}$$

This is true when the following condition must hold

$$hI_h \leq zI_z \tag{7}$$

Hence, a wage led regime is cooperative if the semi-elasticity of investment to the profit share is smaller than the semi-elasticity of investment to capacity utilization.

On the other hand, a profit led regime is cooperative if an increase in the profit share is accompanied by an increase in the wage bill caused by a large enough increase in employment.

The wage bill (Ω) can be rearranged in order to be expressed as a function of the wage share (1-h), the level of capacity utilization, the inverse of capital productivity and the capital stock

$$\Omega = \frac{\Omega}{Y}\frac{Y}{Y^*}\frac{Y^*}{K}K = (1-h)za^{-1}K. \tag{8}$$

Therefore, a profit led regime is cooperative if there is a positive relationship between the profit share and the wage bill

$$\frac{d\Omega}{dh} > 0.$$

This is true when the following condition must hold

$$\frac{dz}{dh}\frac{h}{z} > \frac{R}{\Omega}. \tag{9}$$

Hence, a profit led regime is cooperative if the elasticity of capacity utilization with respect to the profit share is greater that the ratio between total profit and total wage bill.

Independently from the form that the IS function takes, the main intuition of the framework proposed by Bhaduri and Marglin is that the curve can change over time depending on the conditions discussed above.

Consequently, the model does not suggest specific policy implications but rather a policy methodology. In different times, depending on certain conditions, the economy might benefit from very different redistributive policies. In a profit led situation, economic growth is not going to be stimulated by higher wages - that also represent higher costs for the firms - just like in a wage led regime, wage moderation in favour of profits is not going to stimulate economic growth. What policy maker should rather do is, once understood in which regime their country is in, to find a way to transform the regime into a cooperative one. Independently whether it is a profit led or a wage led regime, cooperation guarantees a stable growth and allow both classes to enjoy the fruits of economic growth.

4. The non-linearity of growth regime.

The first step of the empirical analysis is therefore to understand how the growth regime changed over time. In this section, we show that the relationship between the growth rate and the functional distribution of income was non-linear and that the growth regime switched from profit to wage led during the 1980s.

We tackle the first task following a similar method used by Reinhart and Rogoff (2010) to study the relationship between GDP and public debt. Over the period under examination, the adjusted wage share ranged between 53.2% and 70%. In the graph below, it has been divided into five equal groups so that each interval account for about 3.4 percentage points. For each group we have plotted the average and the median growth rate in first and second bar respectively.

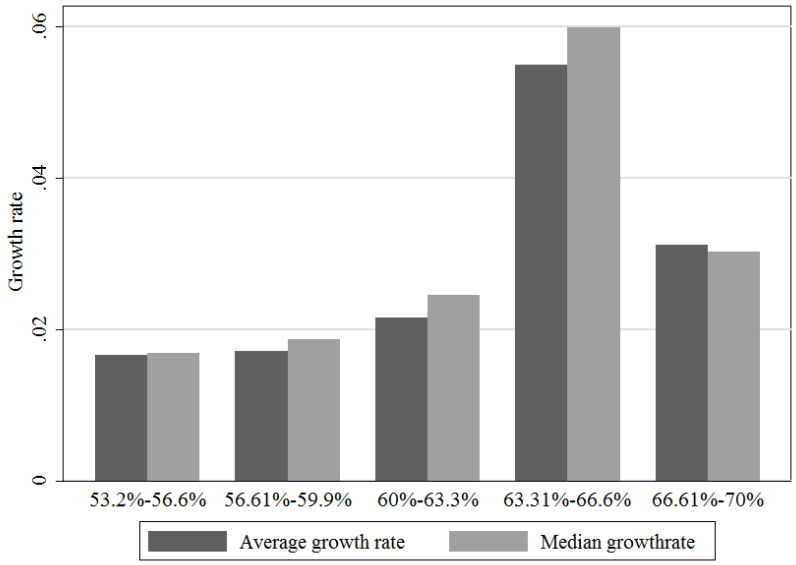

Fig. 3: *Average and median growth rate divided into 5 (equal) wage share intervals*

Table 2: *Average growth rate divided into 5 equal wage share intervals*

Adjusted Wage Share	Observations	Average Real Growth
53.2% - 56.6%	11	0.017
56.61% - 59.9%	3	0.017
60% - 63.3%	8	0.021
63.3% - 66.6%	11	0.055
66.6% – 70%	14	0.031

From Figure 3 and Table 2 we can see that over the past forty-seven years, the highest growth rate was achieve when the wage share was between 63% and 66.6% of total income and decreasing substantially when the distribution of income fell outside this interval. Hence, the relationship was non linear.

As a robustness check, we repeat the analysis diving the adjusted wage share into ten equal groups (Figure 4 and Table 3). Moreover, in the appendix we show that this nonlinear relationship holds even if we exclude the observation in 1975. Indeed this year was characterised by the highest wage share and the lowest growth rate, which was however, probably caused by the oil crisis started at the end of 1973.

This result is in contrast with a linear interpretation of the distribution-growth relationship. At a first glance, it would seem that when the wage share was higher than 66.6%, Italy had a profit led regime while when it was below 63% the regime was wage led.

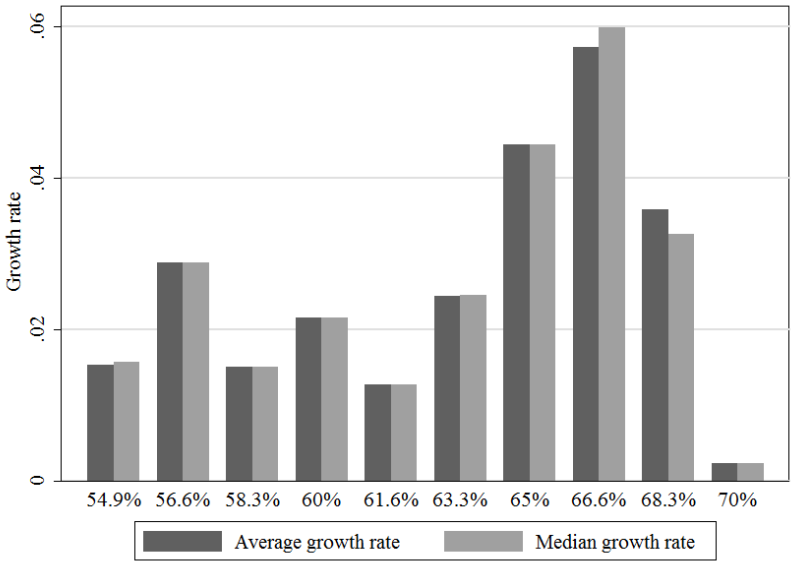

Fig. 4: *Average and median growth rate divided by 10 (equal) wage share intervals*

Table 3: *Average growth rate divided into 10 equal wage share intervals*

Adjusted Wage Share	Observations	Average Real Growth
53.2% - 54.9%	10	0.015
54.91% - 56.6%	1	0.029
56.61% - 58.3%	2	0.015
58.31% - 60%	1	0.021
60.01% - 61.6%	2	0.013
61.61% - 63.3%	6	0.024
63.31% - 65%	2	0.044
65.1% - 66.6%	9	0.057
66.61% - 68.3%	12	0.036
68.31% - 70%	2	0.002

Regarding the task of identifying if and when the regime switch happened we use an approach that is substantially different from the one prevailing in literature.

The principal method used to classify a growth regime is to estimate the effect of an increase in the profit share on each component of aggregate demand and sum them up. If the result is positive, the economy is profit led and if it is negative, the economy is said to be wage led[5]. The main drawback of this method is that the result depends strongly on the magnitude of the individual estimated effects of distribution on the different components of aggregate demand, and not simply

[5] Representative "structural" studies are Bowles and Boyer (1995), Naastepad and Storm (2006), Stockhammer and Ederer (2008), Stockhammer et al. (2009), Onaran and Yenturk (2001), Hein and Vogel (2008, 2009) and Onaran and Galanis (2012). Stockhammer and Onaran (2004) and Onaran and Stockhammer (2005 and 2007) instead use a SVAR to determine the growth regime.

on their sign. Small changes in the estimated coefficients – that might happen using different data or a different econometric model – can very well lead to contrasting results.

Here we propose an approach that should overcome the problem mentioned above. Bhaduri and Marglin, in the short run, define as profit (wage) led regime, one in which – keeping constant the productivity of capital – there is a positive (negative) relationship between capacity utilization and the profit share. Since the rate of capital utilization is an indicator of the level of demand[6], if the profit share has a positive effect on demand, and hence the regime is profit led, we should observe an increase in the rate of capital utilization. Consequently, if a positive relationship between capacity utilization and the profit share is detected, we can deduce that the regime is profit led.

One technical difficulty however, is the lack of precise data on capacity utilisation. Hence, for consistency purposes, in the remaining of the paper we will always use two proxies for capacity utilization: the income capital ratio (z*) and the acceleration of growth (z**).

