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**IS THE FISCAL POLICY INCREASING INCOME
INEQUALITY IN URUGUAY?***

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Abstract

Despite having a relative size of the public sector similar to that of many upper-middle or high income countries, Uruguay is characterized by persistent high inequality levels. This paper investigates to what extent these two features are interconnected and whether economic growth affects and is affected by this relationship. Empirical results from Vector Autoregression (VAR) models reveal the existence of important long-run Keynesian effects associated to current public expenditure, and that both the country's tax and expenditure structure are, in part, responsible for increasing net income inequality,, being the public investment the only fiscal policy that breaks this tendency.

Keywords: fiscal policy, economic growth, income inequality, VAR models, Uruguay

JEL Classifications: C5, E6, H3

1. Introduction

In this paper we investigate the empirical effects of different fiscal policy instruments on economic activity and income distribution in Uruguay. Fiscal policy has traditionally been considered an effective instrument for affecting aggregate demand, the distribution of income and wealth, and the economy's capacity to produce goods and services (Musgrave, 1959). Therefore, the correct selection of the composition and combination of these policies has become of crucial importance for the purpose of achieving a broad-based stable path of economic growth across countries.

The reduction of economic disparities has emerged as one of the most challenging public policy topics in macroeconomic literature. A central concern of this discussion is the role that government policies may play in reducing economic inequalities, and determining the effects on economic growth rate (Bénabou 2000, 2002 and 2005; and Seshadri and Yuki, 2004).

Most of the empirical evidence about the macroeconomic effects of fiscal policies is based on separately estimated regressions, analyzing the growth effect of fiscal policy¹ or alternatively the distributive effects of fiscal policy². Despite its demonstrated relevance, the joint response of economic growth and income inequality to different measures of fiscal policies has been largely overlooked, with significant exceptions in recent empirical papers referring to a panel of countries (Muinelo-Gallo and Roca-Sagalés, 2011 and 2013), or a specific country (Ramos and Roca-Sagalés, 2008; Roca-Sagalés and Sala, 2011 and 2013). In this paper we consider the same methodological strategy of these specific-country studies, and we apply a similar analytical framework to the Uruguayan case.

Despite having a relative size of the public sector similar to that of many upper-middle or high income countries, Uruguay is characterized by persistent high inequality levels. However, there are several economic reasons for policy makers to be concerned with this situation of persistent and high inequality levels. First, for a given average income per capita level, higher inequality implies higher poverty levels (Bourguignon, 2003). Second, high inequality constitutes a barrier to poverty reduction (Bourguignon, 2004; Azariadis and Stachurski, 2005). Third, countries with higher and persistent initial inequality tend to grow less in the medium and long term (Bénabou, 1996; Aghion et al, 1999; and Hornstein et al, 2005).

To shed some light on the seeming paradox of a country with high inequality and a relatively big public sector, and provide a comprehensive analysis about the effects of fiscal variables in the Uruguayan economy, we adopt a Vector Auto-Regression (VAR) modeling framework. By adopting this methodology we assess the long-term incidence of different fiscal policies on economic growth and income inequality. Specifically, the VAR model we employ in this paper uses the information about the evolution of the economic, fiscal and inequality variables during the last three decades in Uruguay to

¹ For a survey of this empirical literature see Myles (2009).

² For a survey of these empirical studies see Atkinson and Brandolini (2006).

forecast the responses of economic growth and income inequality to a shock produced in the respective fiscal variable.

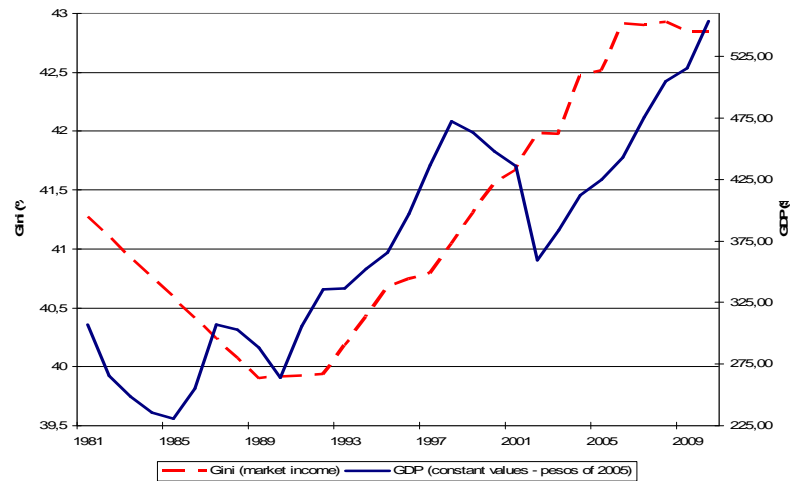
Our findings suggest the existence of significant Keynesian output effects of fiscal spending in Uruguay; the estimated long term impact on GDP of increasing current government expenditures is significant and positive. Moreover, we find significant long term distributional effects associated to fiscal policies over the period 1981-2010, showing that an increase in current spending and direct taxes increase net income inequality (post tax and government transfers), while a raise in public investment reduces it. A deeper analysis on the effects of these fiscal policies per income quintiles show that the low (Q1) and middle class (Q2, Q3 and Q4) are negatively affected by current public spending and direct taxes, while the richer (Q5) accumulates the benefits being the public investment the only fiscal policy that breaks this tendency, however this policy represents a small part of the total public expenditures. In this vein, the results show strong evidence that the redistributive impact in the long run of the fiscal system in Uruguay is regressive.

The article is structured as follows. Section 2 provides an analysis about the co-evolution of growth, inequality and fiscal policy in Uruguay. Section 3 describes the database and details the empirical methodology and the model, while section 4 presents the main results. In section 5, we estimate and discuss how the fiscal policies impact on the quintiles income share. Finally, section 6 contains some concluding remarks.

2. Growth, inequality and fiscal policy in Uruguay

The empirical experience in recent decades of several countries (including Uruguay) of a simultaneous rise in Gross Domestic Product (GDP) and market income inequality (pre government intervention) has generated a growing strand of economic literature relating economic growth and inequality³.

Figure 1 Evolution of GDP and Inequality in Uruguay (1981 – 2010)



Sources: Inequality measure comes from Solt (2009) database.

GDP measure comes from Central Bank of Uruguay at constant pesos of 2005

In this sense, Figure 1 illustrates two remarkable points concerning the case of the economy of Uruguay. First, market income inequality has suffered a continuous deterioration since the late eighties. Second, the evolution of economic activity does not seem to solve these problems of growing inequities arising from the market.

The rise in market income inequality experienced not only by Uruguay but many other countries, have reinforced the interest in fiscal policy as an instrument for long-term growth and development. In this context, countries have strong incentives to seek out new domestic engines for efficiency and productivity growth, as well as for greater equity in development (Martínez-Vázquez et al, 2012). Indeed, the distributive instruments linked to expenditures, like transfers and subsidies, have been the most rapidly growing component of government spending in the last decades⁴. In this sense, Figure 2 shows the evolution of market and net income inequality measures in four countries in recent decades measured through Gini coefficients using the same data source (Solt, 2009) and graph scale in order to facilitate comparisons. The difference between both Gini measures

³ See, for example, Drazen (2000; chapter 11) or Persson and Tabellini (2000; chapter 14) for political economy implications of the relation between both market income inequality and economic growth; and Cornia et al (2004) for an estimation of the empirical relationship between both macro-variables.

