# The markup and aggregate fluctuations in Venezuela. Testing distributional shocks

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**THE MARKUP AND AGGREGATE FLUCTUATIONS IN VENEZUELA: TESTING FOR DISTRIBUTIONAL SHOCKS**[*]

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Abstract

In Venezuela, exchange controls affect firm competitiveness, market structures and, potentially, markups' size. Also, legal rigidities in the labor market and an active setting of minimum wages by the government could produce other markup innovations. These exogenous variations in markups could be the expression of distributional processes between firms, consumers and workers, and ultimately affect the business cycle. Based on different markup measures, we empirically identify how much of the markup variability in Venezuela is due to aggregate fluctuations (supply and demand shocks) and how much can be attributed to distributional processes (exogenous markup shocks). We find that while aggregate fluctuations tend to be more important, exogenous shocks explain a substantial part -about 40%- of the markup. These exogenous shocks mostly affect inflation and nominal wages, but not real activity. When aggregate fluctuations take place, the markup is mainly procyclical.

Keywords: markup, distributional conflict, labor productivity, cyclical fluctuation, exchange control, sign restriction identification.
JEL codes: E32, F30, J30

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# I. INTRODUCTION

Venezuela is a relatively small economy that is exposed to large commodity price shocks. The distributional effects of these shocks are significant, although the transmission channels are not well understood. There is one additional element that adds complexity to this case: because most of the fiscal funding comes from oil revenues, the government has a substantial size and a considerable discretion for establishing exchange rate regimes. Given the large volatility of foreign currency flows, Venezuelan governments have frequently introduced exchange rate controls to hypothetically avoid capital outflows and domestic currency collapses. These controls have always been implemented as both price and quantity restrictions to trade and financial flows that explain the emergence of dual markets for the exchange rate. In fact, it is not surprising that exchange rate controls have been operational in Venezuela in different periods, to wit: 1983-1988, 1994-1996 and 2003 to the present (2018). Interestingly, the long duration of the last control is difficult to rationalize, given the occurrence of two commodity price booms since 2004.

In Venezuela, exchange controls typically aim at subsidizing foreign currency, and their administrative apparatus inevitably ends up discretionally picking the receivers of massive subventions. This process affects firm competitiveness, market structures and potentially, markups' size. In other words, by deepening non-competitive goods markets, the exchange control creates propitious conditions for the emergence of markup innovations that are not necessarily driven by the business cycle. Also, legal rigidities in the labor market and an active setting of minimum wages by the government could produce other markup innovations that become the source of distributional processes between firms, consumers and workers.

In most theoretical models, the markup is regarded as an endogenous variable that reflects the interaction between total factor productivity and costs, given that structural factors, such as the degree of price stickiness and the level of competition among firms, remain constant. Therefore, little attention has been paid to the effects of markup variations that are not endogenously driven by the business cycle. In a relatively recent DSGE model, Smets and Wouters (2007) introduce the possibility that the markup is subject to exogenous innovations. Although these authors do not explain the source of such innovations, their empirical findings suggest that a great deal of the US inflation, in the short and medium run, can be explained by these markup shocks.

In this paper, we empirically disentangle how much of the markup variability in Venezuela is due to aggregate fluctuations (supply and demand shocks) as opposed to how much can be attributed to distributional processes (exogenous markup shocks). In this way we can determine, how important exogenous markup shocks are, and, what the effects of these shocks are on the aggregate goods market. We are also able to determine the impact of aggregate supply and demand shocks on the markup and the rest of related variables.

We find that while aggregate fluctuations are more important, distributional shocks account for about 40% of the markup. This implies that a subtancial part of the markup has its explanations in factors not associated with the business cycle dynamics. In this sense, the presumption that institutional factors explain the Venezuelan markup becomes relevant. However, these exogenous increases in the markup only affect positively a small fraction of the inflation rate, especially at a medium-term horizon. Overall, the markup also responds to aggregate supply and demand shocks procyclically. In both cases, the gains in productivity exceed the rise in unitary labor costs.

We estimate the markup using measures based on the labor input margin. Specifically, our benchmark estimate is based on the proportionality between the markup and the inverse of the labor share. Nonetheless, we also incorporate other elements that may affect markup calculations and that reflect the presence of other rigidities. For example, we implement markup measures that consider different possibilities: a production technology with elasticity of substitution smaller than one, the effect of technology shocks, variable utilization of capital, and overhead labor among others. We combine both aggregated data with information obtained from household surveys. Specifically, we obtain measures of worked hours and overhead labor from household surveys. We use data from national accounts to obtain a markup rate for the whole economy and for the manufacturing and trade industries.

Econometrically, we use a structural VAR (SVAR) to distinguish between aggregate shocks and exogenous markup shocks. Shocks are identified with a combination of sign restrictions and zero restrictions. The system uses information on the markup, productivity, the goods and labor market.

Our paper is related to two strands of the literature. One of these is the literature on markup and business cycles. A long discussion in the literature is whether the markup is procyclical (Domowitz, Hubbard, & Petersen, 1986; Haskel, Martin, & Small, 1995; Morrison, 1994) or countercyclical (Banerjee & Russell, 2004; Bils & Chang, 2000; Bils & Kahn, 2000; Bils, Klenow, & Malin, 2013; Fedderke, Kularatne, & Mariotti, 2007; Gali, Gertler, & Lopez-Salido, 2007; Karabarbounis, 2014; Kryvtsov & Midrigan, 2013; Marchetti, 2002; Rotemberg & Woodford, 1999; Santaeulalia-Llopis & Koh, 2014). This discussion, although is recently inclining to the lack of cyclicality of the markup, has not been completely settled because markup estimates tend to be sensitive to the way theoretical assumptions are implemented. Nevertheless, the core of this discussion revolves around the question of what shocks actually drive the business cycles: technological or demand shocks. Depending on this answer, the markup would respond procyclically or countercyclically to output. For instance, if the economy is mainly driven by technological shocks, increasing factor productivity allows for higher markup rates while increasing output. On the other hand, an economy hit by demand shocks will raise its production only by facing higher marginal costs that most likely drive markup rates down. Our paper approximates the relationship between the markup and the business cycle from a different perspective by explicitly distinguishing the sources of business cycle fluctuations in supply and demand shocks.

Another highly discussed topic in the literature refers to the connection between inflation and the markup. One view is that when inflation increases, price dispersion also rises, leading to a reduction in the markup (Banerjee & Russell, 2001, 2005; Benabou, 1992; Jonsson & Palmqvist, 2006). This occurs because firms end up facing a flatter demand curve as a result of more intense search by consumers due to relatively smaller leather-shoe costs. There is the opposite view as well that rising inflation is positively related to less competitive markets that allow for higher markup rates (Noyola Vázquez, 1956). Also, increasing inflation can be associated with higher levels of uncertainty, which in turn results in a rising markup (Frenkel, 1979). Our paper contributes on this topic by empirically exploring the connection between markup and inflation and by allowing a direct effect of exogenous markup shocks on inflation.

The structure of the paper is the following: next, we provide a historical perspective on annual and quarterly markups for the total economy and most important sectors. Then, we explain the econometric strategy that allows us to analyze the behavior of the quarterly markup and other aggregate variables for fifteen years. In section IV, we present the results of the econometric model for the benchmark case -the Cobb-Douglas markup measure- and our interpretation regarding the conditions that trigger distributional markup shocks. In section V, we check the robustness of econometric results for other measures of the markup and labor productivity. We also check the response of markups for the manufacturing industry and trade sector to aggregate goods market shock. In the last section, we provide the final remarks.

## II. HISTORICAL ANALYSIS OF THE MARKUP

### a. YEARLY DATA

The markup ($\mu$) is defined in the neoclassical theory as the ratio of price to marginal cost. When firms minimize costs, they make marginal costs equal across all possible margins. Traditionally, the computation of markup has focused on the labor margin. Under the assumption that the production function takes a similar form to a Cobb-Douglas production function, we can write markup as:

$$\mu = \alpha \, sh_L^{-1} \quad \Rightarrow \quad \dot{\mu} = - \, s\dot{h}_L \tag{1}$$

where $sh_L$ is the labor share and $\alpha$ is the elasticity of output with respect to labor inputs. This is by far the most common empirical approximation to the markup rate.

There is some confusion in the nontechnical literature about the meaning of the markup. The markup rate is sometimes confused with the profit rate. While the latter is related to the net profitability of an investment, the markup reflects a wedge between marginal revenues and marginal costs, which is directly associated with the structure of the market demand and firm production. This wedge varies for each additional unit produced, and it pays for fixed costs, opportunity costs, financial costs and even macroeconomic uncertainty (Frenkel, 1986). Therefore, the existence of an increasing markup does not necessarily reflect the existence of increasing profits, if the sum of fix costs faced by firms is also growing. Nonetheless, the fact that a markup rate has a positive tendency might indeed reveal that there are objective conditions that allow firms to hold increasing margins.