The first proxy, the ratio between income and capital, does not simply quantify how intensely capital is used but also how productive it is. This problem is partially mitigated by the Italian industrial structure. In fact, after the Second World War Italy specialised its production in low technology and low capital intensity sectors populated mainly by small and medium enterprises (Carlucci 2008). Moreover, capital utilization will mainly be used in first difference and the change in productivity is unluckily to change significantly from one year to the other.

The second proxy (z**) is the change in growth rate of GDP. The rationale behind this choice is that an acceleration of growth should be strongly related to an increase in the intensity with which capital is used.

The bar graphs in Figure 5 and 6 depict the evolution of the responsiveness of capacity utilisation to the profit share. The average and median value of the ratio between the change in capacity utilization and the change in the profit share have been plotted in the graphs using respectively the first and second proxy for capacity utilization[7].

While changes in the profit share are positively associated with changes in capacity utilization in the first two decades, from the 1980s to 2007 the relationship becomes weaker and often negative. We can conclude that, while until the end of the 1970s, the regime was strongly profit led, from the 1980s the regime became weakly wage led.

This is consistent with our previous finding about the non linearity of growth regimes. It would seems that until the profit squeeze of the 1970s the regime was profit led and this justifies why the decreased in the profit share was associated with a decrease in the growth rate. Symmetrically

[6] Capacity utilization is an indicator of demand because in order to cope with higher the demand, capital has to be use more intensively.
[7] In order to remove significant outliers, values that fell outside ten times the 95% confidence interval have been excluded from the graph.

during the 1990s and the early 2000, while the regime seems to have been wage led, the profit shared soared and the growth rate fell considerably.

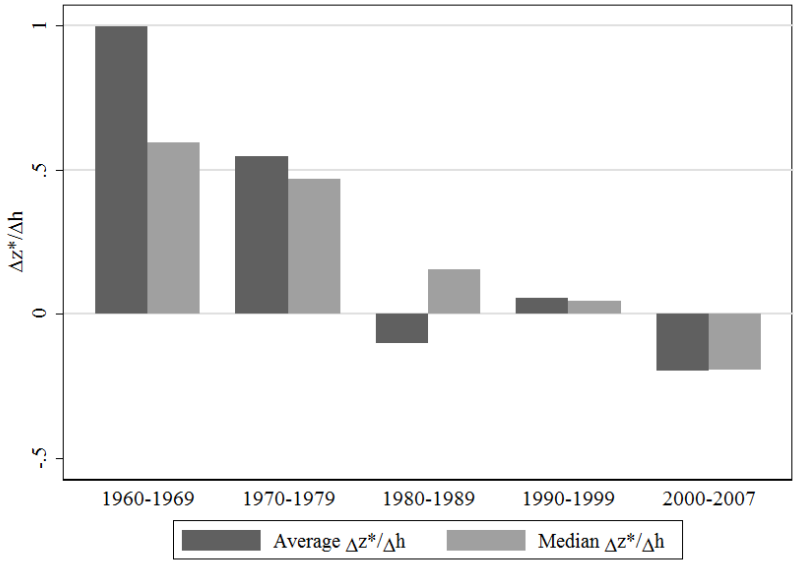

Fig. 5: *Change of the responsiveness of capacity utilization to the profit share. $z^{*}=Y/K$*

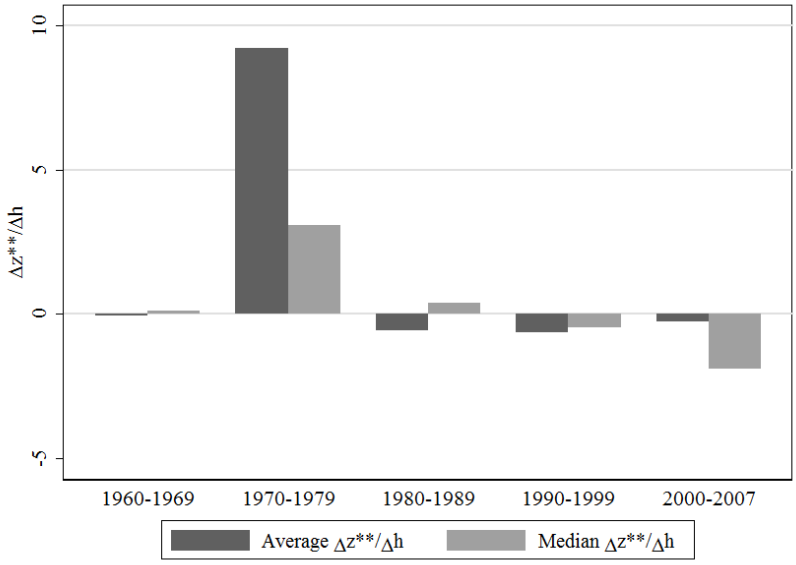

Fig. 6: *Change of the responsiveness of capacity utilization to the profit share. $z^{**}=\Delta$(growth rate)*

5. Determimants of cooperative and conflictual regimes

So far we have shown that Italy was probably characterised by a profit led regime until the end of the 1970s and a wage led regime from the 1980s. At the same time, the regime was cooperative

until the 1970s and conflictual after the 1980s. We now turn to the analysis of the conditions, as highlighted in the model, that would guarantee a cooperative regime and their evolution over time.

6.1 Cooperative profit led regime: 1960s – 1970s

The model predicts that, in the presence of a profit led regime, the following condition must hold in order to achieve a cooperative situation between workers and entrepreneurs

$$\frac{dz}{dh}\frac{h}{z} > \frac{R}{\Omega}$$

That is, the elasticity of capacity utilization respect to the profit share has to be larger than the ratio between total profit and wage bill. Hence, if the prediction of the model is accurate, we expect this condition to hold only until the end of the 1970s or the begging of the following decade.

6.1.1 The evolution of the total profit/total wage ratio

Starting from the right hand side of the formula, we can notice, from Figure 7, that the ratio between total profits and wage bill (R/Ω) slightly decreased from 1960 to 1980 and rapidly increased afterwards. Hence, because R/Ω grew by 75% from 1980 to 2000 unless the term on the left hand side increased substantially during the same years, it is reasonable to believe that the condition was not respected after the 1980s.

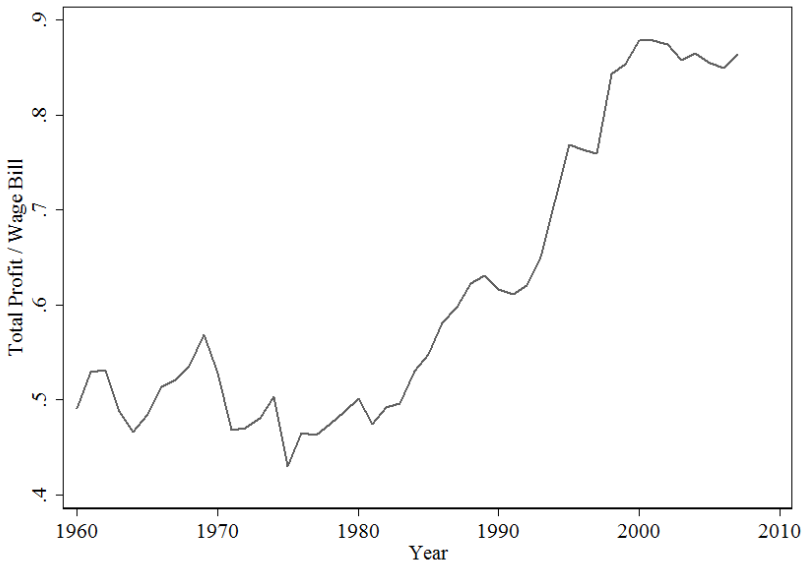

Fig. 7: *Evolution of the total profit/adjusted wage bill ratio (1960 – 2007)*

6.1.2 Elasticity of capacity utilization respect to the profit share: a structural break

The first method that we use to investigate whether this elasticity changed over time and in which manner, is a test for structural change. In particular, we first split the sample into two periods and

create a time dummy (i) that takes values of one in the first period and zero in the second. Secondly, we regress capacity utilization on the profit share interacted with the dummy and the profit share interacted with one minus the dummy.

$$z = \beta_1 \mathrm{h} * \mathrm{i} + \beta_2 \mathrm{h} * (1 - \mathrm{i}) + \varepsilon$$

The two coefficients represent the effects of the profit share on the capacity utilization in the first and second period respectively. The final step is to test whether the coefficients for the two different periods are statistically different from each other; we do this using an F test and the following null hypothesis

$$\mathrm{H0}: \beta_1 = \beta_2$$

To estimate the relationship between capacity utilization and the profit share we have to address first the problem of endogeneity. Since it is possible that these two variables have feedback effects on each other we will use a TSLS with the lag of an adjusted measure of unemployment as an instrument for the profit share. Past unemployment is strongly positively correlated with the profit share both before and after the 1980s[8] and it explains about 30% of its variation. The main limitation of unemployment as IV is that, as shown in Appendix C, it can very well be correlated with past levels of capacity utilization. If we were to use the lagged value of unemployment as IV for profit share, our regressor would not be strictly exogenous. For this reason rather than using unemployment as an instrument, we use the residual of the regression of unemployment on past and present capacity utilization. Hence, the instrument for the profit share is all the variation in unemployment that is not explained by changes in past levels of capacity utilization. Moreover, the Hausman test for endogeneity rejected the hypothesis of an omitted variable bias[9].

