The Behaviour of Social Transfers over the Business Cycle: Empirical Evidence of Uruguay*

LEONEL MUINELO-GALLO**

Universidad de la República. Uruguay

RONALD MIRANDA LESCANO***

Universitat Autònoma de Barcelona

Universidad de la República. Uruguay

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Abstract

This paper analyses the cyclical fluctuations of public social cash transfers and its components in Uruguay over 1988/Q1 to 2016/Q3. The unobservable cyclical components are extracted from the observable time series using different empirical strategies. The results show that components of public social cash transfers are procyclical and lag the macroeconomics fluctuations. This enables us to say that instead of these cash transfers contributing to stabilizing the Uruguayan economy they have thereby aggravated the business cycle, and through various expenditure items expose the vulnerable groups of society to more adverse economic conditions.

Keywords: Social transfers, business cycles, detrending, Uruguay.

JEL Classification: C10, E32, H50, H55.

1. Introduction

The cyclicity of fiscal policy has received considerable attention in the public finance literature. Scholars have claimed counter-cyclical fiscal policies to be important (Lane, 2003). Counter-cyclical policies involve spending less in good times in order to cool off the economy and allow the government to increase its savings, and spending more in bad times to mitigate recession and speed up recovery. This can be contrasted with pro-cyclical spending

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** ORCID ID: 0000-0001-9215-5381.

*** ORCID ID: 0000-0002-3014-1360.

policies, which increase spending in good times and cut it in bad times. This tends to amplify output fluctuations and create large social costs, particularly affecting the most vulnerable segments of the population (Vegh and Vuletin, 2014).

This paper complements previous empirical work related to the cyclicity of aggregate measures of public expenditures¹. In it, we address the cyclicity of disaggregated measures of public social cash transfers. The exercise reveals structural deficiencies, not only in actual spending, which in many developing countries is pro-cyclical and discretionary, but also in the design of more specific fiscal policies.

Our analysis focuses on the cyclicity of contributory and non-contributory public social cash transfers for two main reasons. First, these transfers are an important proportion of government expenditures. Therefore, their design is relevant for the role of fiscal policy as a stabilization tool for the business cycle. Second, they respond to very specific government policy objectives which focus on income maintenance, income and wealth inequalities reduction, and reduced poverty. As is well known, governments operate this cash transfer system as a form of insurance for their population against income losses, notably during recessions. Thus, one important goal of fiscal policy design is to understand the extent to which higher income risk in recessions is mitigated by these specific policies. In this context, well-designed management of fiscal policy during the cycle impacts sustainability, as well as distributive and re-distributive outcomes achieved, and also social tension.

Uruguay is a good case study for these issues. In a context of macroeconomic stability and rapid economic growth fostered by an increase in international demand for commodities, and via redesign of its social transfer system, this country has achieved a large reduction in poverty levels and lower inequality over the last decade (Amarante *et al.*, 2014 and Bucheli *et al.*, 2014). In fact, the country recently reached high-income status according to the World Bank's country classification. In this context, Uruguayan citizens are demanding more and better services from their government. If the Uruguayan government cannot meet these new demands, social tensions may arise, stalling development. This challenge is presently even greater due to comparatively high world interest rates, low commodity prices and low world growth; these external factors may not favour Uruguay as they did in the early 2000s.

We explore the cyclical movements of a novel disaggregated fiscal database of different contributory and non-contributory public social cash transfers for the Uruguayan economy from 1988/Q1 to 2016/Q3. We use time series analysis tools to do so. A time series approach helps us to find the main time components of different variables (Ladiray and Quenneville, 2001). First, we detected seasonality in unadjusted macroeconomic time series. Then, we estimated the unobservable cyclical components of the series using different detrending procedures. Finally, we revised the most relevant cyclical properties of components of social transfers (obtained using different detrending methods). This last point is extended further to examine the nonlinear causal relationships.

We obtain empirical evidence that social transfers are pro-cyclical and lag the business cycle in the Uruguayan economy during the sample period. In this article, we show that among the

social transfers this pattern is driven by old age benefits and survivors' pensions. Also, we found a high degree of variability and persistence of social transfers and components thereof. Our results indicate that social cash transfers exacerbated the business cycle and additionally exposed the most economically vulnerable groups of Uruguayan society to macroeconomically adverse episodes. This suggests that social demands and fiscal strengthening can be attained in Uruguay through an effective cyclical design, rather than the standard solution of spending cuts to achieve fiscal sustainability. It is important to carefully manage redistributive spending demands throughout the business cycle, including in good times, when specific interest groups and weak institutions may combine to push expenditures above trend and toward more inflexible spending (i.e., transfers) that may be difficult to sustain during the next stage of the business cycle.

The remainder of the paper proceeds as follows. Section 2 presents a detailed review of the related literature. In Section 3, the social cash transfer system in Uruguay is described. Data and variables are presented in Section 4. The empirical strategy is described in Section 5, while Section 6 presents the main empirical findings. Section 7 presents two additional empirical exercises with important policy implications. Concluding remarks and policy recommendations are in Section 8.

2. Background: Social transfers over the economic cycle

One important topic in fiscal literature is cyclical aspects of fiscal policy. Scholars have identified different patterns through which public expenditures may affect output fluctuations (Vegh *et al.*, 2017):

- counter-cyclical: government expenditures act in the opposite direction to output fluctuations, and this tends to stabilize the business cycle;
- pro-cyclical: associated with government spending moving in the same direction as changes in output, which reinforces the business cycle;
- a-cyclical: aggregate government expenditures are constant over the output cycle; it does not stabilize or reinforce the business cycle.

Public spending policy over the business cycle essentially results from deliberate decisions of policymakers on whether to increase or cut spending (discretionary spending). Public consumption (wages and salaries; goods and services) and public investment result from deliberate spending decisions when policymakers approve the budget. A large percentage of primary spending is basically not determined by policymakers' discretionary spending decisions. Instead, much of it results from implementation of social programs and benefits that are automatic in nature². Such expenses, mostly cash transfers to individuals or households, involve disbursement of public funds in accordance with laws intended to benefit people who meet certain criteria (Atkinson, 2000 and 2003). The specific criteria depend upon the type of social program and benefits, which are themselves shaped by countries' most pressing social challenges. The most important automatic spending categories include: (i) social security

(mainly transfers to individuals of retirement age), (ii) family programs and benefits, which include conditional cash transfers mainly to the poor and the most vulnerable households and (iii) unemployment insurance (payouts to unemployed individuals).

These social transfers should not be expected to relate to business cycle output fluctuations, as the underlying criterion for their design and application is determined by demographic shifts, such as in the age structure. The same should hold true, although may be to a lesser extent and depending on the specific program design, for family programs and benefits. In principle, these social programs aim to target structural and deep-rooted problems that are not expected to change much over time, with short-term output supports (or removal of supports). Meanwhile, the unemployment insurance mechanism is, by construction, an automatic stabilizer. During a recession, when people lose their jobs in countries with unemployment insurance mechanisms, these unemployed people receive transfers to compensate for the loss of income. Broadly speaking, countries with a correctly designed unemployment insurance program should see an automatic increase in these transfers during recessions (as unemployed people claim their benefits) and, by the same logic, a large decline in these transfers as the economy recovers and people return to work.

Change in aggregate measures of fiscal policy over the business cycle has received increasing attention in empirical literature in recent years. These studies use annual data, and indicate that fiscal policy has typically been a-cyclical or counter-cyclical in developed countries and pro-cyclical in developing ones, respectively stabilizing and exacerbating the business cycle. For instance, Gavin and Perotti (1997) found pro-cyclicality of total government expenditures and its components (capital, government consumption, and subsidies and transfers) for a panel of 13 Latin American countries over 1968-1995. Similarly, Talvi and Végh (2005) studied a sample of 56 countries (20 developed and 36 developing countries) from 1970 to 1994, and found pro-cyclicality of government consumption in developing countries and a-cyclicality among the developed ones. Furthermore, Klemm (2014), based on a panel of 33 advanced economies and 146 emerging and developing economies over 1980-2012, showed primary balances to have been pro-cyclical in Latin America, but counter- or a-cyclical in industrial economies.