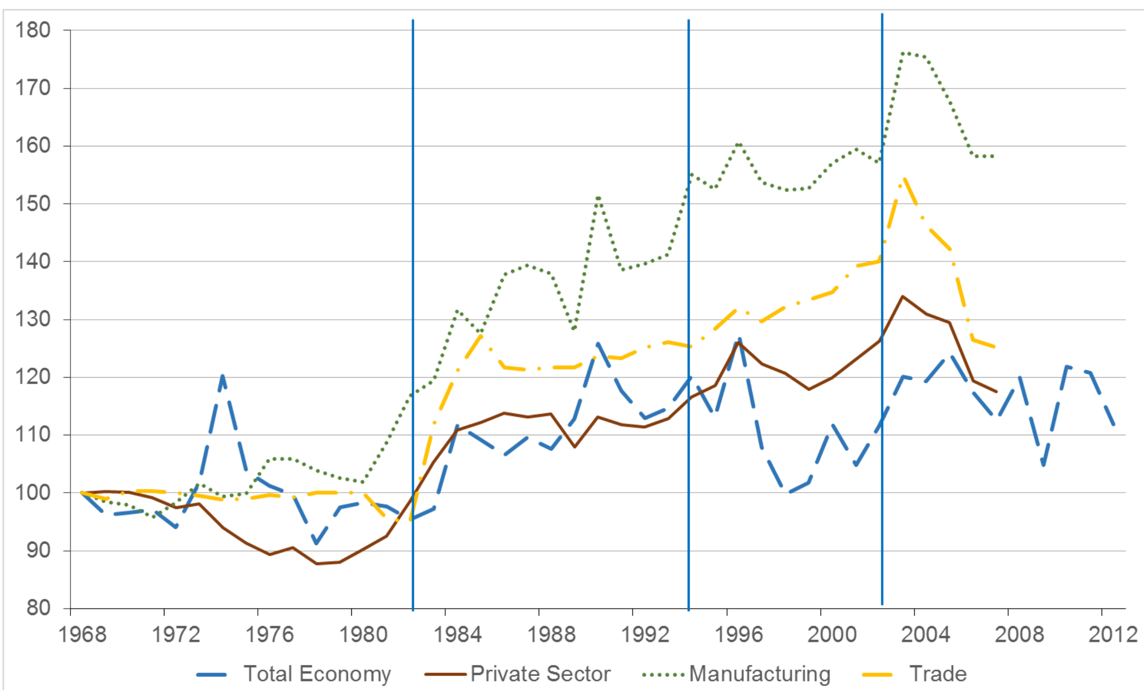
Using Venezuelan national accounts annual data for the period 1968-2012, we compute the labor share as the ratio of compensations to employees over the nominal domestic value added. Then, we calculate how this ratio has changed over time by constructing an index for the markup. This index reflects the accumulated variations applied to the level of markup existing during the base year. Figure 1 shows markup series for the total economy -for the period between 1968 and 2012-, and for the private sector, the manufacturing industry (excluding the refinement of oil products), and trade industry -for the period running from 1968 to 2007. Because disaggregated national accounts are not available beyond 2007, sectoral markups have a shorter length.[2]

In figure 1, all markup measures show a growing tendency. However, this trend is significantly less pronounced for the total economy than for the other measures. This could occur for several reasons. First, the value added of the total economy includes many goods and services that are not actually valued at market

[2] The Central Bank of Venezuela, which is the producer of the national accounts, is in the process of updating the base year to 2007.

prices. Excluding oil production, around 17% of the value of all goods and services produced are provided by the public sector. The oil sector accounts for an additional 18% approximately of the GDP. Second, the nominal value of oil is highly volatile due to the significant swings in the international oil prices. This important volatility in oil prices is partially passed through the nominal GDP and, hence, through the labor share and the markup rate. For instance, the total economy markup rate, for 1997 and 2009, shows important troughs that are mostly explained by the significant slump in oil prices during those years. In those cases, the fall -or small increases- in the nominal GDP tended to raise the total labor share, and consequently reduce the markup. For these reasons, we also calculate the markup index for some sectors of the economy, i.e., the private sector, the manufacturing industry, and the trade and repair industry, which are also provided in Figure 1.[3]

Figure 1. Markup indexes based on annual figures of the labor share




[3] There is another reason to focus on sectoral markup indexes. Rotemberg and Woodford (1999) consider that a markup index for the whole economy is less satisfactory because it includes the government and income of the proprietors (mixed income), which contains an element of compensation as well.

Differently than the total economy markup, these three series present a pronounced upward trend during the whole-time span. Moreover, the private sector markup displays large temporary increases in 1983-1984, 1994-1996 and 2003. All these important surges take place during the initial implementation of exchange rate controls. Those spikes in the markup together with the growing trend during the rest of the exchange rate control years -1985 through 1988-, could hint at structural connections between exchange rate controls and markups. However, these hypotheses will be more carefully explained for the quarterly data, which cover the behavior of the markup for the last -and longest- exchange rate control.

The markup for the manufacturing industry exhibits the fastest growth of all three series especially during the 1990s. A remarkable finding is that this large markup increase occurs in a context of generalized deindustrialization -as Vera (2009) describes. This implies that the rise of the markup is not likely to have occurred amid a process of increasing productivity. Therefore, the combination of a rising markup and a significant deindustrialization could hint instead at a reorganization in the manufacturing process, in which high-wages labor were mostly slashed. That is, the manufacturing industry likely specialized in activities that were more intensive in low-skilled, low-wage labor.[4] The trade markup also shows a steady increasing tendency for the whole sample.

In summary, the markup has increased over time, although it remains unclear the effects caused by the performance of labor productivity. It also remains open the discussion about the impact of minimum wage decrees on firms' salaries and the role of employment protection regulations. With minimum wage decrees, an important part of the economy salary mass is set up unilaterally by the central government, potentially affecting the trajectory of real wages and markups. With a new employment protection regulation decree passed on 2002, any dismissal

[4] Some authors have argued that an excessive capital accumulation -especially during the exchange rate control in the eighties- allowed the manufacturing sector to become more capital intensive. This excessive capital accumulation would have raised labor productivity and therefore explain an increasing markup. Nonetheless, this last hypothesis might be at odds with many other interpretations that picture the nineties as a decade of falling productivity.

without cause is considered illegal.[5] Therefore, the presence of several exchange controls and highly controlled labor markets characterize particular conditions for the Venezuelan economy that stress the importance of evaluating the occurrence of non-cyclical markup variations.

### b. RECENT QUARTERLY MARKUP BEHAVIOR

There are several ways of defining the markup growth rate, depending on the assumptions implemented for its calculation. For our benchmark case (the Cobb-Douglas measure), we define the variations in the markup as the negative variations in the labor share, which is defined by the difference between the growth of the nominal (non-oil) gross domestic output (nGDP) and the growth in the total salary mass (smass), i.e. the number of occupied in the economy times the nominal salary per worker. In particular, we measure this definition as:

$$\dot{\mu} = -\dot{sh}_L \stackrel{\text{def}}{=} \dot{nGDP} - \dot{smass} \stackrel{\text{m}}{=} \dot{y}_M - \dot{rw} \qquad (2)$$

where $\dot{y}_M$ is the variation in the average productivity per worker (since for the Cobb-Douglas case the marginal product is proportional to the average product) and $\dot{rw}$ is the variation in the real wage per worker, which is computed as the nominal variation in average wages adjusted by the non-oil GDP deflator.[6,7]

Although simple, this decomposition of the markup highlights the fact that growing markup rates can be obtained either by increasing the (marginal)

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[5] In general terms, all permanent employees -except those that are public servants, temporal workers or domestic service workers-, with at least three-month tenure could not be dismissed without just cause. The exceptions for this decree are workers that exercise managerial functions, trusted employees and those who earned more than three times the minimum wage.

[6] We use the measure average productivity per worker instead of the average productivity per hour worked because of the lack of statistics measuring hourly salaries.

[7] The growth of the nominal salary per worker is obtained from a statistic published by the Central Bank called IRE (índice de remuneraciones de empleados), which basically reflects the behavior of salaries in the formal sector of the economy. Therefore, this measure excludes any kind of labor income perceived by the informal sector and also excludes for instance, the income that pensioned workers might receive through different government ministries. In this sense, the definition of salary implicit in this statistic does not necessarily match the definition of labor compensation in national accounts.

productivity of workers or by reducing the speed of real salary growth in the economy. At the light of the academic discussion, new-Keynesian advocates believe that real salaries are clearly procyclical, so markup rates tend to be countercyclical. On the contrary, more neo-classical economists assume that growth is mainly driven by productivity shocks, or alternatively that under non-competitive market structures the procyclicality of productivity delivers also procyclical markup rates.