The data seem to confirm the view that at time t profit share, through changes in aggregate demand, has a contemporaneous (positive or negative depending on the growth regime) effect on capacity utilization. Capacity utilization then affects unemployment at t+1 and in the following year (t+2) the change in unemployment has a direct effect on the profit share[10].

The specifications are designed using the specific to general approach and they are dynamically complete (Wooldridge, 2009). Moreover, each regression successfully passed the tests for heteroskedasticity, autocorrelation, misspecification and normality of the error term. Finally, throughout this section, the profit share and the income capital ratio are expressed in logarithmic form and in first difference, in order to remove the unit root present in the series. The second proxy for capacity utilization instead, the acceleration of growth, is used in levels as it is already stationary.

[8] There is more than one explanation for this correlation. For example, more employment in one year could be associated with a lower profit share in the following year either because labour becomes a more scarce recourse or because lower unemployment increases the contractual power of workers.
[9] The test always rejects the hypothesis of an omitted variable bias except in equation 4 but, the bias would occur only before 1980.
[10] A more detailed discussion of endogeneity and the validity of the instrument can be found in the appendix.

Regarding the structural change, we know that the change in the regime from cooperative to conflictual happened during the 1980s but it is likely that it did not happen in single year. Hence, for each proxy we test the magnitude of the coefficient before and after 1985 (equation (1) and (3) and before and after the 1980s (equation (2) and (4)).

(1) $\Delta\ln(z^*) = \Delta\ln(\hat{h})i_{60-84} + \Delta\ln(\hat{h})(1 - i_{60-84})$

(2) $\Delta\ln(z^*) = \Delta\ln(\hat{h})i_{60-79} + \Delta\ln(\hat{h})(1 - i_{60-79})$

(3) $z^{**} = \Delta\ln(\hat{h})i_{60-84} + \Delta\ln(\hat{h})(1 - i_{60-84}) + z^{**}_{t-1}$

(4) $z^{**} = \Delta\ln(\hat{h})i_{60-79} + \Delta\ln(\hat{h})(1 - i_{60-79}) + z^{**}_{t-1} + z^{**}_{t-2}$

Table 4: *Regression output: the elasticity of capacity utilization with respect to the profit share*

VARIABLES	(1) $\Delta\ln(z^*)$	(2) $\Delta\ln(z^*)$	(3) z^{**}	(4) z^{**}
$\Delta\ln(\hat{h})i_{60-84}$	0.505***		0.705***	
	(0.108)		(0.118)	
$\Delta\ln(\hat{h})(1 - i_{60-84})$	0.209		0.441*	
	(0.230)		(0.242)	
$\Delta\ln(\hat{h})i_{60-79}$		0.495***		0.717***
		(0.0988)		(0.113)
$\Delta\ln(\hat{h})(1 - i_{60-79})$		-0.181		0.315
		(0.296)		(0.293)
z^{**}_{t-1}			-0.456***	-0.495***
			(0.106)	(0.112)
z^{**}_{t-2}			-0.267**	-0.272**
			(0.108)	(0.113)
Time period	1960 - 2007	1960 - 1979 1990 - 2007	1960 - 2007	1960 - 1979 1990 - 2007
Adj-R^2	0.320	0.406	0.603	0.688
H0: $(\hat{h}*i) = \hat{h}*(1-i)$	0.251	0.0405	0.332	0.214

Note*: i60-84* = 1 ∀ year<1985 and *i60-84* = 0 ∀ year>1984. *i60-79* = 1 ∀ year<1980 and *i60-79* = 0 ∀ year>1979. z^* = Δln(Y/K) and z^{**} = Δ[Δln(Y)]. Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

The results in Table 4 indicate that the magnitude of the elasticity of capacity utilization respect to the profit share is always larger in the first part of the sample independently from the proxy used to account for capacity utilization and the breakpoint year. The coefficient of Δlog (*h*)*i* is always greater than the coefficient of Δlog (*h*)(1- *i*). In particular, the magnitude of the elasticity in the first period - that is always statistically significant at 1% - fluctuates from 0.495 to 0.717. In the second period, instead, the elasticity is strongly non significant, except in equation 3, and its magnitude oscillate between -0.181 and 0.441. In conclusion, the average value of the

coefficient in the second period is at least half the magnitude compared the coefficient in the first period[11] in equation (1), (2) and (3) and about one third smaller in equation (3).

The test however (last line in Table 4) rejects the equality of the coefficients only in equation (3). Hence as a robustness check, we employ the Chow breakpoint test on the following IV estimation[12]

(5) $$\Delta\ln(z^{*}) = -0.004^{*} + 0.56^{***}\Delta\ln(\hat{h}) + 0.27^{*}\Delta\ln(z^{*}{}_{t-1})$$

(6) $$z^{**} = -0.006^{**} + 0.67^{***}\Delta\ln(\hat{h}) - 0.52^{***}z^{**}{}_{t-1} - 0.24^{**}z^{**}{}_{t-2}$$

For both equation (5) and (6), the test rejects at 1% the null hypothesis that the coefficient of the profit share was the same before and after 1985.

The second method used to check the evolution of the elasticity between capacity utilisation and profit share is a rolling correlation analysis.

Figure 8 and 9 show the evolution of the correlation coefficient calculated using a rolling fifteen years window. The horizontal axis indicates the last year of the window, so that the first point in 1975 represents the correlation coefficient calculated for the interval 1960-1975.

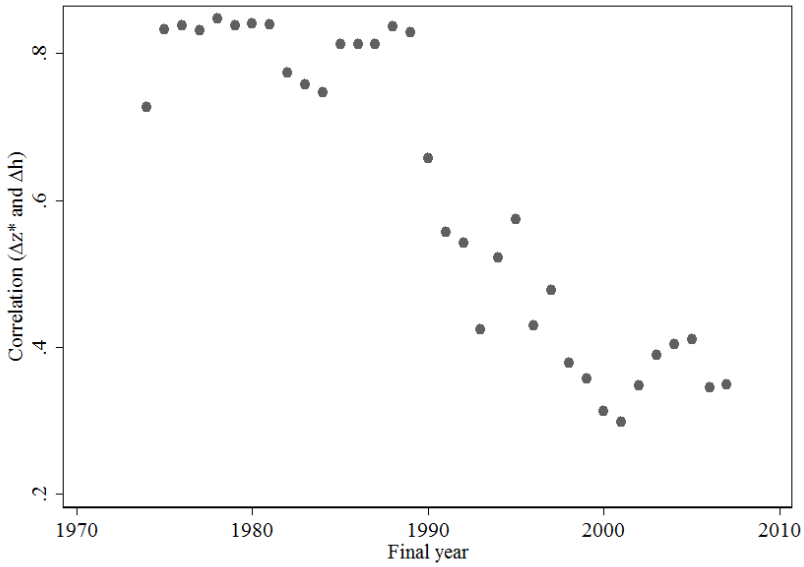

Fig. 8: *Coefficients of the rolling correlation, with a 15 years window, between Δz* and Δh*

[11] Note that the p-value is unsurprisingly high given the exceptionally small sample size and the use of instrumental variables that increases the variance of the estimator.
[12] Both specifications are dynamically complete and have been tested for autocorrelations, heteroskedasticity and normality of the error term. The instrument for the profit share is the same as in the previous specifications.

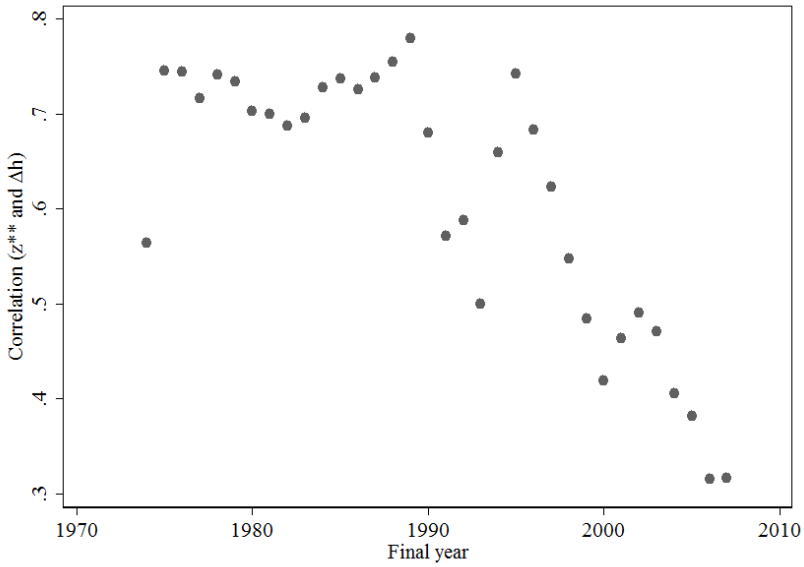

Fig. 9: *Coefficients of the rolling correlation, with a 15 years window, between z** and Δh*

The results are consistent with the structural break analysis. Independently from the proxy used, the correlation is high in the first part of the sample and drops in the second half. In particular, it is possible to notice that the correlation coefficient starts to decrease starting from the subsamples that begin in the late 1970s and finish in the early 1990s.