In this context, scholars provided two main arguments to explain why aggregate fiscal policy measures would be pro-cyclical in developing countries. The first references the lack of access to international financial markets during bursts in developing countries, which leaves governments not in a position to run a counter-cyclical policy (Kaminsky *et al.*, 2004). The second argument is associated with pressures of multiple interest groups in society to appropriate additional public spending in good times (e.g. booms in commodities prices, expanded foreign aid transfers and natural resources endowments), labelled as the “voracity effect”. In such a case, there are social and political pressures that lead governments to spend too much in good times, even supporting expansion of structural expenditures to be paid for by temporary additional revenues (Akitoby *et al.*, 2006).

Far fewer studies have examined the cyclicity of government social subsidies and transfers components of public spending. Recently, Michaud and Rothert (2018) analysed government spending over the business cycle in a sample of 30 countries across 1980-2015. They

found that the cyclical aspects of the government spending are explained by the cyclicalities of their aggregate measure of social transfers, which is pro-cyclical in emerging economies and counter-cyclical in developed economies.

In conclusion, to the best of our knowledge none of these studies have decomposed public social cash transfers and used higher frequency data (quarterly instead of annual data to capture cyclical movements) to investigate the cyclicalities of fiscal policy. The empirical literature involves studies of panels of countries which use aggregate measures of expenditures (either total or social expenditures). Only recent work (Busch *et al.*, 2018), based on annual longitudinal micro-data, adopts a similar methodological approach as proposed in our research. Specifically, they examine the cyclicalities of gross household earnings to post-government household earnings over 1976-2010. However, these authors work with three developed countries (Germany, Sweden and the United States) and with aggregated measures of public spending³. We can observe that there is not much more information and analysis to extract from off-the-shelf data sources to help to analyse the pro-cyclicalities of public policy in the developing world. Our work is a start to filling this gap, by using a novel dataset for Uruguay with quarterly frequency and focusing on the most important social cash transfer and benefits programs (covering the 100 per cent of social cash transfers).

3. The social transfer system in Uruguay

The Uruguayan social transfer system consists of a set of benefits that meet the needs of differentiated population groups in terms of demographics, economic activity status and income levels. This country has been characterized by having developed a social security system that, regionally speaking, has achieved an acceptable level of coverage, in terms of population covered and risks considered in legislation.

Over time, this country has had important developments in its social security system. The first social insurance was created at the end of the 19th century, and extended in the first half of the 20th century to cover the different sectors of activity and various short- and long-term risks. In general, this process was cumulative and decentralized (organized/operated independently by different collectivities). However, in 1967 the Banco de Previsión Social (BPS) was created, with constitutional authority as an independent institution. This centralized different retirement and pension funds throughout the century, granting the institution the role of coordinating governmental social welfare services and organizing the country's social security.

It is since the democratic restoration of 1985 that an organic structure of the social security system has been consolidated in this country, characterized by an important degree of centralization in the BPS. The BPS, in addition to coordinating and executing the disability, old age and survivorship programs, also began to administer benefits for economically active persons. The individuals receiving this set of benefits include public employees as a whole and private sector worker, whether employees or employers, and from almost all sectors of activity: rural, domestic service, industry, commerce, services.

The main benefits currently in force are:

- benefits to individuals who are not active in economic activity (defined as benefits for those who are outside of economic activity): pensions, survivors' pensions, old-age and disability pensions.
- benefits to individuals who are active in the labour market (active benefits): unemployment insurance, and maternity and family allowances (*Asignaciones Familiares*, AFAM).

In the early days, the different benefits programmes were strongly linked to the contributory situation of the beneficiaries or their families. This type of survivors' pensions and disability benefits became widespread around 1950, unemployment insurance was created in 1958, AFAMs linked to private contributory workers were established by the law creating the Wage Councils in 1943, and old-age pensions emerged in 1919. Initially, these benefits packages were not conditional on the financial situation of households, with the exception of old-age pensions, the early emergence of which was linked to the poor coverage of the pension system. In 1995, however, AFAMs became a means-tested benefit.

Source: Own elaboration based on data of Instituto Nacional de Estadística (Uruguay).

At the beginning of the 21st century, a redesign of the benefits which were not linked to the contributory situation of the beneficiaries was introduced for low-income segments of the population⁴. These initiatives include the expansion, in 1999 and 2004, of the AFAM scheme for low-income households, the monetary benefit of the National Social Emergency Attention Plan (PANES) which covered a broad spectrum of non-contributory interventions, and the reformulation of the AFAMs within the framework of the Equity Plan launched in 2008. This second generation of benefits is subject to verification of means and conditionality to

receive them. The verification of means is according to two main modalities: declaration of income below a certain threshold in the AFAM system that was in force until 2007, and deprivation indices based on household characteristics in the case of the Citizen Income (*Ingreso Ciudadano*) and the new AFAM system. In both cases, deprivation indices are combined with income thresholds. This new group of social cash benefits were principally aimed at reducing inequality and alleviating poverty in the context of economic growth. These policies have achieved considerable reductions in extreme poverty and drops in inequality levels (see Bucheli *et al.*, 2014). In Figure 1 we detail the changes in inequality and poverty measures.

A visual inspection of Figure 1 shows major decreases in these indicators, in the poverty case from 2004, and in the case of inequality from 2008. But, despite this notable progress, Uruguay still lags significantly behind OECD countries in terms of redistribution achieved through social spending tools (Lustig and Pereira, 2016). In this sense, it is natural to ask about the fiscal sustainability of these policies. We believe that the correct anti-cyclical design of the current system of non-contributory and contributory social cash transfers in Uruguay is an important part of the answer.

4. Data

Our analysis focuses on the case of Uruguay for which we have a novel complete and disaggregated database of contributory and non-contributory public social cash transfers for a sufficiently long period. The sample used consists of quarterly data on these transfers and economic variables of the Uruguayan economy for 1988/Q1 to 2016/Q3.

Gross Domestic Product (GDP) comes from the Uruguayan Central Bank. Quarterly information on GDP is available from 1988/Q1 on, which determines the starting quarter of our period of analysis. Meanwhile, we cover 100 per cent of the contributory and non-contributory public social cash transfers implemented in Uruguay. All fiscal data is administrative information obtained from the BPS expressed in millions of Uruguayan pesos, which we convert into constant prices using the Consumer Prices Index (CPI) (base 2010=100) from the Instituto Nacional de Estadística (INE-Uruguay).

We define social cash transfers as the cash amount of public social benefits from the government to the population that is associated with social and economic risks. This is the sum of passive and active benefits⁵. The first category, passive benefits, includes old age pensions, survivors' pensions, temporary subsidies, and pensions for old age and disability, the last being the only non-contributory program. Old age refers to cash transfers to formal sector workers that have reached the retirement age; survivors' pensions are cash transfers to widows of formal workers and family members who meet specific requirements (such as physical disability); pensions for old age are cash transfers to people 65 and older with insufficient income; and temporary subsidies are associated with cash transfers related to specific injuries of workers.

The active benefits include illness subsidies, employment injury, unemployment subsidies, and maternity and family allowances, all of which contributory programs. Illness sub-

sidies refers to cash transfers to formal workers with temporary illness; employment injury benefits are cash transfers to formal workers with total and permanent incapacity; unemployment subsidies are cash transfers to unemployed workers; maternity allowances refer to maternity and parental leave allowances and care for the parent; and, family allowances (AFAM) are cash benefits to the family based on the income level and also includes medical care for children and mothers⁶.