In figure 2 and 3, we present the behavior of the markup indexes for the Cobb-Douglas case and five additional measures. We present the corresponding indexes of productivity as well, since each markup measure has an implicit definition of marginal productivity. The diverse definitions of markup are explained in appendix 1, and comparisons with the benchmark case are presented in the section IV.

Despite the differences in the levels, all markup and the productivity indexes tell a similar story. Markups and productivity start their rising trajectory by mid-2003, until a slowdown occurs during 2009-2010. Later, both indexes rise again, recovering their levels before the slowdown. This possibly implies that, for most periods, markups could have increased due to the gains in productivity. It could also suggest that markups are generally procyclical. Nonetheless, most measures of markups end up with accumulated growth rates that exceed the accumulated variations in productivity. This last observation provides some room for presuming that there are other non-cyclical factors that might have push markups rates upwards.

One important factor that could have allowed rising markups is the implementation of the exchange rate control in 2003. As suggested in the introduction, the administrative apparatus of the control inevitably ends up discretionally picking the receivers of massive subventions through a system of import licenses. Due to the premium that usually arises in the non-official exchange rate market, discretional subventions tend to drive non-receiving firms out of the market, endowing receiving firms with more monopoly power. This implies that as the control becomes more restrictive -and the exchange rate premium sores-, the degree of competitiveness among domestic firms is reduced and actual changes in market structures take place.

Figure 2. Markup indexes for different definitions

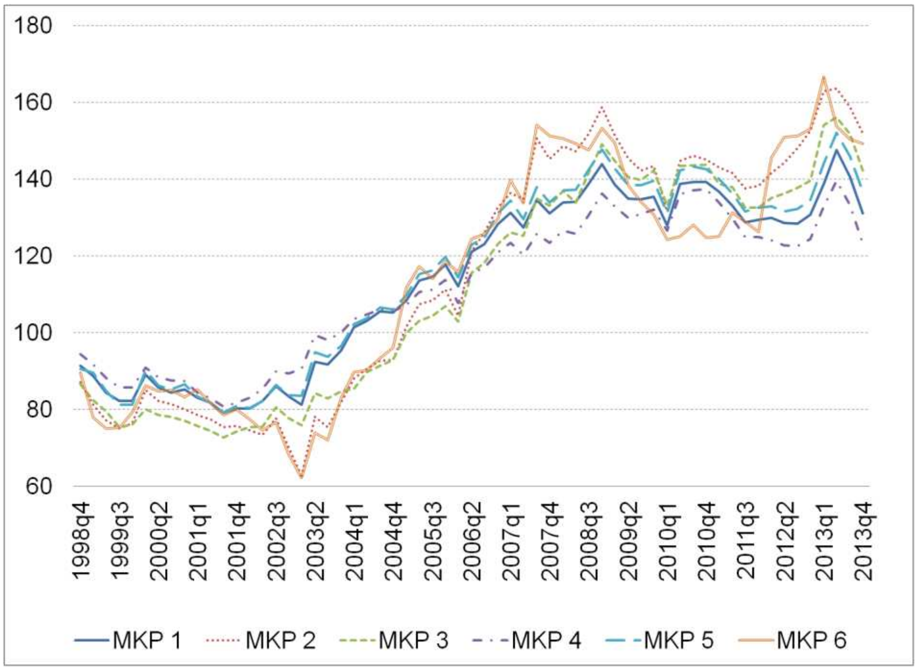
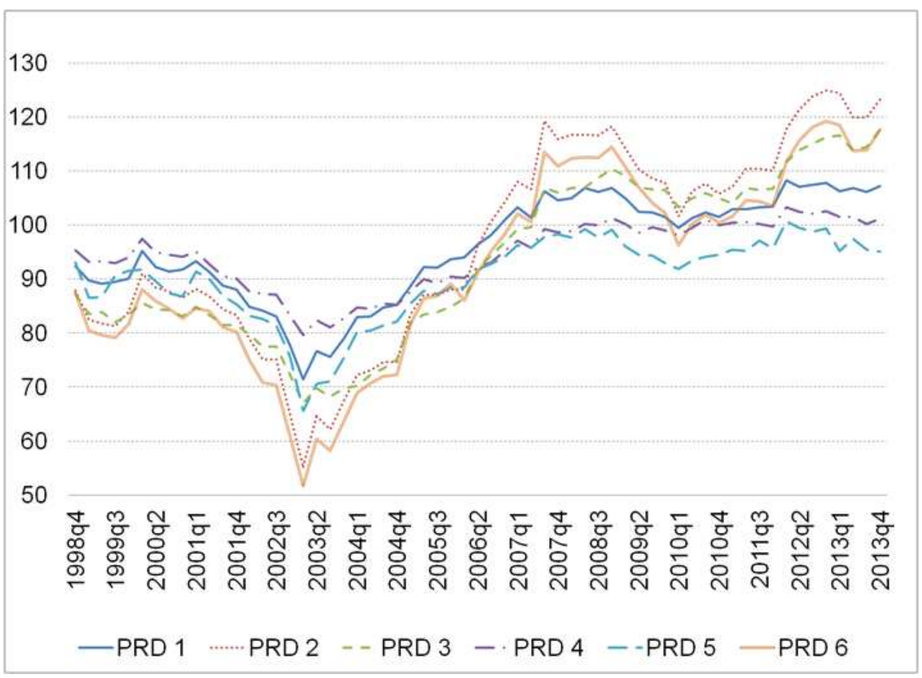



Figure 3. Productivity indexes for different definitions




Measure 1: Cobb-Douglas production function; Measure 2: CES production function; Measure 3: technology - adjusted CES production function; Measure 4: GGL generalization of CES production function; Measure 5: variable capital-adjusted GGL generalization of CES production function; Measure 6: overhead labor/variable wage-adjusted CES production function

## III. DYNAMIC BEHAVIOR OF THE MARKUP: ECONOMETRIC SETTING

As previously stressed, the objective of this paper is to disentangle the effects of aggregate fluctuations from the effects of exogenous markup shocks on the markup itself and on the rest of the economy. We focus on the markup for the non-oil economy. Econometrically, we consider an SVAR with six endogenous quarterly variables: the level of non-oil GDP, the consumer price index (CPI), the total quarterly hours worked, an index of the nominal wage per worker, a productivity index, and a markup index. All variables are considered in logarithmic fourth-differences, so they can be interpreted as annual growth rates. The sample runs from the last quarter of 1998 through the last quarter of 2013.

Theoretically, we divide these variables in two groups: the aggregate goods market (real activity growth and inflation), and the sectoral variables (total hours, nominal wage, productivity and markup rates). At the aggregate level, we identify two shocks that explain the fluctuations in the goods market: a supply and a demand shock. While both expansionary supply and demand shocks increase real activity, they have the opposite effects on inflation. At a sectoral level, we focus our attention on the identification of two additional markup shocks: an inflationary markup shock - that allows firms to pass a higher markup through consumer prices-, and a non-inflationary markup shock - that allows for a higher markup by reducing the rate of growth of nominal wages. Because these two markup shocks clearly imply a redistribution of wealth between firms, consumers and workers, we call them the distributional markup shocks. To our knowledge, this is the first attempt to empirically measure these distributional shocks in a formal econometric setup. In the literature, the closest theoretical references to these shocks are related to the structuralist views of inflation, surveyed in Vera (2013), or to models such as Sarantis (1991) where workers and capitalist engage in a distributional conflict over income that impacts wage inflation.

The importance of these distributional markup shocks is that they allow for exogenous variations in the markup (not associated with the business cycle) that potentially might represent an important source of fluctuations in real activity or inflation. Additionally, these two shocks address two potential channels of markup generation that might emerge in imperfectly-competitive markets or from bargaining in imperfect information settings. In the inflationary markup shock, the existence of non-competitive markets for the provision of final goods allows firms to cause inflationary surprises that reduce consumers' access to goods. In the non-inflationary markup shock, we can imagine a direct bargaining between firms (or the government) and workers, where firms (or the government) are capable to affect the trajectory of nominal salaries, by not committing to a pre-negotiated arrangement. Despite the strategic and dynamic considerations that could arise, these two channels could be analyzed from the distributional point of view to understand their welfare implications. However, we are not going to explore this route in this paper. Instead, we will limit our scope to test the existence of these channels of markup generation and understand their empirical relevance.

### a. SVAR SPECIFICATION

Endogeneity between aggregate and sectoral variables can be represented with an SVAR (q) model, as follows:

$$B^{-1}Z_t = \Gamma_1 Z_{t-1} + K + \Gamma_q Z_{t-q} + \Psi X_t + u_t \tag{3}$$

where $Z_t$ is the column vector of N=6 endogenous variables, $Z_t = [y_t, P_t, hrs_t, nw_t, prd_t, mkp_t]'$, where $y_t$ and $P_t$, refer to real activity growth and the inflation rate, while $hrs_t$, $nw_t$, $prd_t$, $mkp_t$ are the growth rates in total hours, nominal wage per worker, productivity and markup respectively. Additionally, $X$ is a weakly exogenous variable that captures the growth rate of the value of imported intermediate goods.[8] Total hours are computed using information on weekly hours worked reported in household surveys.