Overall, the evidence supports the finding of the model that requires the elasticity of capital utilization with respect to the profit share to be larger than the profit/wage bill ratio in order to achieve a cooperative profit led regime. Until the beginning of the 1980s we observe that this condition could have held. In fact, while initially relatively large values of the elasticity of capacity utilization respect to the profit share are associated with a low profit/wage bill ratio, from the 1980s and in particular from the 1990s, the value of the elasticity largely decrease while the profit/wage bill ratio soars.

6.2 Conflictual wage led regime: 1980s - 2007

The condition necessary to have a cooperative regime however, changes depending on the type of regime. We have shown that if the regime were to remain profit led, after the 1980s, it would not have been a cooperative one. However, as the regime became probably wage led from the 1990s until at least 2007, the condition that has to hold for the regime to be cooperative changed as well. The model predicts that a wage led regime is cooperative if

$$hI_h \leq zI_z.$$

That is, the product of the profit share and sensitivity of investment to the profit share has to be smaller than the product of capacity utilization and the sensitivity of investment to capacity utilization.

6.2.1 The evolution of the profit share and capacity utilization

Figure 10 shows the evolution of capacity utilization and the profit share. While the share of income allocated to the entrepreneurs rose greatly from 1980 until the beginning of the new millennium, the capital income ratio (z*) decreased from the 1980s. In particular, it is worth pointing out that the Italian profit share of income rose by 40% in twenty years from 1980 to 2000. Hence, we can conclude that unless, during the same years, I_h decreased substantially and I_z increased, the condition necessary to have a cooperative regime probably did not hold in the last part of the sample.

Fig. 10: *Evolution of the adjusted total profit and adjusted capacity utilization (income capital ratio) from 1960 to 2007*

6.1.2 Elasticity of investment respect to capacity utilization and profit share

In order to test how the sensitivity of investment to the profit share and capacity utilization changed over time, we cannot employ the same breakpoint test used in section 6.1.2 because we could not find an appropriate instrument for capacity utilization. Even though most of the empirical papers referenced above do not take into account the endogeneity problem in the investment function, it seems reasonable that both capacity utilization and profit share are affected by past levels of investment. For this reason, we estimate the investment function before and after 1985 with a Structural Vector Autoregressive model and subsequently we compare the impulse responses generated by the system in the two time periods.

Given the exceptionally small sample, each variable is a function of only one lag the other dependant variables[13].

$$\begin{cases} \Delta\ln(\mathrm{I}) = \Delta\ln(\mathrm{I}_{t-1}) + \Delta\ln(\mathrm{z}_{t-1}) + \Delta\ln(\mathrm{h}_{t-1}) + \mathrm{y75} + \mathrm{y93} \\ \Delta\ln(\mathrm{z}) = \Delta\ln(\mathrm{I}_{t-1}) + \Delta\ln(\mathrm{z}_{t-1}) + \Delta\ln(\mathrm{h}_{t-1}) + \mathrm{y75} + \mathrm{y93} \\ \Delta\ln(\mathrm{h}) = \Delta\ln(\mathrm{I}_{t-1}) + \Delta\ln(\mathrm{z}_{t-1}) + \Delta\ln(\mathrm{h}_{t-1}) + \mathrm{y75} + \mathrm{y93} \end{cases}$$

Moreover, this specification was used independently on the proxy for capacity utilization and the time period and each SVAR was successfully tested for autocorrelation, heteroskedasticity, normality of the residual and system stability.

The advantage of a Structural VAR compared to a simple VAR is that the former allows to impose restrictions on the contemporaneous relationships between variables according to economic theory. In particular, we use the following matrix, B, to model the contemporaneous effects between our dependent variables (vector *y*).

$$y = \begin{vmatrix} I \\ z \\ h \end{vmatrix};\ B = \begin{vmatrix} b_{11} & 0 & 0 \\ b_{21} & b_{22} & b_{23} \\ 0 & 0 & b_{33} \end{vmatrix}$$

b_{11}, b_{21}, b_{22}, b_{23}, b_{33} are the contemporaneous effects that are estimated in the system while the zeros are the restrictions that we have imposed on the system. At time t, it is imposed that capacity utilization and the profit share do not have an effect on investment because it can take time for firm to react to changes in demand and profitability. Moreover, there can be a lag between investment decision and spending. Capacity utilization instead is contemporaneously affected by investment - new capital immediately lowers capacity utilization – and by the profit share, because, as shown in table 3, the distribution of income has a rapid effect on capacity utilization through changes in demand. In the third row, it is imposed that neither investment nor capacity utilization has a contemporaneous effect on the profit share since, as discussed above and in Appendix C, there is a lag with which unemployment respond to changes in capacity utilization and growth and there is a further lag with which unemployment affect the profit share. This restrictions are similar to those imposed in Stockhammer and Onaran (2004) and Onaran and Stockhammer (2005) even though there is a difference in the definition of some of the variables.

Graphs 11 to 14 show the response of investments to changes in capacity utilization and the profit share[14]. As it is possible to notice, at time t=1 there is no change in investment because of the restrictions in matrix B.

The reaction of investment to a shock in profit (I_h) remains substantially unchanged before and after 1985 while the response to a shock in capacity utilizations (I_z) decreases substantially. When

[13] Time dummies for 1975 and 1993 are added as exogenous variables in the regression line because in 1975 the oil crisis hit Italy generating the largest downturn of the sample size and the year 1993 is an outlier in the relationship between profit share and investment.

[14] Even though the confidence interval are not shown in the graph, the impulse response of investment to capacity utilization and the profit share is almost always non statistically significant. This is not surprising given the short sample size and it does not affect the results of our analysis that focuses on how the response of investment, on average, changed before and after 1985.

we use z* as proxy for capacity utilization (Figure 11 and 12) the response of investment to capacity utilization decreases, at time t=2, from 2.2% to 0.6%. On the other hand, when z** is used (Figure 13 and 14) the response of investment to a shock in capacity decreases from 0.4% to 0.1% at time t=2. In other words, I_z is always at least 70% smaller after 1985 compared to the previous two decades.

Hence, since I_h did not decreased and I_z did not increase after 1985, we can conclude that the condition necessary to achieve a cooperative wage led regime was (probably) not met.

As a robustness check, we also employ rolling regressions to analyse the evolution of the investment function. The following equation was estimated using fifteen and twenty years rolling windows and both proxies for capacity utilization.

$$\Delta \ln(\mathrm{I}) = \Delta \ln(h) + \Delta \ln(z) + \mathrm{y75} + \mathrm{y93} \tag{7}$$

Given the small sample size in each regression, we simply estimate the static equation with the usual two dummies not taking into account, in this case, the problem of endogeneity.

Graphs 15 to 18 report the evolution of the coefficients[15]. Consistently with the previous analysis, the sensitivity of investment respect to capacity utilization (the top line in the graphs) declined considerably from the 1960s to the end of the sample in 2007, independently from the proxy or the window that was used. On the other hand, the relationship between investment and the profit share (the lower line in the graphs) has an inverted U shape but the coefficient at the end of the sample is similar to the first coefficients.

To summarise, the impulse response function and the rolling regressions highlight a decrease in the sensitivity of investment to capacity utilization while the effect of the profit share on investment remains constant. When we combine this trends with the increase in the profit share and the decrease in capacity utilization started in 1980 we can see that the prediction of the model is correct. Moving from the first to the second half of the sample, the left hand side of the inequality condition (in section 6.2) increased while the right hand side decreased. For this reason, it is likely that from the 1990s the condition was no longer respected and the regime became conflictual.

[15] To keep the graph tidy, the confidence intervals are not reported. However, the effect of capacity utilization on investment is always statistically significant independently from the proxy and window used while, the coefficient measuring the effect of the profit share is mostly insignificant except in the regression in which we use the twenty years window and the second proxy for capacity utilization.