Table 1 provides a statistical overview of public spending and social transfers in Uruguay.

Table 1
GOVERNMENT SPENDING AND SOCIAL CASH TRANSFERS IN URUGUAY
(averages, percentage of GDP)

	1988/ 1989	1990/ 1994	1995/ 1999	2000/ 2004	2005/ 2009	2010/ 2014	2015	2016
Expense of Central Government	17.80	22.82	25.80	25.94	25.42	28.08	28.79	28.59
Current expenditure	15.48	20.49	23.04	23.27	22.51	24.94	26.48	26.07
Compensation of employees	3.10	4.06	4.61	4.75	4.67	4.93	4.99	4.75
Non-personal expenditure	2.32	3.05	3.50	3.53	3.97	3.59	3.75	3.70
Social passive benefits	6.96	9.31	10.39	10.52	8.71	8.88	9.38	9.71
Transfers ^(*)	3.10	4.06	4.54	4.47	5.16	7.54	8.35	8.19
Investment	2.32	2.49	2.77	2.67	2.91	3.13	2.31	2.24
<i>Social cash transfers</i>								
A) Social Cash Transfers	7.67	9.91	11.02	11.28	9.43	9.90	10.64	9.71
A.1) Passive benefits	6.96	9.31	10.39	10.52	8.71	8.88	9.38	9.71
Contributive								
a. Old age	5.31	7.18	7.86	7.70	6.14	6.25	6.68	6.93
b. Survivor pensions ^(**)	1.23	1.62	1.99	2.27	2.05	2.04	2.09	2.16
No contributive								
c. Pensions to Old Age and Disability	0.42	0.51	0.54	0.55	0.52	0.58	0.61	0.63
A.2) Active benefits	0.71	0.60	0.64	0.76	0.72	1.02	1.25	—
Contributive								
d. Illness subsidies	0.11	0.10	0.08	0.08	0.09	0.20	0.27	—
e. Unemployment	0.15	0.20	0.26	0.34	0.20	0.33	0.49	—
f. Maternity allowances	0.05	0.04	0.05	0.05	0.05	0.07	0.13	—
No contributive								
g. Family allowances ^(***)	0.40	0.25	0.24	0.29	0.38	0.42	0.37	—

Notes: (*) Include: active benefits, transfers to public entities, debt services and affected rents. (**) Include: Transitory subsidies. (***) Include: AFAM, PANES and Plan de Equidad.

Source: Own elaboration based on data from Ministerio de Economía y Finanzas and Banco de Previsión Social.

While the size of government was below 23% of GDP over 1988-1994, it reached 28% by the end of the sample period. The amount of contributory and non-contributory cash transfers currently represents about 40% of total public expenditures, the passive benefits being the largest share of social transfers over the period.

Table 1 also shows the composition of the passive and active benefits by subcategory. Old age benefits were the largest item among passive social benefits (6% of GDP), followed by survivors' pensions (2% of GDP). In terms of active social benefits, family allowances and unemployment subsidies are the most important components of the active social benefits. However, their sum is less than 1% of GDP. Specifically, we find a key difference relative to developed countries in the size of unemployment insurance spending and family allowances. In Table 2 we compare the main cash transfer programs of Uruguay with the USA and other OECD countries.

Table 2
PUBLIC SOCIAL CASH TRANSFERS
(averages, percentage of GDP)

	1988/2016		
	Uruguay	United States	OECD ^(*)
a. Old age benefits	6.8	5.4	6.3
b. Unemployment subsidies	0.3	0.4	0.9
c. Family allowances	0.4	0.7	1.8

Note: SOCX database provided annual data of the USA and OECD countries over 1988-2016 period.

(*) not included the United States.

Source: Own elaboration based on data from Ministerio de Economía y Finanzas, Banco de Previsión Social (Uruguay) and SOCX database.

We observe active social benefits to be very small as a share of GDP. Specifically, we find a key difference relative to OECD countries in the size of family allowances and unemployment insurance spending. For example, while unemployment insurance represents about 0.9 per cent of GDP in the OECD sample, it is barely 0.3 per cent in Uruguay. This asymmetry could reflect low unemployment insurance coverage in Uruguay.

5. Empirical strategy

The formal statistical treatment of our database, through time series analysis tools, allows us to obtain adequate information on the cyclicity of these variables, which may inform policy implications for the Uruguayan economy⁷. This section explains the procedure we use to analyse the cyclical fluctuations of the social transfers and its components over the business cycle. First, we revise the seasonal adjustment techniques of the time series due to quarterly data being used. Second, we describe the detrending procedures we use to extract the unobservable cyclical component of the observable economic time series. Finally, we explain the properties of the cyclical fluctuations, and explore the nonlinear causal relationships between series.

The procedure allows us to decompose the observed series Y_t into four unobservable components (Espasa and Cancelo, 1993):

— T_t is the trend, representing the long-term evolution of Y_t .

- C_t is the cycle, corresponding to the systematic deviations of Y_t with respect to the trend, displaying successive phases of expansion and recession.
- S_t is the seasonal movement, including the regular and systematic intra-year oscillations of Y_t , such as quarterly, that repeats year by year.
- I_t is an irregular component, referring to non-systematic oscillations or idiosyncratic shock.

A well-known decomposition of the observable time series Y_t is:

$$Y_t = T_t \cdot C_t \cdot S_t \cdot I_t \quad t = 1, \dots, T \quad (1)$$

Let the natural logarithm of the previous expression (the observable time series Y_t) be denoted by y_t , and the unobservable components $\{T_t, C_t, S_t, I_t\}$ by $\{t_t, c_t, s_t, e_t\}$:

$$y_t = t_t + c_t + s_t + e_t \quad t = 1, \dots, T \quad (2)$$

Removing the seasonal and irregular components from the series could make it possible to obtain the relevant features of the trend component of the cycle. The discussion in the literature is centred on two issues: the “seasonal adjustment,” and that seasonal adjustment does not distinguish between trend and cycle, and the other deals with “cycle extraction” techniques (Canova, 1998).

5.1. Seasonal adjustment

The main objective of the seasonal adjustment process is to identify and subtract the seasonal components (fluctuations and intra-year effects) of the unadjusted time series, which can impede a clear interpretation of the time series movements. As a result, the seasonally adjusted series obtained is comprised of the trend, the cycle and irregular components.

We examine signal extraction in a univariate time series context of an ARIMA data generating process. More specifically, we use both parametric and non-parametric methods. The parametric method decomposes the observable time series, assuming that each unobservable component follows a theoretical econometric model; in this case, the reference procedure is TRAMO-SEATS (Gómez and Maravall, 1996). The non-parametric method analyses the real series decomposition but does not explicitly refer to any type of theoretical model of data generation. In this case, the most recent implemented method is X-13 ARIMA-SEATS (US Census Bureau, 2017).

5.2. Cycle extraction

In the economic literature, there is controversy about which procedures to adopt to extract the cyclical component of the times series, so some researchers decided to implement alternative methods. In this vein, Canova (1998) removed the trend using different detrending techniques, and found that their results are sensitive to the selection of the procedure. In

light of the aforementioned, and as robustness checks of our results, we apply four different trend-removing methods: Linear Trend (LT), Beveridge-Nelson filter (BN), Hodrick-Prescott (HP) and a Hamilton filter (Hf).

