CLIMATE-INDUCED DROUGHT AND FINANCIAL SYSTEMS: THE CASE OF PARAGUAY

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Abstract

The increasing severity and frequency of drought driven by climate change is significantly impacting agriculture. Drought causes social and economic damage, increases the risk of default, and reduces the value of assets linked to agricultural production. This is particularly detrimental to Global South countries, where agriculture supports many people's livelihoods. This article aims to investigate the effect of climate change-induced droughts on financial systems, using Paraguay as a case study. A Structural Vector Autoregressive model (SVAR) was used to understand the spreading dynamic of climate shocks with impulse-response functions. Findings indicate that a drought shock results in more than USD 500 million increase in modified credits in Paraguay after 3 years, and that targeted financial measures can prevent farmers' credit profiles from default. The article offers actionable recommendations aligned with SDG 13 (climate action) and SDG 8 (decent work and economic growth), and Economic Growth, aiming to contribute towards a global financial system that works for all, as envisioned in the Pact for the Future.

Keywords

Drought; financial system; agriculture; climate change; Paraguay; Global South; SVAR.

Evidence for decision-making

1. Droughts increase the risk of loan defaults and reduce the value of assets linked to farming. This severely affects the financial systems of agriculture-dependent countries.

2. The effect of a drought shock implies more than USD 500 million increase in modified credits set by Paraguay after 3 years.

3. Renewed, refinanced, and restructured credits, along with transitional complementary measures issued by the Central Bank of Paraguay kept farmers' credit profiles from default.

4. In countries with fully privatised agricultural insurance, public subsidies can incentivise private investment or agricultural resilience and help mitigate climate risks for small-scale farmers.

Introduction

Severe weather events, intensified by climate change, pose several risks to global macro-financial stability and economic growth (Kim et al., 2022). Developing economies heavily reliant on climate-sensitive sectors, such as agriculture, bear its effects at a higher scale (The World Bank & United Nations Capital Development Fund, 2024; Abbass et al., 2022). The agricultural sector stands out in the Global South, with most small-scale farmers living in Asia and Sub-Saharan Africa, where agriculture contributes approximately 15% of the gross domestic product (GDP) and supplies over 40% of jobs (Chiriac & Naran, 2020). In Latin America and the Caribbean (LAC), 18% of the total population lives in rural areas, and agricultural activities contribute around 7% of GDP, employing 14% of the workforce (World Bank Group, 2024a).

One phenomenon that heavily affects agriculture is drought (Meza et al., 2020). Depending on its duration and intensity, drought can cause devastating social and economic damage among others due to production loss, and financial institutions are not indifferent to such climate disruption (Özsoy et al., 2020). Production loss caused by droughts leads to an increasing risk of default and a decreasing value of agricultural assets. The Basel Committee on Banking Supervision [BCBS] (2022) highlights the importance of identifying and understanding the risks associated with severe weather in credit portfolios, and the relevance of establishing action schemes to mitigate climate-related impacts. Among its high-level principles for risk management and prudential supervision, BCBS includes imposing loan limitations on high-risk sectors. In contrast, some authors manifest that encouraging farming activities helps to achieve sustainable economic growth in agriculture-dependent countries (Abidi et al., 2024; Galbiati et al., 2023).

This article aims to investigate the effect of drought on the financial system, using Paraguay as a case study. The agriculture sector in Paraguay employs approximately 16% of the working population (National Institute of Statistics, 2020) and constitutes 10% of the total GDP, or 30% when adding industry derived from agricultural products (Central Bank of Paraguay [CBP], 2024a). Additionally, Paraguay is severely affected by droughts (Benítez Schneider, 2016; González Santander, 2016), with fluctuations in temperature and precipitation affecting main yields such as soybeans, corn, wheat, sesame, beans, sugar cane, cassava, and cotton (Economic Commission for Latin America and the Caribbean [ECLAC], 2014).

In 2019, a severe drought in Paraguay led the Central Bank to issue a set of measures targeting the agricultural sector to mitigate its economic impact.

These included considering individuals working in agriculture and livestock as eligible for credit if they had suffered losses (CBP Resolution No. 5, 2019; CBP Resolution 10, 2019), making reserve requirements in foreign currency available for credits and modifications in credit conditions (CBP Resolution No. 14, 2019), and formalising credit conditions adjustments along with additional support for affected agricultural activities (CBP Resolution No. 21, 2019). This article analyses such measures on credits to estimate the effect of drought on the Paraguayan financial system. It uses this estimate to contribute to understanding the multi-effects of climate change, in line with Sustainable Development Goal (SDG) 13 (climate action) and SDG 8 (decent work and economic growth). Ultimately, the article aims to contribute to building a global financial system that works for all, as envisioned in the Pact for the Future (United Nations [UN], 2024).

Methods

A Structural Vector Autoregressive (SVAR) model was employed to understand the spreading dynamic of climate shocks with impulse-response functions, as implemented in Waiguru, Kyalo, & Gichuhi (2018). Climate, financial, and agricultural variables were considered due to their relationship with climate change (Campiglio et al., 2022; Grippa et al., 2019; Kjellstrom et al., 2019). Additionally, a multi-sector analysis was conducted, incorporating the financial sector, the agricultural sector, and climatic factors.