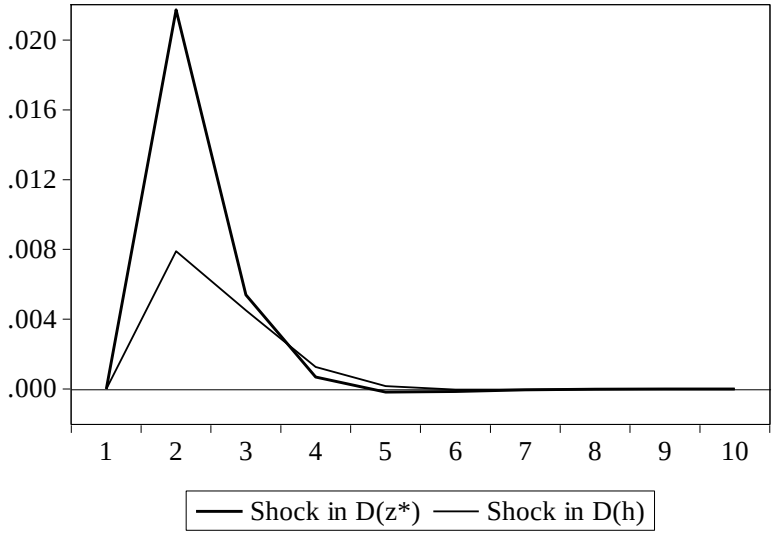

Fig. 11: 1960-1984. Response of Δln(I) to one standard deviation innovation in Δln(z*) and in Δln(h)

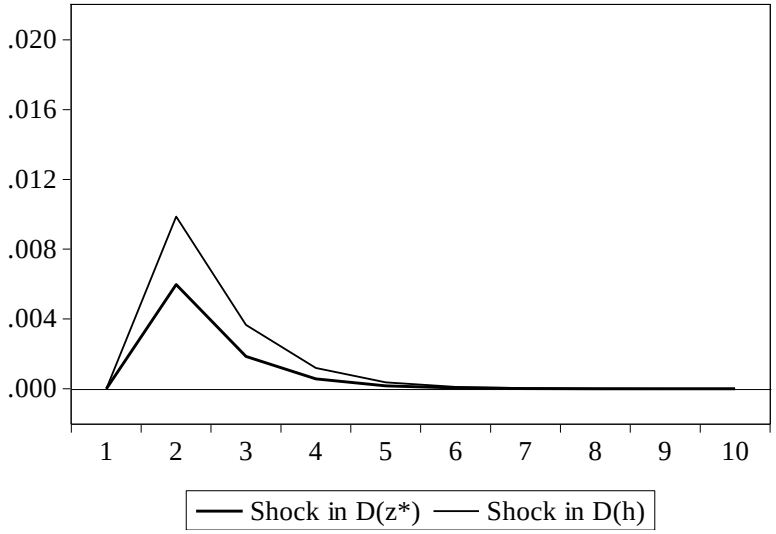

Fig. 12: 1985-2007. Response of Δln(I) to one standard deviation innovation in Δln(z*) and in Δln(h)

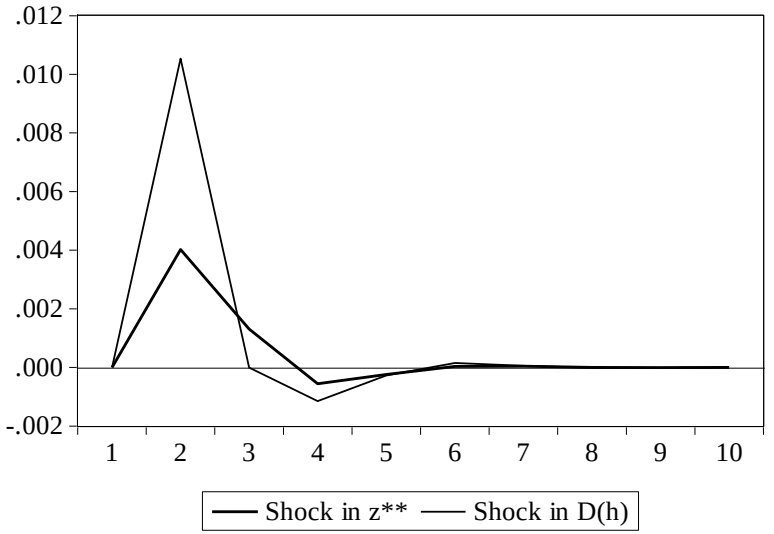

Fig. 13: 1960-1984. *Response of* Δln(I) to one standard deviation innovation in z** and in Δln(h)

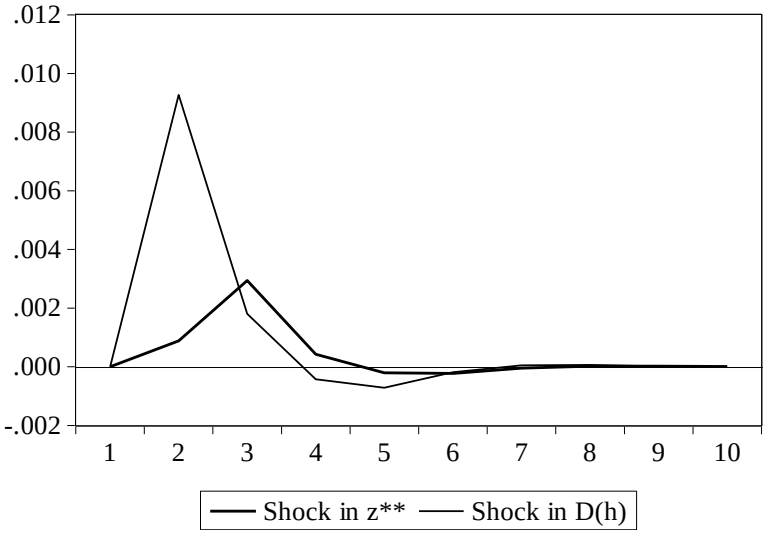

Fig. 14: 1985-2007. Response of Δln(I) to one standard deviation innovation in z** and in Δln(h)

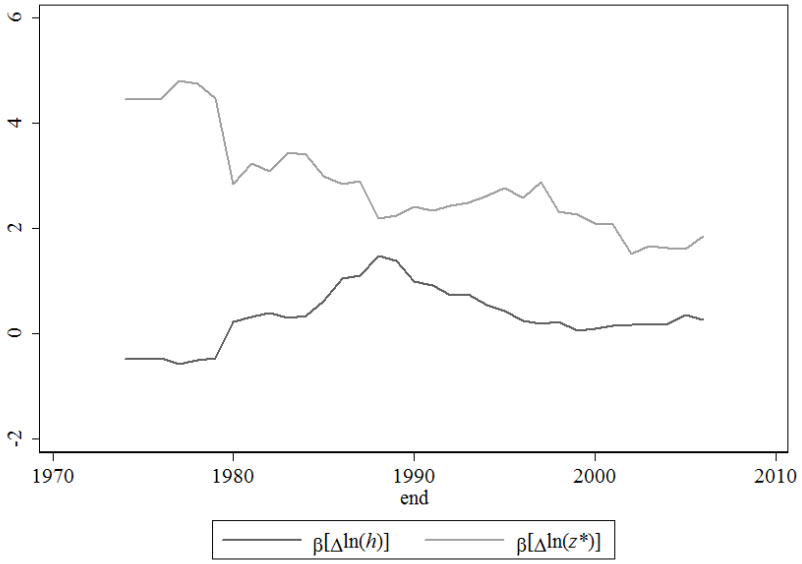

Fig. 15: *Rolling regression: 15 years window and Proxy I*

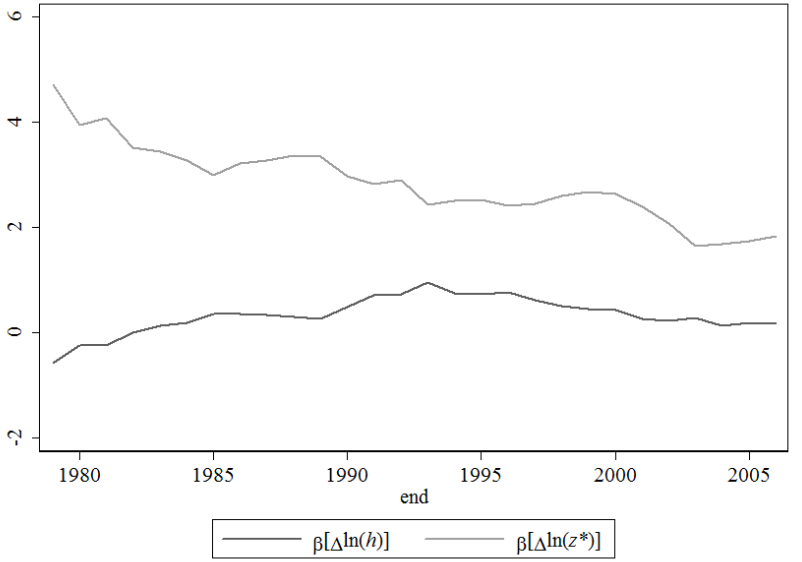

Fig. 16: *Rolling regression: 20 years window and Proxy I*

Fig. 17: *Rolling regression: 15 years window and Proxy II*

Fig. 18: *Rolling regression: 20 years window and Proxy II*

6. Conclusion

The motivation of this paper was twofold. On the one hand, since the Bhaduri and Marglin model is a Keynesian framework that allows to analyse the evolution of the relationship between the functional distribution of income and economic activity, we have proposed an empirical study that tries to capture possible non-linearities. The result of our analysis shows that in Italy there have been significant changes, especially before and after the 1980s, in the sign and magnitude of fundamental economic variables. In particular, the beginning of the sample was characterised by a profit led regime while during the last part, from the 1980s to 2007, the regime became weakly wage led. At the same time, until the end of the 1970s the Italian economy was characterised by a cooperative regime in which wages and profits were growing at similar rates while, during the 1980s and the 1990s, the regime became conflictual.