[8] The decision to control for the effect of intermediate goods in the system follows from the presumption that quantities of intermediate goods can affect productivity. As Gopinath and Neiman (2014) and Basu (1995) suggest, the existence of non-competitive goods markets for (imported) intermediate goods can translate into productivity gains, when the prices of these goods fall. These gains take place mostly because of the occurrence of efficiency gains.

The vector $u_t$ represents the structural error vector, which is normally distributed with an identity covariance matrix. Matrices $\mathrm{B}, \Gamma, \Psi$ contain the structural VAR parameters. This SVAR(q) can be rewritten as a reduced-form VAR(1):

$$Z_t = \mathrm{A} Z_{t-1} + C \mathrm{X}_t + e_t \tag{4}$$

where $e_t$ is the reduced-form error vector, which is distributed normal with covariance matrix $\Sigma$ and satisfies $e_t = \mathrm{B}\, u_t$ . We achieve identification of structural shocks by using sign restrictions on impulse-responses. Identification begins with any orthogonal decomposition V that rewrites $\Sigma$ as $\Sigma = V\, V'$, and implies that orthogonal errors ($\varepsilon$ ) are a linear combination of reduced-form errors: $\varepsilon_t = V^{-1}\, e_t$ .

Because structural shocks are strictly identified by their expected effects on economic variables, orthogonal errors may not necessarily qualify as such. Therefore, the way sign restriction identification works is by combining orthogonal errors in such a way that the resulting structural (also orthogonal) errors have the properties imposed by the researcher. Structural shocks are related to orthogonal errors through a matrix $Q$ . According to Rubio-Ramírez, Waggoner, and Zha (2010), we can always find a rotation matrix *Q* that satisfies $Q\, Q' = Q'\, Q = \mathrm{I}$ and preserves $\Sigma = V\; Q\; Q'\, V'$. In this case, impulse-responses to structural shocks at horizon (*h*) are given by the following expression:

$$IR(h) = \mathrm{A}^{h-1}\; V\; Q \tag{5}$$

Equation (4) also implies that structural errors (*u*) are related to orthogonal errors $\varepsilon$ as well: $\varepsilon_t = Q\, u_t$ , and $e_t = VQ\, u_t$ .

Generally speaking, sign restriction identification consists of finding several sets of structural parameters that satisfy restrictions imposed on impulse-responses of several variables. Operationally, sign restriction identification also consists of finding several rotation matrices *Q* that satisfy the restrictions imposed on impulse-responses of variables (given by equation 4). Since each potential draw of *Q* generates a single impulse-response and represents a set of structural parameters, we keep only those *Q*s satisfying restrictions. We can generate an arbitrary number of *Q*'s (or impulse-responses) satisfying restrictions. The way to summarize these different impulse-responses is by computing their empirical percentiles, such as the median, the 16th and the 84th percentiles typically shown in this type of identification. However, because we do not want these percentiles to change with the number of simulations, we need to consider a sufficiently large number of *Q* matrices that satisfy restrictions, but do not change results when adding additional draws. Once percentiles are computed, the usual interpretation of impulse-responses applies: significant impulse-responses do not contain zero within their bands.

Besides the implementation of sign restrictions to identify structural shocks, we further impose some zero restrictions in impulse-responses at *h*=1. These zero restrictions further distinguish aggregate from sectoral shocks by requiring that aggregate (supply and real demand) shocks only use information from the goods market. Likewise, sectoral shocks are born only from the combination of information contained in sectoral variables. These zero restrictions are obtained by using a block diagonal structure for *Q*. In particular, we set $Q = \begin{bmatrix} Q_1 & 0 \\ 0 & Q_2 \end{bmatrix}$, where $Q_1$ and $Q_2$ are non-zero matrices that preserve $Q_1 Q_1' = \mathrm{I}$ and $Q_2 Q_2' = \mathrm{I}$. For our six variables SVAR, $Q_1$ has dimension 2x2, while $Q_2$ has dimensions 4x4 (it combines information from all sectoral variables). Aggregate shocks are defined through $Q_1$, while sectoral (markup) shocks are defined through $Q_2$. Impulse-responses at h=1 imply that aggregate shocks contemporaneously affect all variables in the system, while markup shocks can only affect aggregate variables with a lag of one quarter.

### b. IDENTIFICATION OF STRUCTURAL SHOCKS

For aggregate supply and demand shocks, we follow the simplest definitions: a positive aggregate supply shock leads to growth in real activity and a reduction in inflation, while a positive demand shock generates a joint boost in real activity and inflation.

Distributional markup shocks are defined in such a way that an increase in the markup is either explained by a rise in inflation or by a reduction in the growth rate of nominal salaries. Restrictions are imposed for two consecutive quarters to capture shocks whose effects are observed for at least two quarters.

Notice that the markup shock sustained by the reduction in the nominal wage growth rate is called non-inflationary because by definition, does not affect inflation. However, whether this shock might end up affecting inflation, it is an empirical matter. Methodologically, the definitions of shocks implemented tend to be as agnostic as possible in the words of Uhlig (2005).

Table 1. Restrictions imposed on structural impulse-responses

| **Structural shocks** | **Restricted variables** | |
|---|---|---|
| Expansionary supply | y >0 | P <0 |
| Expansionary demand | y >0 | P >0 |
| Inflationary markup | mkp >0 | P >0 |
| Non-inflationary markup | mkp >0 | nw<0 |

### c. INTERPRETATIONS OF RESULTS FOR THE BECHMARK CASE

To test more accurately the impact of structural shocks on the benchmark case (markup measure 1), we present the accumulated impulse-responses for the SVAR variables to all four shocks: aggregate supply, aggregate demand and two distributional markup shocks (figures 4 to 7). We also present the accumulated variance decompositions of variables in table 2.

In figure 4, we observe that an expansionary aggregate supply shock generates an increase in the total markup by enabling an important increase in labor productivity and consecuently, a reduction in marginal costs. Real activity is also driven by a slight increase in the number of hours worked, which is consitent with a rise in both the number of occupied workers and the number of hours worked per week. In the presence of demand shocks (figure 5), the economy also seems to exhibit an increase in labor productivity that allows for a growing markup rate. In this case however, the growth in the markup reverses as soon as the increase in salaries (unitary labor cost) starts increasing marginal costs.

Since the increase of productivity for the demand shock is also significant, a subsidiary discussion from these two results is about what actually drives labor productivity. One way to rationalize productivity gains without a clear origin is to suppose the existence of labor hoarding. Under this this type of rigidity, firms hire a fixed number of workers, but a fraction of them only produces when the objective conditions of the economy change and firms require so. Considering how strict the employment protection regulation is in Venezuela since 2002, swifts increments in productivity could arise if firms facing a growing demand would use all their workers to produce more. This would occur without observing formal changes in the number of occupied workers or total hours worked.

Another -more intricate- possibility is that the positive external (oil price) conditions for most of the period and the discretional allocation of subventions trough the control would have boosted labor productivity further. In this hypothesis, the greater access by selected firms to cheap imported intermediate goods would have worked as reductions in unitary costs of imported inputs that spreaded to the rest of the economy in the form of gains in total factor productivity. As Gopinath and Neiman (2014) suggest, this mechanism would be triggered, not necessarily by a change in the quantities of aggregate intermediate imports, but by an increase in the varieties of imported inputs by some firms, when facing reductions in the price of imports. This mechanism takes place because the monopoly power of importing firms transform their efficiency gains in lower prices of inputs that spread to the rest of the economy. In Venezuela, these efficiency gains would likely be artificially induced by the control. However, to test this type of transmission mechanism, we would need disaggregated data for imports -by firms and products- and estimations of deep production parameters.

In figures 6 and 7, we observe that exogenous increases in the markup tend to have a temporary effect on the level of the markup, and that they occur at the expense of nominal variables, such as the inflation rate or the growth rate in nominal salaries. Nonetheless, none of these shocks seems to statistically affect the real performance of the economy in terms of GDP growth or productivity. While the inflationary markup shock affects inflation by definition, the data supports that this effect is indeed permanent, i.e. the accumulated response of inflation does not return to zero. For the non-inflationary markup, the data supports that this shock does not actually affect the inflation rate. A further implication of this last result is that variations in nominal wages are not probably related to changes in the inflation rate.

