COVID-19 in Uruguay: A survey of policy responses and their impact*

Elizabeth Bucacos, Patricia Carballo, Miguel Mello and Jorge Ponce†

Banco Central del Uruguay

September 24, 2021

Abstract

COVID-19 implied a huge shock with large economic consequences. In this paper we provide an evaluation of the impact of the social, economic and financial policy measures undertaken to ameliorate its negative consequences in Uruguay. We start by surveying the immediate impact of the shock and the main policy responses. Next, we take a threefold approach to evaluate their impact in GDP, inflation, inflation expectations, investment, consumption and firms' financing. The results show that the policy response had a significant effect on mitigating the negative impact of the pandemic.

JEL Codes: E50, E60.

Keywords: COVID-19 pandemic, policy response, impact evaluation, Uruguay.

*The opinions and views therein are of the authors and do not necessarily represent those of Banco Central del Uruguay. Authors would like to thank Agustina Affonso for excellent research assistance, David Argente and colleagues involved in the 2021 CEMLA Joint Research Project for their comments and suggestions. Part of the contain of this paper was produced during the first months of the pandemic by the team of the Research Department at Banco Central del Uruguay. We are particularly thankful to Agustina Affonso, Marcelo Álvez, Fernando Borraz, Cecilia Dassati, María Victoria Landaberry and Rodrigo Lluberas for their incredible effort during that uncertain and hard time.

†E-mails: ebucacos@bcu.gub.uy (Bucacos), pcarballo@bcu.gub.uy (Carballo), mmello@bcu.gub.uy (Mello), jponce@bcu.gub.uy (Ponce).

1 Introduction

The first cases of COVID-19 were registered in Uruguay on March 13, 2020. The Government quickly took measures to reduce both domestic and international mobility of the population; although without resorting to extreme measures such as a lockdown. These restrictions had their correlation with economic, financial, sanitary and social policy measures implemented with the aim of mitigating the negative impact of the pandemic and of the social distancing measures put in place during its first stages.

The COVID-19 shock was huge, with immediate and medium term economic consequences. In this paper, we propose an evaluation of the impact of the shock and of the policy responses undertaken during 2020 and 2021 by the Uruguayan authorities in order to ameliorate its negative effects. Particular emphasis is put on assessing the impact over economic activity, inflation and inflation expectations. In addition to that, we provide empirical estimates of the impact of the budget effort on aggregate consumption. We also exploit granular data from a monthly survey to firms in order to provide evidence on the effect of the pandemic and the policy response on their liquidity, access to credit and preference for the currency of their debt.

During the first weeks of the pandemic the level of uncertainty was large. The projection of the epidemiological models we performed alert about the need to reduce mobility and take social distancing measures. In turn, these measures harm ample sectors of vulnerable population through a sharp reduction on their income. We estimate that around 20% of the labor force, composed of independent and informal workers, were specially exposed to the negative consequences o social distancing and reduction of mobility measures. Moreover, around 49% of the formally employed population served in very and somewhat affected sectors (see Section 2.1.2). Hence, it was clear that as well as to reduce mobility was necessary in any attempt to keep the health system in a position to successfully response to the infections, it was also necessary to provide social and economic support to vulnerable populations.

After summarizing the most important social and economic policy response in Section 2.2, we assess their impact on households' consumption (see Section 3.3). More precisely, we take an aggregate approach and estimate a vector error-correction model were households' consumption is explained by the budget effort and financial conditions. The fiscal measures implemented by the Uruguayan government in response to the pandemic are aggregated in the COVID-19 Fund, a separated account on fiscal accountability. Regarding financial conditions, we find that during the COVID-19 pandemic quantity variables (e.g. new loans to firms) gain importance over the price factor that was the only significant before the pandemic starts. Overall, we find that per-capita welfare losses would have been 0.7 percent higher during the first quarter of 2021 and 1.9 percent higher in the second quarter had not public help been implemented.

With the aim of projecting the impact of the COVID-19 shock in activity, we developed a series of high-frequency indicators, short-run projection models and growth-at-risk models (see Sections 2.1.3 to 2.1.5). The results of these projections were pretty precise and they got confirmed afterwards by official data. Financial policy measures in response to the shock include an expansionary monetary policy stance, several measures to facilitate credit restructuring, extend maturity, grace periods and other flexibility to help financial institutions to monitor credit and support those viable firms that were affected by the pandemic. Among these policies, the government extended an existing public credit guarantee scheme in order to facilitate credit provision to small and medium enterprises and avoid a potential credit crunch. See Section 2.2.2.

We take a twofold approach in order to assess the impact of these policies. First, from an aggregated point of view we use a macroeconomic projection model to assess the impact of the expansionary monetary policy on GDP gap, inflation and inflation expectations (see Section 3.1). We also use a DSGE model to assess the impact on GDP, aggregate consumption and investment (see Section 3.2). Results show that the impact of expansionary monetary policy policy on the level of activity during 2020 is around 1.4%. Interestingly, the impact of monetary policy on year-on-year inflation rate at the end of 2020 is also estimated in 1.4%. In turn, estimates also suggest that expansionary monetary policy cushioned the fall in consumption (with an estimated impact of 0.4%) and investment (2.3%).

Second, we use granular, firms' survey data to assess the impact of monetary and regulatory measures on firms' liquidity, loans currency preferences, and access to credit (see Section 3.4). Firms' responses suggest an increase in their liquidity, an improvement in their perception of the facility to access credit, an increase (decrease) in the preference for domestic (foreign) currency denominated credit, and a reduction in the interest rate of credit in local currency. Empirical analysis confirms these results. More precisely, the preference for liquidity and credit in local currency is negatively correlated with the interest rate in local currency. This suggests that the impact of the policy measures on this variable transmits to firms' liquidity and currency preference. Moreover, the interest rate in local currency is negatively correlated with the ease to access credit, in particular bank loans. This results also holds if we consider the expected ease to access credit for the next three months.

Overall, our evaluation of the impact of the policies in responses to COVID-19 in Uruguay shows that they have a significant effect on mitigating the negative effect of the pandemic.

The paper is structured as follows. In the next section we survey the immediate impact and policy responses to COVID-19 in Uruguay. This section presents a brief description of the real-time projections performed during the first week of the pandemic, which alerted about the magnitude of the shock and justify a rapid response. The focus

on the description of the policy reaction is on economic and financial measures. Section 3 presents the methodologies and main results of the impact evaluation exercises. Section 4 ends with final remarks. Tables and other material is in the Appendix.

2 COVID-19: Immediate impact and policy responses

Uruguay declared a health emergency in March 13, 2020. That day the first cases of COVID-19 in Uruguay were reported. The Government quickly took measures to reduce both domestic and international mobility of the population, but without resorting to extreme measures such as a lockdown. At the same time, other sanitary and non-sanitary measures were put in place to mitigate the negative effects of the pandemic. Health measures aimed to reduce infections, increase the capacity of the health system and included the vaccination of a large proportion of the population. Both the pandemic itself and some of the measures to reduce its propagation had a negative, immediate impact on large part of the population and economic sectors. With the objective of supporting the affected households and economic sectors, several measures were taken to support the labour market, provide liquidity through expansionary monetary policy, foster credit through regulatory forbearance and public credit guarantees, and subsidize the most affected families and economic sectors.

Tables A.1 and A.2 in the Appendix present a detailed list of the health, social and economic measures implemented to mitigate the negative impact of the COVID-19 in Uruguay.[1] In this section we first present an overview of the immediate impact of COVID-19 in Uruguay. For so doing, we will describe some of the real-time monitoring tools we developed and use during the first week of March 2020 to evaluate the likely impact of the shock and forecast its consequences. This analysis, together with that from others, helped to inform decision making in a stress situation. A description of the key policy responses are in the second part of this section.

2.1 Immediate impact: real-time monitoring and projection

2.1.1 Epidemiological models

Once the virus was detected in Uruguay, one of the main questions was about the spread of the virus, its velocity and its capacity to saturate the health system. For this purpose, we estimate SIR (Susceptible, Infected, Recovered) and SEIR (Susceptible, Exposed, Infected, Recovered) models.[2] It was relevant to incorporate the characteristics

[1] See also Chapter 4 of the 2020 Statement of the Government to Congress for a detailed summary of the policy response to the COVID-19 health emergency: https://www.gub.uy/ministerio-economia-finanzas/sites/ministerio-economia-finanzas/files/documentos/publicaciones/Exposición de motivos.pdf.

[2] We are specially thankful to María Victoria Landaberry for her work with these models.

of the country, particularly the high coverage of the health system, into the models. Using different calibrations for the epidemiological models, we produce estimates of the spread of COVID-19 in Uruguay to obtain projections of the velocity of contagion and assess the capacity of the health system to cope with the disease. The projections alerted about the need of reduce mobility and take social distancing measures.

2.1.2 Vulnerable populations

Social distancing and reduction of mobility measures were necessary in any attempt to keep the health system in a position to successfully response to the infections. These measures came with another immediate, negative consequence: vulnerable households and independent workers were deeply affected by a reduction in their income.

Table 1: Work formality
(% of total, 2018)

	Dependent	Independent
Formal	55	15
Informal	11	19

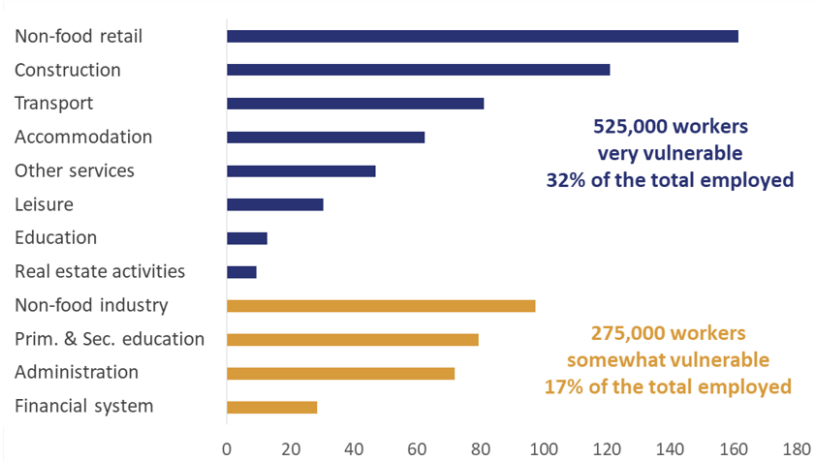
Source: BCU based on ECH and INE

The first set of government measures in support of affected workers were announced on March 19, 2020. However, they reached basically dependent and formal workers. At this moment, our team worked on data from the continuum survey to households (Encuesta Continua de Hogares - ECH) to estimate those households that being vulnerable were not covered with the measures.[3] Table 1 shows that around 20% of the labor force is composed by independent workers in the informal sector. This segment of the labor force was specially exposed to the negative consequences of social distancing and reduction of mobility and was supported by special packages of measures by the government. As we will see in Section 3.3, these measures had a significant, positive impact in aggregate consumption.

Another look at the immediate impact of the COVID-19 on employment and income comes from assessing the population whose employment may be affected by the emergency situation. The vulnerability of a working position is identified according to two possible causes: i) teleworking is not easily applicable in its sector of activity, and ii) the production of the sector of activity may suffer from social distance measures. As a result of the analysis, approximately 800 thousand workers (49% of the employed population) were identified to have labor ties of medium or high vulnerability (see Figure 1).

[3]We are specially thankful to Marcelo Álvez, Fernando Borraz y Rodrigo Lluberas for their work in this assessment.

Figure 1: Vulnerable workers by activity sector
(thousands of people)



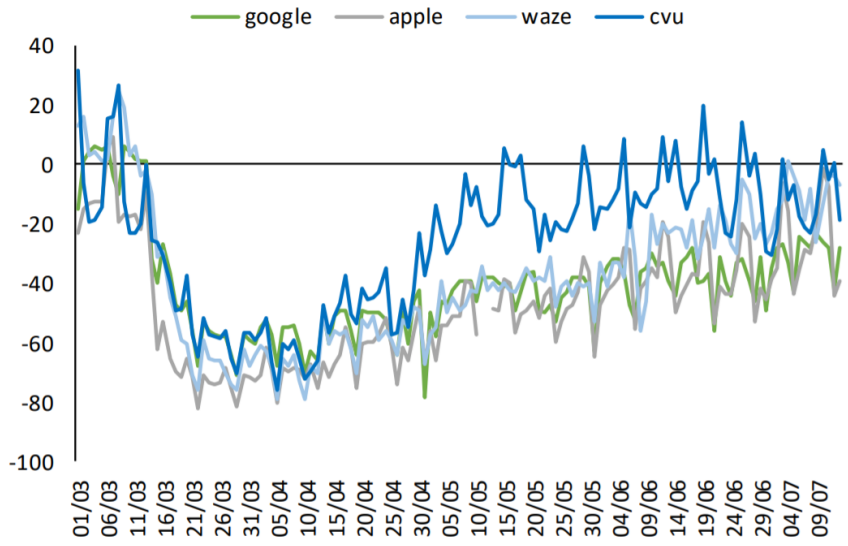
Source: BCU based on ECH

2.1.3 High-frequency indicators

In order to have a real-time picture of the impact of COVID-19 and the measures undertaken to mitigate its negative effects on activity, we developed a series of monitoring tools using high-frequency indicators.

To start with, mobility indicators came from sources like Google, Apple and Waze, but also from Corporación Vial del Uruguay (CVU), the consortium managing tolls in the country. Figure 2 shows these indicators. Interestingly, mobility in national routes recovered before other measures as a result of the decision that some economic sectors, like 'Construction', would return to work by the end of April, 2020.

Figure 2: Mobility indicators



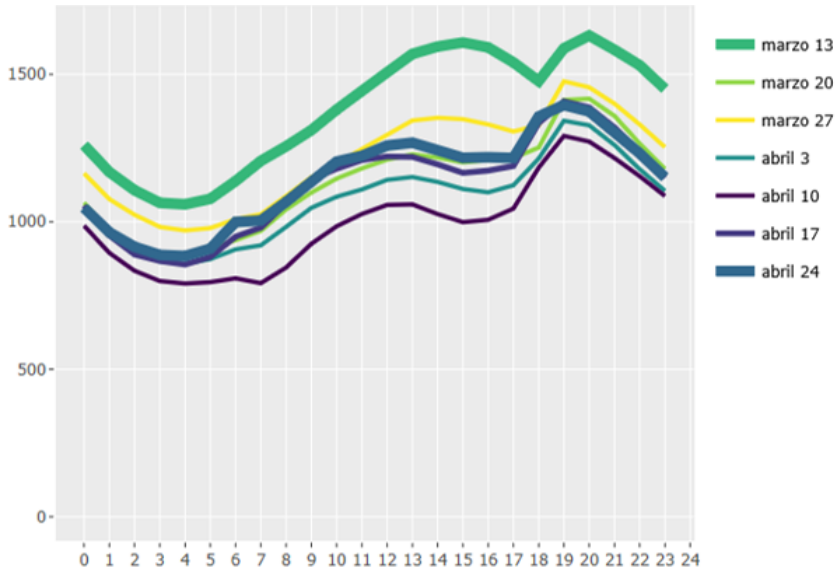
Source: Government budget document

One of the main concerns when the first cases were detected in Uruguay was to obtain

data that would allow us to monitor and project economic activity. As is well known, traditional variables are available with delay and in a context of extreme uncertainty it was essential to have data in (almost) real time. Hence, we exploit real-time data on electricity and fuel consumption.[4]

Figure 3 presents the electric power demand as an hourly average on Friday of every week. The curve for March 13th, the day the first positive cases were reported, may be considered the benchmark. The message is clear in the sense of the big fall in electricity consumption in the following weeks. The fall is deeper in the afternoon, when most commercial activity usually takes place, and shallower during the nights, when most people is at home.