On the other hand, this paper studies and highlights the conditions that, according to the model, allow a regime to be cooperative. So far, most empirical studies put a great deal of effort in trying to determine whether a regime is wage led or profit led because this has obvious important policy implication. However, they have ignored the cooperative-conflictual dynamics that is probably the most significant intuition of the model. Independently from which type of regime (wage or profit led) characterises the economy in each period, the aim of policy makers should be to try to reach a cooperative relationship between profit and wage earners. In this way, the fruits of economic growth are shared between social classes and this helps to soften social tension and to have a well distributed increase in the standards of living. Our results confirm that the conditions that have to hold in order to have a cooperative regime, are relevant. We show that when the first condition (section 6.1) held and the elasticity of capacity utilization was relatively lower than the ratio between total profit and the wage bill (1960 -1970) the profit led regime was indeed cooperative. In the second period instead, when the product of capacity utilization and the sensitivity of investment respect to capacity utilization decreased and the product of the profit share and the sensitivity of investment to the profit share increased – i.e. the second condition (section 6.2) was not respected – the wage led regime was conflictual.

Graphically, the Italian IS curve, over the period from 1960 to 2007, should have had an asymmetrical inverted U shape in the (h,z) space (see Fig. 20). When the profit share was relatively low, until the 1980s, the regime was cooperative and profit led (IS is steep and upward sloped) while afterwards it became conflictual and slightly wage led (flat and downward sloped IS curve).

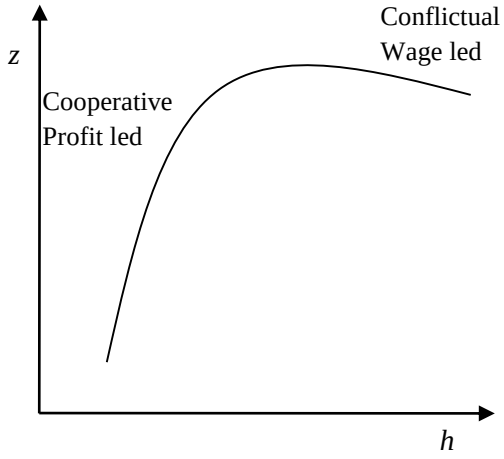

Fig. 19: *Italian IS curves in the (h, z) space*

To conclude, we point out two limitations of this study that can be the foundation for further research. While we estimate the evolution of the growth regimes in Italy but it does not explain what caused it. For example, what are the factors that determined the decline in the sensitivity of investment to capacity utilization starting in the 1980s? Why did the profit share soared in the same period? The second limitation is related to the policy implication side of this analysis. Knowing in which type of growth regime an economy finds itself is, or it should be, paramount to design appropriate policies. However how can a policy maker know in which type of growth regime the economy is at the current time or will be in the future? Combining the facts that the nature of each country's growth regime is an empirical question (but we can only analyse previous years) and that the regime can slowly change over time, we cannot know for certain in which type of regime an economy find itself at the current time.

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Appenidix A: Data

Table A1: *Data sources and definition*

Variable	Description	Source	Note
Gini index	Gini index before taxes and transfers	OECD Income distribution database	
Yn	Gross domestic product at current market prices	AMECO	
P	Price deflator gross domestic product at market prices	AMECO	
Y	GDP, real (2005)		Yn/p*100
aWS	Adjusted wage share: total economy: as percentage of GDP at current market prices	AMECO	
aRS	Adjusted Profit Share		1-aWS
aW	Adjusted wage bill		Y*aWS
aR	Adjusted gross operating surplus		Y*aRS
I	Investment, real (2005 PPP)	AMECO	
K	Net capital stock (2005 PPP)	AMECO	

Appendix B: The non-linearity of the growth regime without 1975

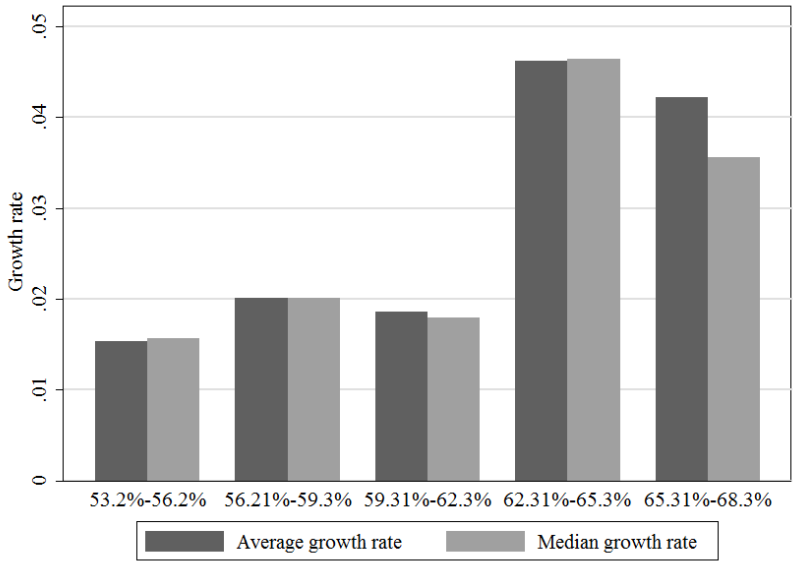

Fig. A1: *Average and median growth rate divided into 5 (equal) wage share intervals*

Table B1: *Average growth rate divided into 5 equal wage share intervals (1960-1974 / 1976-2007)*

Adjusted Wage Share	Observations	Average Real Growth
53.2% - 56.2%	10	0. 015
56.21% - 59.3%	4	0. 020
59.31% - 62.3%	6	0. 019
62.31% - 65.3%	6	0. 046
65.3% – 68.3%	20	0.042

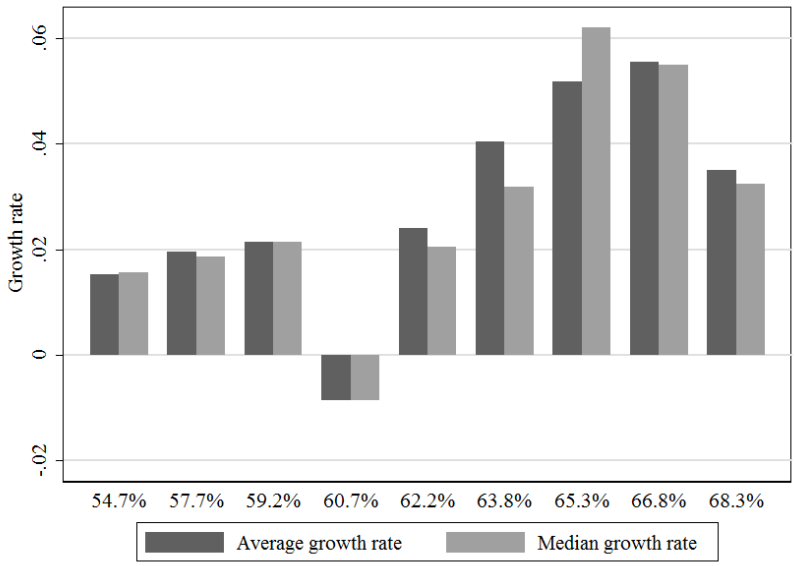

Fig. A2: *Average and median growth rate divided into 5 (equal) wage share intervals*

Table B1: *Average growth rate divided into 10 equal wage share intervals (1960-1974 / 1976-2007)*

Adjusted Wage Share	Observations	Average Real Growth
53.2% - 54.7%	10	0.015
54.71% - 56.3%	0	
56.31%% - 57.7%	3	0.02
57.71% - 59.2%	1	0.021
59.21% - 60.7%	1	-0.008
60.71% - 62.2	5	0.024
62.21% - 63.8%	3	0.040
63.81% - 65.3%	3	0.052
65.31% – 66.8%	7	0.055
66.81% - 68.3%	13	0.035

Appendix C: Capacity utilization and profit share, an endogenous relationship.

Establishing a causal relationship between capacity utilization and the functional distribution of income it is not an easy task and there are reasons to believe that there are feedback effects going

in both directions. The profit share has an effect on capacity utilization through changes in the aggregate demand (consumption, investment and net export) and the sign of this relationship depends on whether the demand regime is wage or profit led. On the other hand, capacity utilization could affect the distribution of income because of its effect on unemployment. In particular, we would expect that an increase in capacity utilization would increase employment and hence improve the wage bill and the bargain power of workers which would in turn reduce the profit share.

In our view however, at least in Italy, the two variables influence each other with different time lags: while the effect of changes in income distribution on capacity utilization happens within one year, capacity utilization affects the distribution of income only with a time lag of one or two years.

The following graphic analysis cannot be the proof of our hypothesis but it will show its plausibility.

Fig. C1 and C2 show that while the correlation of profit rate and capacity utilization, at time t, is positive; the profit share is negatively correlated with past values (t-1 and t-2) of capacity utilizations. Fig. C3 and C4, on the other hand, illustrate the relationship between capacity utilization and the profit share at time t, t-1 and t-2. Also in this case there is a contemporaneous positive relationship between the two variables but the lag values of the profit share seem not to have any relationship with capacity utilization.

