MACROECONOMIC POLICY RESPONSES TO COVID-19

COVID-19 IN URUGUAY: A SURVEY OF POLICY RESPONSES AND THEIR IMPACT

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

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Abstract

COVID-19 implied an overwhelming 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 on GDP, inflation, inflation expectations, investment, consumption, hours worked 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.

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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 overwhelming, 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 on economic activity, inflation, inflation expectations, consumption, investment and hours worked. In addition to that, we provide empirical estimates of the impact of the budget effort on aggregate consumption. We also exploit monthly survey data on 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 high. The projection of the epidemiological models we performed alerted the need to reduce mobility and take social distancing measures. In turn, these measures harmed ample sectors of the vulnerable populations through a sharp reduction in their income. We estimate that around 20% of the labor force, composed of independent and informal workers, were especially exposed to the negative consequences of 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 in addition to reducing mobility in order to keep the health system in a position to successfully respond to the infections, it was also necessary to provide social and economic support to the vulnerable population. The most important social and economic policy responses are summarized in Section 2.2.

With the aim of projecting the impact of the COVID-19 shock on 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 afterward by official data. Financial policy measures in response to the shock include an expansionary monetary policy stance, several measures to facilitate credit restructuring, extended maturity, grace periods, and additional 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.

In order to assess the impact of these policies, we take a threefold approach. 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). Results show that the impact of expansionary monetary policy on the level of activity during 2020 is around 1.4%. Interestingly, the impact of monetary policy on the year-on-year inflation rate at the end of 2020 is also estimated at 1.4%. This approach is complemented by using the DSGE model (see Section 3.2). It should be noted that the impact of monetary policy on economic activity is consistent across approaches. In turn, DSGE estimates also suggest that expansionary monetary policy cushioned the fall in consumption and investment with impacts estimated at around 0.4% and 2.3%, respectively.

Second, we use a vector error-correction model to evaluate the impact of the fiscal and financial measures implemented by the government on private consumption (see Section 3.3). More precisely, we take an aggregate approach and estimate a vector error-correction model where households' consumption is explained by the budget effort and financial conditions. The fiscal measures implemented by the Uruguayan government in response to the pandemic were aggregated in the COVID-19 Fund, a separate account that facilitates fiscal accountability. Regarding financial conditions, we find that during the COVID-19 pandemic quantity variables (e.g. new loans to firms) gained importance over the price factor that was the only one significant before the pandemic started. 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.

Third, 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. The 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 of access to credit, in particular bank loans. These results also hold 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 effects of the pandemic. Hence, this paper informs about a toolkit that has shown useful and set a roadmap for action in future, similar events.

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 to 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 are in the Appendix.

2 COVID-19: Immediate Impact and Policy Responses

Uruguay declared a health emergency on 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 taken to reduce its propagation had a negative, immediate impact on a large part of the population and several economic sectors. With the objective of supporting the affected households and economic sectors, several measures were taken to support the labor 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.

Figures A1 and A2 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 used during the first week of March 2020 to evaluate the likely impact of the shock and to forecast its consequences. This analysis, together with those from others, added critical information for the decision-making process in a stressful situation. A description of the key policy responses is in the second part of this section.

[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.

2.1 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 estimated SIR (Susceptible, Infected, Recovered) and SEIR (Susceptible, Exposed, Infected, Recovered) models.[2] It was relevant to incorporate the characteristics 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 to the need to reduce mobility and take social distancing measures.

2.1.2 Vulnerable Population

Social distancing and reduction of mobility measures were necessary for any attempt to keep the health system in a position to successfully respond 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.

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 households' survey (Encuesta Continua de Hogares - ECH) to estimate those households that being vulnerable were not covered by the measures.[3] Table 1 shows that around 20% of the labor force is composed of independent workers in the informal sector. This segment of the labor force was especially 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 on aggregate consumption.

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

	Dependent	Independent
Formal	55	15
Informal	11	19

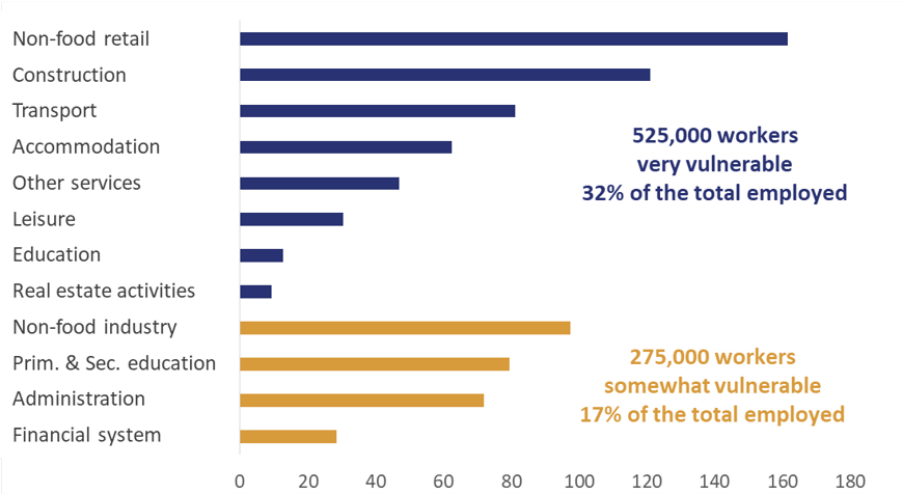
Notes: Formal workers pay contributions to the Social Security System. Source: BCU based on ECH and INE.

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

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

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 activity sector, and ii) the production of the activity sector 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).

Figure 1: Vulnerable Workers by Activity Sector
(thousands of people)



Notes: Source: BCU based on ECH.

2.1.3 High-Frequency Indicators

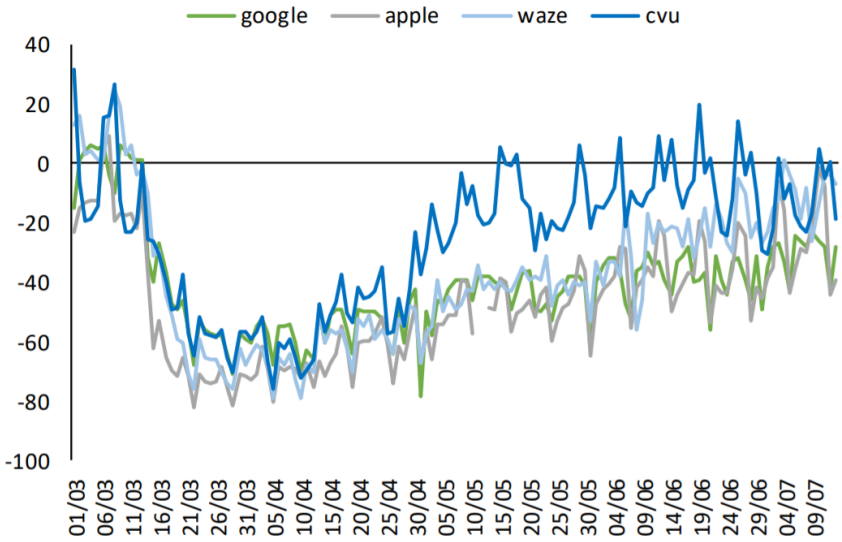
In order to have a real-time picture of the impact of COVID-19 and the measures undertaken to mitigate its negative effects on activity, we developed a series of monitoring tools using high-frequency indicators.

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 figures as a result of the decision that some economic sectors, like 'Construction', would return to work by the end of April 2020.

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]

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

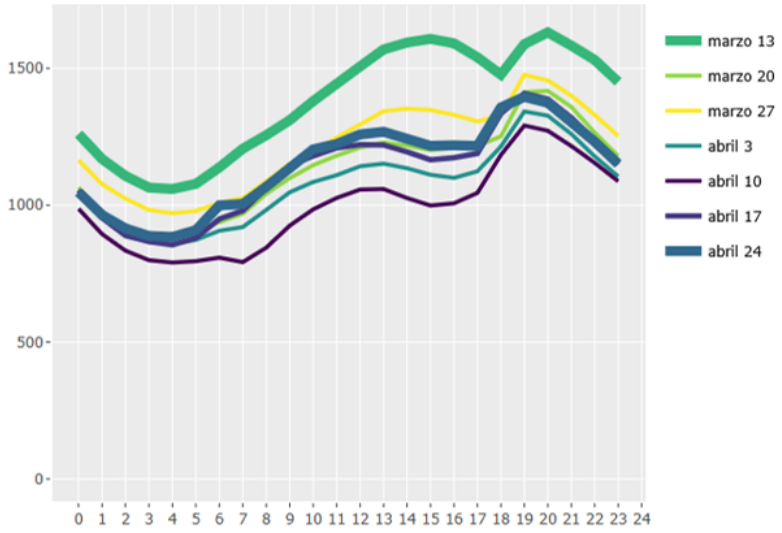
Figure 2: Mobility Indicators



Notes: Source: Government budget document.

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 case was 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 night when most people are at home.