Figure 3: Electric power demand
(MV, hourly average on Friday of every week)

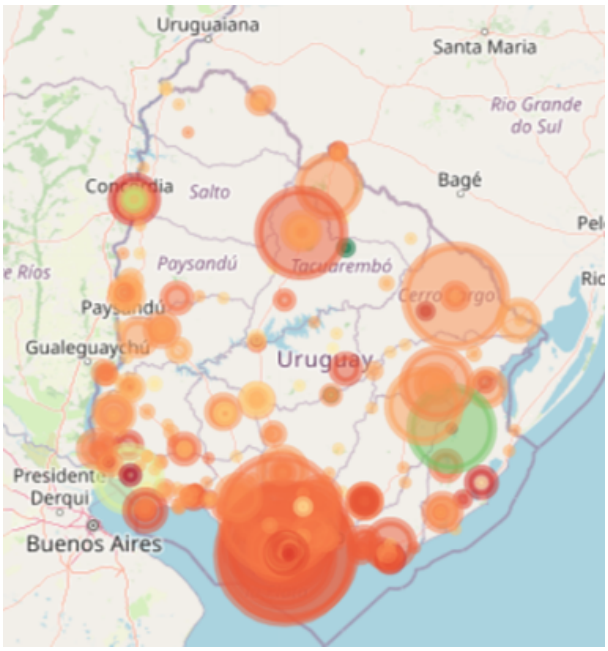


Source: BCU based on ADME

Regarding fuel consumption, we also observe an enormous fall during the first week of the pandemic. Figure 4 shows the massive fall in the sale of diesel, in particular in the area of Montevideo as a consequence of the reduction in mobility. The reduction in the demand of gasoline was even larger and more persistent. Diesel is mainly used in trucks, buses and machinery that recovered activity before general mobility, for which gasoline is mainly used in particular cars.

[4]We thank Pablo Picardo for his work on these indicators.

Figure 4: Sale of diesel
(Variation with respect to the same period of 2019)



Source: BCU based on ANCAP

The use of geo-located fuel sales outperforms other mobility indicators (e.g. Google mobility) to forecast activity. For instance, looking at the sales of diesel by regions allows us to anticipate the impact of the pandemic in different productive activities. For example, in the period of reduced mobility, there was a drop in the activity associated with tourism and services which is similar to the drop in fuel sales in its region of influence, i.e. mostly the south of the country. However, in the region of rice production there is no drop in diesel sales but an increase (see the green circle to the east of the country in Figure 4). Although mobility was reduced, economic activity in that region increased because it coincides with the harvest period. This distinction was very important for our main objective, which was to forecast economic activity in real time.

2.1.4 Short-run projections

After a couple of weeks since the first positive cases, i.e. by the end of March 2020, we developed some simple projection models of economic activity. First, we estimate a three-stage estimation using as explanatory variables the demand of electricity and fuel. The model that used electricity demand projects a fall in the level of activity for March 2020 with respect to February 2020 of around 14% (see Table 2). Since in normal times the fall should be only 2%, one can infer that the immediate impact on activity was massive and in the order of 12%.

Table 2: Three-stage estimation using electricity demand

	Activity index	Variation
February – real	160,1	
(1) March – normal	156,9	-2,00%
(2) March – stressed	137,8	-13,95%

Source: BCU

Table 3 shows the result of an Ordinary Least Squares (OLS) estimation in differences of the variation in the activity index taking the demand of electricity, diesel and gasoline as explanatory variables. The results confirmed the previous figures with falls in activity of around 10% for March and 17% for April.

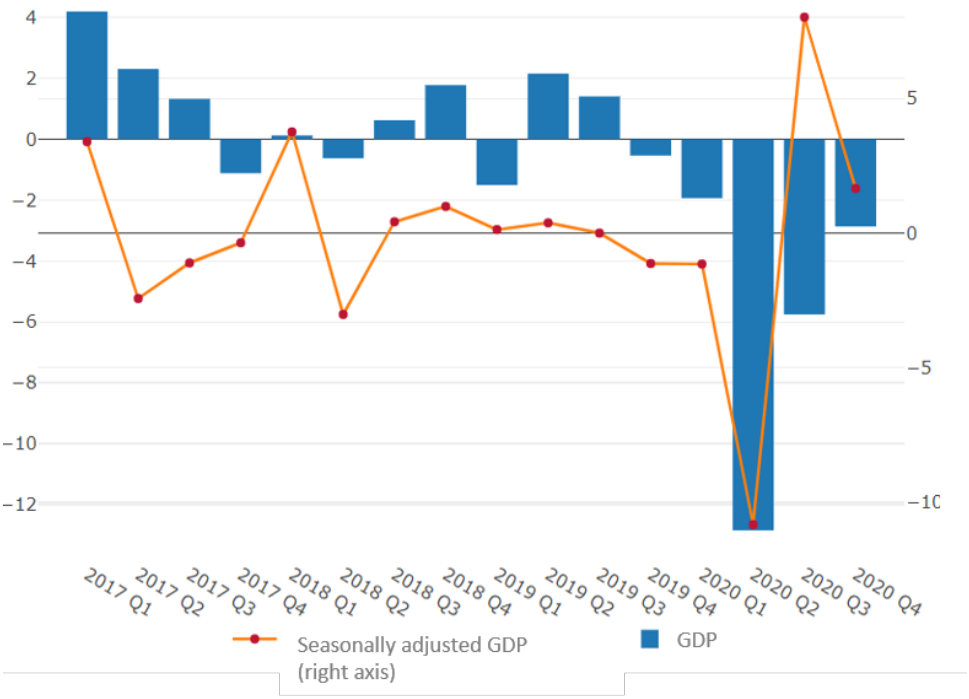
Table 3: OLS in differences model of the variation in the activity index, taking as explanatory variables electricity demand, diesel and gasoline sales

	Variation in Activity
March – respect to fitted	-10,03%
April – respect to fitted	-16,87%

Source: BCU

Once the official figures of GDP growth were released around six month later, we were able to confirm the precision of our projections: GDP fell around 13% in the second quarter 2020 (see Figure 5).

Figure 5: Variation in GDP
(%)



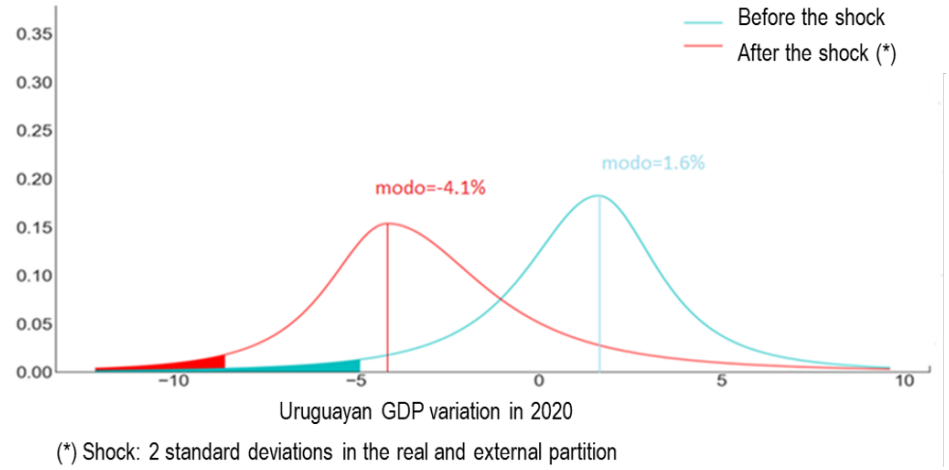
Source: BCU

2.1.5 Growth-at-Risk model

In Landaberry et al. (2021) the Growth-at-Risk (GAR) methodology of the International Monetary Fund (Prasad et al., 2019), is applied to the Uruguayan case. Variables from the external, financial and real sectors are used to project the distribution function of GDP. The variables considered in each sector are the same that are used in the construction of the financial instability index (see Landaberry, 2015, 2017). The methodology also allows to simulate shocks on the variables, which reflect the risk scenarios, and to observe the changes in the distribution with respect to the baseline scenario.

The density of Uruguay's GDP growth for 2020 before and after the shock is presented in Figure 6. The baseline scenario for GDP growth in 2020 incorporated the information from the indicators as of March 2020. In this scenario, the probability that the economy would contract was 29%, and there was a 10% probability that the contraction would be greater than or equal to -2.6% and a 5% probability that the contraction would be greater than or equal to -4.9% (Table 4).

Figure 6: Density of the variation in GDP - Uruguay 2020



Source: Landaberry et al. (2021)

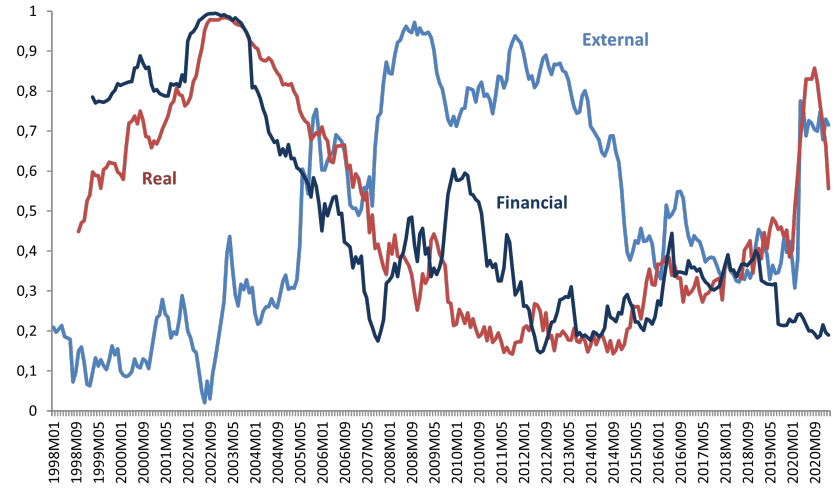
Table 4: Projections of the variation in GDP in the base and in the COVID-19 scenario

	Base scenario	COVID-19 scenario
GAR 5%	-4.9	-8.6
GAR 10%	-2.6	-6.9
Prob. of contraction	29%	83%
Mode	1.6	-4.1

Source: Landaberry et al. (2021)

The COVID-19 scenario is defined as a shock to the external and real sector of 2 standard deviations. The choice to affect these partitions, as well as the magnitude of the impact, arise from the result obtained in the financial instability indicator. According to these results, the COVID-19 shock materialized as an external and real shock, while the financial sector indicator remained at levels similar to those observed before the shock (see Figure 7). In turn, the shock in the real and external sectors observed with data as of March is similar to a shock of two standard deviations of the corresponding indices.

Figure 7: Financial instability indicators



Source: Landaberry (2015) and Landaberry (2017)

In the COVID-19 scenario, a strong shift to the left of the growth probability distribution for 2020 is observed. In this case, there was a probability of 10% that the contraction is greater than or equal to -6.9% and a probability of 5% that the contraction was greater than or equal to -8.6%. The most probable value in this scenario (mode) was -4.1%. Several month after, when the official figures of GDP for 2020 were published, we were able to confirm the accuracy of these projections: GDP growth in 2020 was -5.9%.

2.2 Policy responses

The policy response to the COVID-19 has its core in health measures. In the first place, via restrictions that seek to reduce infections. These are measures mainly focused on reduction of mobility and requests to minimize social meetings. Second, a set of measures aimed at increasing the capacity of the health system, mainly by increasing hospital and ICU places, but also by defining protocols regarding the presence of care for non-priority pathologies. The primary aim of this response was to avoid saturation of hospitals in the event of a wave of infections. Third, vaccination. Table A.1 in the Appendix presents an overview of the health measures.

In this section we will focus on providing an overview of social, economic, monetary and regulatory responses that were put in place to mitigate the negative, immediate impacts that we described previously. Then, in the next section we will evaluate the impact of these measures on key economic and financial variables.

2.2.1 Social and economic measures

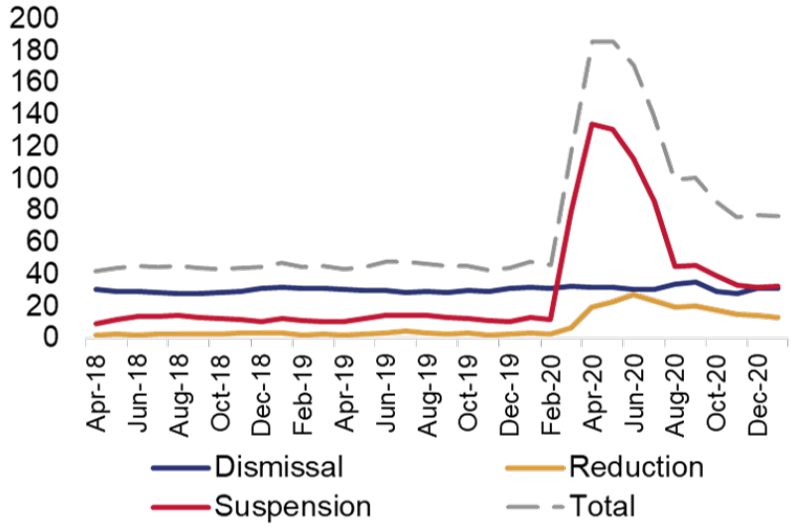
The economic policy response seeks to reduce the impact on general and sectoral economic activity caused by the restrictions on mobility. These economic measures were

taken in a complex scenario, with very weak GDP growth since 2015, a compromised fiscal framework (i.e. a public deficit-to-GDP ratio of 5%), a growing public debt-to-GDP ratio (67% in 2019), and an inflation rate above the inflation target range (8.79% in 2019) with inflationary expectations anchored above the upper bound of the target range (of 7%).

Social and economic policy response focused on the labor market by extending the regular unemployment subsidy and giving monetary aid to those who are not covered by the formal social security network. We also document the sectoral measures carried out in order to protect the firms harmed by the reduction in mobility, mainly in transport, tourism, services and commerce. Table A.2 in the Appendix presents a detailed description of the policy measures.

The old Uruguayan tradition of comprehensive social spending within the welfare state has knitted a thick social fabric whose links have been used by economic institutions to implement the policy relief. Automatic stabilizers, like unemployment subsidies and illness leaves, have been improved (see Figure 8) and together with reinforced monetary subsidies, e.g. through Tarjeta Uruguay Social (TUS, a mobile phone application through which beneficiaries receive the subsidy) and Asignaciones Familiares, public health care, and soft credits have been the main instruments for policy implementation. All those policies have a common underlying component: to fight the negative economic effects of the pandemia.

Figure 8: Beneficiaries of unemployment insurance
(thousands of people)



Source: BCU based on BPS

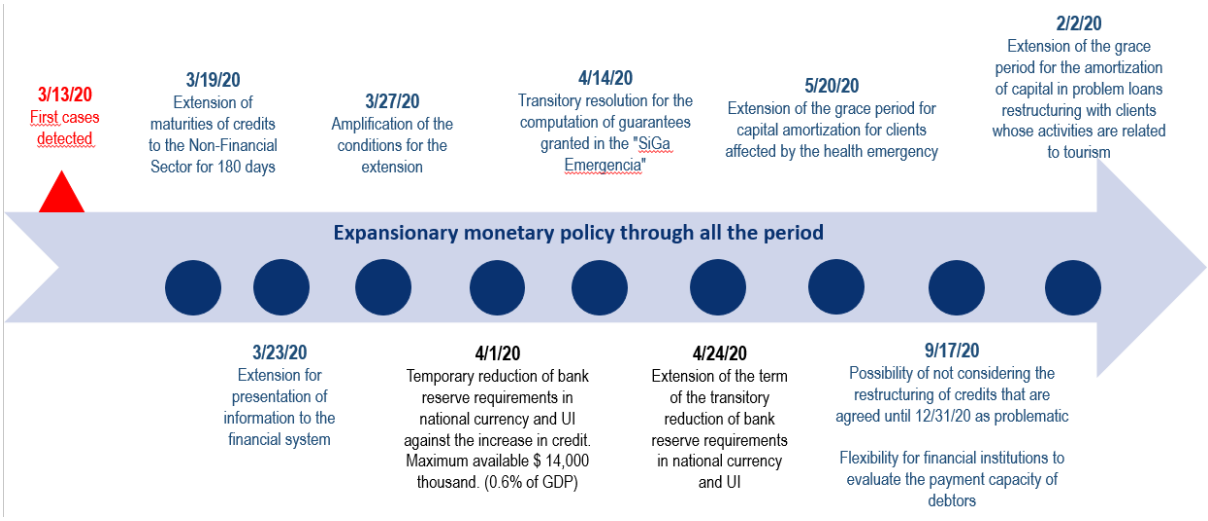
In Section 3.3 we assess the impact of these measures, which are summarized in the budget effort exerted during the pandemic, on households' consumption.