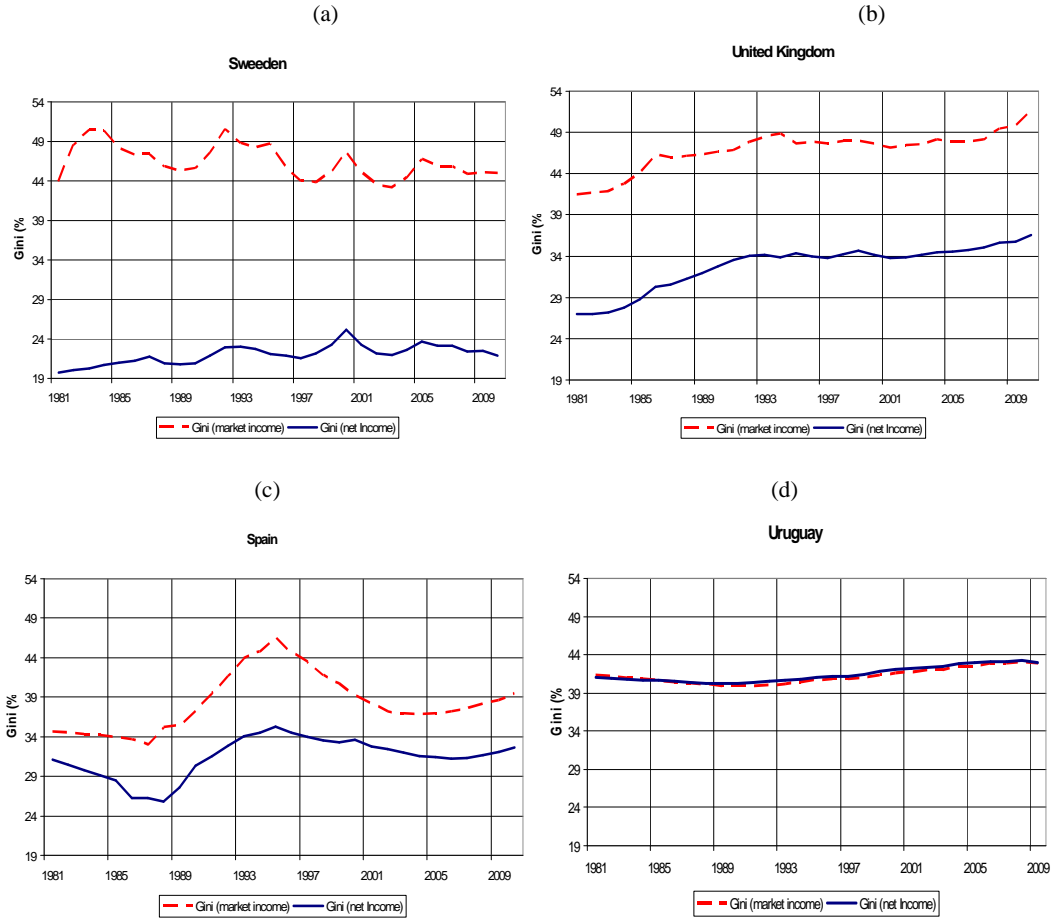
⁴ For example, the studies of Tanzi and Schuknetch (1995) or Tanzi and Davoodi (1997) found that governments' transfers and subsidies were almost non-existent at the mid-twentieth century in the seventeen industrialized countries analyzed, while in recent times they represent nearly the 31 % of their GDP (see Solimano 2009, for more recent data).

(market and net indicators) reveals the overall redistributive action of fiscal policy, and illustrates the redistributive capacity of the respective governments.

Figure 2 includes the case of Uruguay plus three other countries that we use as comparative cases. These three countries have been selected because they represent different models of sector public performance (they have different public sector size and have followed different fiscal policies), and also importantly, because we do have data and comparable results already obtained using a similar VAR approach and including a very close period⁵. This Figure 2 clearly illustrates, first of all, that the respective public sectors have played a very different role in terms of modifying the market income distribution. Thus, in the case of Sweden (figure 2a) the public action have reduced very hardly the inequality (a 50% reduction); in United Kingdom (figure 2b) we also observe a strong but lower reduction provoked by public sector intervention, although the tendency is that both inequality indicators in this country increase during the analyzed period; and in Spain (figure 2c) the public action has a lower but still important effect reducing market inequality; in fact, in the Spanish case the redistributive capacity increases in the eighties and the first half of the nineties, but is in clear decline later. Finally, the Uruguayan case (figure 2d) shows a very different performance because not just both indicators have the same magnitude; moreover they present a very similar evolution.

⁵ The cases of United Kingdom, Sweden and Spain are analyzed in the aforementioned Ramos and Roca-Sagalés (2008); and Roca-Sagalés and Sala (2011 and 2013), respectively.

Figure 2 Evolution of gross and net income inequality, by country (1981 – 2010)



Source: Solt (2009) database

If we compare the market and net income inequality measures in Figure 2, it is easy to recognize that in high-income countries fiscal policy seems to be more effective at reducing market income inequalities; this effectiveness was greater in Sweden than in United Kingdom (UK), and in UK than in Spain. A possible explanation for the different effectiveness in reducing market income inequities may be the different size and composition of fiscal policies across countries (Afonso et al, 2010).

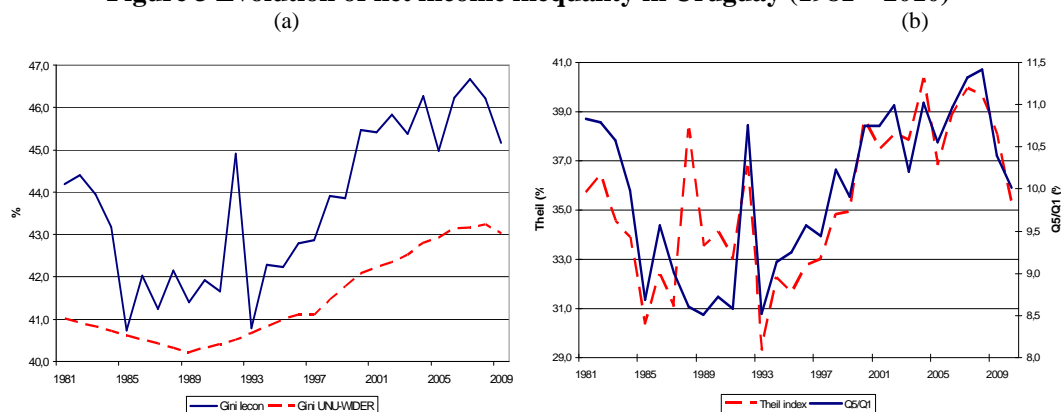
However, if we compare the market and net income inequality measures in the case of Uruguay (figure 2d), surprisingly it seems that the public intervention through different taxes and expenditures has not affected the income distribution that arises from the market, which it is unexpected, especially if we take into account that this country had a public sector relatively developed during this period representing a 25% in 1981 and a 33% of their GDP in 2010. A possible explanation for this amazing result could come from the specific data source used to construct both market and net income inequalities measures in the case of the Uruguayan economy (Solt, 2009). Fortunately, an Uruguayan public institution, the IECON⁶, has provided information on different inequality measures

⁶ Instituto de Economía de la Universidad de la República of Uruguay (www.iecon.ccee.edu.uy).