Figure 3: Electric Power Demand
(MV, hourly average on Friday of every week)

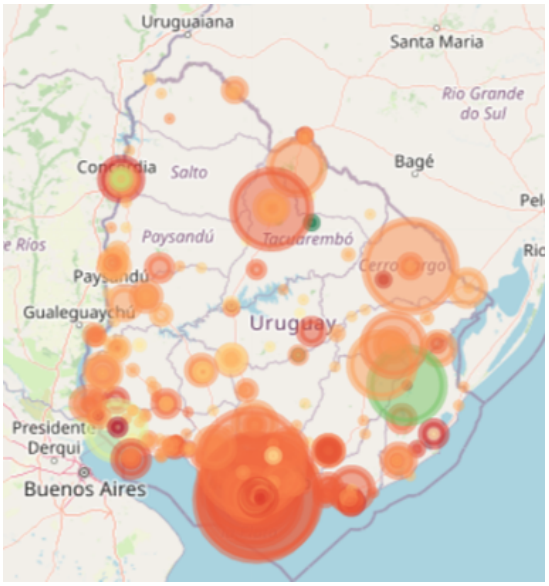


Notes: Source: BCU based on ADME.

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 for 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 private cars.

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



Notes: 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 region 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 coincided 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

By the end of March 2020 and after a couple of weeks since the first positive cases appear, we develop some simple projection models of economic activity. First, we estimate a three-stage estimation model using as explanatory variables the demand for electricity and fuel. The model that used electricity demand forecasts 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) March – normal	157	-2.0%
(2) March – stressed	138	-13.9%

Notes: 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 the activity of around 10% for March and 17% for April.

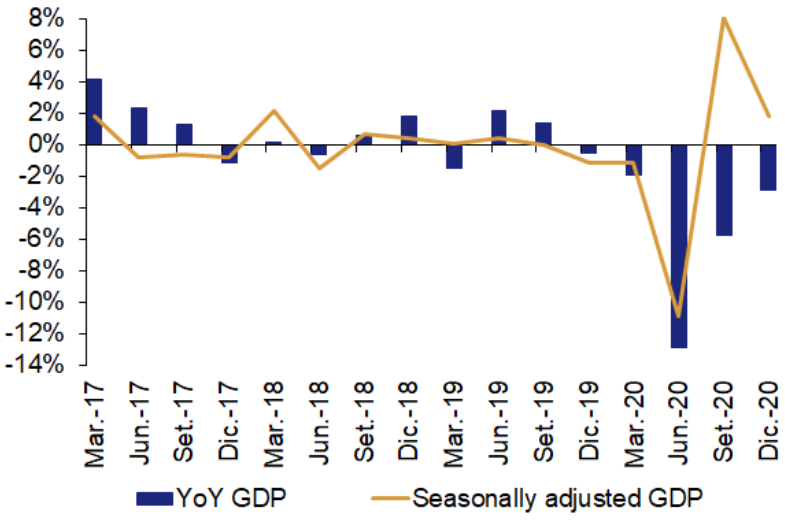
Table 3: OLS in Differences Model of the Variation in the Activity Index, Taking as Explanatory Variables Electricity Demand, Diesel and Gasoline Sales

	Variation in Activity
March – respect to fitted	-10.0%
April – respect to fitted	-16.9%

Notes: Source: BCU.

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

Figure 5: Variation in GDP



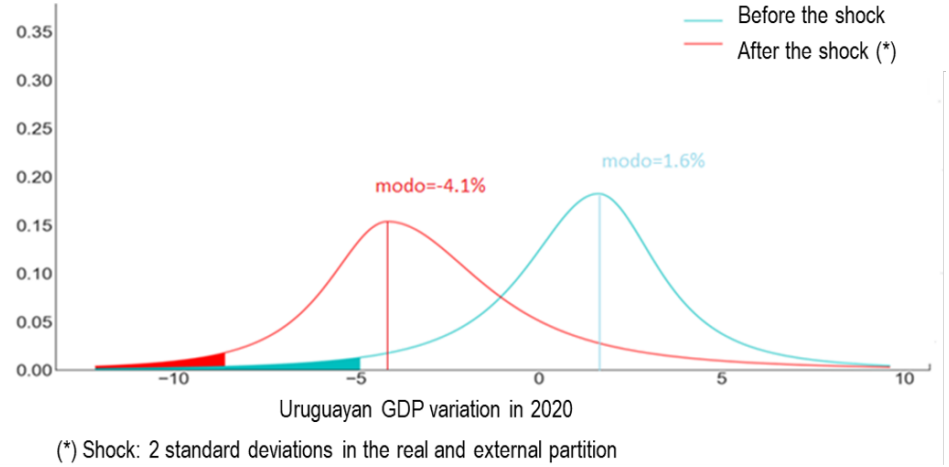
Notes: Source: BCU.

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), was applied to the Uruguayan case. Variables from the external, financial and real sectors were used to project the distribution function of GDP. The variables considered in each sector were the same that were used in the construction of the financial instability index (see Landaberry 2015, 2017). The methodology also allowed 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: The Density of the Variation in GDP - Uruguay 2020



Notes: Source: Landaberry et al. (2021).

Table 4: 2020 GDP Growth Projections in Base and COVID-19 Scenarios

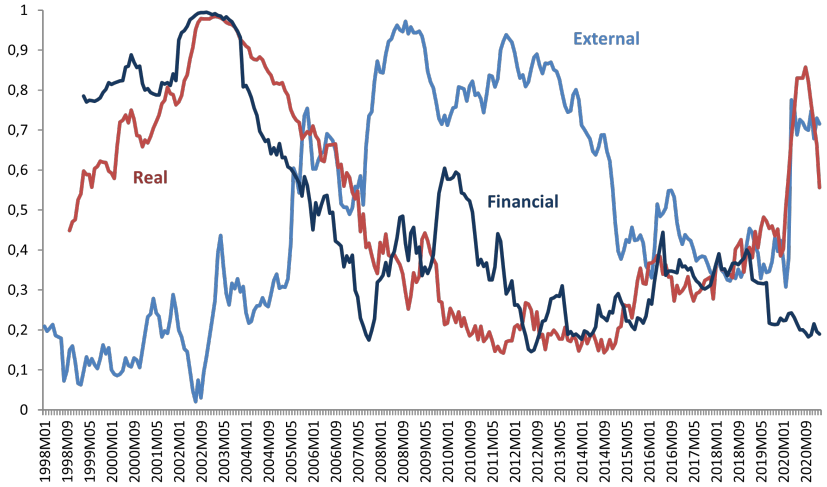
	Base scenario	COVID-19 scenario
GAR 5%	-4.9	-8.6
GAR 10%	-2.6	-6.9
Prob. of contraction	29%	83%
Mode	1.6	-4.1

Notes: Source: Landaberry et al. (2021).

The COVID-19 scenario was defined as a shock to the external and real sectors of 2 standard deviations. The choice to affect these partitions, as well as the magnitude of the

impact, arose 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



Notes: Source: Landaberry (2015) and Landaberry (2017).

In the COVID-19 scenario, a strong shift to the left of the growth probability distribution for 2020 was observed. In this case, there was a probability of 10% that the contraction was 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 months 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 the 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 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. Figure A1 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 are 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 (8.79% in 2019) above the inflation target range (i.e, between 3% and 7 %) with inflation expectations anchored above the upper bound of the target range.

Social and economic policy response focused on the labor market by extending the regular unemployment subsidy and giving monetary aid to those who were 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. Figure A.2 in the Appendix presents a detailed description of the policy measures.

Uruguayan economic institutions have used the already comprehensive social spending links to implement the policy relief. Automatic stabilizers, like unemployment subsidies and disease leaves, have been improved (see Figure 8) and monetary subsidies were reinforced to fight the negative economic effects of the pandemic.[5]

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

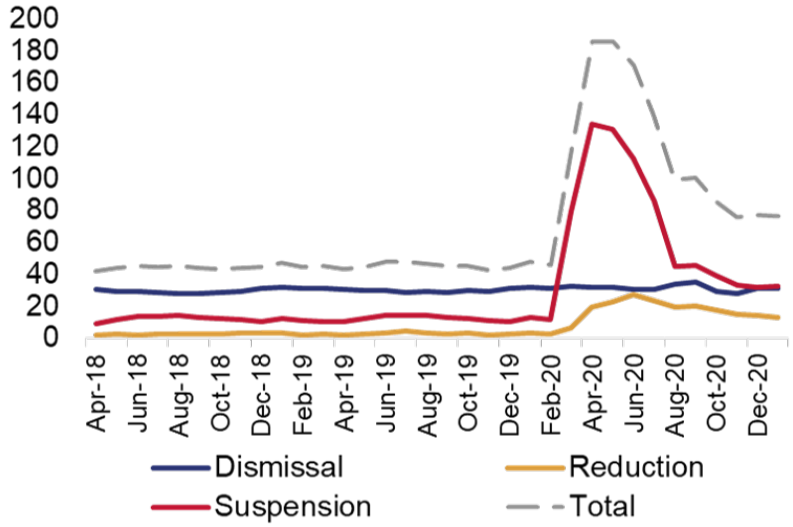
Banco Central del Uruguay and the fiscal authority started to undertake a series of financial measures aimed to secure the payment chain, provide liquidity, and foster credit in order to help to keep the economy's engine functioning.

Figure 9 describes the monetary and regulatory measures implemented by Banco Central del Uruguay.[6] Given the huge impact on economic activity and the need of providing liquidity to businesses, the monetary policy takes an expansionary stance immediately after the first positive cases of COVID-19 were confirmed. In addition to that, a series of actions to support credit provision was taken, particularly in domestic currency. There were temporary reductions in reserve requirements that were linked to the credit growth

[5] "Tarjeta Uruguay Social", 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.