2.2.2 Financial measures

Banco Central del Uruguay and the fiscal authority undertake a series of financial measures aimed to secure the payment chain, provide liquidity and foster credit in order to help to keep the economy's engine functioning.

Figure 9 describes the monetary and regulatory measures implemented by Banco Central del Uruguay.[5] Given the huge impact on economic activity and the need of provide liquidity to business, monetary policy takes and expansionary stance immediately after the first positive cases of COVID-19 were confirmed. In addition to that, a series of actions support credit provision, particularly in domestic currency. There were temporary reductions in reserve requirements that were linked to the credit growth of financial institutions. In addition to that, the financial supervisor implement several measures to facilitate credit restructuring, extend maturity, grace periods and other flexibility to help financial institutions to monitor credit and support those viable firms that were affected by the pandemic.

Figure 9: Monetary and regulatory measures



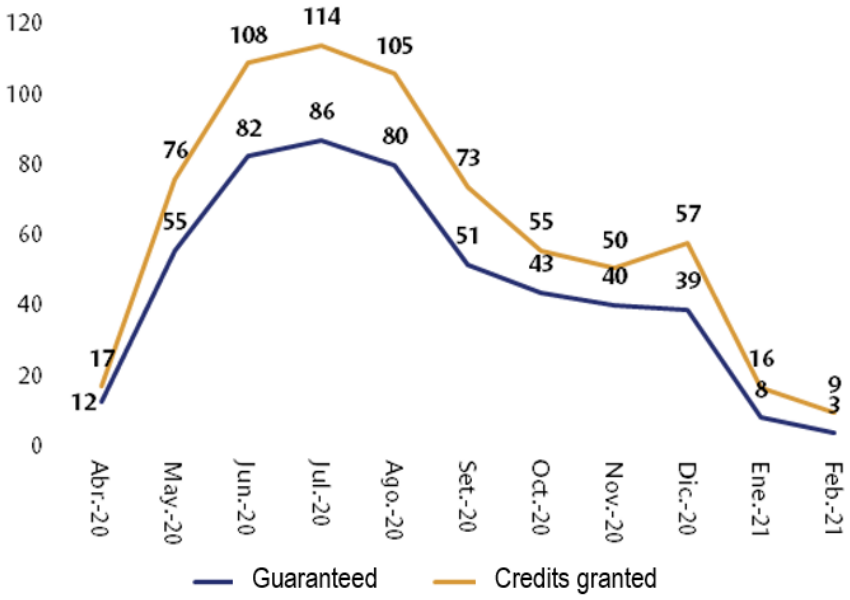
Source: BCU

The government extended an existing public credit guarantee scheme in order to facilitate credit provision to small and medium enterprises (SMEs) and avoid a potential credit crunch. Credit granted using the scheme reached a total of USD 780 million, which on average represented almost 13% of total monthly credit granted to SMEs. At its peak in August 2020, 27% of credit to SMEs was backed with this public guarantee scheme. Figure 10 shows the monthly evolution of credit granted and the related guarantee, which on average represents a 80% coverage rate.

In Sections 3.1 and 3.2 we evaluate the impact of monetary policy measures on the GDP gap, inflation, inflation expectations, aggregate consumption and investment. In

[5]For a detailed description of the policy measures implemented in response to COVID-19 please visit https://www.bcu.gub.uy/Comunicaciones/BCU-Abril-2020/Paginas/Default.aspx.

Figure 10: Credits granted with a public credit guarantee
(millions of dollars)



Source: SiGa Emergencia

Section 3.4 we assess the impact of financial measures, in particular public guarantees and supervisory flexibility measures, on the financial situation of firms.

3 Impact evaluation

In the previous section we provide estimates of the immediate impact of the emergence of COVID-19 in Uruguay. We also overview some of the key policy responses undertaken to mitigate the negative effects of the pandemic. In this section we assess the impact of these policy actions. We take a threefold approach. First, we use a macroeconomic projection model to assess the impact of the expansionary monetary policy on GDP gap, inflation and inflation expectations. We also use a DSGE model to assess the impact on GDP, aggregate consumption and investment. Second, we use a vector error-correction model to assess the impact of the fiscal measures implemented by the government on private consumption. Third, we use firms' survey data to assess the impact of monetary and regulatory measures on firms' liquidity, loans currency preferences, and access to credit.

3.1 Macroeconomic projection model

3.1.1 The model

The Macroeconomic Projection Model (MPM) is a semi-structural New Keynesian model (Carballo et al., 2015; Carballo, 2021). The economy operates in monopolistic

competition and there are price rigidities. The model is semi-structural in the sense that the equations have a clear economic interpretation, although it is not micro-founded. It is a stochastic general equilibrium model, with rational expectations. The model is defined in gaps, so it operates based on cyclical oscillations of output, real exchange rate, and real interest rate around their long-term trends. As these long-term trends are unobservable variables, we use estimates derived from the application of a multivariate Kalman filter. In turn, the growth rates of the long-term trends converge to an exogenous steady state that is associated with the long run.

The MPM model consists of six behavioral equations that represent aggregate demand, aggregate supply for tradables and non tradables, the formation of expectations of the private sector, the uncovered interest rate parity condition and the monetary policy rule respectively:

$$\hat{y}_t = \beta_1 \hat{y}_{t-1} + \beta_2 \hat{r}_t + \beta_3 \hat{z}_t + \beta_4 \hat{y}_t^* + \varepsilon_t^{\hat{y}}, \tag{1}$$

$$Exp_t = \gamma Exp_{t-1} + (1-\gamma)[\psi \pi_{t+1}^{YoY} + (1-\psi)\pi_{t+1}^{T}] + \varepsilon_t^{Exp}, \tag{2}$$

$$\pi_t^{ntx} = \alpha_1 \pi_{t-1}^{ntx} + (1-\alpha_1)\pi_{t+1}^{e,ntx} + \alpha_2 \hat{y}_t + \alpha_3 \hat{z}_t^{ntx} + \beta_4 \hat{y}_t^* + \varepsilon_t^{\pi^{ntx}}, \tag{3}$$

$$\pi_t^{tx} = \alpha_4 \pi_{t-1}^{tx} + (1-\alpha_4)\pi_{t+1}^{e,tx} + \alpha_5 \hat{y}_t + \alpha_6 \hat{z}_t^{tx} + \alpha_7(\hat{z}_t - \hat{z}_{t-4}) + \varepsilon_t^{\pi^{tx}}, \tag{4}$$

$$s_t = \theta_1 E_t s_{t+1} + (1-\theta_1)(s_{t-1} + \frac{2}{4}(\pi_t - \pi_t^* + \Delta \bar{z}_t)) + (i_t^* + \varrho_t - i_t) + \varepsilon_t^s, \tag{5}$$

$$i_t = \rho_i i_{t-1} + (1-\rho_i)[\bar{i}_t + \alpha_\pi \frac{(\pi_t - \pi_t^T) + (\pi_{t+1} - \pi_{t+1}^T)}{2} + \alpha_y \hat{y}_t] + \varepsilon_t^i, \tag{6}$$

where $\hat{y}_t, \hat{r}_t, \hat{z}_t, \hat{y}_t^*$ represent the deviations of output, real interest rate, real exchange rate, and foreign output from their respective non-inflationary (natural) levels, Exp_t stands for the expectations of the private sector (six months ahead), π_t^{ntx}, π_t^{tx} represent non-tradables and tradables inflation, $(\hat{z}_t - \hat{z}_{t-4})$ captures the direct effect of international inflation, s_t is the nominal exchange rate, $\Delta \bar{z}_t$ represent changes in the trend real exchange rate and i_t is the nominal interest rate. Structural shocks are denoted by ε. All variables are in logs, except for interest rates.

Equation 1 represents aggregate demand. Monetary conditions are captured by the two principal channels of transmission of monetary policy, via interest rate movements that generate an intertemporal substitution of consumption and affect investment, and through real exchange rate from the substitution between domestic and imported goods. The behavior of external product has an impact on exports and thus on economic activity.

Inflationary dynamics are inspired by the New-Keynesian Phillips curve. In this conceptual framework, inflation is a prospective process derived from profit maximization of firms operating under monopolistic competition and price rigidities. Thus, inflation depends on the percentage deviation of real marginal cost (averaged across firms) from its steady state level and expected future inflation. So, expectations play a central role in price formation in these models, via the assumption of rational expectations. However, numerous empirical papers have documented significant departures from the rational expectations assumption under full information in the short run.

In the MPM these features are introduced by an equation for the formation of private sector inflation expectations. For this purpose, we use data from the expectations survey conducted by the BCU among local analysts. Following Branch (2004), private sector expectations are considered to adjust adaptively (Equation 2). This model considers an adaptation of the predictor proposed by Branch (2004) considering a weighted average of expectations consistent with the model and the inflation target as the inflation forecast.

The non-tradable component of the CPI basket is modeled through a New-Keynesian Phillips Curve (Equation 3), where the forward-looking term is an average of expectations consistent with the model and inflation expectations from the BCU survey of professional forecasters. The persistence component represents the share of firms that have a backward-looking behavior, considering that not all firms adjust prices in t optimally, but index their prices to past inflation. Finally, a term that accounts for the degree to which cost movements affect price formation is included. As a measure of marginal costs, a proxy is incorporated that arises from the output gap and the real exchange rate gap. The output gap is the proxy for the real marginal cost of producers of domestic goods, while the real exchange rate gap is associated with the use of imported inputs in the production of the domestic good and the existence of dollar-denominated domestic goods.

The Phillips Curve for tradables described in Equation 4 is similar to that of non-tradables, with a greater weight of the international component. Given the nature of these goods, with a high preponderance of imported goods and export commodities, a greater impact of international prices on price formation is to be expected. For this reason, in this case the marginal cost depends mostly on the relative price gap of tradables and, to a lesser extent, on the output gap. The introduction of price rigidities allows reflecting the existence of non-competitive market structures that result in failures of the law of one price, in the case of imported goods, and special conditions of access to international markets in the case of export commodities (see Basal et al., 2016).

Exchange rate formation is based on the uncovered interest rate parity (Equation 5), where the expected depreciation is equal to the differential between the domestic and international rates, plus a premium for country risk. In this framework, the exchange rate tends to increase if there are positive depreciation expectations, if there is a gap between

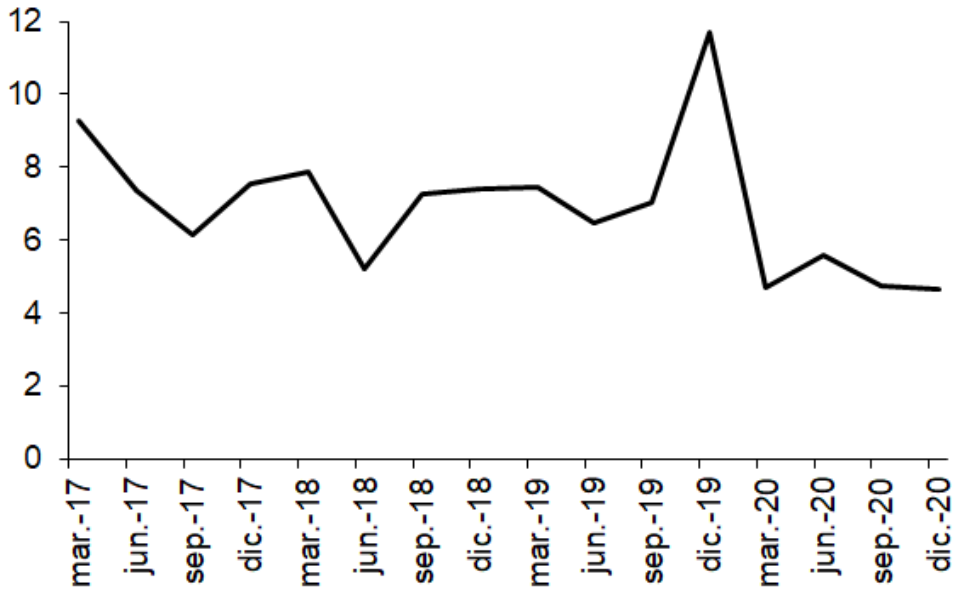
domestic interest rate and international interest rate, and if there is an increase in the risk premium. Likewise, formation of exchange rate expectations arises as a weighted average of agents who have rational expectations and agents whose expectations are formed from the observed value of the spot exchange rate in $t-1$ and the deviation of long-term domestic inflation with respect to international inflation, adjusted by the equilibrium real depreciation rate.

Monetary Authority's reaction function is represented by a Taylor-type monetary policy rule (Equation 6), according to which the interest rate reacts to deviations in the inflation rate in t and $t+1$ with respect to the inflation target and the activity gap with respect to its trend level. Likewise, an inertia term is incorporated to characterize the behavior of the interest rate and a monetary shock or surprise term is included to capture potential deviations from the monetary policy rule.

3.1.2 Main results

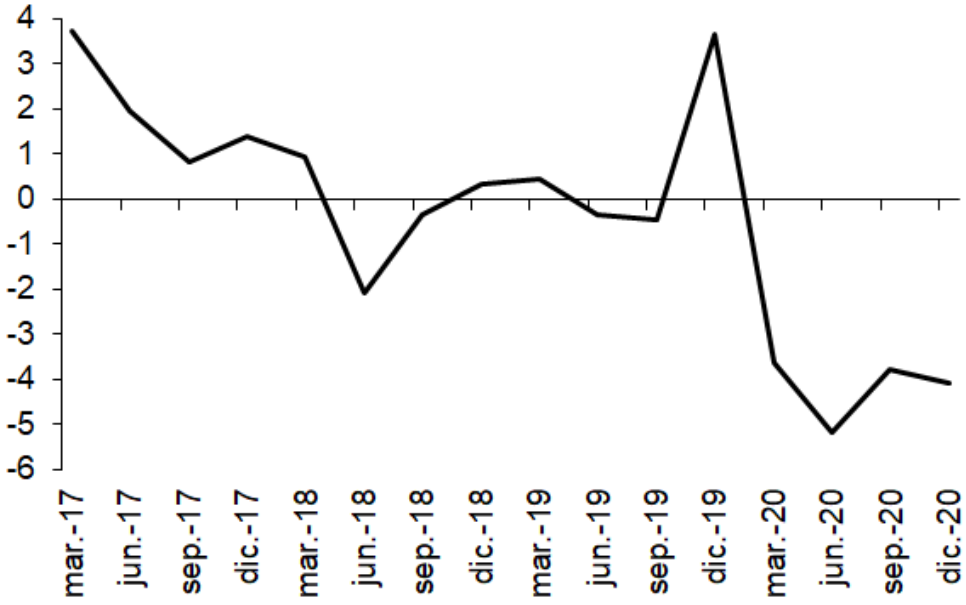
During 2020 Uruguay implemented an expansionary monetary policy focused on easing monetary conditions that did not imply a restriction for economic activity in the face of the pandemic. This implied a sharp fall in real interest rates, which cushioned the fall in economic activity and generated a further increase in inflation (Figures 11 and 12).

Figure 11: Short term interest rate - percentage points



Source: Authors' calculations.