(Ginis, quintiles and Theil index) since the beginning of the eighties, providing annual series that allow using fairly long, homogenous, inequality time-series; but all these series are net income indicators, i.e. obtained post public action.

In Figure 3a we compare the evolution of net income Gini index for Uruguay using IECON and Solt indicators. This comparison shows that although both Gini series are different, especially if we consider the year-to-year evolution, they present similar trends. Thus, they illustrate that after a declining process during the eighties, a remarkable change in net income inequality tendency is produced from the late eighties to 2007; and after, the tendency changes again and net income inequality starts to decrease. Figure 3b shows the other inequality indicators typically used in literature, a Theil index and the Q1/Q5 coefficient both related to net income and provided by IECON, and both series confirm in general terms this temporal evolution, that is to say the three sub-periods already identified on net income performance in Uruguay.

Figure 3 Evolution of net income inequality in Uruguay (1981 – 2010)



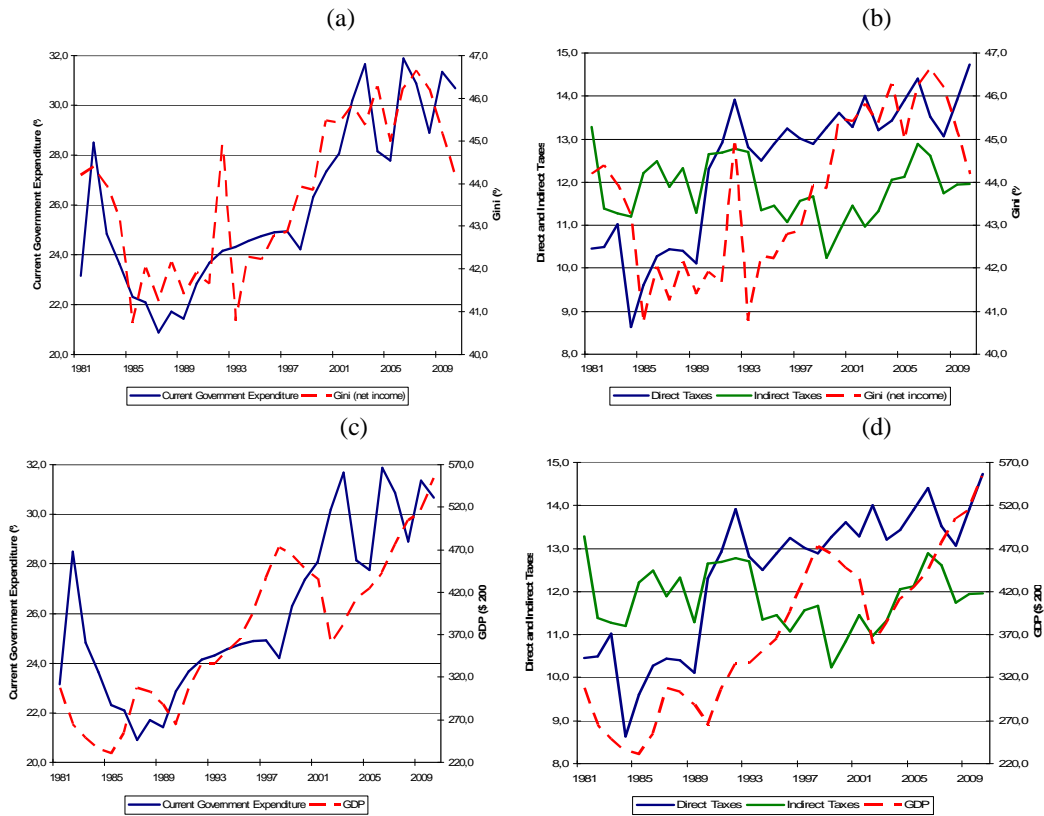
Sources: Solt (2009) and IECON

Over the period 1981-2010 we have raised the question of whether the public sector through the implementation of their different fiscal policies has increased inequality emerging from the market. In this context, it is really important to analyze the overall redistributive action of Uruguayan fiscal policy and their possible effects on macroeconomic performance. Accordingly, the variables of net income inequality, current public expenditures, direct and indirect taxes and GDP, under discussion here, are pictured in Figure 4.

Figure 4 suggests that in the period analyzed (1981-2010), the Uruguayan public sector have not played an effective role fighting economic inequality. This perception is stressed by the visual inspection of panel (a) whether the upward trend in net income inequality is linked to the upward trend in the share of current government expenditures over GDP. Moreover, periods of higher government expenditures seem to go hand-in-hand with spells of higher inequality (from mid nineties to early 2000) and vice-versa (from 1981 to 1988). However, from 2007 we observe a change in this co-evolution.

More specifically, the current government expenditure exhibits an upward trend while inequality decreases⁷.

Figure 4 Net Income inequality, Fiscal Policy and GDP in Uruguay (1981–2010)



Sources: IECON and Central Bank of Uruguay

Similarly, in figure 4b we observe that the amount of direct taxes (in % GDP), which may contain the main progressive taxes, have increased from the mid eighties showing the same tendency that inequality, and interestingly suffer the same jump in 1991-92. However, in the same figure it is not possible to observe a clear relationship between inequality and indirect taxes measure. On the other hand, the visual inspection of the panel (c) seems to suggest that the GDP (in constant terms) and the share of current government expenditures over GDP display similar trajectories, while in panel (d) we may observe that the evolution of direct and indirect taxes and GDP, at least seem to be less coincident.

The relationships embodied in Figure 4 suggest two important hypotheses that in this paper we test and analyze. First, we analyze the possibility that government spending

⁷ This last shift in the evolution of inequality may be due to the implementation of various public programs and redistributive policies. For a complete analysis of this sub-period see, for example, Amarante et al (2011) or Bucheli et al (2013).

and/or direct taxes could exacerbate income inequality. Second, we test the sign and significance of the possible relationship between GDP growth and public expenditure and taxes. To provide a comprehensive analysis of these points we next adopt a Vector Auto-Regression (VAR) modeling framework, which allow us to assess the long-term incidence of fiscal policy on economic growth and net income inequality in the case of the Uruguayan economy. Moreover, VAR models are especially suitable when the variables of interest are endogenous, as it is the case at hand, where output (GDP), public expenditure, tax revenue and inequality are interrelated.

3. Data and Empirical Methodology

VAR models have been extensively used to evaluate the effects of monetary policy (Christiano et al, 2005). Lastly, however, they have also become an important instrument in the debate on the long-term macroeconomic impact of fiscal policies (Kamps, 2005; and Perotti, 2005, provide surveys of the literature). A salient aspect of this debate concerns the possibility of long-term effects of these policies, which we next explore for Uruguay using this empirical methodology. More specifically, following a VAR approach similar to Ramos and Roca-Sagalés (2008) and Roca-Sagalés and Sala (2011 and 2013) we focus on the macroeconomic and also distributional effects of different fiscal policy tools.

Data

The macroeconomic series are obtained from different sources. We use annual data for the period 1981-2010⁸. The frequency and length of the time series analyzed are limited by the availability of inequality data.