The LT method assumes that the trend component is a deterministic process, which is uncorrelated with the cyclical component, which can be represented with a first-degree polynomial function of time (Canova, 1998). The BN, HP and Hf methods assume that the trend component is a stochastic process. Beveridge and Nelson's (1981) decomposition assumes that the trend component behaves as a unit root with drift and the cyclical component follows a stationary process, and both unobservable components are perfectly correlated. However, Kamber *et al.* (2017) show that it does not produce a reasonably accurate cycle component due to overestimation of parameters' contribution to the underlying trend in the variance decomposition. Therefore, they introduce a modified version of the decomposition that improves the detrending procedure, called a BN filter, that uses a Bayesian framework (preceded by a "Minnesota" shrinkage). As for Hodrick and Prescott (1997), they assume that the trend is a smoothly stochastic process over the time, uncorrelated with the cyclical component. Finally, Hamilton (2017) proposes a linear regression of a non-stationary process based on the future value of the time series and the four most recent lags. Here, the estimated residual is the cyclical component that follows a stationary process, and is uncorrelated with the trend component.

5.3. Cycle properties

Once the cyclical component for each series is obtained, we first proceed with analysing the cyclical fluctuations of the series (c_{it}) itself and its relationship with the benchmark cycle series (c_t^*), in our case the GDP, through three kinds of analysis. First, we examine the standard deviation and the first order autocorrelation coefficient of each series c_{it} . The standard deviation is a measure of the absolute volatility (amplitude) of the cycle of each series relative to the trend. In addition, we consider the standard deviation of the cyclical component of one series divided by the standard deviation of a benchmark series, ($\sigma_{c_{it}}/\sigma_{c_t^*}$), which is a measure of relative volatility (deviation from the reference cycle). Meanwhile, the first order autocorrelation coefficient of c_{it} measures the persistence of the cyclical deviations from the trend. Secondly, we estimate the co-movements through the cross-correlation coefficients, $\rho_i(k)$, between the cyclical fluctuation of one series c_{it} and the cyclical benchmark series c_t^* at t . On the one hand, the value of $\rho_i(k)$ for $k=0$ shows the contemporaneous degree of co-movements of c_{it} and c_t^* . A positive (negative) value of $\rho_i(0)$ indicates that c_{it} is pro-cyclical (counter-cyclical). A value of $\rho_i(0)$ close to zero indicates a-cyclicity (non-correlation) between the two series. We follow Fiorito and Kollintzas (1994) who classify and denote the degree of contemporaneous co-movements as: "strong," for $0.5 \leq |\rho_i(0)| < 1$; "weak" for $0.2 \leq |\rho_i(0)| < 0.5$ and "uncorrelated" for $0 \leq |\rho_i(0)| < 0.2$. On the other hand, the values of $\rho_i(k)$ for $k \neq 0$ depict the phase changes of the cycles of c_{it} and c_t^* . We say that c_{it} is leading (or lagging) the c_t^* if $\rho_i(k)$ reaches its maximum value when $k < 0$ ($k > 0$). If the maximum value of $\rho_i(k)$ is reached when $k = 0$, the two series synchronize. Finally, the existence of the correlation between variables does not necessarily imply causality. For this reason, we also analyse the temporal dependence between variables (effects of lagged variables on another variable).

Several studies analyse the linear dependence relations between time series based on the Granger (1969) causality test. However, the Granger test is not useful to detect nonlinear causal relations which are common among economic variables. Therefore, we use a modified version of a nonlinear Granger causality test developed by Diks and Panchenko (2006).

6. Results⁸

First, we present the results of the seasonal adjustment, and then, the detrending methods used to extract the cyclical components of the economic time series. Second, we report the main effects of the cyclical properties on the social cash transfers and its components. Finally, nonlinear causality tests are developed.

6.1. Seasonal adjustment

We use the TRAMO-SEATS method for the seasonal and calendar adjustment of official statistics. Formal diagnostics of seasonality suggest that there is seasonality of the social transfer's variables (see Table A.2 in the Appendix)⁹. For this reason, we used the seasonal adjustment time series of the social transfer's variables.

Figure 2
REAL GDP AND PUBLIC SOCIAL CASH TRANSFERS SEASONAL ADJUSTMENT
(in logarithms)

Note: Seasonal adjustment with TRAMO-SEATS.

Source: Central Bank and Banco de Previsión Social (Uruguay).

In general terms, a visual inspection of Figure 2 shows that both the natural logarithm of real GDP (panel a) and the social public cash transfers series (panel b) have systematic intra-year oscillations, i. e. seasonality, which are even more regular and pronounced in the case of real GDP. However, when the seasonal adjustment is performed over the entire observed series, the estimated series does not indicate seasonality.

6.2. Detrending methods

Figure 3 displays the plots of the estimates of the cyclical components of real GDP, social transfers, old age benefits and unemployment subsidies, using the four different detrending methods. The plot representation allows observing the co-movements of social transfers, old age benefits and unemployment subsidies with real GDP. The y-axis value equal to zero represents the trend; therefore, we see the fluctuations of the cyclical components around it. When the cycle takes a value above zero this indicates an expansion, whereas a value below zero indicates a recession¹⁰.

Figure 3
CYCLICAL COMPONENTS

Note: Shaded area in the time series plots cover the year 2002, it illustrates the most important financial crisis in the Uruguayan economy. Real GDP (grey line) and passive benefits (and its components) were estimated in the sample period 1988/Q1-2016/Q3; public social cash transfers and active benefits (and its components) were estimated in the sample period 1988/Q1-2015/Q4. The selected public social cash transfers categories are represented by column (black line). Significance level: ** $p < 0.05$.

Source: Own estimations.

A visual inspection of Figure 3 allows to see that the patterns of the cyclical component of the series in terms of volatility (e.g. amplitude of the cycle peak from the trend), persistence (e.g. time between beginning of below-trend growth and recovery) and co-movements (e.g. dissimilarity in the number of lag periods). First, all the detrending methods adequately identify the crisis episode of 2002 with the real GDP cycle below its trend; the cyclical components are below zero. Secondly, independently of the trend-removing procedures, social fiscal cash transfers and its components are in sync with or lag the business cycle. Finally, the cyclical components' patterns do not indicate a path with low smoothness, as the HP filter shows.

6.3. Cycle properties

6.3.1. *Volatility and persistence*

We focus on the properties of the cyclical components of the social cash transfers variables, first analysing the volatility and persistence of each series itself, and then the correlation with real GDP. Table 3 illustrates the results for absolute and relative volatility, and the persistence of the real GDP and the social cash transfers components considered.

We observe that the economic cycle (column 1) is less volatile than the social cash transfers series (column 2 to 11), both in absolute and relative terms across the trend-removal procedure. For instance, according to the Hf method, the absolute volatility of the GDP cycle component is 6.8% (column 1) and the absolute volatility of the social cash transfers cycle component is 11.4% (column 2). Meanwhile passive benefits and its categories are shown to have similarly high volatility, and active benefits have lower volatility than its components. Among social cash transfers components, the highest relative volatility among categories of passive social benefits is old age (for formal workers), while illness subsidies and unemployment subsidies have highest volatility among active social benefits categories.

In Table 3 we can also see that the majority of the components of the fiscal transfers series have high persistence. For instance, social cash transfers have a first order autocorrelation coefficient of between 0.75 and 0.96 across the trend-removing methods.

6.3.2. *Co-movements and phase changes*

Table 4 presents the co-movements and phases changes between the cyclical components of social cash transfers variables and the real GDP cycle (the point of comparison/reference).

The contemporaneous co-movements suggest strong pro-cyclicality of social cash transfers (column 1). Passive benefits in this case have strong pro-cyclicality ranging from 0.44 to 0.60. Similarly, old age benefits vary from 0.39 to 0.61, survivors' pensions from 0.43 to 0.51, and pension for old age and disability by between 0.59 and 0.85.

However, the co-movements of active benefits (appear to) differ by more than passive benefits. While the BN, HP and Hf trend-removal procedures indicate a-cyclicality of social benefits to those defined as economically active, the LT method shows strong pro-cyclicality (column 6). Similarly, the co-movements of the different components of active benefits (columns 7 to 10) are sensitive to the trend-removal procedures. However, we found some facts in common. The results for illness subsidies vary from 0.51 to 0.74 and maternity allowances by between 0.29 and 0.76, both categories being pro-cyclical. In the case of unemployment subsidies, they behave weakly counter-cyclically by HP (-0.36) and Hf (-0.23) procedures and appear a-cyclical by BN (-0.15). In other words, they have limited performance as automatic stabilizers of the macroeconomic cycles.