Figure 12: Real interest rate - percentage points



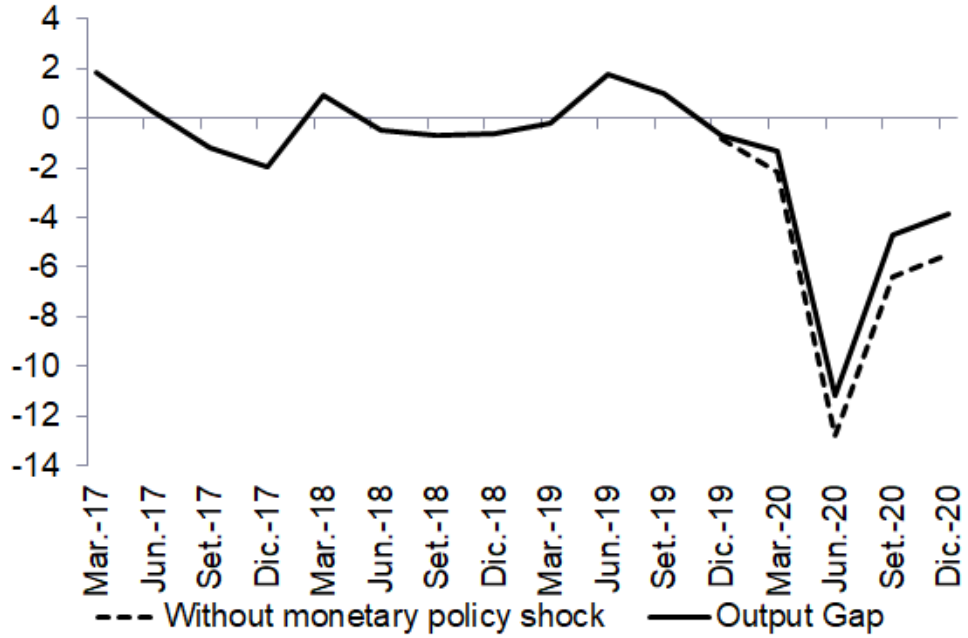
Source: Authors' calculations.

Historical decomposition is used to quantify the impact of shocks on the evolution of variables of interest. This tool facilitates the explanation of the observed phenomena and the transmission mechanisms through which shocks propagate to the rest of the economy. It allows to decompose the deviation of each endogenous variable from its steady state into the effect of initial conditions (deviation from the steady state in period 0) and the sum of all contributions of shocks in the model for the rest of the periods. The state space representation allows the use of the Kalman filter to estimate the unobservable variables, and in particular the structural shocks. In this way, it is possible to reconstruct the evolution of each of the observable variables of the model from the contribution of each shock. Table 11 in the Appendix presents the classification of shocks used for analytical purposes.

Impact on output gap

Figure 13 shows the evolution of output gap during 2020. As can be seen, economic activity tended to deviate sharply from its trend level towards the second quarter and to recover in the second half of the year. However, had the monetary policy measures not been implemented, the contraction in output would have been higher.

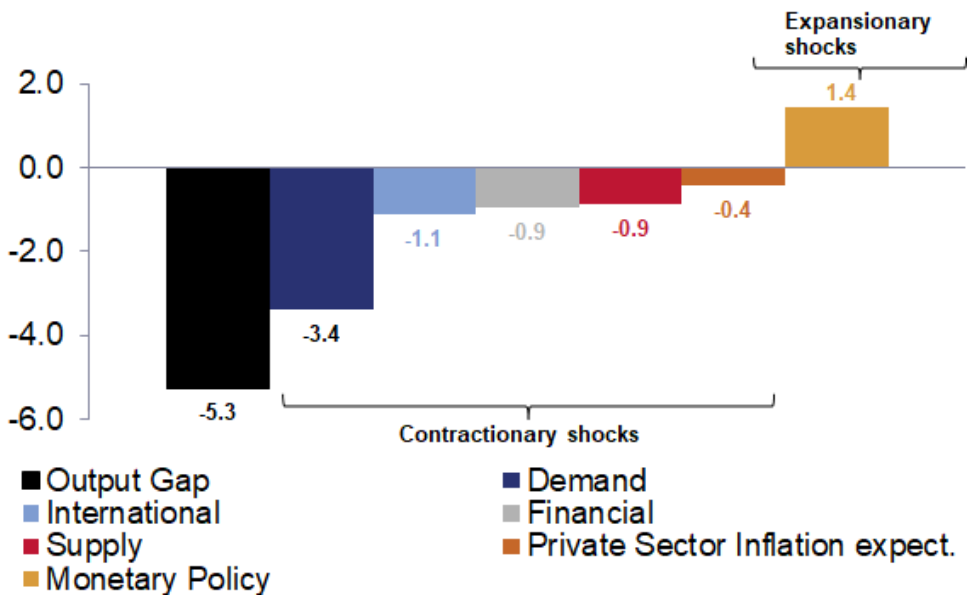
Figure 13: Output gap 2020



Source: Authors'calculations.

Figure 14 presents the contributions of shocks to explain the output gap in 2020. The impact of monetary policy shocks on the level of activity is estimated in 1.4%. The remaining shocks were contractionary during 2020, with a greater share of those associated with the behavior of aggregate demand. International contractionary impulses came from external demand and international deflation. Financial variables were contractionary, mainly through shocks on financing premiums. Cost-push shocks and private sector inflation expectations shocks affected economic activity in a contractionary manner.

Figure 14: Historical decomposition - output gap, average 2020

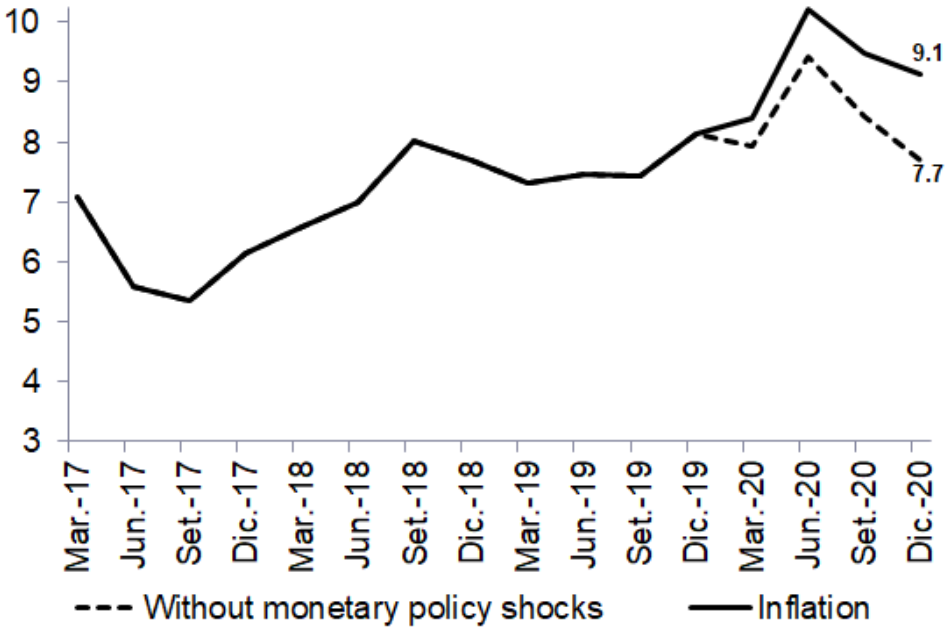


Source: Authors'calculations.

Impact on inflation

Figure 15 shows the evolution of the the year-on-year inflation rate during 2020 and the inflationary path in the absence of monetary policy shocks.

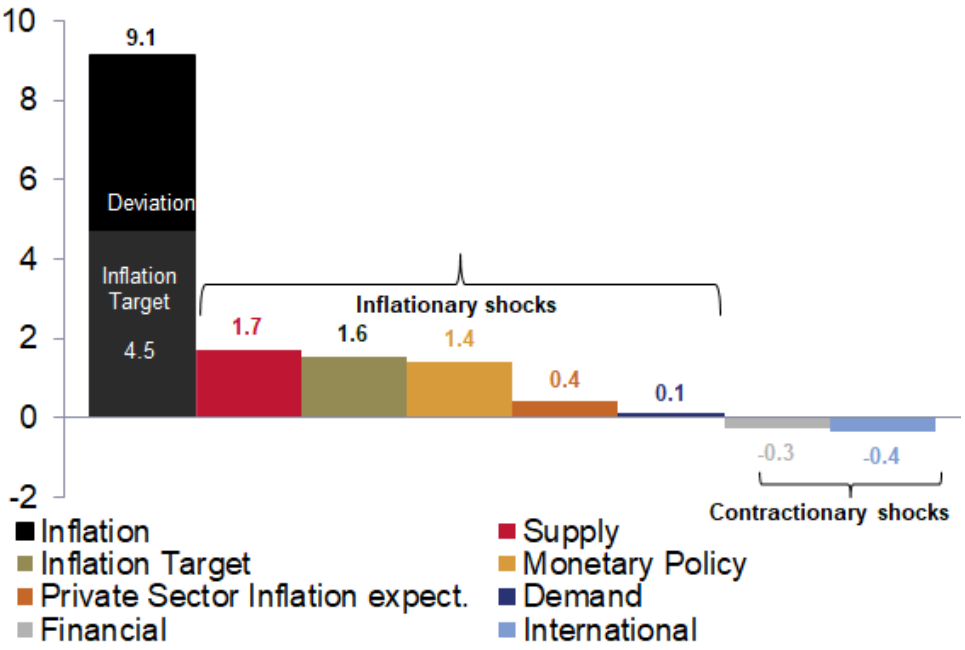
Figure 15: YoY Inflation rate



Source: Authors'calculations.

The historical decomposition shows an impact of monetary policy of 1.4% on the year-on-year inflation rate at the end of 2020. Shocks to inflation target were also significant as another form of easing monetary conditions. Likewise, the model identifies an inflationary impact of cost-push shocks and private sector inflation expectations disturbances during 2020. Disinflationary impulses came from international deflation and exchange rate shocks.

Figure 16: Historical decomposition - inflation rate, 2020 fourth quarter

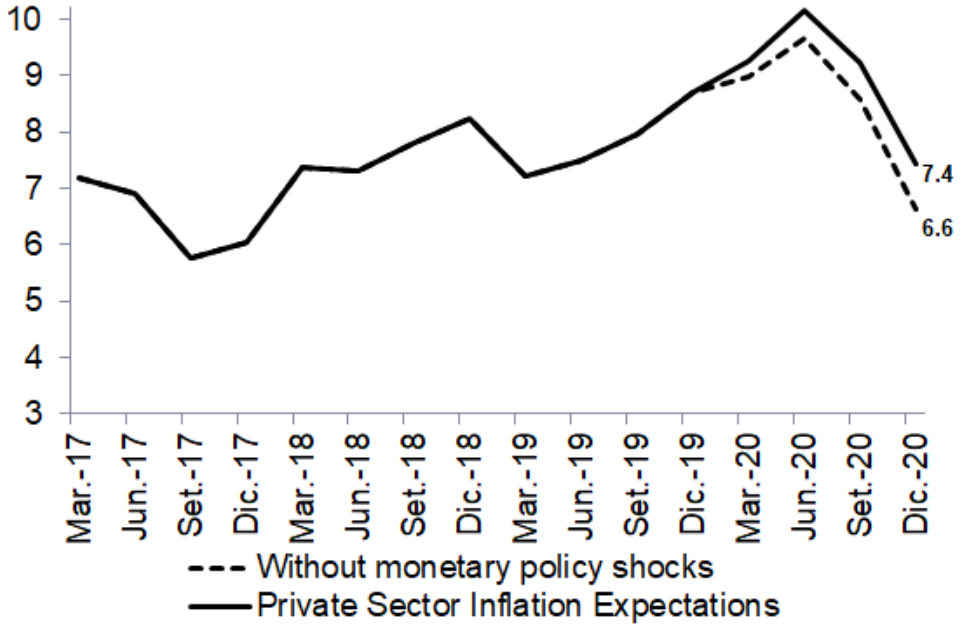


Source: Authors'calculations.

Impact on inflation expectations

Inflation expectations also reacted during the shock. Figure 23 shows the evolution of inflation expectations during 2020 and its path in the absence of monetary policy shocks.

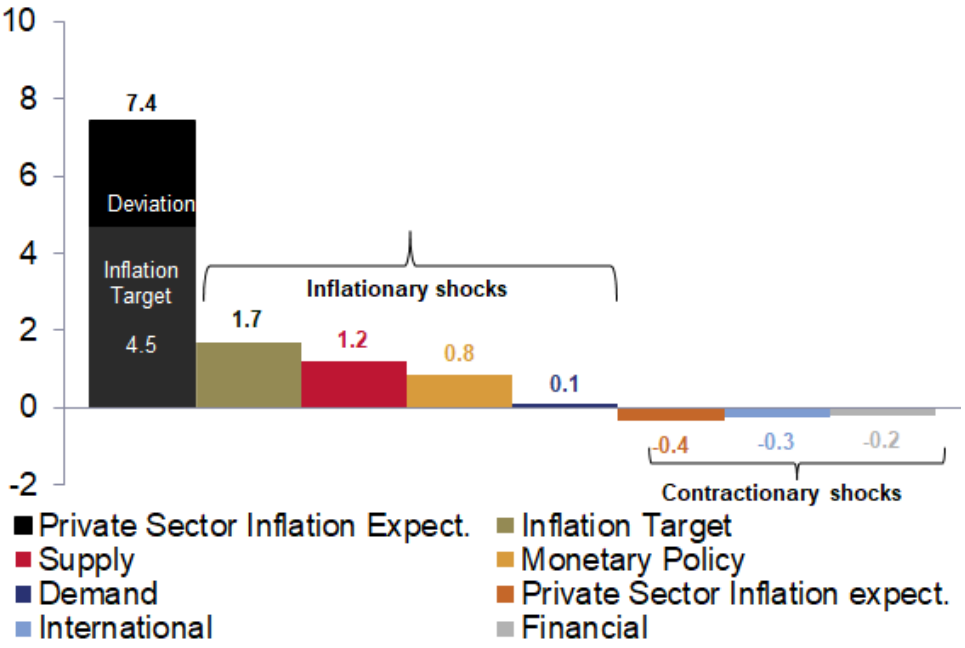
Figure 17: YoY Private sector inflation expectations six months ahead



Source: Authors'calculations.

Figure 18 shows how the value of expectations for the last quarter of 2020 is explained by the model shocks. In 2020Q4 professional forecasters expected an inflation rate of 7.5% six months ahead, 3 percentage points above the inflation target. Of this deviation, 2 percentage points are explained by the gradual convergence to the long-term inflation target and 1 percentage point by the expansionary monetary policy. These two factors explain almost all the deviation of inflation expectations from the target. The inflationary effect of cost-push shocks would have been offset by the contractionary effect of shocks from international deflation and the downward adjustment of the nominal exchange rate, country risk premium and expectations after the shock of 2020Q2.

Figure 18: Historical decomposition - inflation expectations, 2020 fourth quarter



Source: Authors'calculations.

3.2 DSGE model

3.2.1 The model

The DSGE model described in Basal et al. (2016) is a dynamic stochastic general equilibrium model derived from microeconomic fundamentals. It is a small open economy model and it incorporates imperfect financial integration reflected by the existence of a spread above the risk-free interest rate for domestic bond yields. The model incorporates nominal rigidities (Calvo pricing) in various goods and services, and price and wage indexation, trying to capture price transmission and price formation mechanisms observed in the Uruguayan economy. It also includes real rigidities, such as consumption habits and adjustment costs in investment and non-competitive market structures in some sectors. The model is fitted around a steady state which is defined as the sample average (2005-2020).

The level of economic activity is obtained as the sum of the components of the aggregate demand, which are determined by microeconomic decisions of each of the agents involved: households maximize their utility, while firms in the different sectors maximize profits. There is a domestic production sector, which combines capital and labor to produce domestic goods; a commodity sector that is almost entirely exported, which includes cellulose pulp, rice, soybean and wheat sectors; and commodities that are exported and consumed locally, which are meat and dairy products. The rest of the world produces the imported goods.