The different measures of inequality that we use are obtained from the indicators recently developed by the IECON⁹. The clear advantage of the chosen series is their consistency throughout the three decades covered. In addition to measures that allow us to analyze mean income inequality (Gini coefficient and Theil index), we also use income quintiles which allows us to analyze how the different income groups are affected (harmed or benefited) by the different fiscal policies considered.

The macroeconomic series of gross domestic product (GDP) is obtained from the *Central Bank of Uruguay* database and expressed in real terms (millions of 2005 constant

⁸ It should be mentioned that such samples sizes are not uncommon in general and more specifically in the related literature using the VAR approach (see, for example, Kamps, 2005; or Marcellino, 2006).

⁹ These indicators were elaborated considering information of the Uruguayan household surveys, *Encuestas Continuas de Hogares* (ECH) of the *Instituto Nacional de Estadística* of Uruguay. For a complete exposition about the methodology used for construct these inequality indicators, see Amarante et al (2011, Annex 1 and 2).

pesos). Finally, the fiscal policy variables are elaborated by the IECON based on information from the *Ministry of Economy and Finances, General Accounting Office of the Nation* and the *Social Security Bank* of Uruguay, and are expressed in real terms too. We consider two public spending categories, covering about 90 per cent of overall public expenditure in the last three decades, and two types of taxes, covering about 90 per cent of the total fiscal revenue. On the expenditure side, using a perspective economic classification, we consider the current public expenditure (on goods and services and current transfers) and public investment, which represent, in the last three decades, about 26.0% and 1.9% of GDP, respectively. On the revenue side, we distinguish between direct tax revenues (from taxes on income and wealth, payroll taxes and social contributions) and indirect tax revenues (from taxes on output and on imports) which amount, respectively, to 12.4 and 11.8% of GDP each. Using this classification of taxes makes it possible to evaluate both the progressivity and distortionary effects of tax measures. Table 1 shows the evolution of the considered fiscal variables in terms of their GDP ratio over the sample period.

Table 1 Fiscal data 1981 – 2010. Consolidated Central Government (% of GDP)

	<i>1981</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>1981-2010 average share</i>
Public expenditure	25.3	24.6	29.0	32.8	27.9
Current Expenditure (1)	23.2	22.9	27.4	30.6	26.0
Public Investment	2.1	1.7	1.6	2.2	1.9
Tax Revenue	23.7	25.0	24.4	26.7	24.2
Direct Taxes (2)	10.4	12.3	13.6	14.7	12.4
Indirect Taxes	13.3	12.7	10.8	12.0	11.8
Non-Tax Revenue (3)	2.4	2.5	2.4	2.4	2.4
Surplus/Deficit	0.8	2.9	-2.2	-3.7	-1.3

Notes: (1) Current Expenditure includes Social Security expenses; (2) Direct Taxes include Social contributions;
(3) Include revenues of public enterprises not collected by the Central Government

Sources: *Ministry of Economy and Finances, General Accounting Office of the Nation and the Social Security Bank of Uruguay*

Thus, current public expenditure represents the bulk of total expenditure and also tends to increase its GDP weight over the period. On the revenue side, we observe that Uruguay's tax burden has grown, where direct taxes have increased their weight, and from the mid nineties already represents a higher percentage of GDP than indirect taxes (see also Figure 4). Accordingly, one would expect an increase in the progressivity of the tax system during this period in Uruguay.

The VAR Approach: General Considerations

The VAR approach used in this article, developed by Sims (1980), focuses on reduced-form model estimation with all variables treated as endogenous. This empirical method is particularly appropriate to estimate the long term impact of public policy for at least three reasons. First, it takes due account of the dynamic feedback between variables as well as their effect on other variables both in the short and long run. This is of primary importance when the delay between the policy change (e.g. raising taxes or cutting public investment) and its implementation and the ensuing impact is not negligible, as it usually occurs with fiscal policy. Second, the approach avoids both the often arbitrary classification of variables as endogenous or exogenous, and the imposition of restrictive specifications concerning the dynamic adjustment mechanisms of the structural approach. More specifically, VAR models are especially suitable when the variables of interest are endogenous, as it is the case at hand, where output, public expenditure, tax revenue and inequality are interrelated. Finally, VAR models are not too demanding on the data.

In terms of its empirical implementation, we start by determining the order of the integration of the variables. The unit root results are based on Augmented Dickey-Fuller tests. Test results suggest that all series are non-stationary in log levels and stationary in first differences of log levels. Since, however, these tests are known to be very sensitive to the sample size (see, for example, Phillips and Xiao 1998), we test further for unit roots using both the Dickey-Fuller Generalized Least Square test proposed by Elliott et al (1996) and the test proposed by Ng and Perron (2001). All test results point in the direction that all series are stationary in first differences. On this basis, we proceed to estimating a VAR model in first differences of log levels or growth rates.

For the selection of the specifications of the VAR models, we consider several dimensions: order of the VAR, specification of the deterministic components, and possibility of structural breaks. The optimal number of lags is selected using the Bayesian Information Criterion (BIC) test; deterministic components are included when statistically significant. In our empirical analysis we allow for possible structural breaks when fiscal reforms are introduced, which in the case of Uruguay would correspond to six periods, namely, the impact of the fiscal reform of 1982, the adjustments of VAT tax rates in 1985 and 1990, the indirect taxes reform of 2002, the fiscal reform in 2005 (corresponding to the implementation of targeted public transfers or anti-poverty programs), and to the major tax system reform enforced in 2007¹⁰. The possible existence of these structural breaks is fully incorporated into our unit roots, and VAR specification tests, as well as the VAR estimation procedures. We follow the standard procedure in the literature (see, for example, Maddala and Kim, 1998), and consider the possible significance of a dummy variable including these fiscal reforms in every step of the analysis. Test results suggest that for the three VAR models corresponding to the incorporation of the three different inequality variables considered (Gini, Q1/Q5 and Theil index), a first order VAR model with a linear constant and no trend is the appropriate specification. Furthermore, we

¹⁰ For a detailed analysis of these fiscal reforms, see Barreix and Roca (2007), Azar et al (2009) and Amarante and Vigorito (2012).

found statistically significant and do incorporate a dummy variable including the six fiscal reforms.

VAR Specification and Ordering of the Variables

We estimate three different VAR models that include current public spending, public investment, GDP, inequality and direct and indirect taxes, being the difference the variable used to measure net income inequality (Gini, Q1/Q5 and a Theil index). The inclusion of inequality measures in the VAR specification allows the joint analysis of the macroeconomic and distributive effects of fiscal policy. In this way, we are able to provide empirical evidence on the Uruguayan case and shed some light on the traditionally discussed effects of different fiscal policies on efficiency and equity.

In order to accommodate the contemporaneous correlations among shocks in the different variables, we follow the standard procedure in the literature and consider the Cholesky decomposition of the variance-covariance matrix of estimated residuals¹¹. It is well-known that the ordering of variables has potentially great repercussion on the estimated effects of policies. Therefore, we turn to economic intuition to decide on the ordering of our variables. First, as in Blanchard and Perotti (2002) or De Castro (2006), we assume that public spending is essentially exogenous. This means that, on impact, both the GDP and the Gini coefficient respond to changes in public spending, but that public spending does not respond contemporaneously to changes in these variables. The institutional framework implies that decisions on public spending are undertaken before the public authorities obtain information about the actual performance of the economy. As in Ramos and Roca-Sagalés (2008) or Roca-Sagalés and Sala (2011 and 2013), we also consider both that changes in public spending may have an impact on individuals' income and hence on the distribution of income (and even more so if such changes concern cash benefits), and that output changes are not usually distributionally neutral and thus affect income inequality.