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

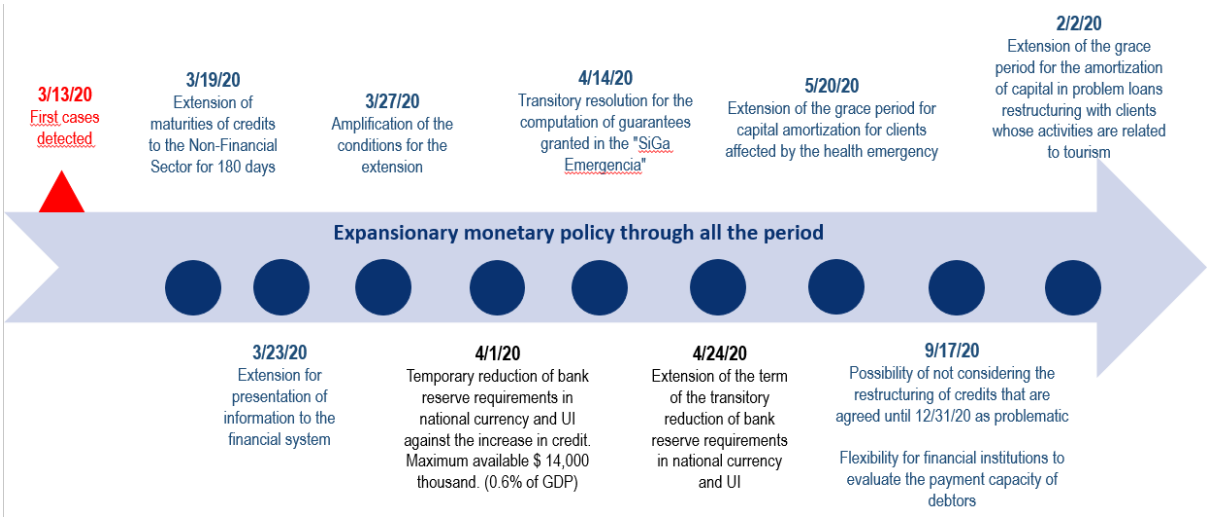
Figure 8: Beneficiaries of Unemployment Insurance
(thousands of people)



Notes: Source: BCU based on BPS.

of financial institutions. Besides, the financial supervisor implemented several measures to facilitate credit restructuring and to extend the maturity of loans. It also put into operation other flexibility measures to help financial institutions to monitor credit and to support those viable firms that were affected by the pandemic.

Figure 9: Monetary and Regulatory Measures

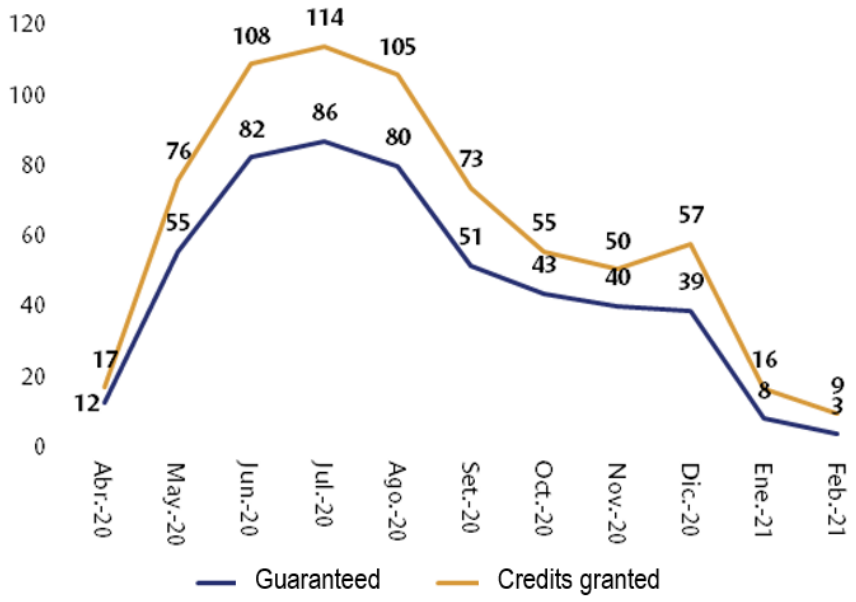


Notes: Source: BCU.

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 780 million USD, which on average represented almost 13% of total monthly credit granted to SMEs. At its peak in August 2020, 27% of the 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 an 80% coverage rate.

Figure 10: Credits Granted with a Public Credit Guarantee
(millions of dollars)



Notes: Source: SiGa Emergencia.

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 Section 3.4 we analyze 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. This exercise is complemented by using the DSGE model to assess the impact on GDP, aggregate consumption, investment and hours worked. This approach has advantages because the effect of the health crisis and the monetary policy implemented is identified in two different frameworks of analysis. However, it should be noted that for COVID-19 analysis, macroeconomic models should be combined with disease transmission models to include dynamics of outbreak spread and assess their effects. Mathematical models such as

SIR (Susceptible-Infectious-Recovered) models produce disease evolution curves through which macroeconomic models can more accurately capture the impact, both of the disease and of the measures implemented to contain it, on production, labor supply, and consumption. This feature is not present in the models considered. Additionally, the framework of this model has some limitations, as it is based on linear approximations around a stable long-run equilibrium. This means that it may not be the best tool to capture the effect of large macroeconomic shocks such as those caused by COVID-19, particularly if they trigger nonlinear dynamics in some macroeconomic variables such as capital flows or the nominal exchange rate. Moreover, the large macroeconomic shock resulting from the pandemic represents a challenge for the estimation of potential GDP, especially the identification of the permanent and temporary components of the shock (supply and demand shock). In addition, the COVID-19 pandemic may have altered the long-run relationships between macroeconomic variables. On the one hand, this may have affected the stability of the parameters and, on the other hand, it could have had effects on long-term growth. These aspects, however, remain the subject of future research. The methodological option adopted consisted of maintaining the original assumptions of the models, prioritizing the analysis of the crisis in a framework of uncertainty.

Second, we use a vector error-correction model (VECM) to evaluate the impact of the fiscal and financial measures implemented by the government on private consumption. The policy response to the pandemic is instrumented by two variables: on the one hand, government expenses that include the so-called Covid Fund and, on the other, an aggregate financial indicator. The effect of such policy on economic welfare is approximated by comparing the performance of private consumption with and without the policy relief. The VECM methodology captures a historical underlying relationship in the Uruguayan economy between government expenses and private consumption, a clear reflexion of the welfare state implemented in Uruguay since the early twentieth century. In addition, VECM's short-run dynamics adjusts any deviation of private consumption from that long-run equilibrium relationship and captures other short-run movements in private consumption. Nevertheless, the estimation strategy relies on parameter stability after the shock.

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. The possibility of surveying firms monthly during the first stages of the pandemic provides timely information to monitor their situation and the immediate impact of the policy response.

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 2022). Domestic firms operate 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 unobserved 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 tradable and non-tradable, the formation of expectations of the private sector, the uncovered interest rate parity condition and the monetary policy rule, respectively:

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

$$\pi_t^{ntx} = \alpha_1 \pi_{t-1}^{ntx} + (1-\alpha_1)\pi_{t+1}^{e,ntx} + \alpha_2 \hat{y}_t + \alpha_3 \hat{z}_t^{ntx} + \varepsilon_t^{\pi^{ntx}}, \tag{2}$$

$$\pi_t^{tx} = \alpha_4 \pi_{t-1}^{tx} + (1-\alpha_4)\pi_{t+1}^{e,tx} + \alpha_5 \hat{y}_t + \alpha_6 \hat{z}_t^{tx} + \alpha_7(\hat{z}_t - \hat{z}_{t-4}) + \varepsilon_t^{\pi^{tx}}, \tag{3}$$

$$Exp_t = \gamma Exp_{t-1} + (1-\gamma)[\psi \pi_{t+1}^{YoY} + (1-\psi)\pi_{t+1}^{T}] + \varepsilon_t^{Exp}, \tag{4}$$

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

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

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-tradable and tradable 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 of the real exchange rate and i_t is the nominal interest rate. Structural shocks are denoted by ε_t. 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 products has an impact on exports and thus on economic activity.

Inflation dynamics are inspired by the New-Keynesian Phillips curve. In this conceptual framework, inflation is a prospective process derived from the profit maximization of firms operating under monopolistic competition and price rigidity. Thus, inflation depends on the deviation of real marginal cost (averaged across firms) with respect to 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, several 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 4). 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 2), 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 tradable goods described in Equation 3 is similar to that of non-tradable, 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 to reflect 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, the 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-run domestic inflation with respect to international inflation, adjusted by the equilibrium real depreciation rate, on a quarterly basis.