The non-tradable market (or domestic, Home) goods are the result of a two-stage

production. In the first stage, there are producers of varieties in a non-competitive market. In a second stage, there is a firm that combines these varieties to produce the domestic good. This firm is a price taker for both its inputs and the final product. The price of the domestic good in a period is composed of a fraction of firms that adjust to the optimal price and a fraction of those that index their price to previous period's domestic good inflation and steady-state domestic good inflation (Calvo pricing).

The production structure of imported goods (F) is also performed in two stages. There are importing firms that buy goods from abroad and transform them into varieties that are then purchased by a firm that combines them and produces the imported good. The introduction of price rigidities in this type of goods allows to reflect the existence of non-competitive market structures that result in failures of the law of one price.

The price of meat and dairy products also presents rigidities (Calvo pricing) with partial indexation to its past evolution and to steady state inflation. The relevant marginal cost for local pricing is their international price measured in domestic currency. This mechanism allows adjusting two divergence factors between the price of meat and dairy products in the domestic market and the price of the commodity at the international level: the conditions of access of the Uruguayan supply to different markets and the volatility of internal costs generated by climatic variations and business management of export market selection.

Regarding to households, in order to solve the optimization problem, they first maximize their expected utility, choosing how much to consume, work, save in the domestic and international market and lend to firms (taking at this stage the wage as a given), and then set their wage subject to the budget constraint and the demand for labor hours they receive from firms. In order to reflect in the model the wage rigidities found in the Uruguayan economy, a Calvo price setting mechanism with indexation is incorporated.

The nominal exchange rate is determined in the model based on the country's relationship with the rest of the world. The reference interest rate for the country has an exogenous component (the external interest rate) and an endogenous one (the risk premium) that depends on the level of indebtedness with the rest of the world measured in real terms and the expected nominal depreciation. This formulation is standard in models for small open economies.

Monetary policy in the DSGE is described by a Taylor-type rule that incorporates as determinants the deviations of the headline inflation rate with respect to the inflation target, the gap of the GDP growth rate with respect to the balanced growth path and the gap of the nominal depreciation rate with respect to its steady state value. An interest rate persistence component and a monetary shock term are also included.

3.2.2 Main results

In this section we use the historical decomposition of the DSGE model to analyze the impact of the main shocks on output, private consumption, investment and hours worked. Table 12 in the Appendix presents the classification of shocks.

Table 5 shows the historical decomposition of GDP, consumption and investment. The contraction of GDP in 2020 was the result of an adverse evolution of components of domestic demand (consumption, investment and public spending) and, to a lesser extent, aggregate supply (driven by the fall in productivity) and international variables, especially the evolution of external demand and international deflation. The MPM also identifies these drivers with incidences of similar magnitude. With respect to monetary policy, the impact on the output growth rate is estimated at 1.1% in the MPM and 0.8% in the DGSE. In the latter, the impact would have been more significant in explaining the evolution of investment than the behavior of private consumption.

Table 5: Historical decomposition - DSGE model
Annual log difference - Average 2020

	GDP	Consumption	Investment	*MPM*(GDP)
Supply	-2.8%	-0.7%	0.1%	-3.0%
Demand	-4.1%	-7.4%	-0.4%	-4.4%
Financial	-0.9%	-2.2%	-7.3%	-0.8%
International	-1.9%	0.9%	-1.3%	-1.3%
Monetary Policy	0.8%	0.4%	2.3%	1.1%
Others	-0.2%	-0.9%	1.4%	-0.2%
Average growth rate	-6.1%	-6.5%	-0.8%	-6.1%
Steady state growth rate	3.1%	3.4%	4.4%	2.5%

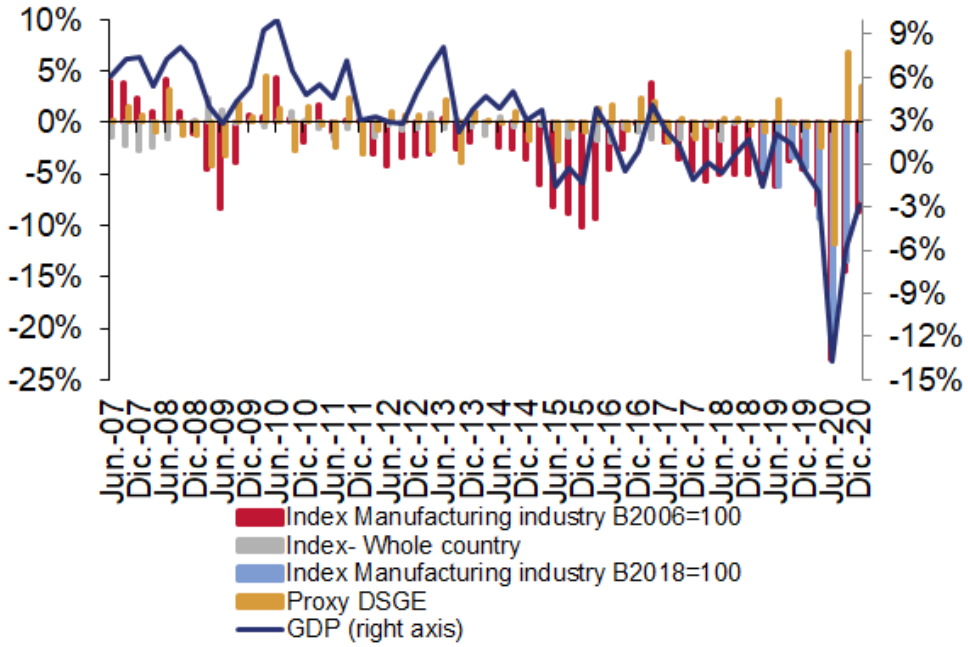
Source: Authors' calculations

During 2020, private consumption contracted by more than 6%, mainly driven by its own shocks (demand) and by shocks affecting the nominal exchange rate (financial). International variables would have had an expansive impact due to the effect of low international interest rates that more than offset the contractionary effect of international deflation. Expansionary monetary policy cushioned the fall in consumption with an estimated impact of 0.4%. Investment recorded a slight contraction (0.8%) during 2020 in a context of strong investment flows associated with the installation of a new pulp mill in the country. Shocks on financial variables (mainly the foreign exchange rate) and, to a lesser extent, those coming from international variables and it own shocks had a negative impact on investment. Monetary policy would have had a positive impact, estimated at around 2%. The category "Others" could be reflecting the impact of works associated with the new pulp mill.

Uruguay's labor market was hit by the COVID-19 pandemic and related containment measures. Labor market adjustment was processed via a sharp decline in hours worked.

Figure 19 shows the evolution of some indicators of hours worked vis-à-vis economic growth. All indexes show a contraction during 2020, specially in the first half of the year. In particular, indexes corresponding to hours worked in the manufacturing industry show an average contraction of around 13%, while the one denoted by "Proxy DSGE" declined only around 1%. This performance should be taken with caution given that the labor market in the DSGE is modeled in a very simple way, a subject that is currently under development. However, this analysis can still be a valid reference to evaluate the impact of shocks on the behavior of hours worked.

Figure 19: Hours worked and GDP - annual log difference



Source: INE data and authors'calculations.

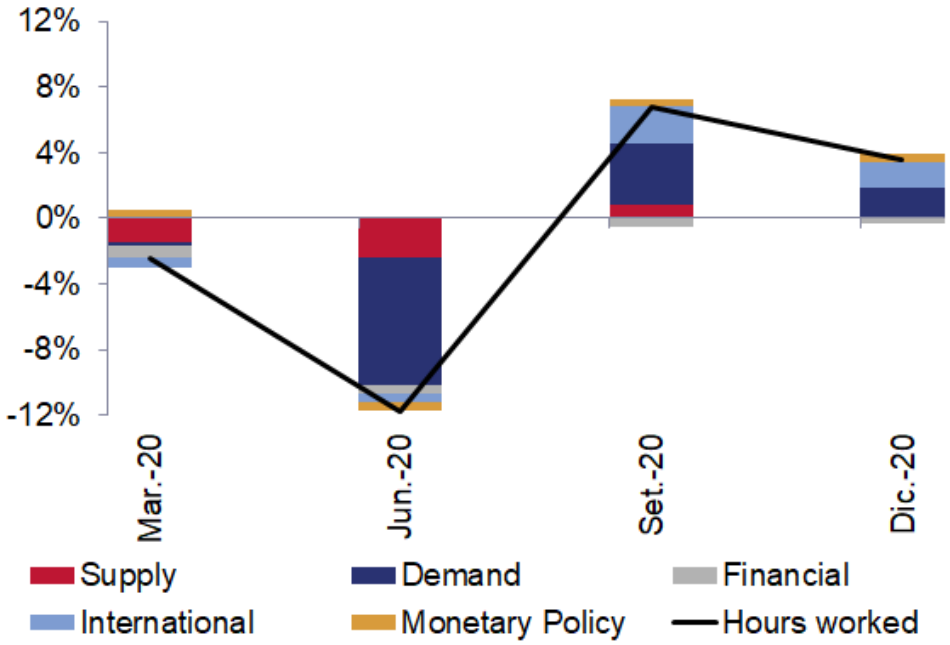
The historical decomposition in the DSGE model (Table 6 and Figure 20) shows that supply, demand, and financial shocks may help explain the decline in hours worked. Supply shocks (productivity) account for about 0.7% of the decline in hours worked in the average of 2020. This may reflect the impact of voluntary lockdowns, which led firms to temporarily shut down or reduce their activities. The negative aggregate demand shock is estimated to account for 0.6% of the decline in hours worked, presumably capturing demand-side constraints and possible effects of uncertainty on consumption behaviour. Financial variables have also negatively affected hours worked, mainly through movements in the exchange rate that affect the production costs of goods that use imported inputs, thus generating a retraction in supply. The expansionary impact of monetary policy would have cushioned the drop in hours during three of the four quarters with an estimated impact of around 0.2% on annual average. International variables would also have buffered this fall, mainly in the second half of the year driven by an environment of low international interest rates and the recovery of external demand.

Table 6: Historical decomposition - hours worked in DSGE, annual log difference 2020

	Hours
Supply	-0.7%
Demand	-0.6%
Financial	-0.5%
International	0.7%
Monetary Policy	0.2%
Others	0.0%
Average growth rate	-0.9%

Source: Authors' calculations

Figure 20: Historical decomposition - hours worked in DSGE, annual log difference 2020



Source: Authors'calculations.

3.3 Vector Error-Correction Model

As a first step to assess the efficacy of the policy implemented to cushion individuals' well-being during the pandemia, we analyze its quantitative impact on private consumption from the second quarter of 2020 up to the second quarter of 2021. We compare two scenarios: one, with policy relief and, another, without it. A statistically significant better performance of private consumption under active government policy would be indicative of some degree of fulfillment of the official goal.

3.3.1 An aggregated approach

One of the main concerns of the Uruguayan authorities has been the negative effects of COVID-19 pandemia on the real economy. Many small businesses and industries have

been totally or partially locked down in an effort to limit infections, social interactions have been constrained and unemployment has been rising sharply. As a result, both firms' and households's income risk increased against the backdrop of growing general economic uncertainty. Automatic stabilizers – e.g. umemployment subsidies, sick leaves, among others – have mitigated income risk and the adverse impact of slower activity while the pandemic also triggered an exceptional fiscal response as has been described in earlier sections.

The old Uruguayan tradition of comprehensive social spending within the welfare state has knitted a thick social fabric throughout the decades whose links have been used by economic institutions to implement the policy relief. Automatic stabilizers have been improved and together with reinforced monetary benefits – e.g., Tarjeta Uruguay Social (TUS), Asignaciones Familiares –, public health care services, and soft credits have been the main instruments for policy implementation. In addition, the measures taken by the central bank in coordination with the fiscal authority, have secured the payment chain and have helped to keep the economy's engine functioning. In particular, all those measures were targeted at limiting welfare losses for the Uruguayan people.

Economic literature considers private consumption a better proxy for welfare than income or output. The value of goods and services spent by people reflects better the level of satisfaction of individuals' needs than how the total amount of income or production does. Total income is partially devoted to current consumption and a fraction of total output may be invested in capital goods to improve future conditions. On the other hand, private consumption measures consumer spending on final goods and services for personal use and enjoyment, done by individuals and households in an economy. It includes all purchases made by consumers aggregated over time and space, such as food, housing (rents), energy, clothing, health, leisure, education, communication, heating, transport as well as hotels and restaurant services. Surely, aggregate figures even in per capita terms may mask differences in individual preferences but they give a first picture of people's needs. HANK models may be the answer to solve those inconveniences by introducing heterogeneity in the economic analysis.

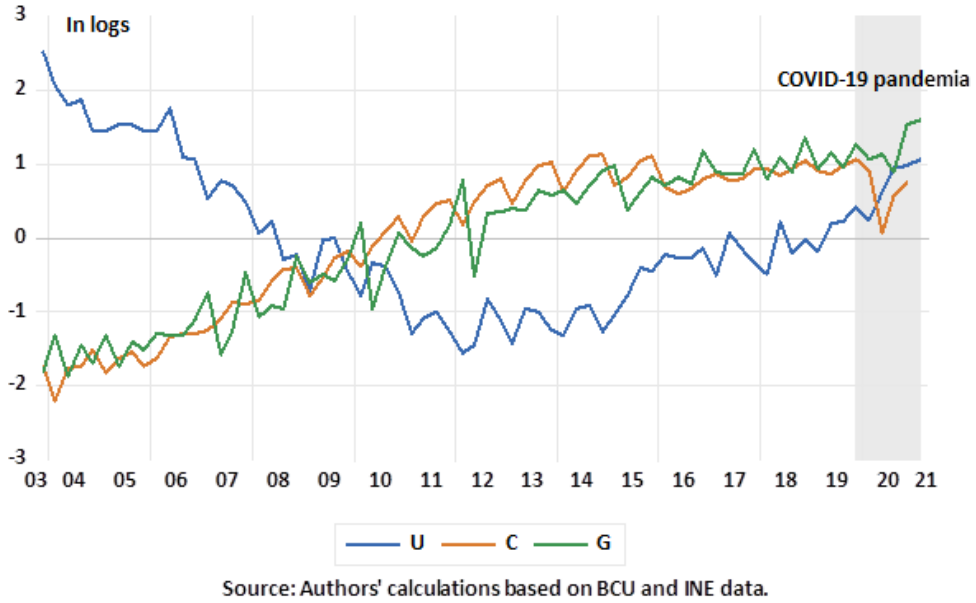
3.3.2 Data

The database expands from 2003Q4 to 2020Q4 and is composed of per capita government spending (G), per capita private consumption (C), the unemployment rate (U) and a financial conditions index (F). In addition, the COVID-19 Fund (CF) is available for the 2020Q1-2021Q2 period. Only the financial index is stationary according to the usual tests.

Government spending is one third of Uruguayan GDP similar to that of Switzerland (35%), higher than those of Costa Rica (22%), Chile (26%) and Mexico (29%) but lower

than those of Argentina (42%), Brazil (48%) and most European countries. Figure 21 depicts the strong correlation (0.92) between government spending and private consumption in per capita terms. Public spending enables governments to produce and purchase goods and services, in order to fulfil their objectives – such as the provision of public goods or the redistribution of resources. Over 2005-2018 , the fiscal priority of Uruguayan Public Sector spending - measured by the Social Public Spending over Total Public Spending ratio - has been steadily around 73%. It has been focused mainly on social security and social care (38%), health (17%) and education (13%).

Figure 21: Per capita government spending, per capita private consumption, and unemployment. 2003-2020



Source: Authors'calculations based on BCU's and INE's data.

It is not surprising to find two-way causality at 5 between G and C. In effect, government spending (i.e. public salaries, pensions, unemployment compensations, health subsidies) back individuals' expenditure and, on the other hand, households' expenditure include taxes.

The unemployment rate of the Uruguayan economy has had a declining path from the beginning of the sample up to 2012, it began to rise by 2015 and exploded when the COVID-19 pandemia arrived. This behavior resembles the opposite one showed by G and C.