To have a better idea of the effects of shocks on variables, we resort to the variance decomposition (table 2). In table 2, we can observe that supply and demand shocks account for all the variations in output and productivity, and most of the variability of inflation. Only the inflationary markup shock attains to explain up to a 14% of the inflation rate at a four-year horizon. This contribution, although non-negligible, is proportionally smaller than the contribution provided by supply and demand shocks. This decomposition also shows, that supply shocks explain most of the output performance at all horizons. Demand shocks only explain up to 40% of inflation fluctuations. These results for Venezuela are consistent with evidence on six other Latin American economies, in which supply shocks also explain a great deal of output and inflation fluctuations, as reported in Pagliacci (2017).

Nominal wages and hours worked are partly explained by the distributional markup shocks, but mostly for the short run. In terms of the markup itself, distributional shocks describe up to 37% of its fluctuations, both at the impact of shocks and at a four-year horizon. This implies that a subtancial part of the markup has its explanations in factors not associated with the business cycle dynamics.

Figure 4. Accumulated responses to an aggregate supply shock

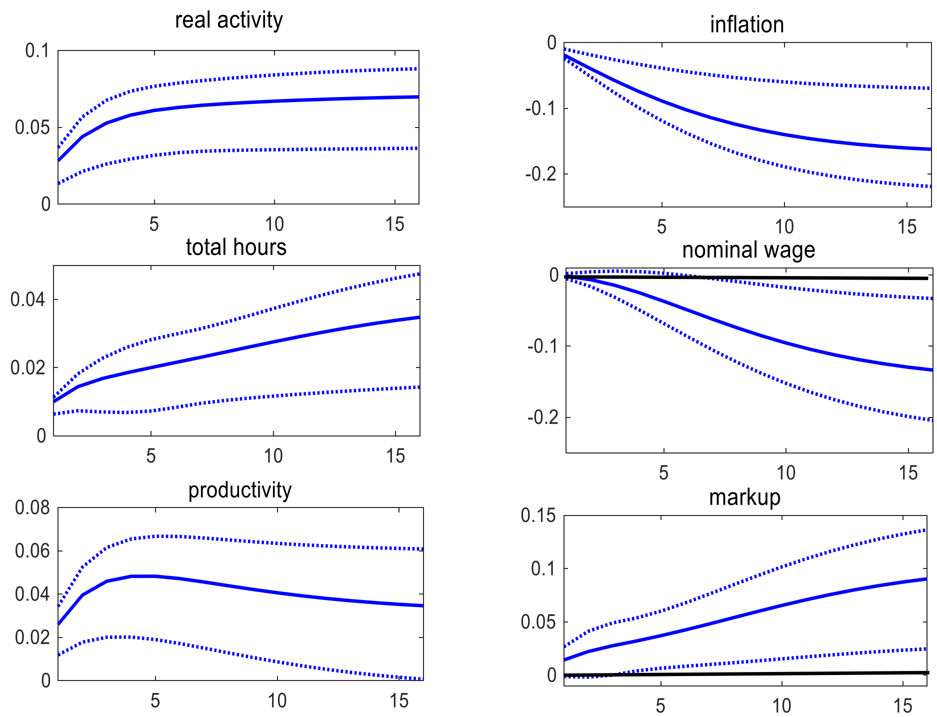



Figure 5. Accumulated responses to an aggregate demand shock

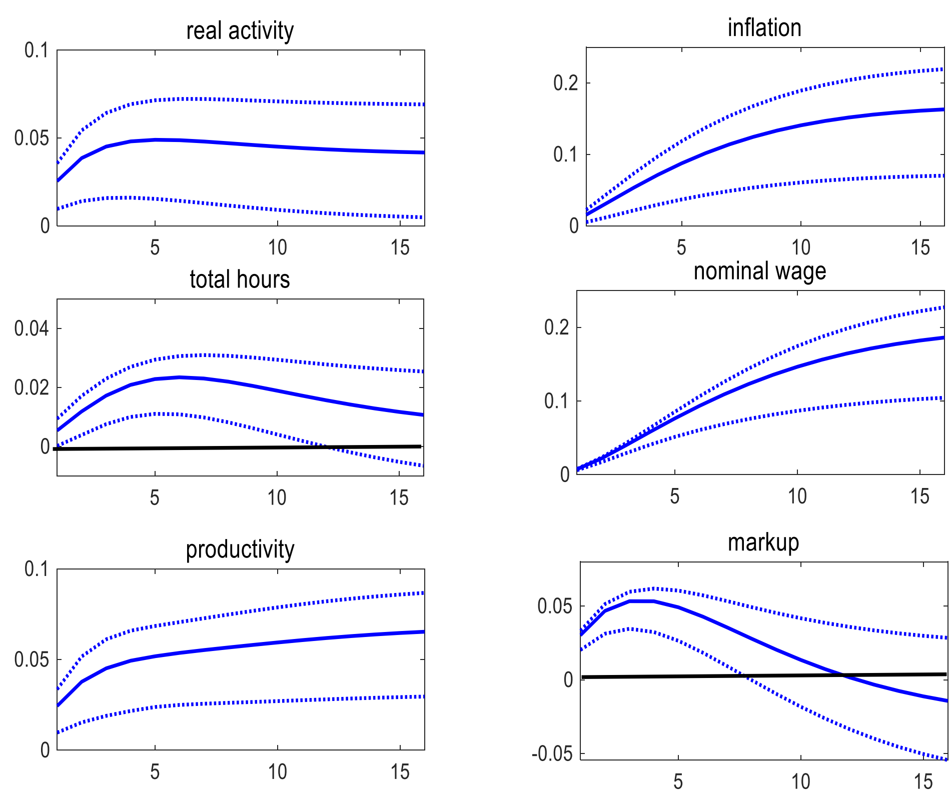


Figure 6. Accumulated responses to an inflationary markup shock

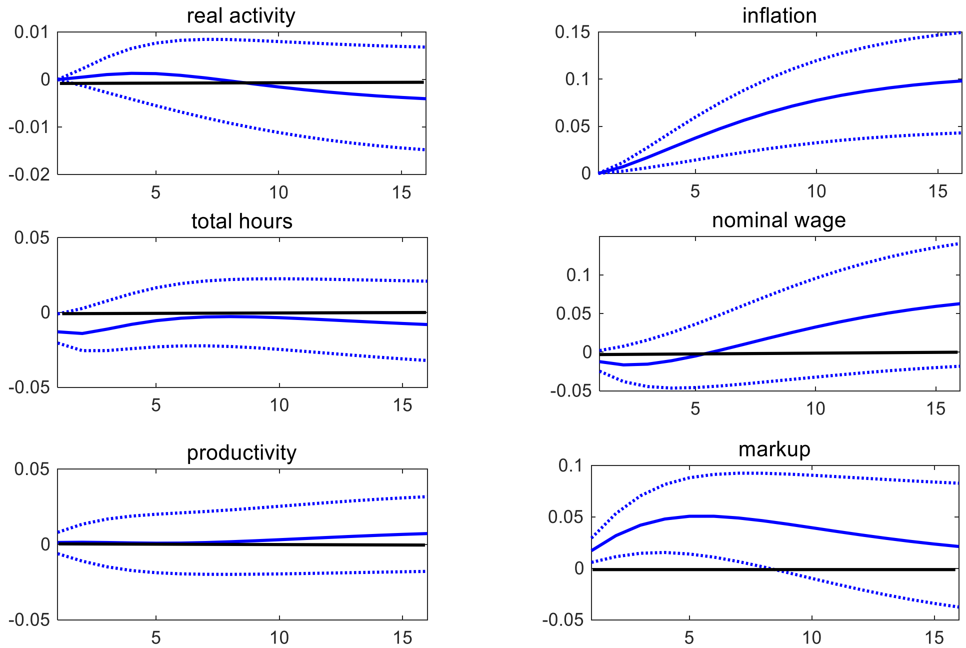



Figure 7. Accumulated responses to a non-inflationary markup shock

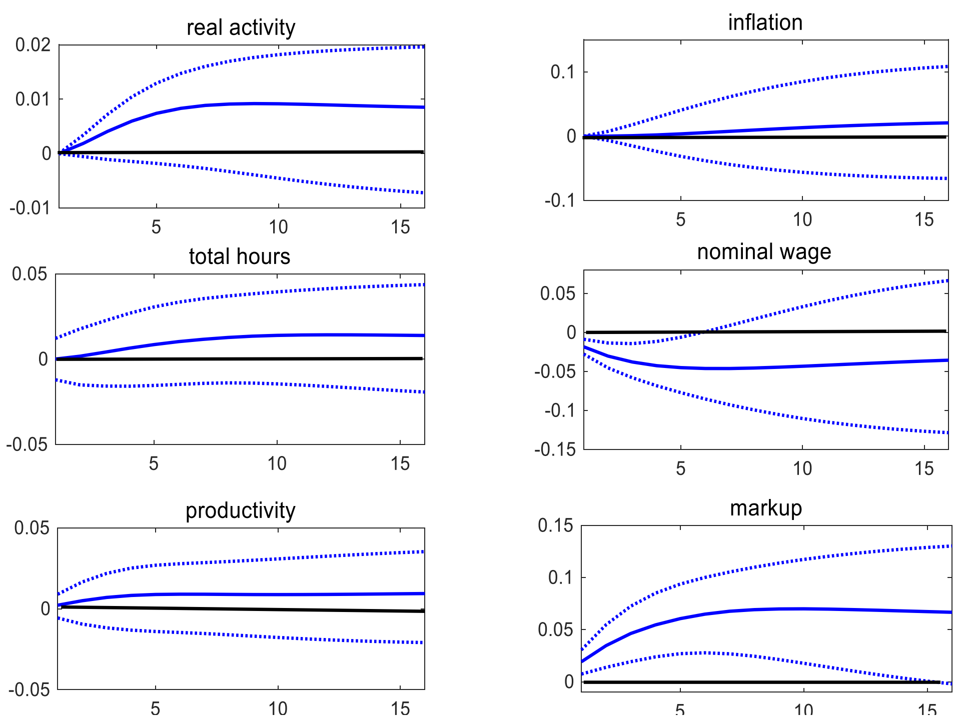


Table 2. Variance decomposition of variables to shocks

| quarters | Supply shock | Demand shock | Inflationary markup shock | Non-inflationary markup shock |
|---|---|---|---|---|
| Real activity | | | | |
| 1 | 52% | 48% | 0% | 0% |
| 8 | 62% | 37% | 0% | 1% |
| 16 | 70% | 29% | 0% | 1% |
| Inflation | | | | |
| 1 | 63% | 37% | 0% | 0% |
| 8 | 48% | 41% | 11% | 0% |
| 16 | 46% | 40% | 14% | 1% |
| Total hours | | | | |
| 1 | 34% | 12% | 53% | 0% |
| 8 | 44% | 40% | 0% | 16% |
| 16 | 74% | 9% | 3% | 14% |
| Nominal Wage | | | | |
| 1 | 1% | 10% | 32% | 57% |
| 8 | 27% | 64% | 1% | 8% |
| 16 | 35% | 58% | 5% | 2% |
| Productivity | | | | |
| 1 | 49% | 50% | 0% | 0% |
| 8 | 33% | 65% | 0% | 1% |
| 16 | 19% | 79% | 1% | 1% |
| Markup | | | | |
| 1 | 10% | 53% | 16% | 21% |
| 8 | 27% | 8% | 21% | 44% |
| 16 | 63% | 1% | 4% | 32% |

Given the availability of data and the econometric setting selected for this analysis, we cannot provide an exhaustive list of all the factors that could cause exogenous markup movements. Merely, we can provide two potential narratives for the markup appropriation that are not rejected by the data.