The central bank's reaction function is represented by a Taylor-type monetary policy rule (Equation 6), according to which the interest rate reacts to average 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

In 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-Run Interest Rate - Percentage Points

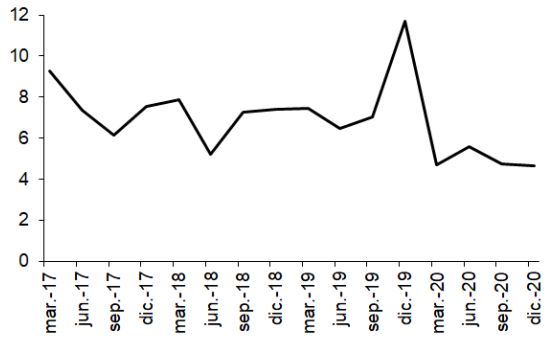
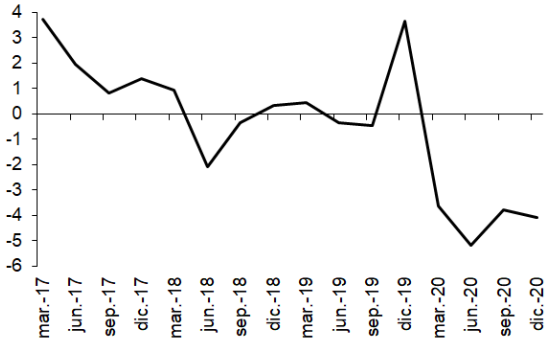


Figure 12: Real Interest Rate - Percentage Points



Notes: Authors' calculations.

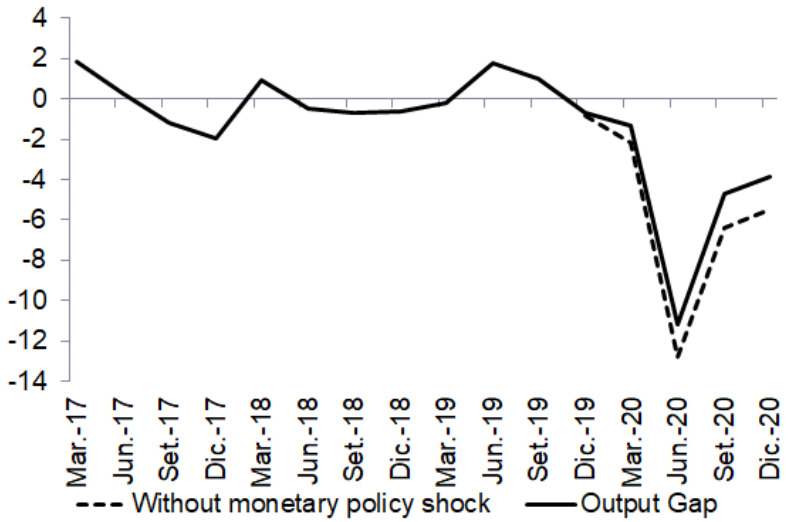
Historical decomposition is used to quantify the impact of shocks on the evolution of variables of interest. This tool facilitates the explanation of the observed phenomena and

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 to use 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 B.1 in the Appendix presents the classification of shocks used for analytical purposes.

Impact on Output Gap

Figure 13 shows the evolution of the output gap in 2017-2020. As it can be seen, in 2020 economic activity tended to deviate sharply from its trend level, showing a trough by the second quarter and a rebounding afterwards. However, had the monetary policy measures not been implemented, the contraction in output would have been higher.

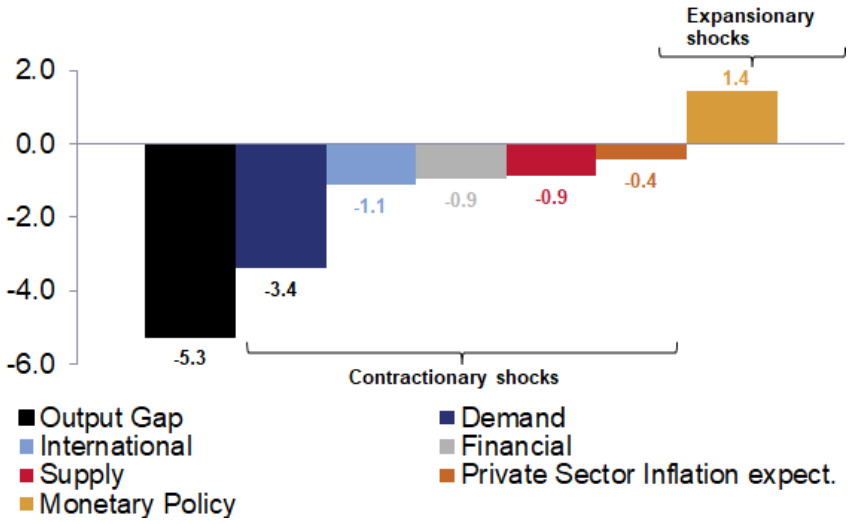
Figure 13: Output Gap 2020



Notes: 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 at 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

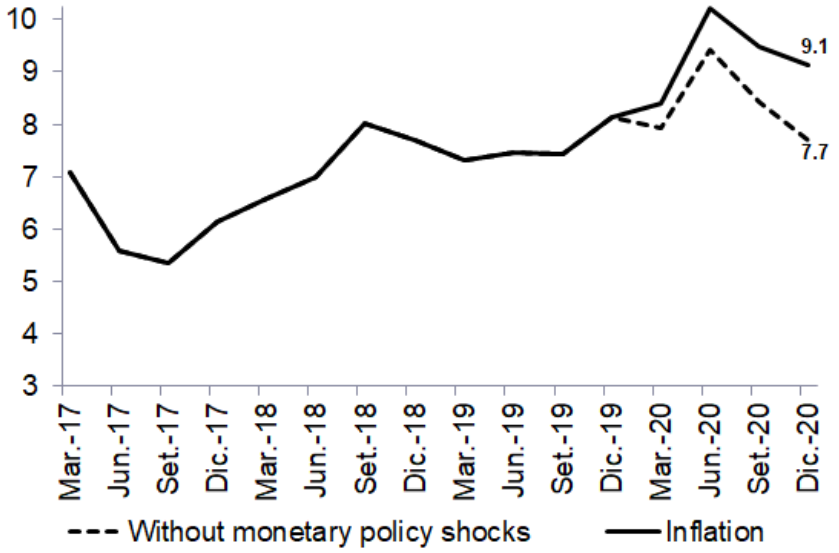


Notes: Authors'calculations.

Impact on Inflation

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

Figure 15: YoY Inflation Rate

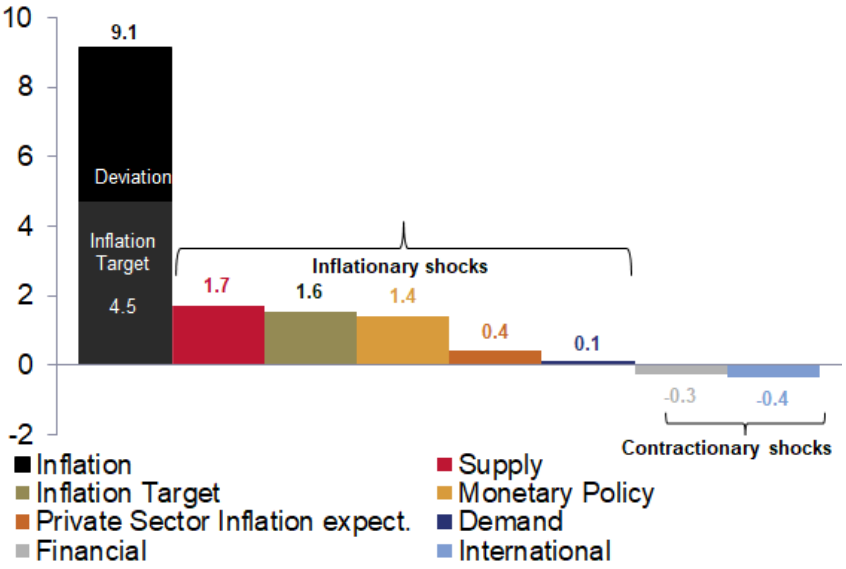


Notes: Authors'calculations.

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 targets were also significant as another form of easing monetary conditions. Likewise, the model identifies an infla-

tionary 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

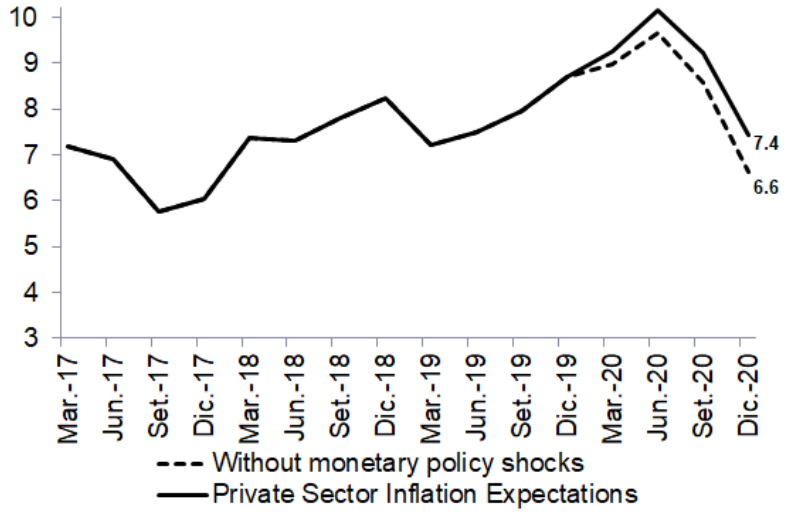


Notes: Authors' calculations.