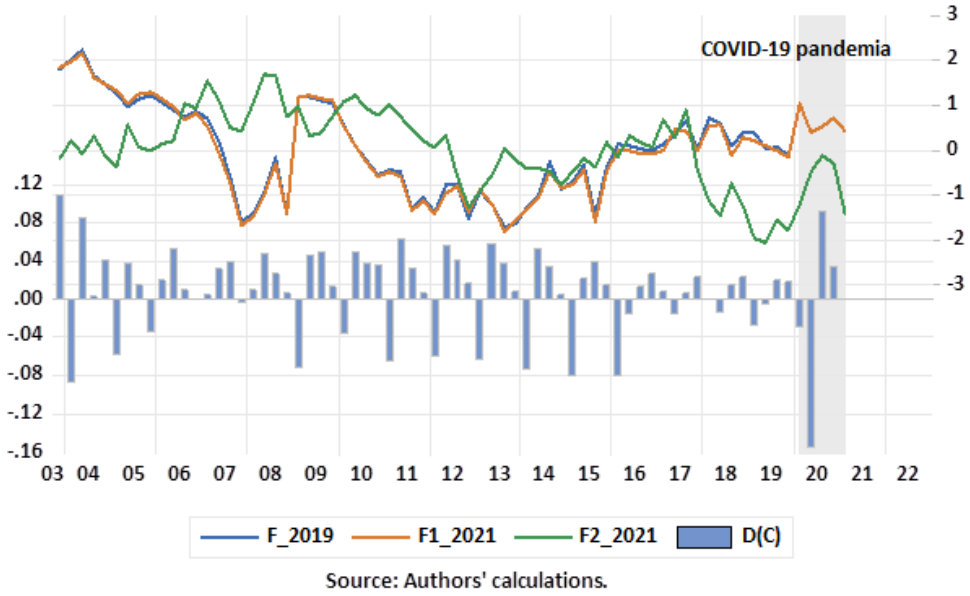
Most of the fiscal measures implemented by the Uruguayan government are aggregated in the COVID-19 Fund, which is compiled and released by the Ministry of Finance (MEF). In order to summarize several central bank's actions into fewer variables we construct a financial conditions index (F). It extracts the common factors from local financial information - both in UY pesos and in US dollars – that may affect consumption bundles:

(i) Financial price measures that influence the user's cost of capital (active interest rates) (ii) Consumer interest rates that affect the tradeoff between consumption today and consumption tomorrow (iii) Measures of borrower risk (percentage of nonperforming loans) (iv) Quantitative indicators (number of transactions)

27 time series are deseasonalized, made stationary if needed to, purged from business-cycle feedbacks and standardized (see Bucacos-Iguini, 2017). Goodness of fit criteria and measures of sample adequacy pointed the optimal number of common factors that are responsible for the comovements in the data. Velicer's criterium indicates that only one factor (F_2019) summarizes all relevant financial information for household's consumption decisions for the pre-pandemia period. Nevertheless, when the pandemia timespan is included, factor analysis shows two factors: one, (F1_2021) coincides with pre-pandemia factor and it can be related to prices (interest rates spreads both to firms and families), while the second factor (F2_2021) is more related to quantities (new loans to firms). See Figure 22.

COVID-19 measures seem to have affected the financial framework because the second factor only appears when the pandemia is included in the span of the analysis.

Figure 22: Financial Conditions Index: pre and post COVID-19 pandemia. 2003-2020



Source: Authors' calculations.

3.3.3 Methodology

Economic theory and empirical knowledge suggest the possibility of a stable long-run relationship among I(1) variables unemployment rate, per capita consumption, and per capita government spending. Financial conditions index, being I(0) by construction, stands out of that relationship but still may be related to the other variables in the short run. We explore these topics in a Vector Error-Correction Model (VECM). Per capita variables are transformed into logarithms.

Only one cointegrating vector is found: C = -3.6942 - 0.2293 μ + 0.5990 G which quantifies a strong and positive influence of policy relief through public expenses: an increase of 1 percent in per capita government spending rises per capita consumption in 0.60 percent. Besides, rising unemployment leads to income reductions that even if partially compensated by unemployment and sick subsidies, reduce individuals' consumption possibilities.

The unemployment rate and per capita government spending are weakly exogenous for per capita consumption determination in the long run, indicating that any change in government spending is immediately followed by a change in per capita consumption (of the same sign) only in order to keep their long-run equilibrium relationship. Labor markets seem to have other fundamentals and are do not respond to active fiscal policy.

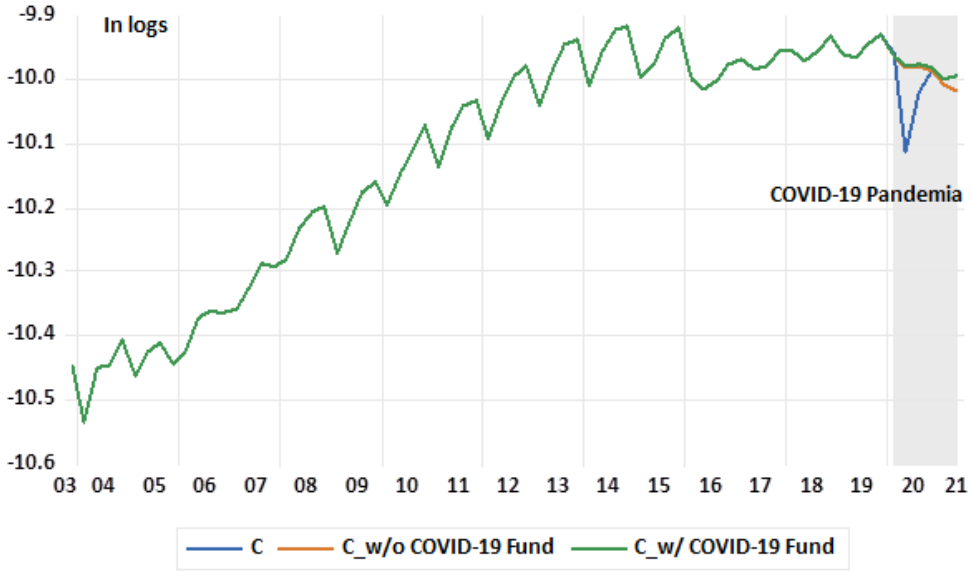
This model is estimated by maximum likelihood from 2003Q4 to 2019Q4 and then it is forecasted for 2020Q1 to 2021Q2 in two scenarios: one, including policy measures and another without them. Two policy instruments are considered: the COVID-19 Fund (CF) and the F index.

In this framework, the COVID-19 Fund works through government spending because it either increases public expenses or reduces public revenue. Consequently, in the period from 2020Q2 to 2021Q2, G includes the COVID-19 Fund in the scenario with policy measures. With respect to the financial conditions, F_2019 is used in the simple scenario and both F1_2021 and F2_2021 summarize those conditions in the second scenario, when COVID-19 policy is in action.

3.3.4 Main results

Although the model is unable to capture the dip in per-capita consumption in the second and third quarters of 2020, it can replicate its annual growth rate in 2021Q1. Fiscal and monetary measures - through COVID-19 Fund and financial conditions index, respectively - seem to reduce the fall in per-capita consumption and suggest the beginning of a recovery road since the second quarter of the current year (see Figure 23).

Figure 23: Per capita Consumption pre and post COVID-19 pandemia: Relevance of policy relief. 2003-2021



Source: BCU data and authors' calculations.

Policy relief seems to be responsible for cushioning individuals' well-being from the negative consequences of the COVID-19 pandemia. In effect, per capita welfare losses would have been 0.7 percent higher in 2021Q1 and 1.9 percent higher in 2021Q2 had not public help been implemented.

3.4 Firms' survey data

During 2020 and 2021 the Banco Central del Uruguay included relevant questions in the Inflationary Expectations Survey (IES) answered by Uruguayan firms since 2009. These additional questions were introduced on top to the questions about credit accessibility with the objective of monitoring the financial conditions of firms during the COVID-19 shock.

The monthly inflation expectations survey is sent to companies with more than 50 employees in all economic sectors except the banking and the agricultural firms. It has been conducted continuously with monthly frequency since October 2009 up to date. It is a survey of inflationary expectations of price setters, in which different modules have been added more or less continuously for issues such as financial stability, foreign trade, economic growth, monetary policy, etc. Since 2013, financial stability questions have been regularly asked, particularly about banking, commercial and finance non- banking credit access, and preferences about maturity and currency of credits. During 2020 and 2021, with In the COVID-19 crisis, questions were added regarding the liquidity of the firms and their working capital financing needs. We will focus on these three aspects regarding the: the liquidity of companies measured as the holding of funds to meet their

working capital needs measured in weeks, the perception of access to credit with respect to the immediate past and their expectations for the short term, and the currency of preference to take debt.

Difficulty and facility of access to credit is evaluated 4 times per year since April 2013. In concrete, there are 6 questions that evaluate credit access, 3 referring to the perceptions of firms respect to the accessibility to bank credit, financial non-banking credit and commercial credit, respect to 3 months ago and respect to what they expect for the next 3 months. In relation to currency debt preference, since 2013 the survey includes a question that asks if the firm would take a debt in which currency would she do it, Uruguayan Pesos, US Dollar or Indexed Units.[6] In May 2020, November 2020 and May 2021 there was included a question related to liquidity of firms. In concrete the question was: *"As long as you do not have access to bank credit or supplier credit, how many weeks do you estimate that you will be able to maintain the current activity of your firm with the working capital that you have?"*

In Table 7 we present the descriptive statistics for these questions since January 2018 up to April 2021.

[6]The indexed unit (Unidad Indexada) was created in 2003, and is a accounting unit that is indexed to past inflation.

As it is shown in Figure 24 the median of the number of weeks with cash disposal by firms increased significantly between the May and November 2020 months, from 8 to 10 weeks,and remained at that level in May 2021. In order to assess whether this increase in liquidity was due to government initiatives to solve the pandemic, or to other factors, we analyzed some additional issues such as the perception of access to credit and the currency and rates at which this credit could be accessed.

Figure 24: Firms' liquidity disposal

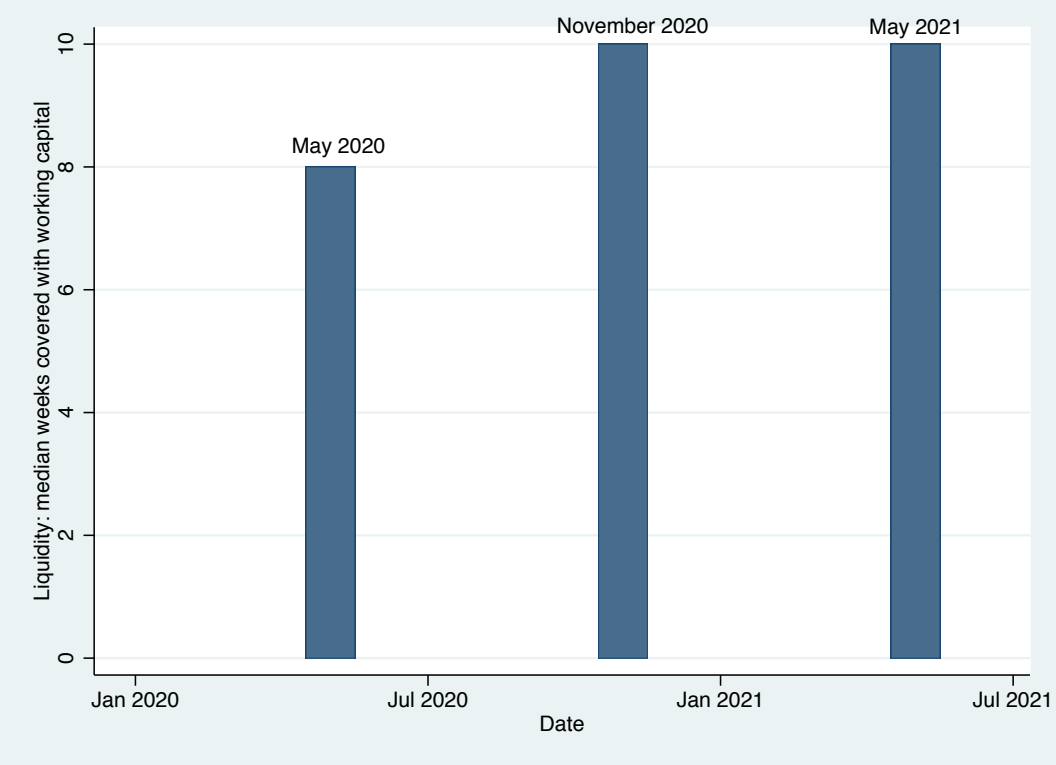
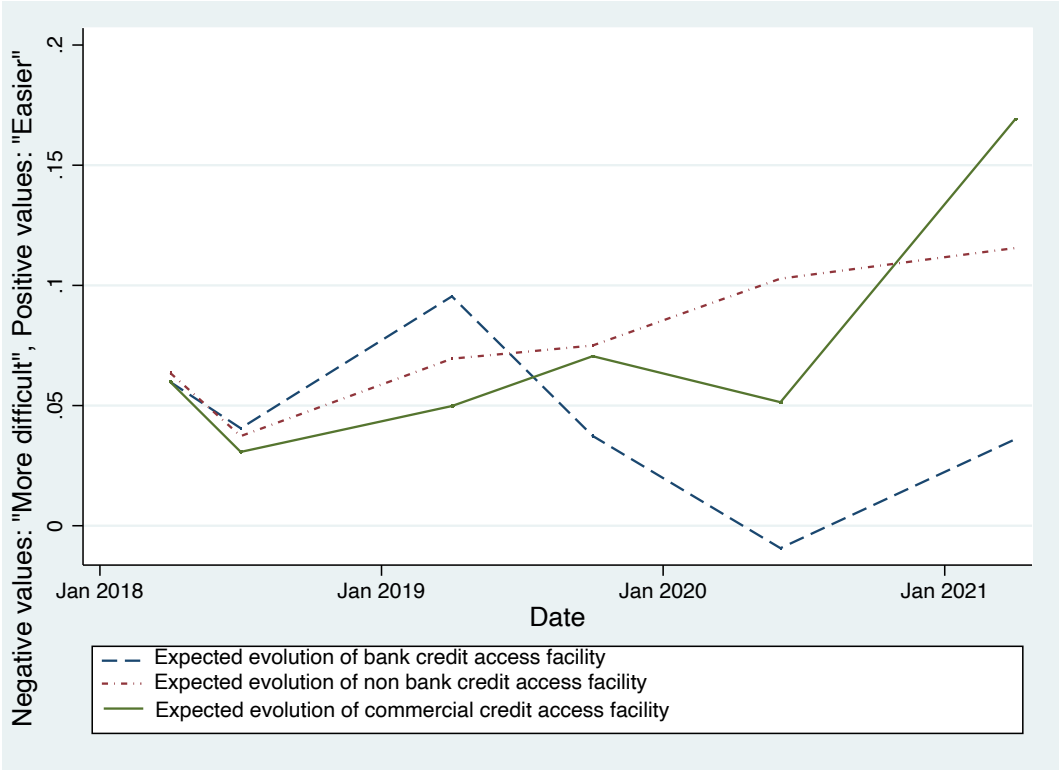


Figure 25 presents the firms expectations about credit access for each type of external financing options. These variables were constructed as the difference between the responses of the perception regarding the ease of access to credit expected in the next three months and the perception of the ease of current access with respect to the three previous months. Positive values of these variables corresponds to an expected increase in ease to access. During 2020 and 2021 firms perceive and increase in facility of acceding to all types of credits, mainly to commercial credit, the principal short term external financing instrument for Uruguayan firms (Mello, 2018). It can be seen that the perceived increase in access is contemporaneous with the credit and liquidity boosting measures already presented, both for bank and non-bank financial sector loans, as well as for commercial credit.

Figure 25: Expectations respect credit access



In Figure 26 we present the share of firms that would prefer to take debt nominate in US Dollar, Uruguayan peso or Indexed Unit. During 2020 there was a significant drop in USD preference, in February 2020 47% of firms declare preferring USD, while 30% preferred it in October. In contrast, both preferences, for Peso and UI, increased during 2020. As shown in Figure 27, this change in firms preferences can be explained by a sharp reduction in local currency interest rates, in part due to the SIGA program presented previously.