In one narrative, because of the importance of the non-inflationary markup shock for explaining the markup at a two-year horizon, markups must be related to the trajectory of nominal salaries. On the one hand, since nominal salaries can be affected by the government decisions on minimun wages, it is possible that exogeneous markup movements are associated with these discretionary decisions. On the other hand, as long as average salaries depart from minimum wages, wage policies from firms might also affect the behavior of nominal salaries and markups.

In appendix 2, we test the relative importance of minimun wage discretionary changes on average wages. From this partial evidence, we find that the trajectory of nominal wages seems to depend more on firms' decisions than on minimum wage decisions. This might imply that the presumed monopoly power gained by firms in goods markets might also translate into monopsony power for bargaining nominal wages. This monopsony power is what allows a redistribution of wealth from workers to firms.

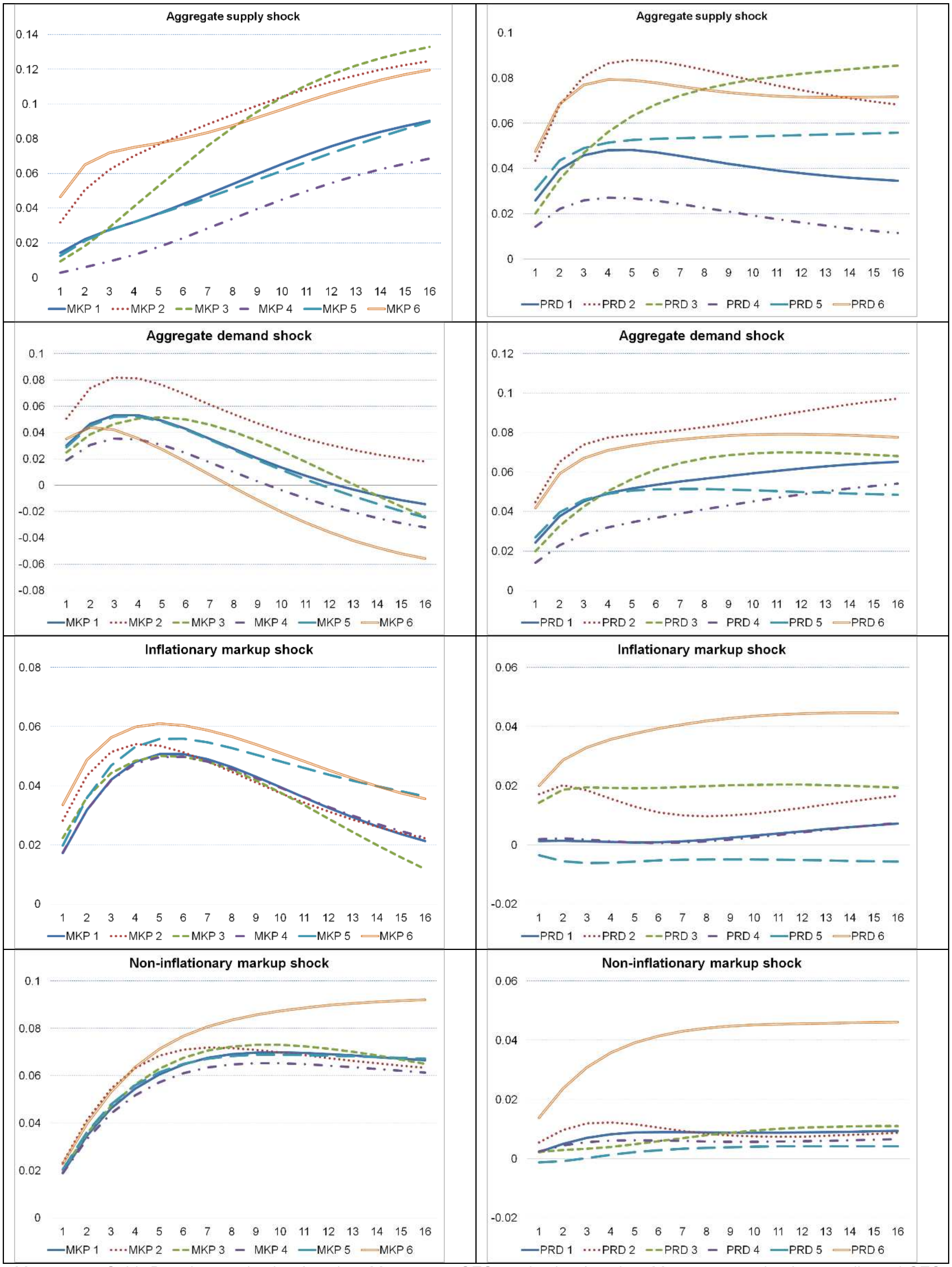
In a second narrative, because temporary increments in the markup translate into permanent higher inflation, final goods markets are likely to be highly non-competitive. That is, firms hold enough monopoly power to pass margin increases through consumer prices. In this process, there must also be some institutional factors that help explain market structures. For instance, the enormous oil windfall experienced up to 2008 and the exchange rate control could be two important elements affectting sectoral market structures and competitiveness. Also, the reduction of the number of running firms -after the 2003 general strike- is an additional element to be considered.[9] However, testing these hypotheses appropiately would require theoretical models that allow us to perform counterfactual exercises on the conections between external conditions and market structures.

## IV. ROBUSTNESS OF RESULTS AND SECTORAL CONSIDERATIONS

As previously shown in figures 2 and 3, the definition of markup and productivity implemented could change the story told by the empirical model. In this section, we re-estimate the model for each of the definitions of markup and productivity available, while maintaining the rest of the variables in the system. Then we compute impulse-responses and compare them to the benchmark case in figures 8. The benchmark case corresponds to measure 1.

[9] In December 2003, accumulated political conflicts during 2002 led to a one-month general strike, in which the state oil company and most of the private sector ceased their production. After the resolution of the strike, many businesses shut down, especially in the trade and manufacturing sectors.