Additionally, we assume that output affects tax revenues contemporaneously but that the converse is not true. This means that, on impact, taxation responds to changes in output. Indeed, in the very short term, changes in tax revenues are due exclusively to changes in the tax base, as changes in economic activity affect tax collections. Within a year we also allow for changes in economic activity to affect tax discretionary measures. In turn, output does not respond contemporaneously to changes in tax revenues. The political process implies substantial delays between the consideration and the implementation of changes in the tax rates, which at the margin would affect output, and the fact that consumption and investment plans take some time to adapt to a policy even after enacted. This assumption is consistent with Bernanke and Mihov (1998) and with the argument in Blanchard and Perotti (2002) that taxation can be adjusted in response to unexpected changes in output within the year, and therefore ours is the appropriate

¹¹ See, for example, Favero (2002) and Kamps (2005).

assumption when using annual data. As argued above, in the very short term, changes in the tax base are the only likely source of changing tax revenue, and the tax base is only likely to change as a result of either output or distributional changes. Thus, we assume that tax revenue reacts contemporaneously to inequality and output shocks¹².

As to the ordering of the disaggregated fiscal variables, first, on the revenue side, we assume that indirect tax revenues do not contemporaneously affect direct tax revenues, while the reverse is true. On the flip side, we assume that changes in indirect tax revenue have no contemporaneous effect on direct tax revenue. On the expenditure side, we assume first that current spending precedes public investment. This assumption reflects the standard view that the budgetary decisions on public investment are conditioned by the decisions on current spending, while the reverse is not true. Taking these arguments into account, the variables will be incorporated to the Impulse Response Function (IRF) analysis in the following order: current public spending, public investment, GDP, inequality, direct taxes and indirect tax revenues. It is worth noting that changing the ordering of the disaggregated fiscal variables does not change any of the results¹³.

4. The effects of fiscal policy

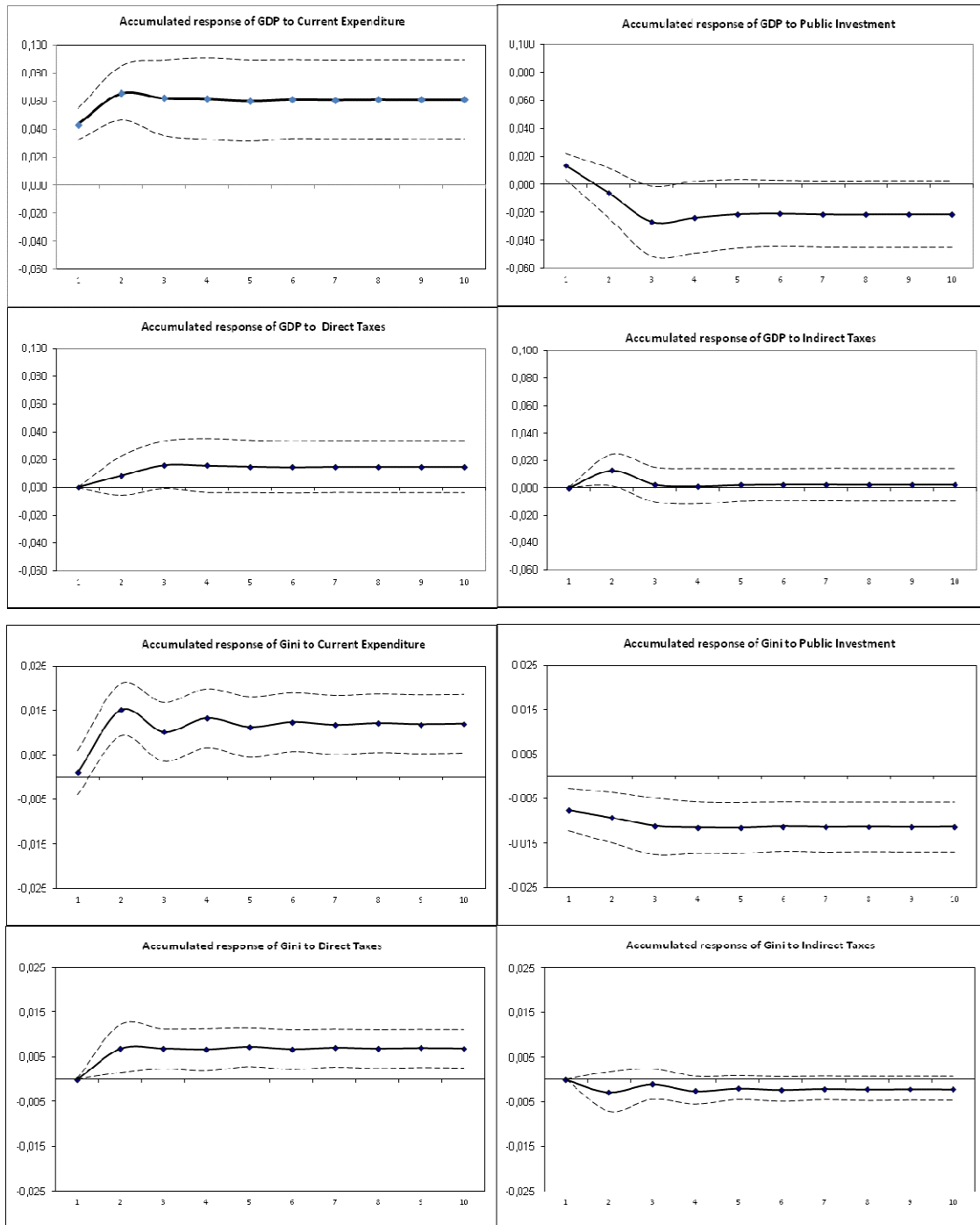
Throughout this article, the income measure used to estimate inequality is the household's disposable income adjusted after public action. Since inequality indices entail different value judgments on income differences at the tails of the distribution (Cowell, 2000; Lambert, 2001), which in turn may lead to different inequality orderings, we check if the estimated long-term effects of different fiscal policies are robust to three different inequality measures: the Gini coefficient, the Q5/Q1 coefficient, and the Theil index. The cumulative IRFs associated with the VAR estimates considering the Gini coefficient as the net inequality measure and the policy function (described above) as well as the corresponding error bands are presented in Figure 5¹⁴.

¹² Arguably, it would be reasonable to presume that (direct) taxes contemporaneously affect inequality. It is, however, important to underline that alternative orderings concerning these variables do not have a major bearing on our results.

¹³ Empirical evidence concerning the different orderings discussed is not present here, due to space considerations, but is available from the authors upon request.

¹⁴ The results corresponding to the Q5/Q1 coefficient and the Theil index are not presented here, due to space considerations, but are available from the authors upon request.

Figure 5 Accumulated GDP and Gini Impulse Response Functions



We observe, without exception, that the cumulative IRFs are very smooth and that most of the effects take place within the first two or three years after the initial fiscal shocks occurs. The error bands surrounding the point estimates for the cumulative IRFs convey uncertainty around estimation and are computed via bootstrapping. We consider

bands of one standard error that correspond to a 68 per cent posterior probability, as suggested by Sims and Zha (1999) and as is now standard in the empirical literature.