Table 3
VOLATILITY AND PERSISTENCE OF PUBLIC SOCIAL CASH TRANSFERS AND REAL GDP CYCLES IN URUGUAY

Property\Variable	GDP	Public social cash transfers	Passive benefits	Old age	Survivors pensions	Pension to old age and disability	Active benefits	Illness subsidies	Unemployment subsidies	Maternity allowances	Family allowances
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>Method: Linear Trend (LT)</i>											
Absolute volatility	0.080	0.160	0.167	0.176	0.152	0.149	0.221	0.415	0.349	0.297	0.250
Relative volatility	—	2.000	2.088	2.200	1.900	1.863	2.763	5.188	4.363	3.713	3.125
Persistence	0.973	0.964	0.938	0.944	0.946	0.944	0.950	0.976	0.959	0.888	0.871
<i>Method: Beveridge-Nelson filter (BN)</i>											
Absolute volatility	1.829	3.687	4.483	4.502	4.203	4.108	5.627	6.319	9.939	8.416	8.179
Relative volatility	—	2.016	2.451	2.461	2.298	2.246	3.077	3.455	5.434	4.601	4.472
Persistence	0.815	0.747	0.551	0.568	0.672	0.623	0.865	0.913	0.908	0.291	0.539
<i>Method: Hodrick-Prescott (HP)</i>											
Absolute volatility	0.023	0.054	0.052	0.066	0.052	0.048	0.076	0.091	0.156	0.108	0.099
Relative volatility	—	2.362	2.262	2.86	2.271	2.109	3.297	3.987	6.808	4.696	4.336
Persistence	0.919	0.874	0.767	0.699	0.782	0.847	0.915	0.933	0.948	0.375	0.808
<i>Method: Hamilton (Hf)</i>											
Absolute volatility	0.068	0.114	0.118	0.119	0.107	0.131	0.201	0.240	0.336	0.248	0.225
Relative volatility	—	1.689	1.751	1.764	1.584	1.944	2.973	3.550	4.975	3.677	3.330
Persistence	0.867	0.839	0.788	0.766	0.822	0.844	0.882	0.851	0.875	0.794	0.834

Note: Absolute volatility measures the cycle amplitude from the trend for each series; relative volatility measures the cycle amplitude of the series w.r.t. the benchmark series; persistence shows the degree of inertia of the cycle to reach the trend. Real GDP, passive benefits (and its components) were estimated in the sample period 1988/Q1-2016/Q3; public social cash transfers and active benefits (and its components) were estimated in the sample period 1988/Q1-2015/Q4.

Source: Own estimations.

Table 4
CO-MOVEMENTS AND PHASES CHANGES OF PUBLIC SOCIAL CASH TRANSFERS IN URUGUAY

Property\ Variable	Passive benefits (2)	Public social cash transfers (1)	Old age (3)	Survivors pensions (4)	Pension to old age and disability (5)	Active benefits (6)	Illness subsidies (7)	Unemployment subsidies (8)	Maternity allowances (9)	Family allowances (10)
<i>Method: Linear Trend (LT)</i>										
Co-movements (k=0)	0.601**	0.655**	0.609**	0.431**	0.851**	0.607**	0.744**	0.458**	0.761**	0.226**
Lead (-)/										
Lags (+) (k)	0.659 (k=5)	0.724 (k=4)	0.676 (k=5)	0.485 (k=5)	0.876 (k=2)	0.768 (k=5)	0.754 (k=1)	0.870 (k=8)	0.845 (k=3)	0.267 (k=-6)
<i>Method: Beveridge-Nelson filter (BN)</i>										
Co-movements (k=0)	0.514**	0.567**	0.513**	0.506**	0.623**	0.059	0.518**	-0.152	0.299**	0.077
Lead (-)/										
Lags (+) (k)	0.502 (k=1)	0.576 (k=1)	0.503 (k=1)	0.508 (k=1)	0.613 (k=1)	0.624 (k=5)	0.648 (k=3)	0.690 (k=8)	0.443 (k=3)	0.232 (k=-6)
<i>Method: Hodrick-Prescott (HP)</i>										
Co-movements (k=0)	0.504**	0.501**	0.463**	0.493**	0.588**	-0.029	0.512**	-0.357**	0.292**	0.211**
Lead (-)/										
Lags (+) (k)	0.531 (k=)	0.528 (k=1)	0.489 (k=1)	0.521 (k=1)	0.615 (k=1)	0.654 (k=6)	0.702 (k=3)	0.713 (k=7)	0.493 (k=4)	0.211 (k=0)
<i>Method: Hamilton (HF)</i>										
Co-movements (k=0)	0.436**	0.503**	0.386**	0.508**	0.638**	0.062	0.614**	-0.234**	0.465**	0.232**
Lead (-)/										
Lags (+) (k)	0.519 (k=2)	0.564 (k=2)	0.469 (k=2)	0.578 (k=2)	0.671 (k=1)	0.662 (k=7)	0.671 (k=3)	0.663 (k=8)	0.673 (k=4)	0.298 (k=-6)

Note: Real GDP benchmark series. k is the cross-correlation order in quarter frequency. Co-movements $\rho_T(0)$: (+) procyclicality, (-) countercyclicality, 0 a-cyclicality. Synchronize: if the maximum value of $\rho_T(k)$ involves $k < 0$, $k = 0$, $k > 0$ the series lead, synchronize, and lags the reference series (respectively). Real GDP and passive benefits (and its components) were estimated in the sample period 1988/Q1-2016/Q3; public social cash transfers and active benefits (and its components) were estimated in the sample period 1988/Q1-2015/Q4. Significance level: ** $p < 0.05$.

Source: Own estimations.

To sum up, we have a systematic relationship between short-term fluctuations of the social cash transfers' components and the business cycle. Consequently, instead of contributing to stabilizing the Uruguayan economy, they have aggravated the business cycle. Similarly, these pro-cyclical patterns are followed by some components of active benefits, such as illness subsidies, maternity allowances, and to a lesser extent, family allowances. Moreover, the most important social transfers component to conduct a counter-cyclical fiscal policy, unemployment subsidies, has unclear results regarding cyclicity. Therefore, due to social transfers being generally associated with governmental goals of income maintenance and poverty reduction, we can infer that the design of social fiscal policy in Uruguay has not had the desired effect on the most economically vulnerable groups.

Table 4 also documents different phases (lead/lags) of social transfer's series over the business cycle, where the k value represents the order of the duration of the time lags, and the respective cross-correlations between those lags and other components of the cycle. We observe that the aggregate of social transfers (column 1) lags the business cycle by between 1 to 4 quarters, depending on the trend-removal method. For example, Hf shows that real GDP at time t has a positive effect on the future level of social transfers, reaching the highest point at two lags (after six months). The main sequence of events and relations within this are expressed as follows: we first have a peak (or slump) in the cyclical fluctuation of the business cycle, and then a peak (or slump) two quarters later in the cyclical movements of social cash transfers. In addition, real GDP is positively cross-correlated with passive benefits and its components, which lag the real GDP cycle by 1 to 5 quarters. Also, active benefits lag the business cycle by 5 to 7 quarters. Regarding the categories of active benefits, unemployment subsidies programs are negatively correlated with the macroeconomic cycle and lag it by 7 to 8 quarters. In this sense, we first have a slump (or peak) in the business cycle, and then 7 to 8 quarters later a peak (or slump) in the cyclical variations in unemployment subsidies.