Figure 26: Currency debt preference and interest rates

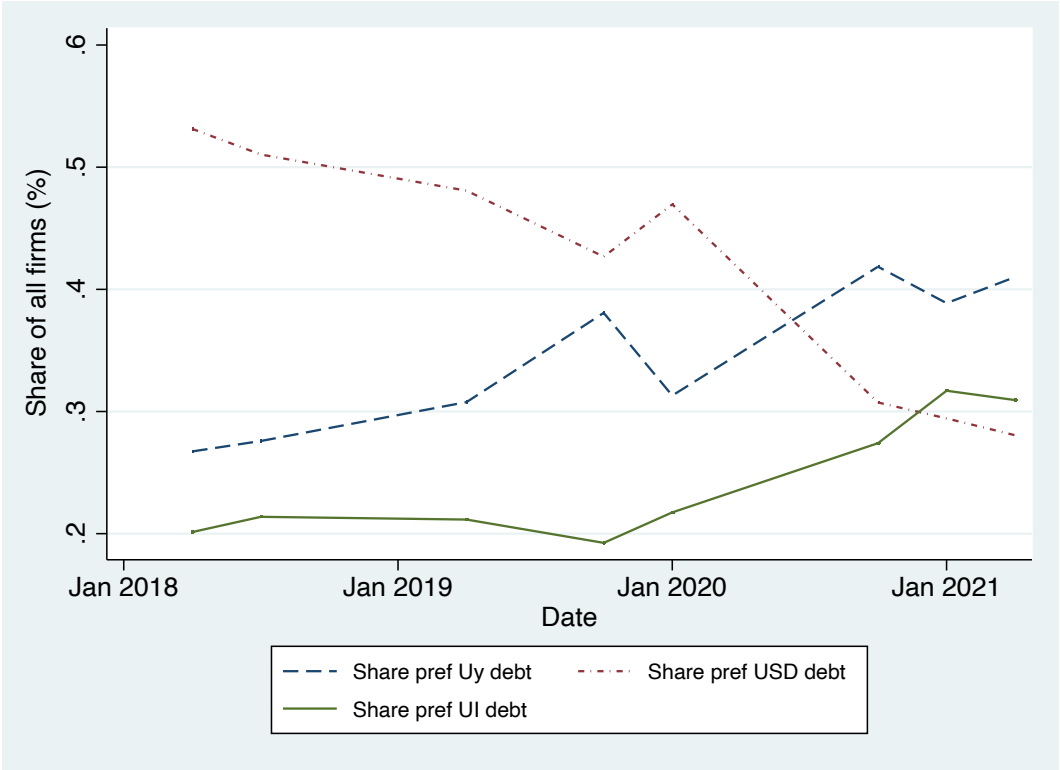
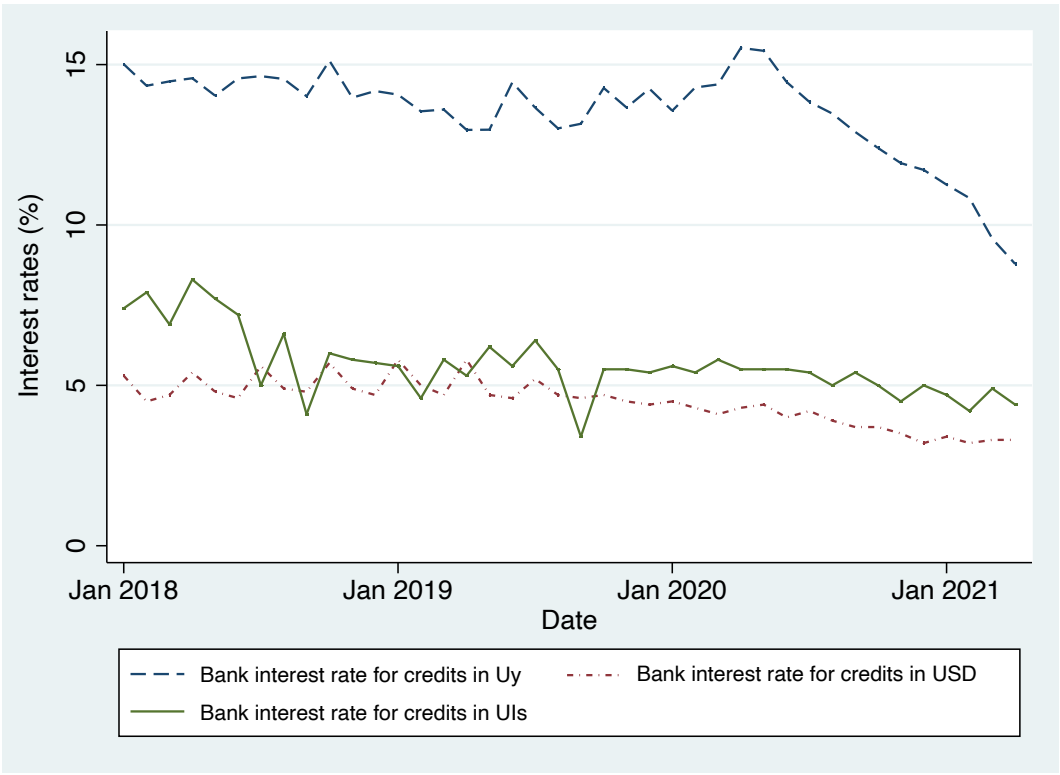


Figure 27: Bank loans interest rates by currencies



3.4.1 Empirical results of firms' financial perspective

With the objective of deepening the financial perception of the firms, we introduced micro econometric analyzes for the liquidity of the companies, their perception of access to credit with respect to the recent past and the immediate future, and the preference for credit according to the currency nomination of the company debt. The variables that we want to model are of a different nature and therefore we use different estimation methods. They are not only different in terms of continuity but also in terms of frequency, since they correspond to questions included sporadically, although regularly, in the IES. Likewise, given that we are interested in analyzing the financial perspective of the firms in the economic environment associated with the pandemic, we limit the sample to the years 2019, 2020 and the first quarter of 2021.

Liquidity

Firms respond about liquidity in May and November 2020, as well as in May 2021. Their response is the number of weeks that they estimate that they could keep in working without appealing to any form of external financing.

Figure 28: Liquidity Histogram

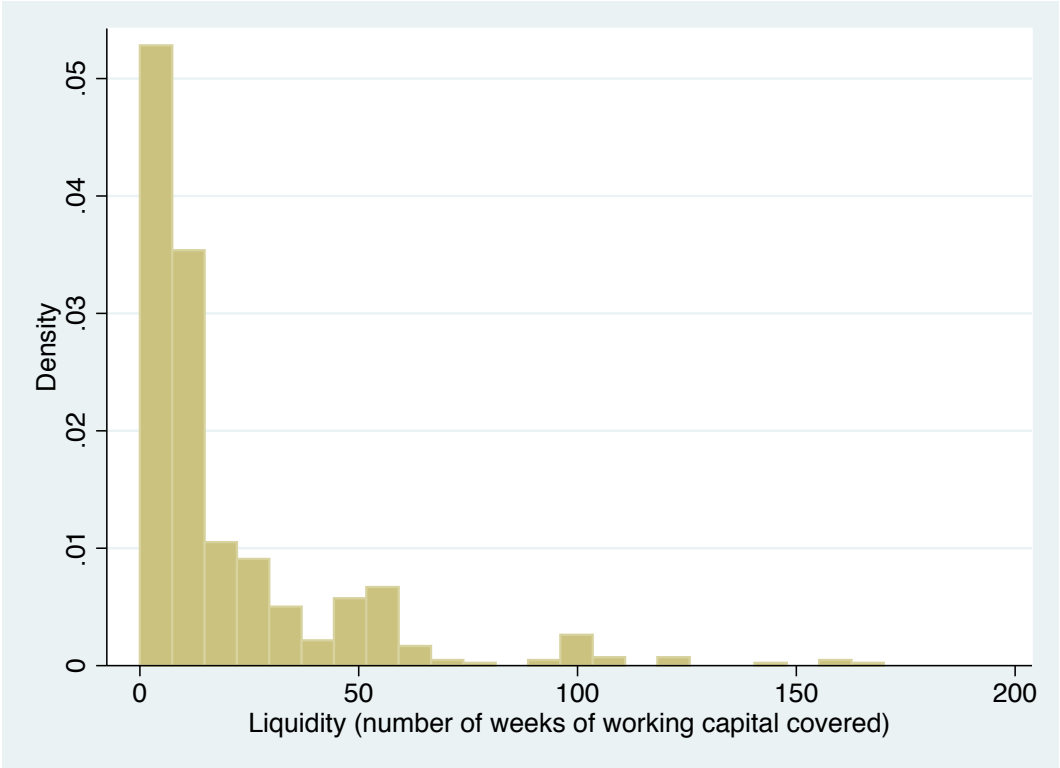


Figure 28 presents the histogram for this variable. As it was said previously, the 19 weeks, the median is 10 weeks, with a maximum of 165 weeks. This implies a high level of liquidity as it was stated in Mello (2018). As it's shown in the histogram this variable is

continuous and thus we will estimate using a fixed effect discrete panel data specification. We estimated the following equation:

$$Liquidity_{it} = \alpha_i + \beta_1 E(C_{it}^{12}) + \beta_2 i_t^{UYU} + \beta_3 Size_{it} + \varepsilon_{it} \tag{7}$$

Where, $liquidity_{it}$ is the response to the liquidity questions of firm i in time t; $E(C_{it}^{12})$ is the expected increase in the firm's costs in the next 12 months; i_t^{UYU} is the bank loans interest rate in local currency; and $Size_{it}$ is the firm's size approximated through the firm's gross production value expressed in logarithms. The results are presented in Table 8.

Loans currency preferences

Firms respond to currency preferences questions regularly since 2015, in our period of interest they respond in which currency they would like to take a loan if they would do so in April and October of 2019, 2020 and 2021, and in January 2019 and 2021. This variable, is a discrete variable that takes values 1 if the firm answers "US Dolla", takes value 2 if the answer is "Indexed Units", and takes value 3 if firms answer "Uruguayan Peso". Thus, this variable is ordered in function of financial stability convenience, so we will estimate an ordered logit model to represent characterize this responses.

$$Currency_{it} = \alpha_i + \beta_1 E(C_{it}^{12}) + \beta_2 i_t^{UYU} + \beta_3 Size_{it} + \varepsilon_{it} \tag{8}$$

Results for the liquidity and currency preference models are presented in Table 8.

As it's shown in the table the loans interest rate in UYU is the main variable that explain firms liquidity and the currency loans preferences. As expected, the interest rate is negatively correlated with liquidity and with the currency variable, these imply that the drop in the local currency loans interest rate presented in Figure 26 is the main explanation for the increase in liquidity and the preference for credit in UYU during 2020 and 2021. This is consistent with the incentives provided by the Central Government and the Banco Central del Uruguay.

Table 8: Liquidity and currency preference estimations

	Liquidity	Currency
$E(\Pi_{it}^{H})$		-0.223
		(0.440)
$E(C_{it}^{12})$	3.054	0.395
	(1.925)	(0.246)
i_t^{UYU}	-0.168**	-0.088***
	(0.080)	(0.028)
$Size_{it}$	0.053	-0.063
	(0.328)	(0.132)
Obs	316	767
N-Groups	292	
R2_W	0.232	
N-Clust		485
Pseudo_R2		0.060
Estimation	Fixed Effects	Ordered Logit

* p<0.10, ** p<0.05, *** p<0.01

Credit access

Questions about credit access ease for firms were done in April and October 2019, January and June 2020, and April 2021. In Figure 25 it seems to be perceived as easier by firms acceding to credit, in particular to banking and commercial credit. At this stance we present estimations for these perceptions respect to the last three months, and what firms expect for the next three months. This implies analyzing retrospective and prospective perceptions. The variables are discrete ordered variables form 1 to 5, where greater numbers implies an easier perception. We estimate using Ordered Logit specifications the following equation:

$$Access_{ijt} = \alpha_i + \beta_1 E(C_{it}^{12}) + \beta_2 i_t^{UYU} + \beta_3 Size_{it} + \varepsilon_{it} \tag{9}$$

Where, $Access_{ijt}$ represents the response of firm i respect to ease of acceding to type of credit j at time t. Table 9 shows the estimations for bank credit, financial non-banking credit and commercial credit perceptions. In both financial type of credits, banking and non-banking, the interest rate of loans in local currency is the main determinant. This is an expected result since the price of taking banking loans dropped sharply in local currency and financial non-banking credit is a substitute of banking credit, so we expect an ease in access when banks more likely to expand credit. The estimation for commercial

credit is consistent with a crisis scenario, since those firms that expect higher increase in their costs, perceive an ease in access to commercial credit.

Table 9: Easiness of credit access with respect to 3 months ago

	Bank credit	Financial non-bank credit	Commercial credit
$E(\Pi_{it}^{H})$	-0.767*	-0.447	-0.423
	(0.392)	(0.439)	(0.422)
$E(C_{it}^{12})$	-0.004	-0.178	-0.687**
	(0.231)	(0.301)	(0.312)
i_t^{UYU}	-0.193***	-0.097***	-0.006
	(0.036)	(0.033)	(0.032)
$Size_{it}$	-0.048	-0.067	-0.054
	(0.109)	(0.092)	(0.095)
Obs	719	718	719
N-Clust	466	465	466
Pseudo_R2	0.039	0.013	0.010
Estimation	Ordered Logit	Ordered Logit	Ordered Logit

* p<0.10, ** p<0.05, *** p<0.01

Table 10 presents the models for expectations respect to credit access. Again we found that the interest rate for loans in local currency is the main determinant on ease of access. We can conclude, that the main instrument in liquidity provision, and in firms financial health during the COVID-19 crisis has been the reduction in interest rates for loans in local currency, in part determined by the provision of state guarantees through the SIGA program presented in subsection 2.2.2

Table 10: Expected easiness of credit access in 3 months

	Bank credit	Financial non-bank credit	Commercial credit
$E(\Pi_{it}^{H})$	-0.565	-0.261	-0.898**
	(0.498)	(0.456)	(0.446)
$E(C_{it}^{12})$	-0.112	-0.270	-0.175
	(0.284)	(0.301)	(0.327)
i_t^{UYU}	-0.161***	-0.147***	-0.090***
	(0.034)	(0.033)	(0.032)
$Size_{it}$	-0.137	0.087	-0.049
	(0.112)	(0.091)	(0.090)
Obs	719	718	719
N-Clust	466	465	466
Pseudo_R2	0.032	0.019	0.017
Estimation	Ordered Logit	Ordered Logit	Ordered Logit

* p<0.10, ** p<0.05, *** p<0.01

4 Final remarks

The COVID-19 shock was huge, with immediate and medium term economic consequences. The policy response to mitigate the negative impact of the shock was rapid. A tandem of policy measures were taken by focusing in the most important priorities as our survey shows. Among them, a series of social, economic and financial measures were developed with the aim of supporting the most vulnerable households and business.

Our assessment of the impact of the policy measures on activity, inflation, inflation expectations, investment, consumption and firms' financing shows that they were useful to mitigate the negative effects of the pandemic. Overall, all these variables show a significantly better outcome than in a counterfactual in which public help had not been implemented.

The positive impact of the measures hold over different variables and using different methodologies. In particular, we use a macroeconomic projection model, a DSGE model, an aggregated vector error-correction model and granular data on firms' financial conditions, expectations and preferences collected through a survey during the pandemic.

We contribute empirical evidence of the aggregate usefulness of the measures undertaken in response to the COVID-19 shock in Uruguay. Next steps may include to go deeper in each of the specific policy measures in order to assess their relative efficiency.

References

Basal, J., Carballo, P., Cuitiño, F., Frache, S., Licandro, G., Mourelle, J., Rodríguez, H., Rodríguez, V., and Vicente, L. Un modelo estocástico de equilibrio general para la economía uruguaya. *Documento de trabajo del Banco Central del Uruguay*, 02-2016, 2016.