We report the empirical results in Table 2, as the output and inequality responses derived from the accumulated IRFs, using the Gini coefficient (see Figure 5), the Q5/Q1 coefficient and the Theil index. These results measure the long-term cumulative percentage change on GDP and on the inequality measures in response to a one percentage point shock to the fiscal variable under consideration. Therefore, we capture the cumulative effects, in the long-term, of fiscal shocks, as filtered through the short-term identifying assumptions and dynamic VAR feedbacks implicit in the estimated models¹⁵.

Table 2 Cumulative Responses to Shocks in the Fiscal Variables

	GDP	Gini	GDP	Q5/Q1	GDP	Theil Index
Current Expenditures	0.776*	0.152*	0.755*	0.087*	0.760*	0.321*
Public Investment	-0.139	-0.075*	-0.148	-0.031*	-0.144	-0.104*
Direct Taxes	0.237	0.111*	0.214	0.053*	0.205	0.146*
Indirect Taxes	-0.049	-0.043	0.097	-0.021	0.101	-0.036

Note: * indicates that zero is not within the one standard error bands

The responses are computed, as it is usually done in the literature, by adding up the whole sequence of responses. We include an asterisk whenever these responses remain significant at the end of the 10 years period, and, at the same time, we acknowledge that this standard method may be counting some annual non-significant responses.

A first noteworthy result is the clear Keynesian long-term effects associated to current government expenditures. In particular, a one percentage point rise in the current spending increases the long term GDP by close to 0.8 percentage points (Furcery and Zdzienicka, 2012; find a similar expansionary effect for a sample of OECD countries). The rest of fiscal categories (public investment, direct and indirect taxes) do not have a significant impact on GDP. The three VAR specifications considered, corresponding to the incorporation of the different inequality indicators (Gini, Q5/Q1 and Theil index), confirm the magnitude and significance of the positive effect on output of an increase in current spending.

On the other hand, we obtain a positive and significant effect on income inequality when current government expenditures increases, again the three specifications confirm this significant effect, which could be intuitively perceived by looking at Figure 4. This positive effect on income inequality in response to an increase in current government

¹⁵ Note that the values of the responses reported in Table 2 cannot be read directly from the Figure 5. This is because, while Figure 5 reports cumulative responses of the GDP and the Gini coefficient to one standard-deviation innovations in fiscal variables, these values are normalized using the initial shock in the fiscal variable where the shock is produced.

spending seems somehow counterintuitive: One would expect that this type of public expenditure reduces income inequality because it includes different social expenses with distributive implications through the immediate benefits, for example, expenses in transfers like pensions or different subsidies.

When we look at the results of public investment, we find a well-known result in the recent empirical literature: higher government spending in infrastructures reduces long-term income inequality (Calderón and Servén, 2004). Again, this significant and negative cumulative response is very robust across the three VAR specifications as Table 2 shows. Conceptually, the result can be explained because the development of public infrastructures helps underdeveloped areas of the economy to be connected to the cores of economic activity, allowing access to additional productive opportunities, and also infrastructures improve access to health and educational services (Brennenman and Kerf, 2002).

Tax revenues are the counterpart of public spending. When looking at the impact of one-off shocks on direct and indirect taxes, we find what could be interpreted as the reversal of the effects found on the spending side. In the case of GDP, we do not find significant effects from both types of taxes. In relation with the incidence of tax shocks on inequality, we find a null effect of higher indirect taxes on income inequality. In contrast, direct taxes have a positive and significant impact; nevertheless, the estimated coefficients are much smaller than those corresponding to current expenditure. This positive impact may reflect the regressive structure of the direct taxes in Uruguay on the analyzed period. This weak redistributive effect of taxes is already pointed by Martínez-Vázquez (2008) in the case of developing countries, and also by Goñi et al (2011) in the Latin American countries.

Finally, it is important to point that when we do the estimations using the net income inequality variable from Solt (2009) database, the estimated results in terms of the effect on GDP is logically very similar; and the estimated effect on inequality provoked by current spending is again negative and significant but with a slightly smaller coefficient, being the main difference the estimated effects of public investment and direct taxes on inequality which are not significant¹⁶.

In summary, the estimated results show first, Keynesian effects with respect to an increase in public current spending, and second, that the fiscal policies that presumably may reduce inequality (current expenditure and direct taxes), in the case of Uruguay do have the reverse effect and do slightly increase inequality, while are the relatively small percentage of resources destined to public investment that reduces inequality.

Moreover, the results obtained are directly comparable with three other papers applying a similar VAR approach to the economies of UK, Sweden and Spain (Ramos and Roca-Sagalés 2008, Roca-Sagalés and Sala 2011 and 2013, respectively). Such comparison reflects, firstly, that the relative magnitude of the fiscal policy effects on GDP is similar in all cases but not the sign; the Uruguayan case is the only one that shows Keynesian effects associated to an increase in public current spending. Secondly, it is remarkable that the magnitude of the impacts in the Gini coefficient is much smaller in

¹⁶ The results obtained using the net income inequality variable from Solt (2009) are not presented due to space considerations and are available from the authors upon request.

the case of Uruguay, and again with the contrary sign that the obtained in the other three economies. Surprisingly, the two main fiscal policies typically used in these developed countries as redistributive tools in order to achieve more income equality, the current expenditure and direct taxes, both increase income inequality in Uruguay, although this effect is much smaller than the estimated in the aforementioned three countries.

These results obtained in the case of Uruguay, confirm the arguments of Goñi et al (2011) in the sense that the redistributive impact of the fiscal system in Latin America is very small, and also that the redistribution is achieved mostly through transfers (current expenditures) rather than taxes. On the other hand, our results also confirm De Mello and Tiongson (2006) main finding when pointing that more unequal societies do spend less on redistribution, in other words do not redistribute through public policies.

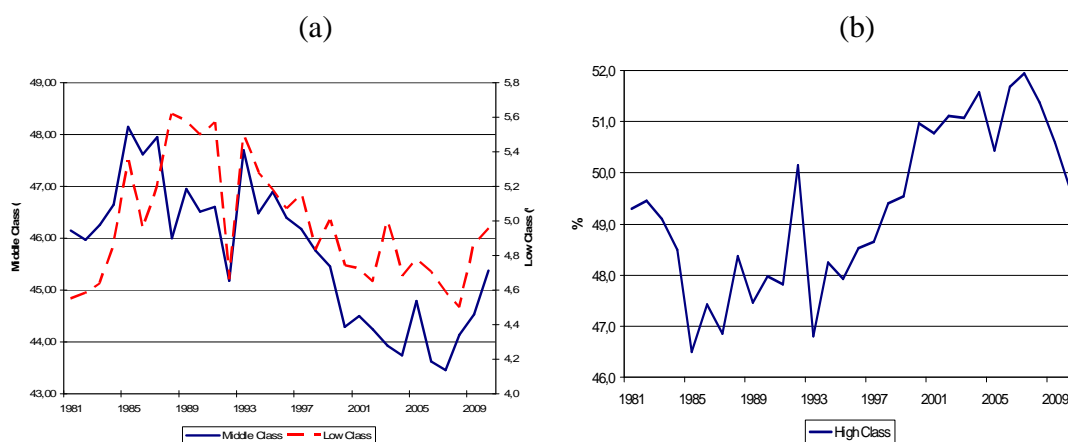
5. The effects of fiscal policy per income groups

In this section we estimate and present the effects of the fiscal policies considered on the different income quintiles. The inequality measures showed in previous sections, which are the more commonly used also by institutions like International Monetary Fund, United Nations, Organization for Economic Cooperation and Development or European Union, do not allow to identify which income groups are affected by a specific public policy. However, the analysis using the income quintiles permits to assess the effects of the different fiscal policy tools on income groups, that is to say on the share of disposable income that goes to the different segments (quintiles) of the population (or households).