Impact on Inflation Expectations

Inflation expectations also reacted during the shock. Figure 24 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

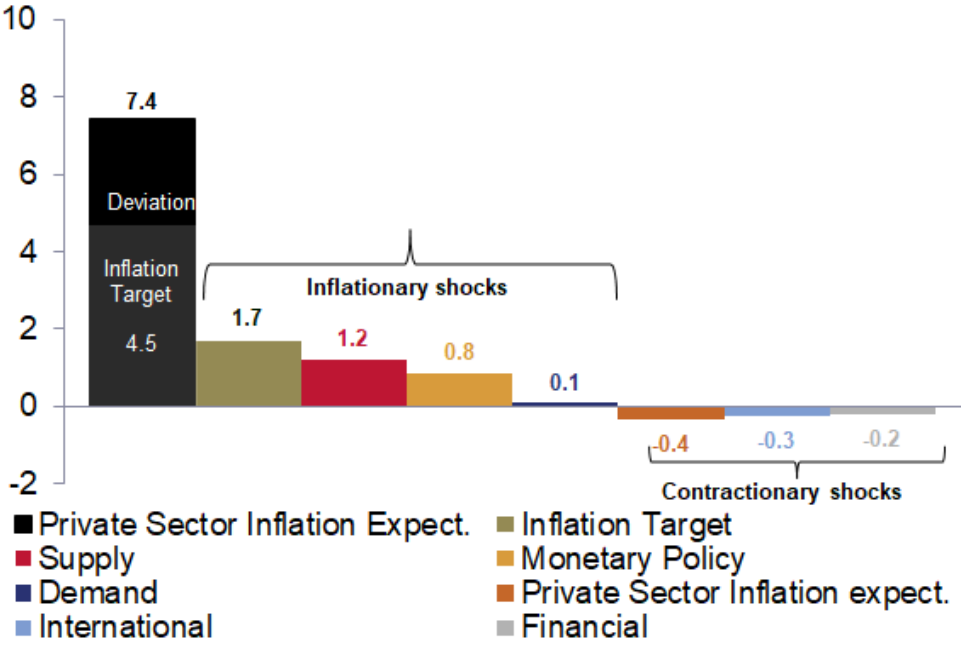


Notes: Authors'calculations.

Figure 18 shows how the value of expectations for the last quarter of 2020 is ex-

plained 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 of 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



Notes: 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 imported goods.

The non-tradable goods are the result of a two-stage production. In the first stage, there are producers of varieties in a non-competitive market. In the 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 the previous period's domestic good inflation and steady-state domestic good inflation (Calvo pricing).

The production structure of imported goods 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 to adjust 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 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. The DSGE model does not consider the existence of unemployment, so the analysis of the labor market is reduced to the evolution of wages and hours worked. The latter are adjusted so that supply and demand are equal in equilibrium with full employment. 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 C.2 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.[7] 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

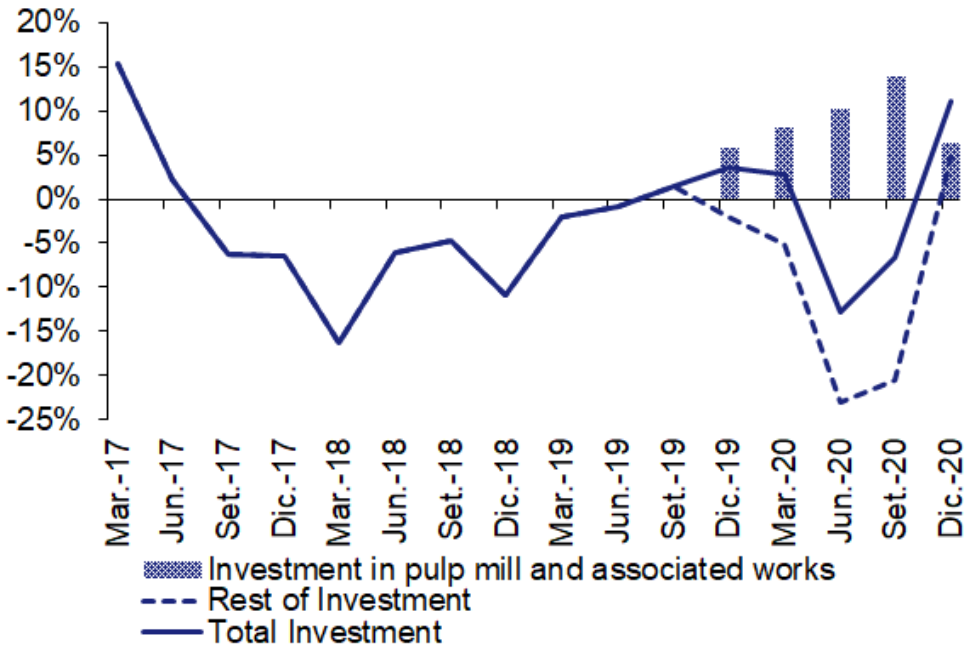
	GDP	Consumption	Investment	*MPM*(GDP)
Supply	-2.8	-0.7	0.1	-3.0
Demand	-4.1	-7.4	-0.4	-4.4
Financial	-0.9	-2.2	-7.3	-0.8
International	-1.9	0.9	-1.3	-1.3
Monetary Policy	0.8	0.4	2.3	1.1
Others	-0.2	-0.9	1.4	-0.2
Average growth rate	-6.1	-6.5	-0.8	-6.1
Steady state growth rate	3.1	3.4	4.4	2.5

Notes: The impact of shocks is computed as a deviation from steady state equilibrium of variables. This means that variables presented in the table deviated from steady state growth by a magnitude equivalent to the sum of the shocks presented in the table. Source: Authors' calculations

[7]Impacts are calculated as deviations from steady-state growth in each model, 2.5% in the case of the MPM and 3.1% in the case of the DSGE.

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 the 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 their 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 part of the impact of works associated with the new pulp mill. Figure 19 shows the estimated impact of the pulp mill and associated works on the evolution of investment. As can be seen, even discounting the effect of the aforementioned infrastructure works, investment recovered after the sharp drop during the second quarter of 2020.

Figure 19: Investment - Annual Log Difference

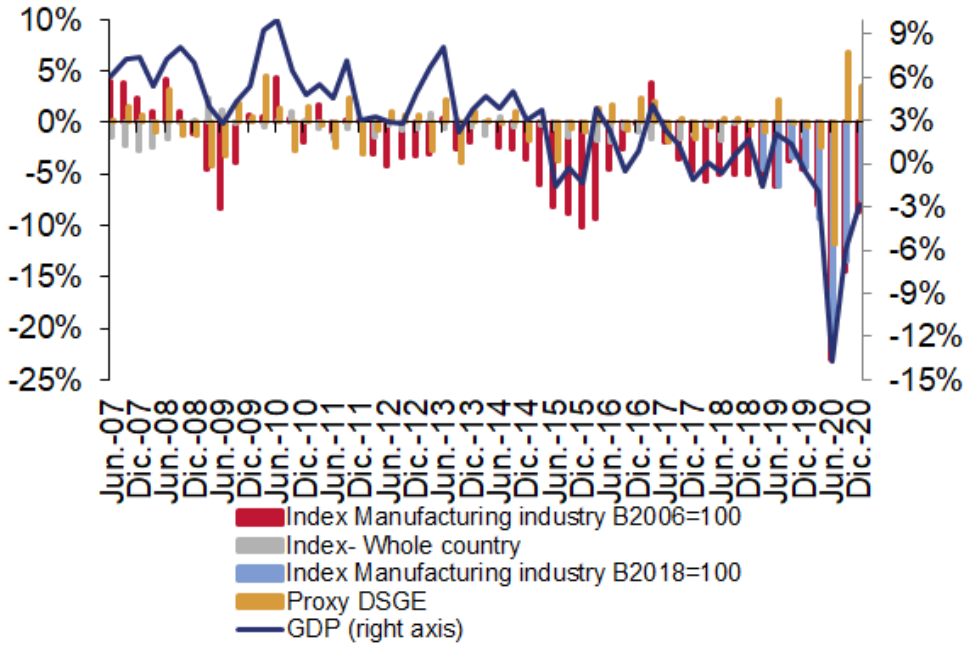


Notes: Source: Own elaboration based on BCU.

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 20 shows the evolution of some indicators of hours worked vis-à-vis economic growth. All indexes show a contraction during 2020, especially 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 20: Hours Worked and GDP - Annual Log Difference



Notes: Source: BCU based on INE.