6.3.3. *Causality*

The results of the nonlinear Granger causality test are shown in Table 5. Given that social transfers and its components lag the business cycle, we aim to find unidirectional causality from GDP to social transfers (or its components). If this unidirectional causality is demonstrated, this would reject the null hypothesis that GDP does not nonlinearly Granger-cause social transfers (or its components) and fail to reject the null hypothesis that social transfers (or its components) do not nonlinearly Granger-cause GDP.

Briefly summarizing the main findings, we obtained evidence of unidirectional nonlinear causality from GDP to social transfers by {BN}, from GDP to passive benefits by {BN, HP}, from GDP to old age benefits by {BN}, from GDP to active benefits by {BN, HP}, from GDP to unemployment subsidies by {Hf}, from GDP to maternity allowances by {LT, BN}, among other causality relationships. I.e., we have detected an impact of the macroeconomic cycle on social transfers and its components. This allows us to state that there a recertain fiscal policy response involving social transfers caused by the economic activity phases.

Table 5
RESULTS OF NONLINEAR GRANGER CAUSALITY TEST

Null hypothesis	LT	BN	HP	Hf
GDP does not cause public social cash transfers	1.060 [0.1446]	1.929 [0.0268]	0.894 [0.1856]	1.305 [0.0960]
Public social cash transfers do not cause GDP	1.056 [0.1453]	0.157 [0.4377]	1.679 [0.0465]	0.680 [0.2483]
GDP does not cause passive benefits	0.633 [0.2634]	2.253 [0.0121]	1.678 [0.0466]	0.162 [0.5641]
Passive benefits do not cause GDP	1.499 [0.0669]	0.919 [0.1790]	1.084 [0.1391]	0.565 [0.2859]
GDP does not cause old age benefits	1.028 [0.1520]	1.816 [0.0346]	1.173 [0.1203]	0.156 [0.4379]
Old age benefits do not cause GDP	1.245 [0.1066]	0.940 [0.1735]	1.025 [0.1526]	1.325 [0.0926]
GDP does not cause survivors' pensions	1.039 [0.8506]	2.031 [0.0211]	0.618 [0.2682]	0.800 [0.2117]
Survivors' pensions do not cause GDP	2.028 [0.0212]	1.067 [0.1429]	1.574 [0.0577]	1.355 [0.0877]
GDP does not cause pensions to old age and disabilities	1.027 [0.1522]	2.670 [0.0037]	1.822 [0.0342]	0.833 [0.2024]
Pensions to old age and disabilities do not cause GDP	1.363 [0.0865]	2.118 [0.0170]	1.400 [0.0807]	1.401 [0.0806]
GDP does not cause active benefits	1.266 [0.1027]	1.957 [0.0251]	1.760 [0.0391]	1.249 [0.1057]
Active benefits do not cause GDP	0.265 [0.6044]	(0.462) [0.6779]	1.512 [0.0652]	0.961 [0.1684]
GDP does not cause illness subsidies	1.291 [0.0984]	1.770 [0.0383]	2.045 [0.0204]	1.975 [0.0241]
Illness subsidies do not cause GDP	0.155 [0.5615]	0.297 [0.3833]	1.229 [0.1094]	0.578 [0.2816]
GDP does not cause unemployment subsidies	2.036 [0.0208]	1.453 [0.0731]	1.588 [0.0560]	1.902 [0.0286]
Unemployment subsidies do not cause GDP	1.707 [0.0438]	0.577 [0.2818]	1.833 [0.0333]	0.845 [0.1991]
GDP does not cause maternity allowances	2.646 [0.0040]	2.329 [0.0099]	0.608 [0.2714]	1.298 [0.0971]
Maternity allowances do not cause GDP	1.119 [0.8683]	0.825 [0.2045]	1.016 [0.1547]	1.436 [0.0755]
GDP does not cause family allowances	0.280 [0.6102]	0.444 [0.3285]	2.018 [0.0217]	0.906 [0.1824]
Family allowances do not cause GDP	1.293 [0.0979]	0.736 [0.2307]	0.253 [0.3999]	0.736 [0.2307]

Note: The null hypothesis is that one series does not nonlinearly Granger cause the other series. T-statistics is illustrated in absolute value and p-value is reported in brackets. Following Kollias *et al.* (2017), the lag length used for the nonlinear causality test and the Bandwidth are set to one. In the case of the Bandwidth, values less (more) than 1 result in larger (smaller) p-values (Bekiros and Diks 2008).

Source: Own estimations.

7. Empirical extensions

In this section we perform two important additional exercises. First, in order to analyse whether the magnitudes and signs of cyclicalities found for Uruguay are relevant, we performed a comparative exercise between Uruguay and the United States. Second, we more deeply investigate the importance of the institutional settings that could influence the cyclicity of social cash transfers in Uruguay¹¹.

7.1. The relevance of pro-cyclicalities in Uruguay: a comparative analysis with the United States

Table 6 shows the co-movements and phases changes of social transfers in Uruguay and the United States over 1988/Q1 to 2016/Q3. Here, our point of reference is the available social transfer's categories for the United States¹², which includes passive social benefits, unemployment subsidies and family allowances.

A visual inspection of Table 6 allows us to observe two very important points. First, the comparison of the sign of the estimated coefficients is extremely important. In contrast with Uruguay, the United States is shown as having a clearly counter-cyclical fiscal policy design¹³. In this sense, we can see that these expenditures have a strong anti-cyclical component in this economy. Second, the magnitude of the estimated coefficients, for both countries, reveals the importance of the cyclicity of these different social transfer programs. While the coefficients on passive benefits are similar in both countries, highlighting the importance of such social transfers in both countries, the coefficients of both unemployment insurance and family allowances are significantly lower in Uruguay, which additionally highlights the suboptimal design of these policies in relation to the economic cycle in Uruguay.

7.2. Pro-cyclicalities of social transfers: the importance of institutional settings

Here we analyse more deeply why social cash transfers increase in good times and fall in bad times in Uruguay. One main reason may lie in the indexing formulas of the social cash transfers. Most industrial countries have formulas that index social security benefits to nominal price inflation (measured through temporal CPI variations) –after all, the purchasing power of retirees should ideally be preserved over time. Unfortunately, that was not the case for the prevailing social security system in Uruguay. In this country, old age and survivors' pensions were updated by the national Average Wage Index (AWI) from 1990 to 2002, and since 2003 by the Average Nominal Wage Index (ANWI), both of which are set according to regulatory laws¹⁴. In the case of family allowances, from 1988 to 2003 these were indexed to the minimum wage, and from 2004 to date contributory child allowances are adjusted on the basis of *Base de Prestaciones Contributivas*¹⁵.

Table 6
CO-MOVEMENTS AND PHASES CHANGES OF SELECTED PUBLIC SOCIAL CASH TRANSFERS IN URUGUAY AND THE UNITED STATES

Property\Variable	Passive benefits		Unemployment subsidies		Family allowances	
	Uruguay	United States	Uruguay	United States	Uruguay	United States
<i>Method: Linear Trend (LT)</i>						
Co-movements (k=0)	0.601**	-0.551**	0.458**	-0.319**	0.226**	-0.643**
Lead (-)/Lags (+) (k)	0.659 (k=5)	-0.556 (k=1)	0.870 (k=8)	-0.388 (k=-4)	0.267 (k=-6)	-0.643 (k=1)
<i>Method: Beveridge-Nelson filter (BN)</i>						
Co-movements (k=0)	0.514**	-0.321**	-0.153	-0.597**	0.077	-0.361**
Lead (-)/Lags (+) (k)	0.502 (k=1)	-0.321 (k=0)	0.690 (k=8)	-0.623 (k=1)	0.232 (k=-6)	-0.440 (k=4)
<i>Method: Hodrick-Prescott (HP)</i>						
Co-movements (k=0)	0.504**	-0.439**	-0.357**	-0.805**	0.211**	-0.348**
Lead (-)/Lags (+) (k)	0.531 (k=1)	-0.439 (k=0)	0.713 (k=7)	-0.809 (k=1)	0.211 (k=0)	-0.353 (k=1)
<i>Method: Hamilton (Hf)</i>						
Co-movements (k=0)	0.436***	-0.739**	-0.234**	-0.749**	0.232**	-0.412**
Lead (-)/Lags (+) (k)	0.519 (k=2)	-0.757 (k=1)	0.663 (k=8)	-0.749 (k=1)	0.298 (k=-6)	-0.455 (k=2)

Note: Real GDP benchmark series k is the cross-correlation order in quarter frequency. Co-movements $\rho_I(0)$: (+) procyclicality, (-) countercyclicality, 0 a-cyclicality. Synchronize: if the maximum value of $\rho_I(k)$ involves $k < 0$, $k = 0$, $k > 0$ the series lead, synchronize, and lags the reference series (respectively). Real GDP and passive benefits were estimated in the sample period 1988/Q1-2016/Q3; unemployment benefits and family allowances were estimated in the sample period 1988/Q1-2015/Q4. Significance level: *** $p < 0.05$.