In this sense, we will be able to analyze how the poor (the income share of the first quintile, Q1) and the middle class, defined as the middle 60 percent of income recipients (Levy, 1987)¹⁷, here considered as the sum of the income share of Q2, Q3 and Q4, and also the richer (Q5) are all affected by the fiscal policy. Considering this definition, Figure 6 shows the evolution of net income participation per social classes in Uruguay over the analyzed period.

¹⁷ The definition of Levy (1987) is based on the “people space”. However, there are other definitions of the middle class based on the “income space” (see, for example, Blackburn and Bloom, 1985; Davis and Huston, 1992; Thurow, 1994; or Atkinson and Brandolini, 2013).

Figure 6 Evolution of Net Income per Classes in Uruguay (1981 – 2010)



Source: IECON

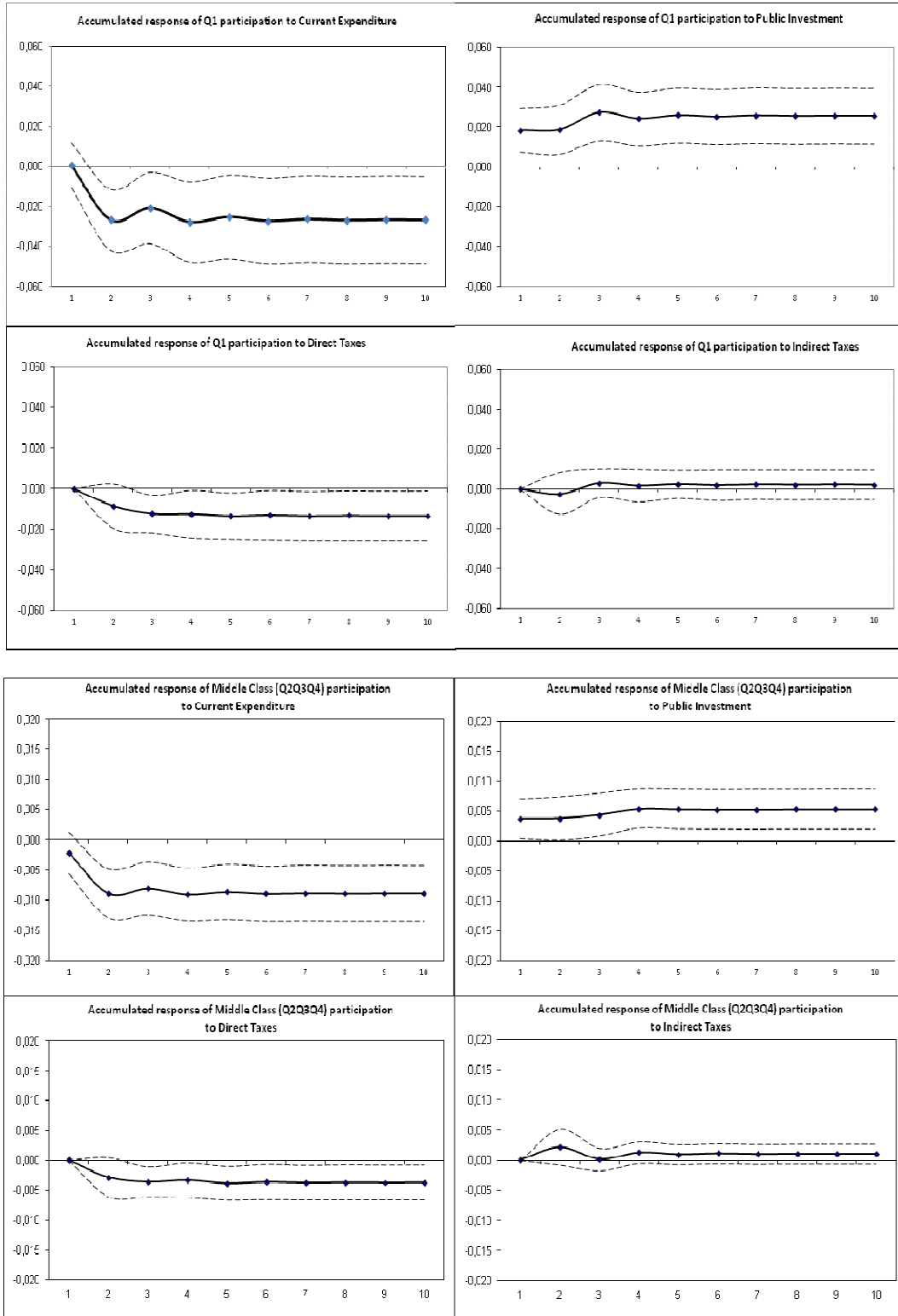
Figure 6a presents the evolution of the income share of the low and middle class and figure 6b illustrates the counterpart, which is the performance of the richer quintile. These figures confirm the three sub-periods previously identified on net income inequality performance in Uruguay. Thus, at the beginning of the eighties the poor and the middle class improve their income share, but during the nineties and until 2007 both groups clearly reduce their participation, specially the middle class, while the rich increase their share in more than 5 points (from 46.7 in 1985 to 52.0 in 2007). In 2007 the tendency drastically changes for the three groups, and as we have already seen the inequality have been reduced. According to Atkinson and Brandolini (2013), the same phenomenon of a reduction of the income share suffered by the middle class has also happened during this period to many developed countries, like Sweden or UK (or even Spain according to data from UNU-WIDER).

In order to assess the impact of different fiscal policy tools in this evolution we estimate our VAR model introducing, alternatively, each income quintile. The next subsection presents the corresponding impulse response functions and cumulative response.

The effects of Fiscal Policy per income quintiles

As in the case of inequality measures, we estimate the effects of changes of different public policies considering the accumulated effects of one shock in the different public policies. Since the IRFs showing the effects of public policies on GDP are almost exactly than the already obtained and shown in figure 5, in this section we focus on the effects on income distribution. Consequently, in Figure 7, we only show the IRFs related to the income quintiles associated to a shock in the specific policy function (described above), as well as the corresponding error bands.