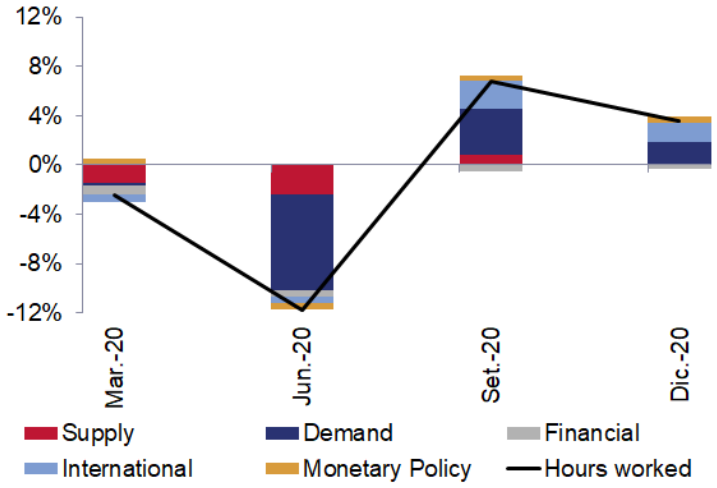
The historical decomposition in the DSGE model (Table 6 and Figure 21) shows that supply, demand, and financial shocks may help explain the decline in hours worked. Supply shocks (productivity) account for about 0.7% of the decline in hours worked in the average of 2020. This may reflect the impact of 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 behavior. 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%. 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%

Notes: Source: Authors' calculations

Figure 21: Historical Decomposition - Hours Worked in DSGE, Annual Log Difference 2020



Notes: 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 pandemic, 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 the COVID-19 pandemic 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' income risk increased against the backdrop of growing general economic uncertainty. Automatic stabilizers – e.g., unemployment 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 safety net 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 keep the economy's engine functioning. In particular, all those measures were targeted at limiting welfare losses for the Uruguayan people.

The 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 the first picture of people's needs. HANK models may be the answer to solve those inconveniences by introducing heterogeneity in the economic analysis.

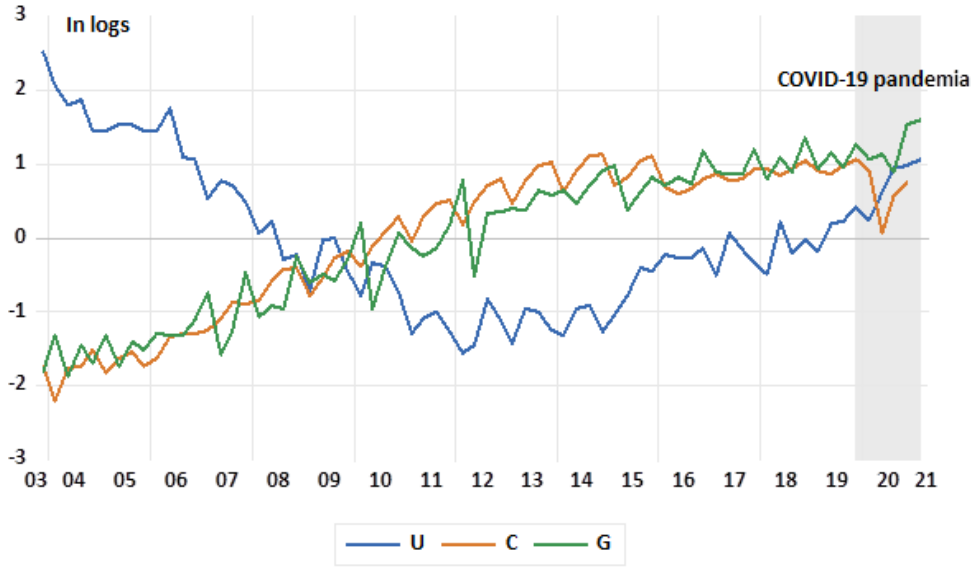
3.3.2 Data

The database extends from 2003Q4 to 2020Q4 and is composed of per capita government spending (G), per capita private consumption (C), the unemployment rate μ, and a financial conditions index. In addition, the COVID-19 Fund 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 22 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 fulfill 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 22: Per Capita Government Spending, Per Capita Private Consumption, and Unemployment. 2003-2020



Notes: Source: Authors' calculations based on BCU and INE 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) backs individuals' expenditure and, on the other hand, households' expenditures 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 grew sharply when the COVID-19 pandemic arrived. This behavior resembles the opposite one shown by G and C.

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

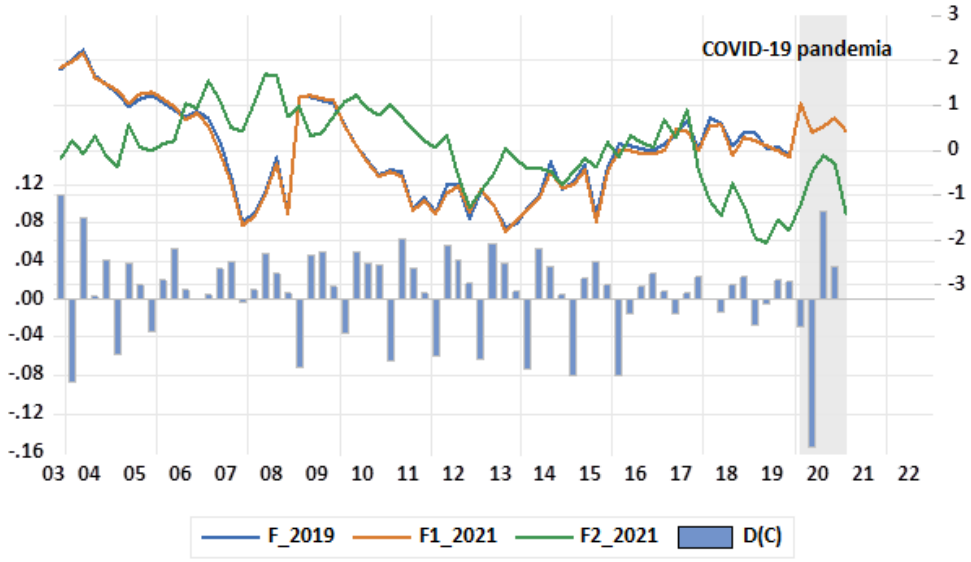
(i) Financial price measures that influence the user's cost of capital (active interest

rates), (ii) Consumer interest rates that affect the trade-off between consumption today and consumption tomorrow, (iii) Measures of borrower risk (percentage of nonperforming loans), and (iv) Quantitative indicators (number of transactions). See a detailed description of the dataset in the Appendix.

27 time series are deseasonalized, made stationary if needed to, purged from business-cycle feedbacks, and standardized as in (Bucacos-Iguini 2017). See Appendix. The goodness of fit criteria and measures of sample adequacy pointed to 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 firms and households' consumption decisions for the pre-pandemic period. Nevertheless, when the pandemic timespan is included, factor analysis shows two factors: one, (F1_2021) coincides with the pre-pandemic 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 23 and Table 7.

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 23: Financial Conditions Index: Pre and Post COVID-19 Pandemic. 2003-2020



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

Table 7: Financial Condition Index: Loadings of Its Main Components

	F1_2021	F2_2021
Consumer interest rates	0.4545	0.7336
Financial price measures	0.9128	0.2636
Quantitative indicators	-0.0736	-0.5530

Notes: Source: Authors' calculations

Table 7 shows the loadings of (initially) 27 time series used in the factor analysis, grouped by broad items in each factor. Those loadings are correlation coefficients of each item with respect to the associated factor. All of the variables included in the F_2019 factor are active interest rates charged mainly to firms and only one to families. Once the sample is extended from 2020Q1 up to 2020Q4, almost all of the variables remain. Nevertheless, there are some changes: the active interest rate to firms up to 367 days is discarded, the number of new loans to firms is included and the optimal number of factors increases to two: F1_2021 and F2_2021. Given that 83% of F1_2021 variance is accounted by financial price measures (0.9128^2), we call it the "Price" factor and because the higher loading of the only variable related to the number of new loans corresponds to the second factor, we call it "Quantity". Nevertheless, the latter factor is still highly correlated with price measures, such as the 30-day interest rate for families (0.7336).

The significant decrease of F1_2021 by the second quarter of 2020 seems to be the result of an important decrease in interest rates faced by the firms (grouped in "Financial price measures"). On the other hand, the increase in the number of new loans to firms seems to be reflected by the sharp fall in F2_2021 by the second half of 2020.

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. The 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:

$$C_t = -3.6942 - 0.2293\mu_t + 0.5990G_t \tag{7}$$

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 by 0.60 percent. Besides, rising unemployment leads to income reductions that decrease individuals' consumption possibilities even if partially compensated by unemployment and sick subsidies.

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 do not respond to active fiscal policy.

This model is estimated by maximum likelihood from 2003Q4 to 2019Q4 and then it

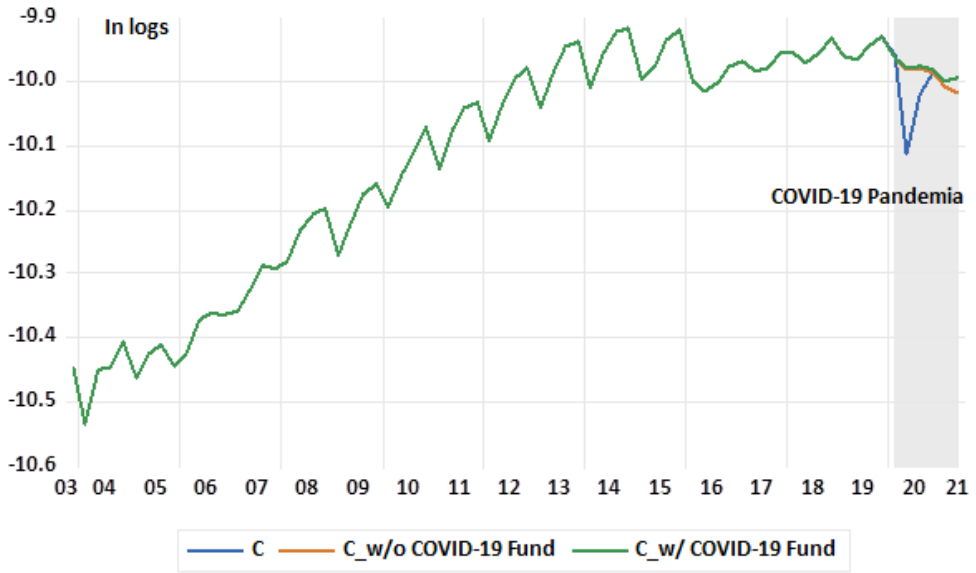
is forecasted for 2020Q1 to 2021Q2 in two scenarios: one, including policy measures, and another without them. Two policy instruments are considered: the COVID-19 Fund and the financial conditions index.