Figure 8. Accumulated responses of different measures to shocks




Measure 1: Cobb-Douglas production function; Measure 2: CES production function; Measure 3: technology - adjusted CES production function; Measure 4: GGL generalization of CES production function; Measure 5: variable capital-adjusted GGL generalization of CES production function; Measure 6: overhead labor/variable wage-adjusted CES production function

Figure 8 shows that the uncertainty over the markup and producitivity measures also translate into uncertainty in the magnitude of impulse-responses. In most cases, the Coob-Douglas responses could stand for median impulse-responses. Nonetheless, the different definitions of markup and productivity do not qualitatively alter the direction of responses for these variables to aggregate supply and demand shocks (first two rows of figure 8). In fact, markup and productivity continue being procyclical to expansionary aggregate shocks.

On the other hand, when addressing exogenous markup shocks, different markup measures deliver different implications for the behavior of productivity. For instance, exogenous shocks (inflationary and non-inflationary) could either not affect or increase labor productivity, depending on the definition of markup used (last two rows of figure 8). This opens the possibility that exogenous increments in the markup might generate positive temporary real effects in the economy. That is, higher markup rates might lead firms to produce more temporarily. However this claim depends on how reliable the measures of productivity are.

Another important consideration for evaluating the robustness of the empirical results is to understand whether conclusions hold for sectoral measures of the markup. For this purpose, we compute the markup for the manufacturing and trade sector respectively. As shown in figure 9, both sectoral markups have increased more importantly than the general non-oil markup .Differently than calculations with annual data, these indexes suggest that greatest markup gains have occurred in the trade sector.

We also compute the responses of these sectoral measures to aggregate supply and demand shocks (figure 10). In figure 10, although markups tend to increase only in the margin for expansionary supply shocks (first row), both measures tend to decrease for expansionary demand shocks, as new-keynesian advocates would predict (second row). In the specific case of the trade markup, an expansionary demand shock temporarily increases it, but as production expands, the markup falls. These results might also suggest that these sectors tend to face more increasing marginal costs than other sectors in the economy.

Figure 9. Sectoral markup indexes

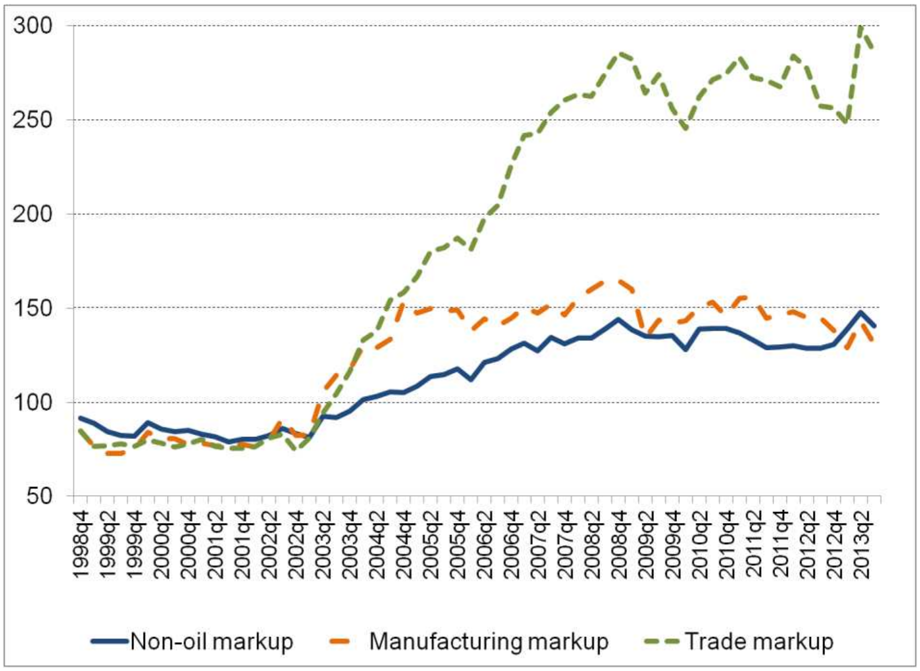
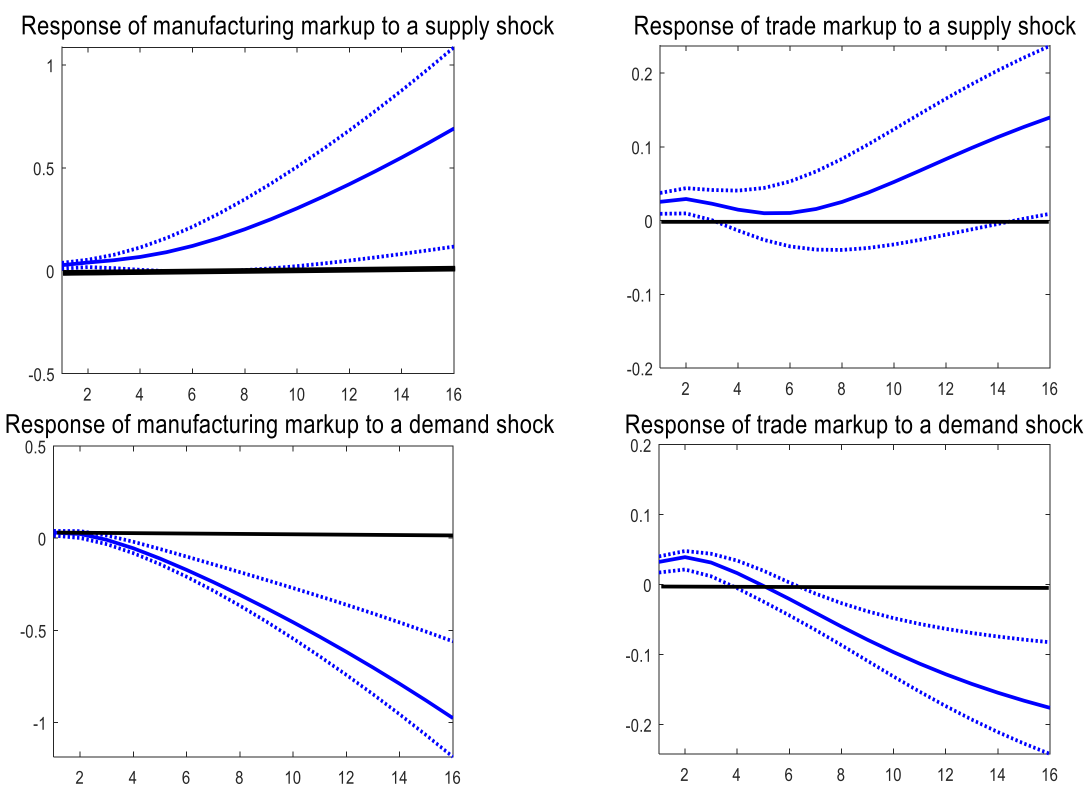



Figure 10. Responses of sectoral markups to expansionary aggregate shocks



Another implication of the impulse-responses is that important growths in these sectoral markups might have taken place after the occurrence of contractionary demand shocks. Therefore, historical increases in manufacturing and trade markups can be related to expansionary supply shocks, to contractionary demand shocks and to exogenous markup increments. According to the variance decomposition of these two exercises, exogenous markup shocks tend to explain a great deal of markup fluctuations, especially for the first year (up to 90% of fluctuations in both sectors). After four years, demand and supply shocks rather explain most of fluctuactions in markups (80% and 60% for the manufacturing and the trade sector respectively). This again implies that, part of these exogeneous markup surges could relate to factors that have affected the sectoral allocation of resources and the degree of competion in markets, such as the oil windfall, the exchange rate control, and the 2003 general strike.

## V. FINAL REMARKS

The discussion about the markup in most of the academic literature refers to the direction of markup responses to the business cycle. This occurs because, in most theoretical models, the markup is regarded as an endogenous variable that reflects the interaction between total factor productivity and costs, given that more structural factors, such as the degree of price stickiness and the level of competition among firms, remain constant.

In emerging small economies such as the Venezuelan, some external conditions and economic policy decisions have created the propitious conditions for the emergence of markup changes that are not related to the business cycle dynamics. We call these exogenous changes *distributional markup shocks* because they necessarily imply redistribution of wealth among consumers, producer and workers. Although we do not focus on the detailed description or implications of these distributional processes, we provide an econometric strategy for the identification of these shocks. In other words, we provide and test two potential channels of markup appropriation that suggest the existence of distributional processes.

Econometric results show that for the Venezuelan economy, a substantial part of the markup (around a 40%) is explained by these distributional shocks. These results lead us to assert that firms can undertake permanent exogenous markup increases by affecting the behavior of average wages or by passing markups through inflation. These two types of behavior can only occur in environments of imperfect competition for the markets of final goods and factors. The context of growing markup rates since 1983, and more markedly since 2003, has also led us to believe that these results are highly associated with a combination of prolonged exchange rate controls and the general deindustrialization process that started in the nineties -and deepened during the last three lustres.