From this, we can draw some conclusions. Firstly, we can rule out that past levels of profit share have any "meaningful" effect on present capacity utilization. Secondly, we can say that past values of capacity utilization have a negative effect on the present profit share. To support this finding, Fig. C5 shows that, while the contemporaneous correlation between capacity utilization and unemployment is weak, the effect of capacity utilization on future unemployment is much stronger. Moreover, Fig. C6 demonstrates that unemployment is positively correlated to the present profit share but the relationship becomes stronger and steeper when we consider future profit share.

If our view is correct, the profit share is exogenous at time t respect to capacity utilization but not at time t+1. This violates the strict exogeneity assumption which would result in biased coefficients. To solve this problem, we regress capacity utilization on the present value of the profit share instrumented by the lagged residual of the regression of unemployment on present and past values of capacity utilization. Moreover, as in each regression line in table 3, we have divided the profit share into two periods, we have instrumented the profit share in each period separately from the other in order to allow for the effect of unemployment on the profit share to change over time. Finally - in the first stage, when instrumenting the profit share - a time dummy for 1975 was added to the regression line if the proxy for capacity utilization was the capital income ratio and a time dummy for 1975 and 1975 was added when the proxy for capital utilization was the acceleration of growth. In particular, we suspect that 1975 is an outlier in the time series of $\Delta\ln(z^{*})$ and 1975 and 1976 are both outliers in the series of z^{**} because in both cases they fall outside eight times the 95% confidence interval. This does not comes as a surprise because in those years the economic contraction caused by the first oil crisis hit Italy.

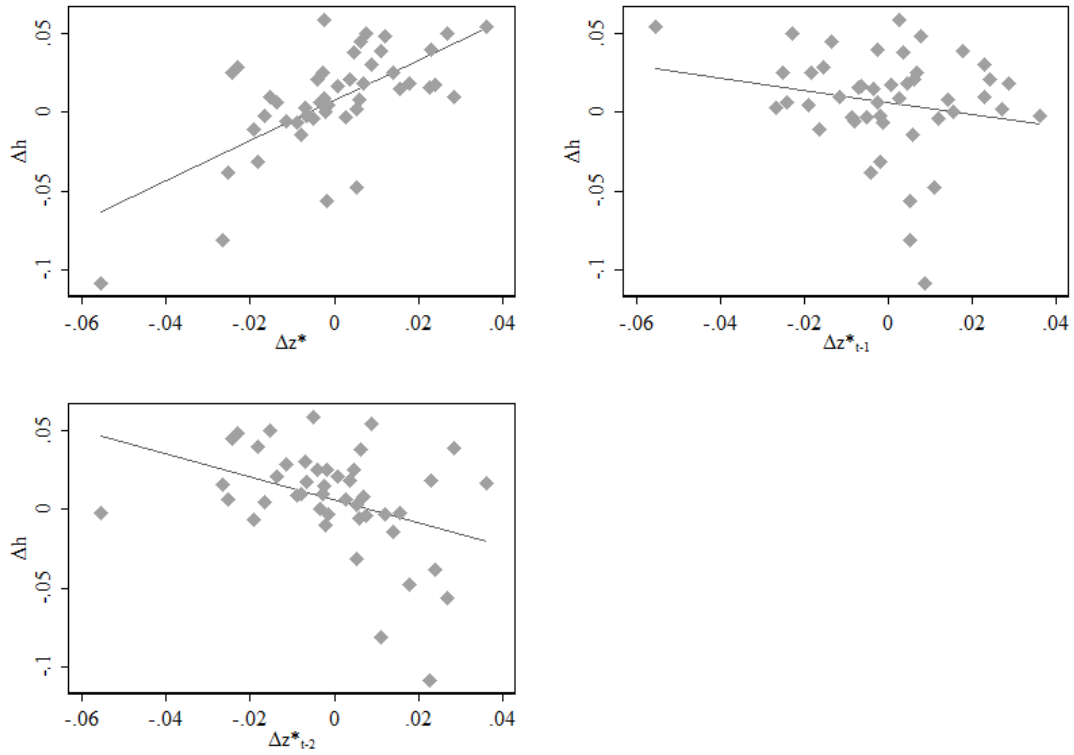

Fig. C1: *Profit share [Δln(h)] VS present and past capacity utilization [Δln(z*)]*

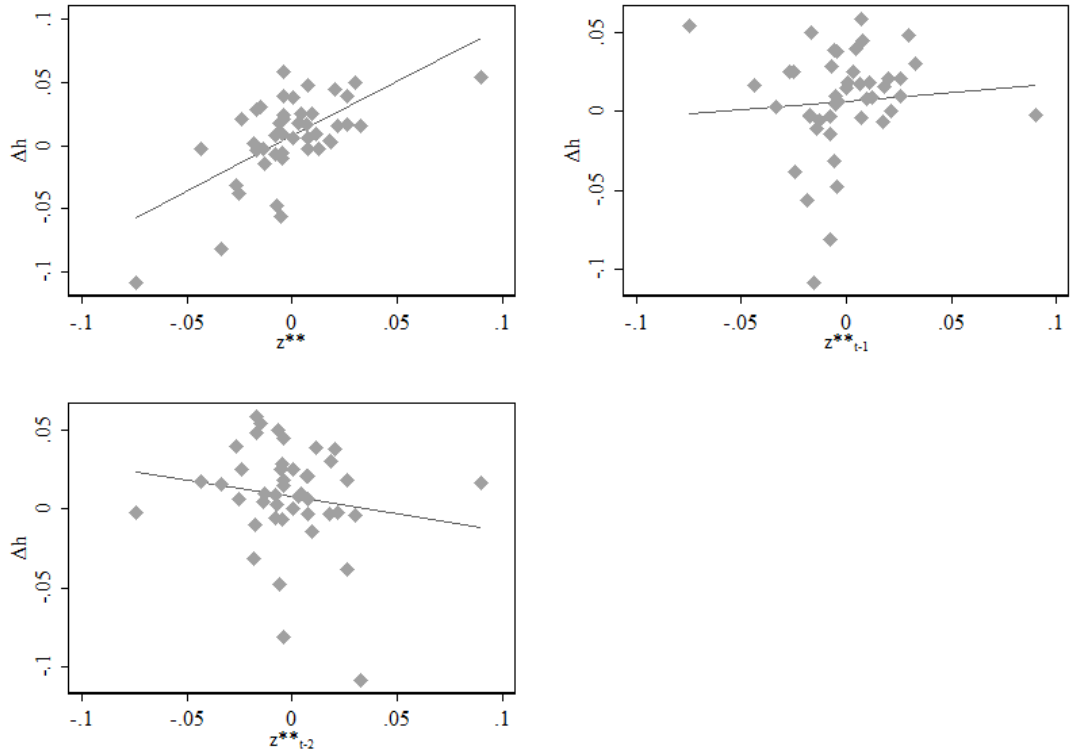

Fig. C2: *Profit share [Δln(h)] VS present and past capacity utilization [z**]*

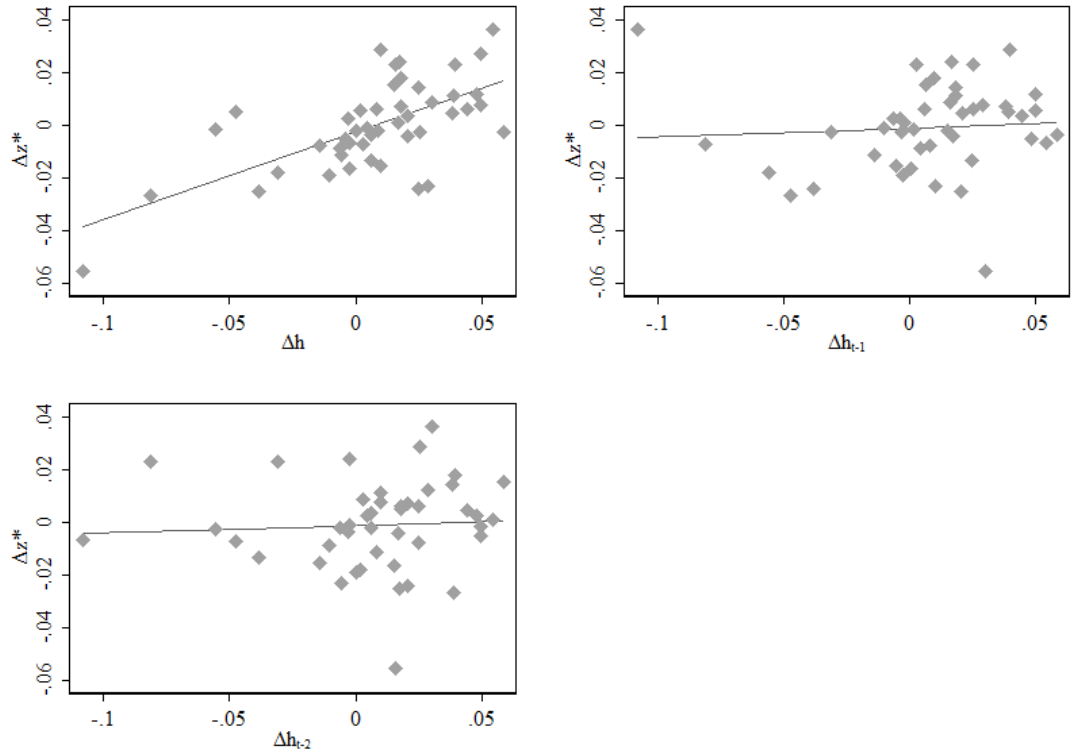

Fig. C3: *Capacity utilization [Δln(z*)] VS present and past profit share [Δln(h)]*