Source: Own estimations.

Note that, typically, real wages grew faster during the economic expansions and less during the economic recessions. Thus, this indexing mechanism could introduce a substantial pro-cyclical component to old age and survivors' pensions in Uruguay. Figure 4 illustrates the evolution of the annual growth rates of the AWI, ANWI and CPI over 1988/Q1 to 2016/Q3. Some important points can be noted in observing the figure. First, no relevant difference is detected in the growth rates of the two wage indices. Second, it can be seen that the growth rates of the AWI and CPI follow a similar trajectory up to 2001, and then both indices began to experience a sharply different evolution. During the financial crisis in Uruguay over 2002-2004, the CPI growth rates are higher than the AWI and ANWI, but since 2004, wage indices clearly depict a more inflationary situation than the CPI. This last point is important due to growth rates of wage indices being applied as a reference index to update the amounts of the old age and survivors' pensions, generating an increase in their real values¹⁶, and it is therefore likely that this has increased their pro-cyclicality.

Figure 4
EVOLUTION OF AVERAGE WAGE INDEX, AVERAGE NOMINAL WAGE INDEX, AND
CONSUMER PRICE INDEX OVER THE PERIOD 1988/Q1-2016/Q3
 (annual growth rates, %)

Note: ANWI was established in 2003.

Source: Instituto Nacional de Estadística (Uruguay).

In order to analyze this scenario, we examine the implications of updating old age benefits, survivors' pensions and family allowances by using the price index (CPI) rather than wage indices. This allows us to see if social transfer's components are pro-cyclical due to the indexing formulas. To do so, we indexed the original series by dividing them by the

AWI/CPI ratio, avoiding the AWI effect and substituting it with an increase equivalent to the CPI.

Table 7
CO-MOVEMENTS OF A SELECTED SOCIAL TRANSFERS COMPONENTS IN URUGUAY
COMPARING DIFFERENT INDEXING FORMULAS

Property\ Variable	Old age benefits		Survival pensions		Family allowances	
	Benchmark	AWI/CPI	Benchmark	AWI/CPI	Benchmark	AWI/CPI
<i>Method: Linear Trend (LT)</i>						
Co-movements (k=0)	0.609**	0.080	0.431**	0.025	0.266**	-0.137
<i>Method: Beveridge-Nelson filter (BN)</i>						
Co-movements (k=0)	0.513**	0.188**	0.506**	0.175	0.077	-0.104
<i>Method: Hodrick-Prescott (HP)</i>						
Co-movements (k=0)	0.463**	0.221**	0.493**	0.244**	0.211**	-0.124
<i>Method: Hamilton filter (Hf)</i>						
Co-movements (k=0)	0.386**	0.363**	0.508**	0.302**	0.232**	0.104**

Note: Co-movements $\rho_f(0)$: (+) procyclicality, (-) countercyclicality, 0 a-cyclicality. Real GDP and passive benefits were estimated in the sample period 1988/Q1-2016/Q3; family allowances were estimated in the sample period 1988/Q1-2015/Q4.

Significance level: ** $p < 0.05$.

Source: Own estimations.

Table 7 shows the co-movements of the selected social transfer's series, for the case of the benchmark case (from Table 3, AWI as the indexing mechanism) and the CPI indexing mechanism. Meanwhile, the contemporaneous co-movements suggest strong pro-cyclicality of old age and survivors' pensions in the benchmark case, and the CPI indexing case shown suggests an a-cyclical or a much more moderately pro-cyclical pattern. In the case of family allowances, our results report clear evidence of a-cyclicality. In this context, we can deduce that the indexing formulas play an important role in the pro-cyclicality of the social cash transfers variables in Uruguay.

8. Conclusions

In this paper, we analyse how a significant component of the public budget, namely contributory and non-contributory social cash transfers, has been handled over the business cycle in Uruguay. We observe that social cash transfers behave pro-cyclically and lagged the business cycle, thereby exacerbating expansions and recessions of the business cycle and exposing vulnerable economic groups to more adverse conditions. In particular, we identified

that the pro-cyclicality has been led by old age benefits and survivors' pensions. Moreover, significant causality relationships were detected, such as from real GDP to old age benefits and from real GDP to unemployment subsidies.

As we explored further, we were able to observe that the cyclicity of the major components of social cash transfers, such as old age benefits, survivors' pensions and family allowances, is largely explained by the indexing mechanism used in Uruguay. Specifically, if these items were updated by the CPI instead of being indexed by wages, their pro-cyclicality would become much more moderate or even a-cyclical.

We therefore believe that satisfying social demands and fiscal strengthening can be attained in Uruguay through a correct cyclical design of social cash transfers rather than the standard solution of spending cuts to achieve fiscal sustainability. Large drops in public social transfers could wipe out the social gains achieved during the good years and, in some instances, rekindle widespread social tensions. In fact, it is crucial to carefully manage redistributive spending demands throughout the cycle, also during good times, when different interest groups and weak institutions may combine to push expenditures above trend and toward more inflexible spending (namely transfers) that may be difficult to sustain during the next stage of the business cycle.

Considering this scenario, three important policy recommendations emerge from our analysis. First, social security indexing formulas should be changed in Uruguay. Using the CPI, as is done in advanced economies, is the best way to protect the purchasing power of the beneficiaries of these programs with no major effect on the sustainability of these cash transfers given the present structure of the economy. Second, due to the low expenditures on unemployment pay-outs and family allowances observed in Uruguay, it is very important to increase such insurance coverage in this country. For example, given large output fluctuations, it may be worth exploring protection programs for those who become unemployed during downturns. Finally, given that updating pensions through the CPI allows to mitigate, but not prevent, their pro-cyclicality, we also recommend the establishment of national fiscal rules (e.g., structural goals of budget balance, revenues, expenditures and debt rules) in order to stabilize the economy throughout the macroeconomic cycle and avoid pressure from different interest groups to increase the real value of their revenues.