In this framework, the COVID-19 Fund works through government spending to either increase public expenses or reduce 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 2021 (see Figure 24).

Figure 24: Per Capita Consumption in Pre and Post COVID-19 Pandemic: Relevance of Policy Relief. 2003-2021



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

Policy relief seems to be responsible for cushioning individuals' well-being from the negative consequences of the COVID-19 pandemic. 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 Survey Data on Firms

During 2020 and 2021 the Banco Central del Uruguay included relevant questions in the monthly Inflation Expectations Survey (IES) to firms with the aim of monitoring their financial condition and the immediate impact of the policy response to the COVID-19 shock.

The IES covers firms with more than 50 employees in all economic sectors except banking and agricultural ones. It has been conducted without interruption with monthly frequency since October 2009 up to date. It is a price-setters' inflation expectations survey, in which different modules have been added more or less continuously for different issues such as financial stability, foreign trade, economic growth, monetary policy, etc. Since 2013, financial stability questions have been regularly asked, particularly those related to banking, commercial and non-banking credit access, and also about preferences on maturity and currency of credits. During 2020 and 2021, other questions were added regarding the liquidity of the firms and their working capital financing needs. We focus on three aspects: the liquidity of companies (measured as the time funds to meet their working capital needs are hold, in weeks), the perception of access to credit (with respect to the immediate past and their expectations for the short term), and the preferred currency to take debt.

Difficulty and facility of access to credit is evaluated four times a year since April 2013. Specifically, there are six questions that evaluate credit access. Three questions refer to the perceptions of firms with respect to the accessibility to bank credit, financial non-banking credit and commercial credit. Each one compares the current situation with respect to that three months before, and with respect to what firms expect for the next three months. Regarding currency debt preference, since 2013 the survey includes a question that asks which is the preferred denomination of new debt: Uruguayan Pesos, US Dollar, or Indexed Units.[8] In May 2020, November 2020, and May 2021 a question related to the liquidity of firms was included. In particular, the question (done in Spanish and translated into English) 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?"*

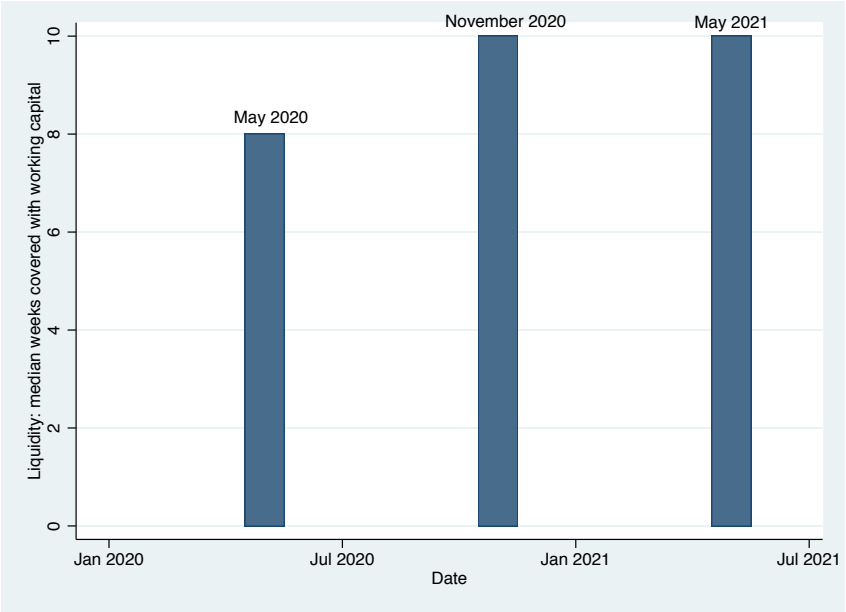
In the Appendix, Table C.1 presents the descriptive statistics for these questions from January 2018 up to April 2021.

As it is shown in Figure 25 the median of the number of weeks that firms had cash availability increased significantly between May and November 2020, 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

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

currency and rates at which this credit could be accessed.

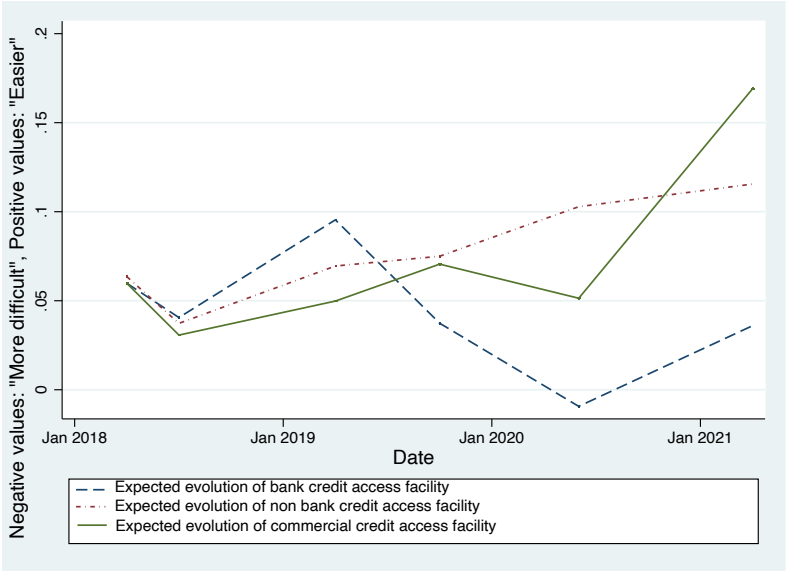
Figure 25: Firms' Liquidity Availability



Notes: Source: Authors' calculations.

Figure 26 presents firms' expectations of credit access for each type of external financing sources. These variables, based on IES´ responses, were constructed as the difference between the perception of expected access-to-credit easiness in the next three months and the perception of the ease of current access with respect to the three previous months. Positive values correspond to an expected increase in the ease to credit access. During 2020 and 2021 firms perceive an increase in the easiness of getting all types of credits, particularly of commercial credit, the main short-term external financing source for Uruguayan firms (Mello 2018). It can be seen that the perceived increase in access is contemporaneous to the credit and liquidity boosting measures taken by the authorities, both for bank and non-bank financial sector loans, as well as for commercial credit.

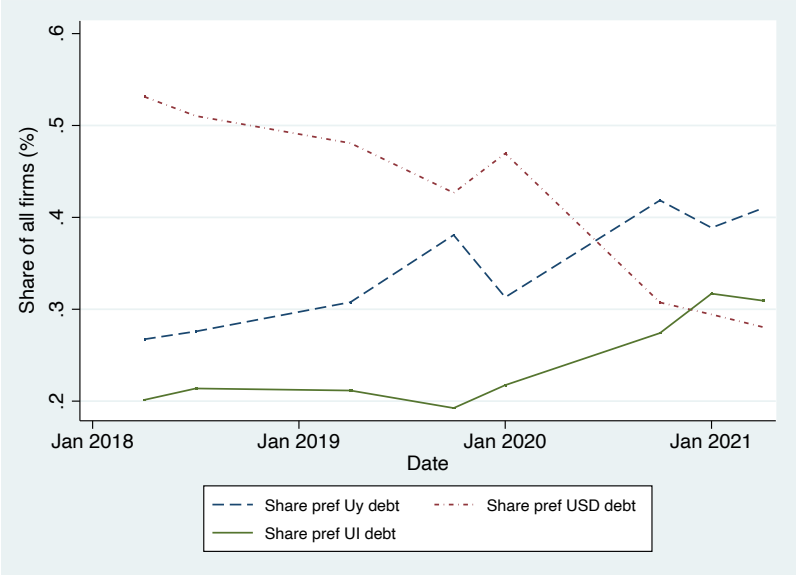
Figure 26: Expectations with Respect to Credit Access



Notes: Source: Authors' calculations.