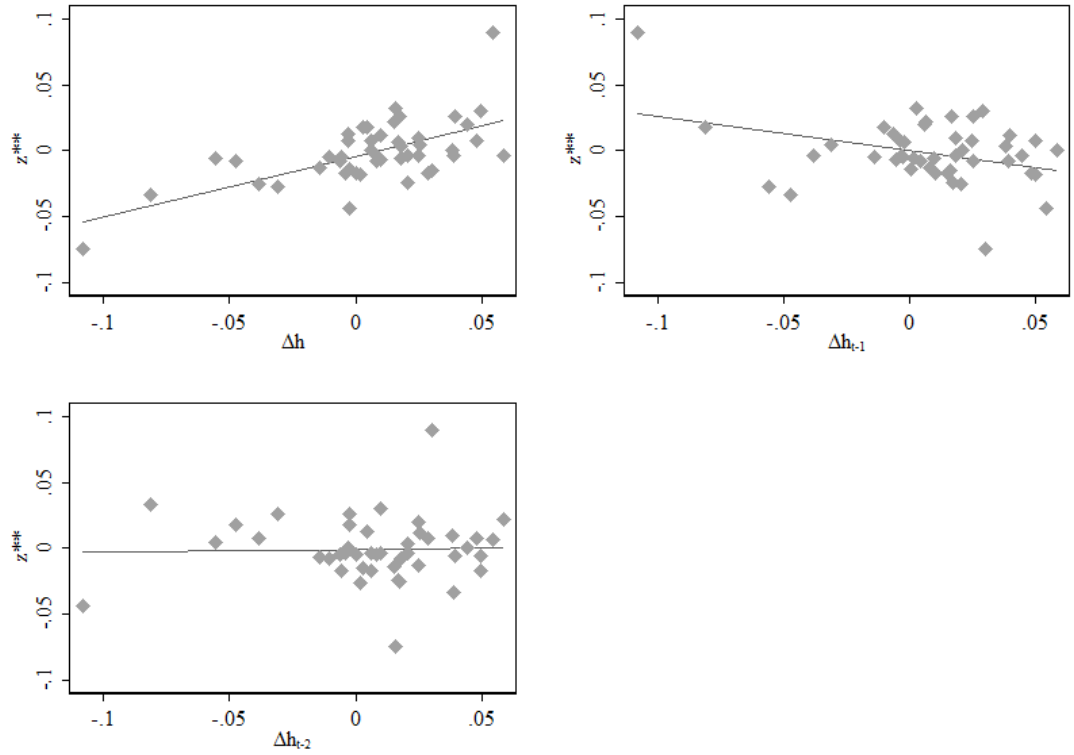

Fig. C4: *Capacity utilization [z**] VS present and past profit share [Δln(h)]*

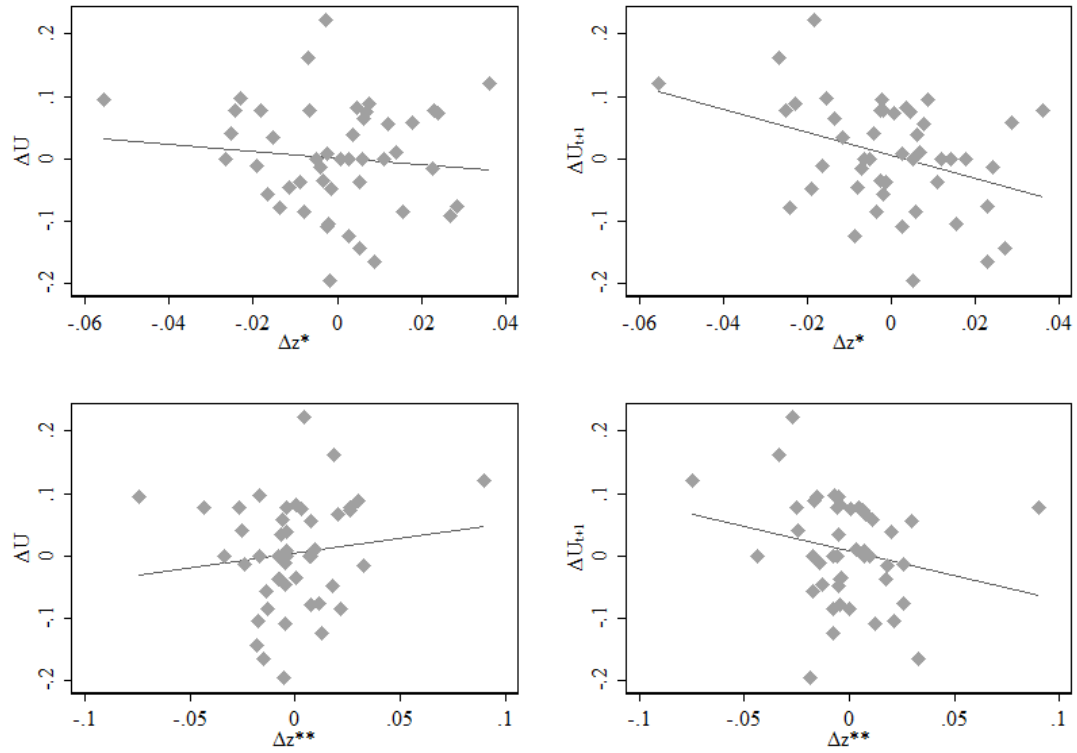

Fig. C5: *Present and future unemployment [Δln(U)] VS capacity utilization (both proxies)*

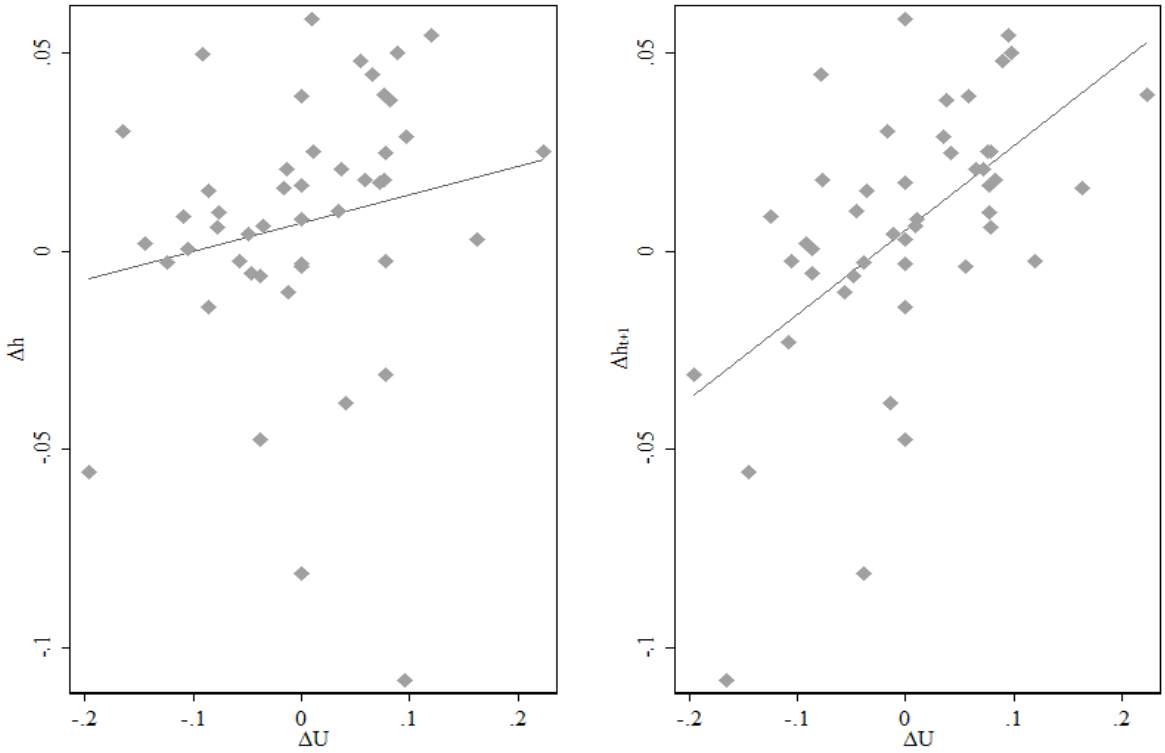

Fig. C5: *Present and future profit share [Δln(h)] VS unemployment [Δln(U)]*