Appendix

Table A.1
DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP	115	105.705	27.923	65.998	166.143
GDP (tc)	115	105.983	27.687	69.806	160.441
GDP (sa)	115	105.752	27.723	69.709	160.854
Public social cash transfers	115	173.535	43.555	83.616	268.464
Public social cash transfers (tc)	115	172.998	42.891	91.716	264.983
Public social cash transfers (sa)	115	173.522	43.320	90.919	271.827
Passive benefits	112	171.905	42.955	83.616	268.464
Passive benefits (tc)	112	171.541	42.642	91.709	267.575
Passive benefits (sa)	112	171.925	42.775	90.914	267.562
Old_age	115	117.156	26.677	59.038	170.730
Old age (tc)	115	117.112	26.305	61.691	168.999
Old age (sa)	115	117.182	26.479	61.451	170.456
Survivors pensions	115	33.550	10.114	12.674	52.544
Survivors pensions (tc)	115	33.572	9.826	14.772	51.289
Survivors pensions (sa)	115	33.555	10.075	12.622	53.007
Pension to old age and disability	115	9.328	2.874	4.489	15.661
Pension to old age and disability (tc)	115	9.328	2.800	5.286	15.349
Pension to old age and disability (sa)	115	9.329	2.864	4.479	15.816
Active benefits	112	13.529	6.514	6.358	33.128
Active benefits (tc)	112	13.461	6.533	7.499	32.212
Active benefits (sa)	112	13.522	6.500	7.369	32.098
Illness subsidies	112	2.151	1.660	0.781	7.091
Illness subsidies (tc)	112	2.149	1.645	0.834	6.811
Illness subsidies (sa)	112	2.149	1.646	0.827	6.933
Unemployment subsidies	112	4.721	2.555	1.586	13.718
Unemployment subsidies (tc)	112	4.745	2.501	1.696	13.297
Unemployment subsidies (sa)	112	4.722	2.534	1.516	13.235
Maternity allowances	112	0.992	0.604	0.349	3.269
Family allowances	112	5.650	2.384	2.429	9.922
Family allowances (tc)	112	5.639	2.393	2.417	9.751
Family allowances (sa)	112	5.565	2.376	2.404	9.755

Note: Trend-Cycle component (tc) and seasonal adjustment series (sa).

Figure A.1
CYCLICAL COMPONENTS
(Passive benefits)

Note: Real GDP (grey line) and passive benefits (and its components) were estimated in the sample period 1988/Q1-2016/Q3. The selected public social cash transfers categories are represented by column (black line). Significance level: ** $p < 0.05$.

Source: Own estimations.

Figure A.2
CYCLICAL COMPONENTS
(Active benefits)

Note: Real GDP (grey line) and active benefits (and its components) were estimated in the sample period 1988/Q1-2015/Q4. The selected public social cash transfers categories are represented by column (black line). Significance level: ** $p < 0.05$.

Source: Own estimations.

Table A.2
RESULTS FROM SEASONAL ADJUSTMENT TRAMO-SEAT

	GDP	Public social cash transfers	Passive benefits	Old age	Survivors pensions	Pension to old age and disability	Active benefits	Illness subsidies	Unem- ployment subsidies	Maternity allowances	Family allowances
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Observation	115	112	115	115	115	115	112	112	112	112	112
Seasonal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log transformations	None	None	None	None	None	None	None	Yes	Yes	Yes	No
Mean correction	None	None	None	None	Yes	None	None	None	None	Yes	Yes
ARIMA model (P,D,Q)	(0 1 0)	(0 1 0)	(0 1 2)	(0 1 2)	(0 1 1)	(0 1 1)	(0 1 0)	(2 1 0)	(0 1 0)	(1 1 0)	(1 0 0)
Seasonal (BP,BD,BQ)	(0 1 1)	(1 0 0)	(0 1 1)	(0 1 1)	(1 0 0)	(1 0 0)	(0 1 1)	(0 1 1)	(1 0 0)	(1 0 0)	(1 0 0)
BIC	1.681	4.018	3.510	3.128	0.428	-1.961	-0.656	-5.650	-4.072	-4.712	-2.634
SE (res)	2.168	6.750	4.666	4.048	1.053	0.324	0.684	0.055	0.126	0.084	0.216
Q-val	5.199	20.773	10.889	10.515	11.971	13.371	11.382	8.296	16.215	16.826	23.722
Easter corrections	Yes	None	None	None	None	None	None	Yes	None	Yes	None
Outlier corrections	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Diagnostic

Basic checks definition	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Residual seasonality:											
– test qs test on sa	Good	Good	Good	Good	Good	Good	Good	Good	Good	Bad	Good
– test qs test on i	Good	Good	Good	Good	Good	Good	Good	Good	Good	Bad	Good
Residual trading days											
tests f-test on sa	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Note: Significant at 5% (Good), significant at 10% (Uncertain) and not significant (Bad).
Source: Own estimations.

Notes

1. See, for example, Talvi and Végh (2005) and Klemm (2014).
2. About the 40 per cent of primary spending in OECD countries is discretionary (see OECD.Stat and SOCX databases).
3. The three aggregate categories analysed by these authors are: labour-market-related policies, aid to low-income families and pension payments.
4. See Amarante *et al.* (2014).
5. Due to the availability of data, real GDP and passive benefits cover 1988/Q1-2016/Q3, while active benefits cover 1988/Q1-2015/Q4.
6. Family allowances were initially a contributory program, and then benefits were extended somewhat in the subsequent periods. Now, the main part of this program is the *Plan de Equidad*, a non-contributory program created in 2008 (Amarante *et al.*, 2008).
7. See, for example, Hamilton (2017).
8. Descriptive statistics of all variables are presented in Table A.1 of the Appendix.
9. Very similar results are obtained using the X-13 ARIMA-SEATS method. These results are not reported for brevity, but are available upon request.
10. The cyclical components of the other social cash transfers are illustrated in figures A.1 and A.2 of the Appendix.
11. Also, we perform robustness checks deflating all social fiscal transfers' series by the GDP price deflator instead of CPI. Very similar results to those observed in Table 4 are obtained. These results are not reported for brevity, but are available upon request.
12. The Bureau of Economic Analysis provides data on government social benefits (quarterly data in millions of seasonally adjusted dollars). We analyse the following available categories: social security (which includes old age, survivors' and disability insurance benefits), unemployment insurance and family assistance. Additionally, real Gross Domestic Product is obtained from Federal Reserve Economic Data (FRED) of St. Louis (quarterly data in millions of seasonally adjusted chained 2012 dollars). Similarly, the Consumer Price Index is obtained from FRED, index 2012 = 100, quarterly data.
13. For similar results for the United States, and explanations of counter-cyclicalities of transfer policies in this country, see Busch *et al.* (2018, pp. 28-30).
14. The AWI was established by Law No. 13,728 in 1968 with the objective of estimating changes to the current income of permanent workers as reflected by dependency of the public and formal private sectors. The ANWI was established by Law No. 17,649 in 2003, its objective being to adjust pensions and retirements in accordance with the provisions of Article 67 of the Constitution of the *República Oriental del Uruguay*. The AWI and the ANWI differ in that the latter does not deduct the legal discounts charged to the worker.
15. The *Base de Prestaciones y Contribuciones* (BPC) is an index used to adjust taxes, income and social benefits since 2005 (Article 2 of Law No. 17.856).
16. For a good comparative analysis about these reform policies and their effects in LAC countries, see Kay (1999). This new indexing formula in Uruguay, together with the statements made by Forteza (2004) and Forteza and Ourens (2012), that one-fifth of the pensioners had not contributed to the system and added to the aging demographic structure of the country, imply imposing severe restrictions on public social spending in Uruguay. According to these authors, such expenditure increased in weight relative to gross domestic product (GDP) by 4 percentage points.

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Resumen

Este artículo analiza las fluctuaciones cíclicas de las transferencias públicas sociales monetarias, y sus diferentes componentes, en Uruguay durante el período comprendido entre 1988/Q1 y 2016/Q3. Los componentes cíclicos no observables se extraen de las series temporales observables utilizando diferentes estrategias empíricas. Los resultados muestran que los diferentes componentes de estas transferencias son procíclicos y se encuentran rezagados respecto a las fluctuaciones macroeconómicas. Debido a ello, en lugar de contribuir a estabilizar la economía, estas transferencias han agravado el ciclo económico y, a través de sus diversas partidas de gasto, han expuesto a los grupos más vulnerables de la sociedad a condiciones económicas más adversas.

Palabras clave: transferencias sociales, ciclos económicos, detrimento, Uruguay.

Clasificación JEL: C10, E32, H50, H55.