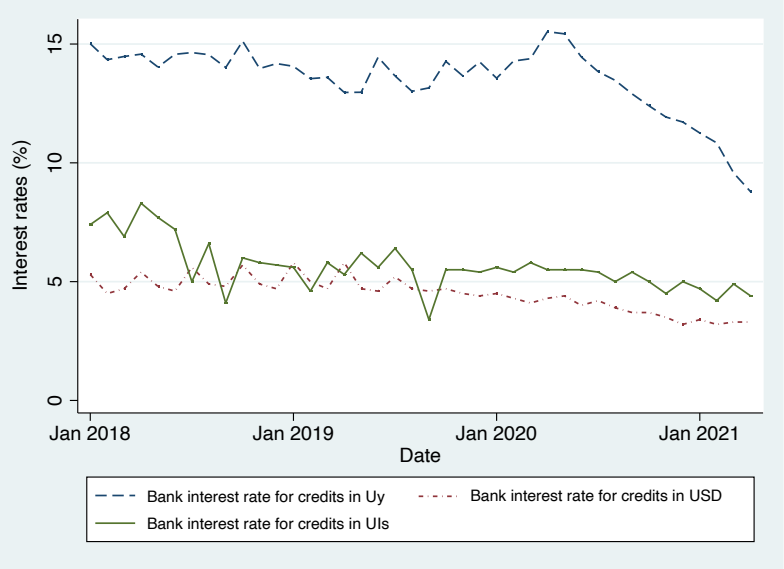
In Figure 27 we show the share of firms that would prefer to take debt denominated in either US Dollars, Uruguayan Pesos, or Indexed Units. During 2020 there was a significant drop in USD preference: 47% of firms declared to prefer USD in February 2020, while 30% in October. In contrast, preferences for Peso and UI, increased during 2020. As shown in Figure 28, this change can be explained by a sharp reduction in local currency interest rates, in part due to the SIGA program, the public credit guarantee scheme previously explained.

Figure 27: Currency Debt Preference and Interest Rates



Notes: Source: Authors' calculations.

Figure 28: Bank Loans Interest Rates by Currencies



Notes: Source: Authors' calculations.

3.4.1 Empirical Analysis

Using data from IES, we assess the liquidity of firms, 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 denomination of the company debt. The variables to be modeled differ in terms of frequency and continuity – i.e., they correspond to questions included sporadically, although regularly, in the IES. Consequently, different estimation methods are used. As our main interest is to analyze 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.

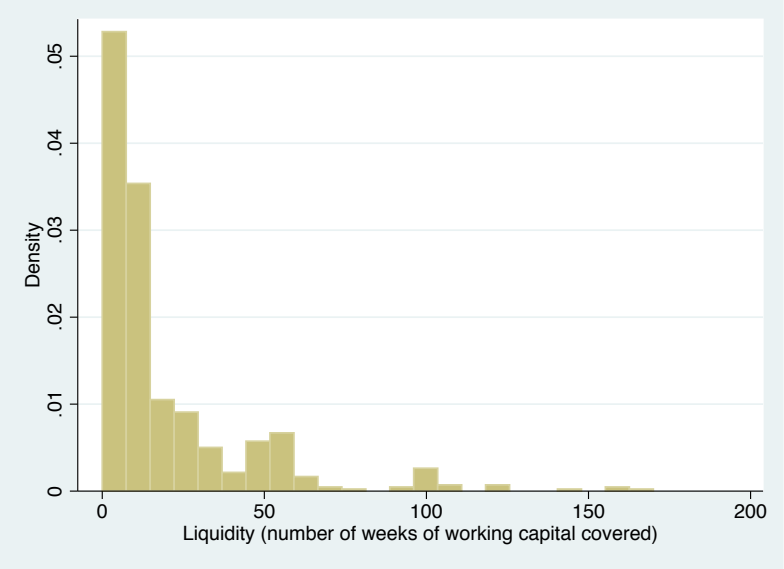
Liquidity

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 they could keep on working without taking any form of external financing.

Figure 29 presents the histogram for this variable. As it was said previously, the mean is 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[9].

[9]We include firm fixed effects and time fixed effects in all our specifications.

Figure 29: Liquidity Histogram



Notes: Source: Authors' calculations.

We estimated the following equation:

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

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 expressed in logarithms. The results are presented in Table 9 and confirm the positive impact of the policy measures through a reduction on the nominal interest rate for credit in local currency.

Loans Currency Preferences

Firms respond to currency preferences questions regularly since 2015; 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. The preference for currency denomination is a discrete variable that takes value 1 if the firm answers "US Dollar", takes value 2 if the answer is "Indexed Units", and takes value 3 if firms answer "Uruguayan Peso". Thus, this variable is ordered in the function of financial stability convenience, so we estimate an ordered logit model to characterize these responses.

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

Results for the liquidity and currency preference models are presented in Table 9.

As it is shown in the table the loans interest rate in UYU is the main variable that

explains firms' liquidity and 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 27 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 9: 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

Notes: Source: Authors' calculations.

Credit Access

Questions about firm´s credit-access easiness were done in April and October 2019, January and June 2020, and April 2021. In Figure 26 it seems that firms perceived it easier to get credit, especially bank and commercial credit. At this stance, we present estimations for these perceptions with 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 ones from 1 to 5, where greater numbers imply an easier perception. We estimate an ordered logit specification:

$$Access_{ijt} = \alpha_i + \beta_1 E(C_{it}^{12}) + \beta_2 i_t^{UYU} + \beta_3 Size_{it} + \varepsilon_{it}, \tag{10}$$

where, $Access_{ijt}$ represents the response of firm i respect to ease of access to type of credit j at time t.

Table 10 shows the estimations for bank credit, financial non-bank credit, and commercial credit perceptions. In both financial types of credits – i.e., bank, and non-bank - the interest rate of loans in local currency is the main determinant. This is an expected result since the price of taking bank loans dropped sharply in local currency and financial non-bank credit is a substitute for bank credit, so we expect ease in access when banks are more likely to expand credit.

The estimation for commercial credit is consistent with a crisis scenario, since those firms that expect a higher increase in their costs, perceived ease in access to commercial credit.

Table 10: 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

Notes: Source: Authors' calculations.

Table 11 presents the models for expectations with respect to credit access. Again, we found that the interest rate for loans in local currency is the main determinant of 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 11: 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

Notes: Source: Authors' calculations.

4 Final Remarks

The COVID-19 pandemic implied a large shock, 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 was taken by focusing on 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 businesses.

Our assessment of the impact of the policy measures on activity, inflation, inflation expectations, investment, consumption, hours worked 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 policies had not been implemented.

The positive impact of the measures holds 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 impact of the measures undertaken in response to the COVID-19 shock in Uruguay. The next steps may include going deeper

into each of the specific policy measures in order to assess their relative efficiency.

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Appendix

A Health, Social and Economic Measures

Figure 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		

Figure 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.

B Macro Models

Table B.1: Classification of Shocks MPM

Classification	Shock
Supply	Trend output growth
	Non tradable inflation
	Tradable 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 tradable
	Trend relative price for tradable

Notes: Source: Own elaboration.

C Financial Conditions Index

There are several statistical indicators designed to measure financial instability. As (Kliesen et al. 2012) pointed out, those indexes "... show latent conditions and are constructed from other economic and/or financial data using sophisticated statistical techniques long in use by economists and statisticians." In essence, relevant variables are appropriately filtered, reduced, and combined in order to deliver a few indicators that show meaningful underlying patterns in the data.

First, raw (seasonally adjusted) time series are put on a common scale by standardization. Instead of applying the usual way – i.e. to subtract the sample mean from the raw score and divide this difference by the sample standard deviation -, we use (Hollo et al. 2012) proposal. In their procedure, extreme events are allowed to have more weight in the standardization process because as most of the raw variables may not be normally distributed, the results obtained from the use of standardized variables are sensitive to aberrant observations. Those authors propose a transformation of raw variables based on their empirical cumulative distribution function (CDF) involving the computation of order statistics.

Following (Hollo et al. 2012), let us denote a particular data set of a raw variable

$$x = (x_1, x_2, ..., x_n)$$

with n the total number of observations in the sample. The ordered sample is denoted

$$x = (x_{[1]}, x_{[2]}, ..., x_{[n]})$$

where

$$x_{[1]} \leq x_{[2]} \leq ... \leq x_{[n]}$$

and [r] refers to the ranking number assigned to a particular realization of $x_{[t]}$.

All values of the original data set are arranged in ascending order such that the order statistic $x_{[n]}$ represents the sample maximum, i.e., the highest level of a variable in a given sample, and $x_{[1]}$ accordingly, the sample minimum. The transformed indicators $z_{[t]}$ are now computed from the raw variable

$$x_{[t]}$$

on the basis of the empirical CDF

$$F_n(x_t):$$

$$z_t = F_n(x_t) = r/n, x_{[r]} \leq x_{[t]} < x_{[r+1]}, r = 1, 2, ..., n-1$$

$$z_t = F_n(x_t) = 1, x_{[t]} \geq x_{[n]}$$

The transformation thus projects raw variables into variables that are unit-free and measured on an ordinal scale with range (0, 1].

Next, all variables are controlled for past GDP growth (d(gdp)) and inflation (d(p)), concentrating on the predictive power of financial conditions for future economic activity (Hatzius et al. 2010):

$$z_t = a_0 + a_1[d(gdp)_{t-1}] + a_2[d(dgp)_{t-2}] + a_3[d(p)_{t-1}] + a_4[d(p)_{t-2}] + e_t$$

The reason for doing this depuration lays in the belief that, ideally, a financial conditions index should measure financial shocks, that is, exogenous shifts in financial conditions that influence or otherwise predict future economic activity. Then, once data is already seasonally adjusted, standardized, and purged, underlying common factors are extracted using Factor Analysis (FA). FA is preferred to Principal Components Analysis (PCA) because we are interested in detecting data structure (i.e., latent constructs or factors) or causal modeling instead of data reduction (i.e., translating variable space into optimal factor space).

Table C.1: 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 C.2: 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	