We also find that for the part of the markup related to cyclical fluctuations, the non-oil markup is procyclical for both expansionary supply and demand shocks. Overall, the increase in the markup is explained by the productivity gains arising during these shocks. These productivity gains could also be explained by the existence of non-competitive markets for the imports of intermediate goods or by rigidities in the labor market, such as labor hoarding. Nonetheless, a further investigation about the sources of these productivity gains would contribute to better understanding the endogenous response of the markup to the business cycle. At the sectoral level -in the manufacturing and trade sectors-, the markup seems to be countercyclical for demand shocks. In these cases, initial increases in markups are eventually wiped out by the rise of real wages.

The policy implications of our results seem also significant. An important part of the markup growth in the recent Venezuelan history is potentially attributed to a set of policies choices that have worsened market structures and competitiveness. This interpretation calls for a revision of these policies and for understanding that lower markup margins require assertive public policies that aim at changing market structures and competitiveness in the right direction.

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Appendix 1. Calculations of different markup measures

Measure 1: Cobb-Douglas production function. Under the assumption that the production function takes is Cobb-Douglas, we can write:

$$Y = g(K)(H)^{\alpha} \tag{6}$$

where $K$ is the capital stock, $H$ the number of hours worked (Bils, 1987). The function $g$ is a positive increasing function and $\alpha > 0$. In this case, markup growth rate is given by:

$$\dot{\mu} = -\dot{sh_L} \overset{\text{m}}{=} \dot{y_M} - \dot{rw} \tag{7}$$

Measure 2: CES production function. One characteristic of the Cobb-Douglas production function is that it is isoelastic in terms of the labor and capital substitution. However, empirical results have shown that capital and labor are less substitutable in the short-run than in the long run (Basu, 1995; Basu & Fernald, 1997). When this happens, elasticity of output with respect to labor input is smaller than one. One way to introduce this element in our calculations is to assume a CES production function, that is:

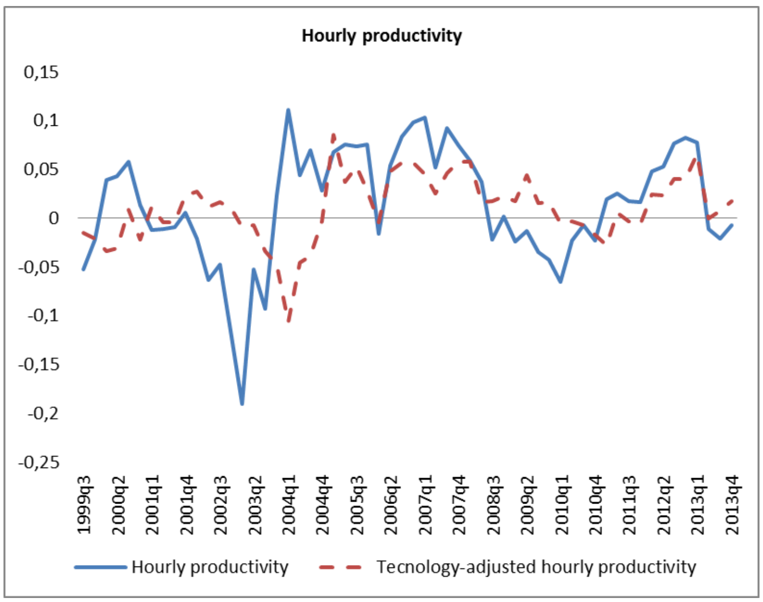
$$Y = \left[\alpha(H)^{\frac{\sigma-1}{\sigma}} + (1-\alpha)(K)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \tag{8}$$

where $\sigma$ is the elasticity of substitution between labor and capital. In this case, the markup growth rate is:

$$\dot{\mu} = -\dot{sh_L} + \frac{1-\sigma}{\sigma}\left(\frac{\dot{Y}}{H}\right) \quad \overset{\text{m}}{=} (\dot{y_M} + \dot{y_{HW}}) - \dot{rw} \tag{9}$$

where we assume that the elasticity of substitution $\sigma = 0.5$ and define $\dot{y_{HW}} = \left(\frac{\dot{Y}}{H}\right)$ as the change in productivity per hour worked (hourly productivity). Therefore, variations in marginal productivity equates the change in average product per worker plus the change in hourly productivity.

Measure 3: technology-adjusted CES production function. For this case, we estimate the technological shock from an SVAR in two variables: variations of hourly productivity ($\dot{y_{HW}}$) and variations in total hours ($\dot{hrs}$). As in Galí (1999), identification of the technological shock is achieved using long run restrictions: a technological shock has a long run impact on hourly productivity. Once identified, we compute the historical decomposition of the technological shock on hourly productivity. This defines the effect of the technological shock on hourly productivity: $hd(Z)$. Adjusted hourly productivity is given by: $\dot{y_{HW}}^a = \dot{y_{HW}} - hd(Z)$ . The markup growth rate calculated for this case is identical to expression (9) but using adjusted hourly productivity instead of plain hourly productivity.




Measure 4: GGL generalization of CES production function. For this case, we implement the CES generalization of the production function used in Gali et al. (2007). As the authors suggest:

$$\dot{\mu} = -\dot{sh_L} + \theta \left(\frac{\dot{Y}}{K}\right)^{\frac{1}{\sigma}-1} \stackrel{m}{=} (\dot{y_M} - 0.4 * \dot{y_K}) - \dot{rw} \qquad (10)$$

where $\theta = -0.4,\ \sigma = 0.5$ and $\dot{y_K} = \left(\frac{\dot{Y}}{K}\right)$ . The stock of capital is obtained from the the annual non-residential capital constructed by Baptista (2012), which is transformed into a quarterly series using the statistics of quarterly investment from the Central Bank.

Measure 5: variable capital-adjusted GGL generalization of CES production function. For this case, we use the same definition as in equation (10), but adjusting the use of capital according to a quarterly capital utilization series. This series is obtained from a DSGE model run at the Central Bank of Venezuela.

Measure 6: overhead labor/variable wage-adjusted CES production function. Another source of rigidity is the presence of overhead labor. One way to model this assumption is that the production function is: $Y = F\big(K, (H - \bar{H})\big)$, where $F$ is homogeneous of degree zero and $\bar{H} \geq 0$ represents "overhead labor", which is labor hired but not directly involved in production. In this case, production exhibits increasing returns to scale and the mark up rate takes the following form,

$$\dot{\mu} = -\dot{sh_L} + \frac{1-\sigma}{\sigma}\left(\frac{\dot{Y}}{H-\bar{H}}\right) \overset{m}{=} (\dot{y_M} + \dot{y_{HH}}) - r\dot{w}^a \qquad (11)$$

where $\dot{y_{HH}} = \left(\frac{\dot{Y}}{H-\bar{H}}\right)$ $, \sigma = 0.5$ and wages are also adjusted. In particular, adjusted wages correspond to the fitted value of wages, once they are regressed against weakly hours and number of occupied workers in production. For the Venezuelan case, the behavior of number of workers directly occupied in production is very similar to the behavior of the total number of workers. Main differences of this measure with respect to other definitions come from the adjusted behavior of salaries, which intend to capture the portion of salaries varying with production (in order to approximate salaries to a marginal salary rate).

Appendix 2. Estimation of the impact of minimun wages on total wages

The average total wage of the economy can be represented by the following equation:

$$NW_t = MS_t^{\beta} \, NW_{t-1}^{1-\beta} \quad (12)$$

where NW is the nominal average wage of the economy and MS represents the minimum wage established by the government. Next, we present the linearized-differentiated estimation of this equation.

Dependent Variable: NW
Method: Least Squares
Sample (adjusted): 1999Q1 2013Q4
Included observations: 60 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C(1) | 0.016907 | 0.016084 | 1.051151 | 0.2976 |
| MS | 0.210688 | 0.049872 | 4.224580 | 0.0001 |
| NW(-1) | 0.731527 | 0.070098 | 10.43572 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.701775 | Mean dependent var | 0.194158 |
| Adjusted R-squared | 0.691311 | S.D. dependent var | 0.064608 |
| S.E. of regression | 0.035896 | Akaike info criterion | -3.767676 |
| Sum squared resid | 0.073446 | Schwarz criterion | -3.662959 |
| Log likelihood | 116.0303 | Hannan-Quinn criter. | -3.726716 |
| F-statistic | 67.06556 | Durbin-Watson stat | 1.488043 |
| Prob(F-statistic) | 0.000000 | | |

Wald Test:

| Test Statistic | Value | df | Probability |
|---|---|---|---|
| t-statistic | -0.696880 | 57 | 0.4887 |
| F-statistic | 0.485642 | (1, 57) | 0.4887 |
| Chi-square | 0.485642 | 1 | 0.4859 |

Null Hypothesis: C(2)+C(3)=1

| Normalized Restriction (= 0) | Value | Std. Err. |
|---|---|---|
| -1 + C(2) + C(3) | -0.057786 | 0.082920 |

Restrictions are linear in coefficients.

Assuming a type 1 error of 5%, we cannot reject the null hypothesis that the sum of coefficients adds up to one.