Figure 7 Accumulated effects on income participation per quintile: IRF to One-Off Fiscal Policy Shocks



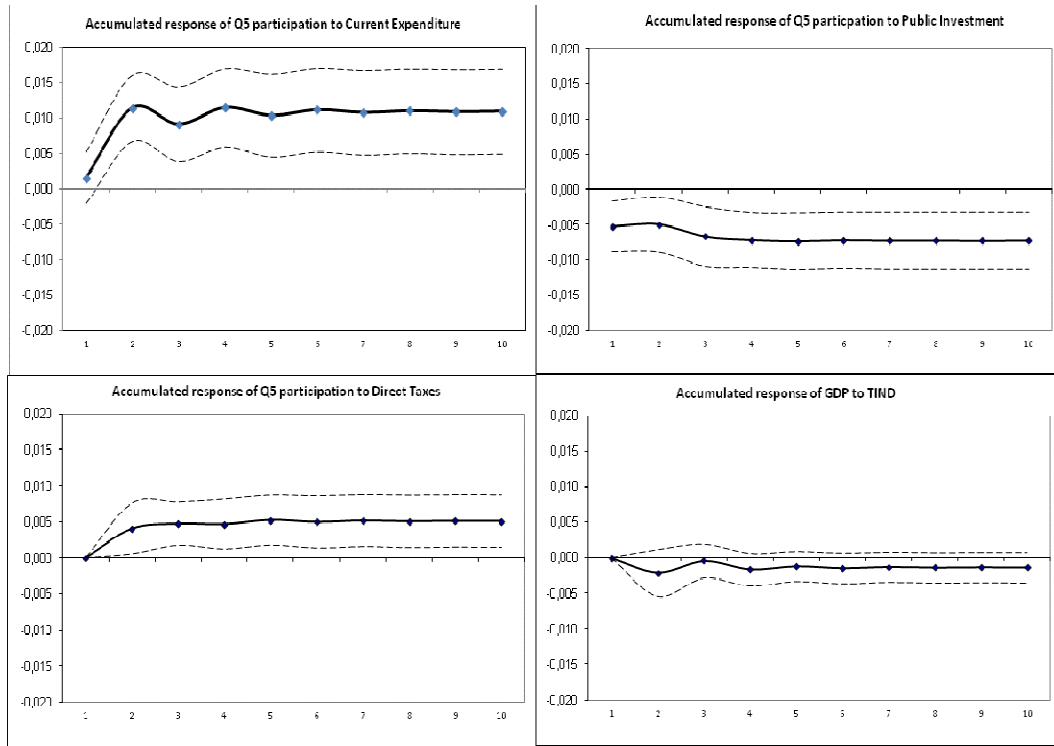


Table 3 reports the empirical results as the output and quintile responses derived from the accumulated IRFs plotted in Figure 7, allowing using the income quintiles to analyze the effects of the different fiscal policies on inequality.

Table 3 Cumulative Responses to One-Off Unit Shocks in the Fiscal Variables

	GDP	Low class (Q1)	GDP	Middle Class (Q2Q3Q4)	GDP	High Class (Q5)
Current Spending	0.799*	-0.233*	0.754*	-0.102*	0.766*	0.116*
Public Investment	-0.129	0.177*	-0.148	0.037*	-0.143	-0.050*
Direct Taxes	0.251	-0.184*	0.217	-0.061*	0.228	0.079*
Indirect Taxes	0.018	0.043	0.102	0.024	0.068	-0.031

* indicates that zero is not within the one standard error bands

Firstly, we want to insist on the positive and significant effect of current public expenditure on GDP, and its consistency through all three specifications including the quintiles in substitution of the inequality coefficient. Secondly, the results using the income quintiles confirm the different effects of the fiscal policies on each income group: As we move from the lowest to the highest quintile (Q5), the fiscal policy coefficients

change magnitude and even the sign. The stronger effects come from the main fiscal tool in terms of its relative size, which is current spending. Thus, a rise in current expenditure reduces the income participation of the low and middle class, but it increases the income participation of the 5th quintile (the richer). This would mean that most of government expenditures occurred in programs which favored the higher income groups. More specifically, according to the coefficients obtained, the poorer they are the more prejudiced by current public spending, and just the richer quintile improves its income participation. Accordingly, it is clear that most of the benefits of government expenditures go to the top income quintile, especially in the case of pensions (see, Amarante and Vigorito, 2012) which make up most of these benefits¹⁸. However, it is really important to point out that as with the measures of central tendency, even when expenses on pensions and revenues from social contributions are excluded from the analysis the estimation results in terms of sign and significance hold with lower coefficients¹⁹. When the same analysis is performed on public investment, we find that higher government spending in infrastructures boots the participation of the low and middle class reducing the share of the rich. Specifically, we find the reverse effect than in the case of current spending, that is to say, the poorer they are, the more benefits they obtain from public investment, and the richer quintile is negatively affected. Finally, when looking at the impact of tax revenues, we find that indirect taxes have a non significant effect on all net income quintiles; however, direct taxes decrease the income share of the low and middle class, consequently increasing the share of the top quintile (Q5).

6. Conclusions

In this paper we have shown that Uruguay does not conform to the characteristics of most countries in terms of the redistribution of income and the tax burden and expenditures patterns of the government. Our results provide strong evidence of first, current public expenditure strongly stimulates economic growth at the long term, and second, that both the direct tax burden and current expenditures increase income inequality, while public investment reduces it; and importantly the impact on the inequality indicators used is much smaller than the corresponding to GDP.

The perverse or unexpected effect on inequality is perfectly illustrated through the incorporation of the income quintiles in the VAR and IRF analysis, which represents a methodological novelty of this paper that allows a more accurate identification of the effects of fiscal policy on income distribution. Using this 'quintiles approach' we are able not just to estimate the effects on net income inequality but to identify the impact on each quintile participation, and demonstrate that the poorer and the middle class in Uruguay are clearly prejudiced by the fiscal policy while the richer are the benefited. This result is

¹⁸ In this special case, it is important to consider that redistribution performed through social security can be better assessed adopting a lifetime perspective (Liebman, 2001). However, in this paper we consider the direct impact of these expenses and revenues.

¹⁹ This empirical evidence is not presented here, due to space considerations, but is available from authors upon request.

produced basically through current spending (that represents the bulk of public spending) and also through direct taxes. Public investment is the only fiscal policy tool analyzed that reduces inequality and improves the income share of the poor and middle class while reducing the participation of the rich; however public investment only represents the 5-7% of the public spending (depending on the specific year) and, consequently, this effect is totally canceled and overwhelmed by the other fiscal policies.

Thus, the seeming paradox of a country with a relatively high public sector size and a concentrated income distribution could be better understood when analyzing the distributive effects of the country's fiscal system. Whereas in many advanced industrial countries fiscal policies have been used to accomplish a distribution of income more equitable, the contrary was the case in Uruguay. The corollary of these findings is that a possible way for reducing net income inequality in Uruguay could be to drastically change not only the tax structure, but also the spending behavior of the government.

Finally, it is also true that from 2007 all inequality indicators shown in this paper indicate an important change in tendency, something that may be related to the change produced in the government and its fiscal policies, and these hypothetical more efficient redistributive policies are contemporaneous with a very high economic growth in Uruguay. In this sense, it is important to remark that because of VAR models use the past information of the evolution of these macro variables, the results obtained in this paper through the IRFs associated to the estimated VARs would trace the expected responses of future values of GDP and inequality shrinking, eventually, the importance of the fiscal changes produced at the end of the sample period (2007-2010). Interestingly, if we reduce the sample period in the analysis and do not include this last sub-period, the estimated increasing inequality effect associated to current government and direct taxes is considerably higher. However, this issue does not invalidate our results, the estimated effects obtained in this paper alert on the consequences of not changing substantially the orientation of the fiscal policies followed in Uruguay during the last decades, especially if the objective is to reverse the increasing inequality effect and the exclusion of the poorer people of the benefits of a sustainable economic growth process.

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