Branch, W. The theory of rationally heterogeneous expectations: evidence from survey data on inflation expectations. *The Economic Journal*, 114(July), 2004.

Bucacos-Iguini, E. Financial conditions and monetary policy in uruguay: An MS-VAR approach. Technical report, IDB Working Paper Series, 2017.

Carballo, P. Política monetaria y formación de expectativas en un modelo neokeynesiano. *Borrador de Documento de trabajo*, 2021.

Carballo, P., González, J., Güenaga, M., Mourelle, J., and Romaniello, G. Un modelo semi estructural de proyecciones macroeconómicas para el uruguay. *Documento de trabajo del Banco Central del Uruguay*, 12-2015, 2015.

Landaberry, M. Modelos e indicadores de la situación de estabilidad financiera: metodología y aplicación. *Documento de trabajo del Banco Central del Uruguay*, 10-2015, 2015.

Landaberry, M. Indicadores de estabilidad financiera: un nuevo índice para el sector financiero. *Documento de trabajo del Banco Central del Uruguay*, 10-2017, 2017.

Landaberry, M., Lluberas, R., and Vidal, M. Una aplicación de la metodología growth at risk a uruguay. *Documento de trabajo del Banco Central del Uruguay*, 9-2021, 2021.

Mello, M. Determinants of leverage maturity structure of uruguayan non-financial firms. *Documento de trabajo del Banco Central del Uruguay*, 06-2018, 2018.

Prasad, A., Elekdag, S., Jeasakul, P., Lafarguette, R., Alter, A., Xiaochen Feng, A., and Wang, C. Growth at risk: Concept and application in imf country surveillance. *IMF Working paper*, 19/36, 2019.

Appendix

Table A.1.: Health measures

Ruduce infections	Increasing capacity of health system	Vaccination
Partial border closure and total closure with Argentina for people. Specific controls in border cities with Brazil. Suspension of flights from Europe for a time. Prohibition of descent of passengers and crew of cruise ships.	Extension of working hours of the Virology Laboratory of the Ministry of Public Health (MSP)	Negotiation with Laboratories. Pfizer and Sinovac are purchased
Exhortation to stay home - physical distancing	Free of charge telephone service in charge of specialized personnel and doctors.	Vaccination plan by stages subject to the arrival of the vaccines: 1. on 2/26 opened the agenda for priority groups with Sinovac (education workers, firefighters, military and customs officials of the first line of control, police). 2.Health workers in priority areas -Pfizer. 3.The plan advanced by age groups and comorbidities.
Suspension of public shows, social gatherings and social entertainments	Development a chatbot to evacuate queries: coronavirus.uy and an application.	
Suspension of in-person school classes 3/14/20, in June the return was voluntary and then mandatory. Since March 2021 classes are suspended again, between May and June the returns begin.	Request for support to the Pan American Health Organization (PAHO) for the acquisition of materials for the protection of health personnel and diagnostic kits	
Reduction to 50% of the number of collective transport units that circulate on weekends. Doubled the frequencies of collective transport in peak hours. Capacity at 50% in the number of passengers in interdepartmental transport units at times of greatest mobility.	Joint work of researchers from the Faculties of Sciences and Medicine, the Hospital de Clínicas and the Pasteur Institute, for the development of molecular diagnostic techniques to detect COVID-19	A bill will be drawn up so that workers have the necessary time to be vaccinated without affecting wages.
Exhortation to wear face masks and then mandatory	Increase of the number of ICU beds and respiratory units	
Dissemination of a public good campaign in the media focused on prevention measures.	Opening of a call from the National Research and Innovation Agency (ANII) for the development and preparation of a COVID-19 diagnostic kit in the short term.	
Circulation of police mobiles to urge the population to avoid crowds on public roads	Definition of ensuring as a priority the necessary resources to attend the national health emergency, which includes financing the purchase of supplies for the Ministry of Public Health (MSP).	
Instrumentation of an application for cell phones. People will access a georeference of cases and receive an alert when they are near a risk zone.	Tax exemption and simplified customs procedure for necessary goods	
Exhortation of people over 65 years of age to comply with the preventive quarantine. Public officials must remain in their homes	Definition of ensuring as a priority the necessary resources to attend the national health emergency, which includes financing the purchase of supplies for the Ministry of Public Health (MSP).	
Random test in cities with focus of infections		
Instrumentation of teleworking in cases where it is required. It is suggested as an alternative, as far as possible, both at the public and private levels.		
Exhortation to owners and administrators of large commercial premises to close them preventively and provisionally, with the exception of those selling food and pharmacies. Restrictive measures for neighborhood fairs that are not food.		
Suspension of entry to the country between 12/21/20 and 1/26/2021		
To allow the limitation of the right of the assembly when it conspicuously violates public health, agglomerations will be dissolved. Private meetings may not exceed 10 people, making the bubble concept prevail.		
Implementation of teleworking in public offices, since December 21 and in the private sphere, the exhortation to telework is reiterated		

Table A.2.: Social and economic measures

Labour market	Monetary Policy/ Financial Stability
Flexibility in the use of unemployment insurance and empowerment to use it for a shorter time and even part-time.	Reference interest rate reduction
Include COVID-19 as an occupational disease for 45 days. This will make it possible to cover sickness insurance for dependent workers, medical and non-medical, from the private sector who become infected.	Temporary reduction of bank reserve requirements in national currency and UI against the increase in credit. Maximum available $ 14,000 thousand. (0.6% of GDP)
All workers who make use of the sickness subsidy for having maintained contact with a person with COVID-19 will have the right to receive the subsidy from the first day of the quarantine indicated by their health provider.	Foreign exchange interventions in the spot market and in the futures market
The MTSS and the OPP drafted a bill that awaits Parliament's approval and that will grant 15,000 jobs to the unemployed for 6 months. The measure will be carried out together with the departmental governments.	Extension of maturities of credits to the Non-Financial Sector for 180 days.
	Possibility of not considering the restructuring of credits that are agreed until 12/31/20 as problematic. Flexibility for financial institutions to evaluate the payment capacity of debtors.
	Extension of the grace period for capital amortization for clients affected by the health emergency.
	Extension for presentation of information to the financial system.
	Public guarantee scheme: "Siga Emergencia". For micro, small and medium-sized companies that demonstrate ability to pay and have a good credit rating and no tax and social security debt. For working capital, investments or restructure existing credits. "SIGA Plus" for medium and large companies and "SIGA Turismo".

Social	Sectoral
Extension of the National Health Insurance (SNS) to all those dependent and non-dependent workers who appeared on the register of a collective medical institution on February 28, 2020 and lost coverage due to the cessation of their work activity during the health emergency.	Subsidy of 6,800 pesos to workers in the artistic sector who do not have income from unemployment insurance, fees or contracts.
Subsidy of up to 50% of the rental amount guaranteed by the Rental Guarantee Service of the General Accounting Office of the Nation, for private activity workers, covered by the Unemployment Subsidy (total) in charge of the BPS.	Extension of the coverage of the State Insurance Bank to all doctors in the country.
Food for schoolchildren during Tourism Week: extra money if they receive Family Allowances or food tickets.	Offer of credit lines under flexible conditions by Banco República up to a total amount of 50 million dollars and work with multilateral credit organizations to increase it to 125 million dollars.
Transfer of 1,000 million pesos from the Ministry of Economy and Finance to the Ministry of Social Development for the extension of hours and the creation of new shelters for homeless people, the strengthening of the plans of the National Food Institute (INDA) and the strengthening of the amounts of the Uruguay Social Card (TAS).	Postponement of the payment of the employer contributions of the owners and partners, corresponding to the months of March and April, for monotributistas, sole proprietorships and personal companies with up to 10 employees (Industry and Commerce), in six equal and consecutive installments from June. That corresponds to 60% of those payments, the remaining 40% will be fully subsidized by the State.
Reinforcement of the available balance in the 86,000 food cards that reach a universe of 400,000 people.	Subsidy received by the social monotributistas from the Ministry of Social Development. The measure covers about 10,000.
One-time duplication of the amount of the Uruguay Social card. Half will be transferred on March 31 and the rest a month later.	Between December 1, 2020 and April 4, 2021, the Government implemented the zero VAT rate for hotels, discounts of 9 VAT points for gastronomic activities and car rentals, monthly discount of 8,000 pesos in employer contributions for new contracts or the reinstatement of employees, and access to credit guarantees through the National Guarantee System (SIGA).
Doubling the amount of food destined for municipal dining rooms in the interior of the country and of the baskets for the territorial offices, both actions in charge of the Ministry of Social Development.	Coronavirus Fund: composed of the contribution, for two months, of salaries of public officials with liquid salaries higher than 80,000 pesos, to which a discount will be made,on a scale of 5, 10 and 20%, according to the nominal fees received.
Expansion of access to food baskets granted by the Ministry of Social Development and increase in Family Allowances.	Postponement of payment maturities of the General Tax Directorate and the Social Security Bank.
Delivery of food baskets in April and May for 118,000 households with Family Allowances from the Equity Plan, complementary to those provided by the municipalities of Montevideo and Canelones. Extension of said benefit for informal workers not registered in the system.	Exoneration of the payment of 100% of the fixed charge and the contracted power of UTE and 100% of OSE's fixed charge to the education, culture, sports and real estate sectors.
Fourth doubling of the amount of the Uruguay Social card and the Equity Plan family allowance, in halves, the second weeks of November and December. The transfer of food baskets will also continue in both months.	Financing of 70% of the value of electricity consumption bills corresponding to the period from April to November of 2020, for hotels and restaurants registered with the Ministry of Tourism. Payments can be made in four installments.
Home health coverage for patients with suspected coronavirus infection and their relatives, through the State Health Services Administration (ASSE) or private providers in the interior of the country.	Access, from May 5, to a loan, for 12,000 pesos in May and 12,000 pesos in June, for sole proprietorships. The benefit will be granted in indexed units (UI), without interest rate and can be paid in 24 equal and consecutive installments.
Deferral of the May, June and July installments of the Social Security Bank (BPS) loans for some 150,800 retirees and pensioners who receive less than 13,600. This is intended to be a relief for the elderly, as almost 60\% of the liabilities are paying off loans.	Implementation of a line for companies directly affected by this health emergency, within ANDE's directed credit programs, which will have a rate subsidized by the Ministry of Economy and Finance. Postponement of maturities for all beneficiaries of ANDE's directed credit programs during the following month.
Development of the action protocol for all people who are in shelters and especially for the elderly. Transfer of 35 elderly people living on the streets to shelters, permanently. Expansion of the number of shelters to locate homeless people over 65 years of age. They will be able to stay there all day.	Automatic cancellation of monotributistas in cases in which two consecutive months remain unpaid in order to avoid the generation of excessive debts.
Extension of the Internet access benefit to 120,000 services of the Universal Hogares plan, free of charge.	Special loans for working capital for the most affected sectors granted by microfinance institutions and rate subsidies by the ANDE.
Publication by the Consumer Protection Area of the prices of different hygiene products for sale. Agreement with merchants, producers and intermediaries to maintain the prices of food, hygiene and sanitary products for three months.	IRPF / IRNR exemption to income derived from temporary leases for tourist purposes accrued from November 16, 2020 to April 4, 2021.
Extension by the Congress of Mayors of the expiration of the vehicle license fee for April 20 and that of the rural contribution for the 30th of the same month.	Increase in the credit guarantee fund of the ANDE so that financial institutions can access loans for an amount of up to 2,500 million dollars.
An awareness campaign, new protocols for health personnel, purchase of electronic anklets and greater coordination with the Judiciary, in order to avoid cases of gender or intra-family violence during the isolation period due to the health emergency. Expansion of quotas for mothers who, by order of the Justice, must leave their homes and design of a system so that children, through the Ceibal Plan, can request help.	Exemption from employer retirement contributions to social security, to companies that provide transportation service for schoolchildren and school canteens, companies with premises dedicated to the organization and holding of parties and events, travel agencies, organizing companies and providers of congresses and fairs national and international companies dedicated to land transportation of tourist groups and excursions. April 1, 2020 - March 31, 2021.
Health Insurance for people over 65 years old.	Facility scheme for personal and employer tax debts for dependent employees, including contributions to FONASA.
	Exoneration of 50% employer retirement contributions to social security all Micro and Small companies of the Industry and Commerce regime. Activities severely affected by pandemic.
	Special Leave for Construction workers.

Table 11: Classification of shocks MPM

Classification	Shock
Supply	Trend output growth
	Non tradables inflation
	Tradables inflation
	Rest of CPI inflation
	Price level
Demand	Aggregate demand
Financial	Exchange rate
	Risk premium
	Credit premium
International	External demand
	International inflation
	International interest rate
Monetary Policy	
Private sector inflation expectations	
Inflation target	
Trends	Neutral interest rate
	Neutral international interest rate
	Trend real exchange rate
	Trend relative price for non tradables
	Trend relative price for tradables

Source: Own elaboration.

Table 7: Descriptive Statistics

	2018			2019			S1 2020			S2 2020			2021 (Jan-May)		
	Obs.	Mean	Std.Dev	Obs.	Mean	Std.Dev	Obs.	Mean	Std.Dev	Obs.	Mean	Std.Dev	Obs.	Mean	Std.Dev
Access to bank credit respect 3m ago (1 difficult, 4 easy)	600	2.110	0.580	504	2.124	0.565	444	2.158	0.607	nd	nd	nd	278	2.500	0.744
Access to financial non-banking ago respect 3m ago	598	2.042	0.582	500	2.060	0.591	444	2.086	0.614	nd	nd	nd	277	2.289	0.814
Access to commercial credit respect 3m ago	598	2.095	0.617	503	2.087	0.622	444	2.149	0.645	nd	nd	nd	278	2.216	0.813
Access to bank credit next 3m	597	2.159	0.605	503	2.195	0.597	444	2.216	0.636	nd	nd	nd	278	2.536	0.739
Access to financial non-banking ago next 3m	594	2.093	0.598	500	2.128	0.604	444	2.149	0.638	nd	nd	nd	277	2.404	0.800
Access to commercial credit next 3m	594	2.140	0.654	502	2.147	0.667	444	2.185	0.680	nd	nd	nd	278	2.385	0.788
Expected evolution of access to bank credit	597	0.050	0.482	503	0.068	0.488	444	0.059	0.530	nd	nd	nd	278	0.036	0.745
Expected evolution of access to financial non-bank credit	594	0.051	0.416	499	0.072	0.490	444	0.063	0.480	nd	nd	nd	277	0.116	0.826
Expected evolution of access to commercial credit	594	0.045	0.506	502	0.060	0.510	444	0.036	0.536	nd	nd	nd	278	0.169	0.817
Preference $U (%)	615	0.272	0.004	512	0.342	0.037	230	0.313	0	270	0.419	0	544	0.400	0.011
Preference USD (%)	615	0.521	0.011	512	0.455	0.027	230	0.470	0	270	0.307	0	544	0.287	0.007
Preference Uis (%)	615	0.207	0.006	512	0.203	0.010	230	0.217	0	270	0.274	0	544	0.313	0.004
Liquidity (working capital weeks coverage)	nd	nd	nd	nd	nd	nd	109	11.959	13.568	210	17.015	18.345	230	19.551	24.537
	nd	nd	nd	nd	nd	nd	nd	nd	nd	24	8.438	24.816	168	-1.509	29.069

Table 12: Classification of shocks DSGE

Classification	Shock
Supply	Transitory productivity
	Permanent productivity (trend)
	Commodity production
	Meat and dairy production
	Labor supply
	Meat and dairy margins
	Home goods margins
	Imported goods margins
	CPI of fruits, vegetables and administered
Demand	Consumption
	Investment
	Public expenditure
Financial	Exchange rate
	Risk premium
International	External demand
	International inflation
	International interest rate
	International price of meat and dairy products
	International price of imported goods
	International price of commodities
Monetary Policy	

Source: Own elaboration.