Climatic variables

The level of precipitation in millimetres was employed to capture drought. Monthly data from the World Bank's Climate Change Knowledge Portal (2024b) was transformed to quarterly data by adding the monthly values in each quarter. The historical average level of precipitation for 1950-1999 was used to calculate the precipitation deficit, defined as follows:

$$pdeficit_t = 100 \times (\ln(\underline{phist}) - \ln(precip_t)) \qquad t=1,\dots,88.$$

Where $precip$ is the quarterly precipitation level, $\underline{phist}$ is the historical average, and $pdeficit$ is the precipitation deficit expressed in percentage terms.

Financial variables

The total credit portfolio, as well as renewed, refinanced, and restructured credits, transitional measures, and COVID-19 measures,[1] referred to hereafter as "3RMC19", were sourced from the Financial Bulletins of the Superintendency of Banks published by the Paraguayan Central Bank (2024b). The set was constructed by adding the monetary value of each variable. A more detailed description of these variables can be found in Appendix 1.

Production loss caused by droughts leads to an increasing risk of default and a decreasing value of agricultural assets.

COVID-19 measures were included as a component of the set because the first two years of the pandemic coincided with the aftermath of the severe drought under study, faced by Paraguay in 2019. Producers who had difficulties paying off their debts because of production damage, aggravated by the pandemic's trade restrictions, took advantage of the general financial relief measures issued to face the impacts of COVID-19.

Agricultural variables

Agricultural GDP data, expressed in monetary terms, was used to capture the effect of climatic shocks on the economy. The data was taken from Quarterly National Accounts Bulletins (CBP, 2023), and all variables were unified to quarterly frequency. The series was seasonally adjusted using the US Census Bureau's X-13 seasonal adjustment (SA). The Hodrick-Prescott filter helped obtain the cyclical component of the series in logarithms. The cyclical component is interpreted as deviations (in percentage) with respect to the trend.

SVAR model

The Vector Autoregressive (VAR) method helps understand how climate shocks spread through the economy. In its reduced form, VAR*(p)* considers a system of equations where the variables of interest depend on the p lags of all variables. With this methodology, the error terms are likely correlated

1. These modifications in credit conditions are authorised and regulated by the CBP.

with each other. Hence, it cannot be studied how innovations in one of them affect the system while keeping the other terms constant. However, a VAR*(p)* in reduced form can be viewed as a representation of the data produced by a SVAR*(p)* model. With this model, unlike the VAR method, the innovations are attributed to one of the variables, keeping the others constant. Once the VAR(p) model is estimated in its reduced form, the structural model can be recovered by orthogonalising the errors in the reduced form model (Sims, 1980). Hannan-Quinn criterion is used to define the number of *p* lags.

Following the SVAR model, the vector y_t of endogenous variables contains:

$$y\_t=[pdeficit_t, agrgdp_t, credit_t, 3RMC19_t]' \qquad t=1,\ldots,88.$$

Where $pdeficit_t$ is precipitation deficit, $agrgdp_t$ is agricultural GDP, $credit_t$ is total credit portfolio, and $3RMC19_t$ is the 3RMC19 set as a percentage of the total credit portfolio. More details on the technical aspects of the model can be found in Appendix 2.

Finally, impulse-response functions are used to measure the effect of precipitation deficit on the Paraguayan financial system.

Diagnostic tests

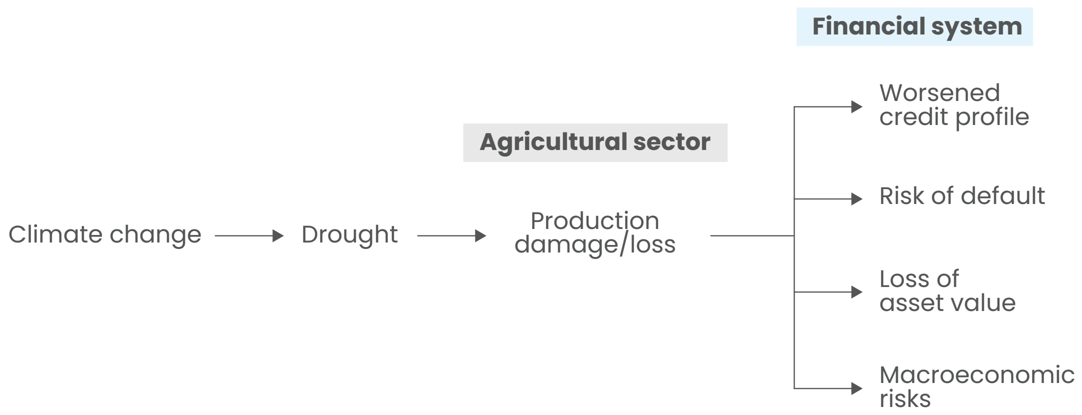
Stability diagnostic tests were performed on the SVAR estimates to ensure the reliability of the results. This test verifies that the statistical properties, such as mean, variance, and autocorrelation, do not change over time, which also satisfies stationarity conditions. Next, diagnostics on the residuals were performed to validate the results and precision within the model. The Lagrange Multiplier (LM) test was used to check serial correlation and ensure the appropriate use of lags in the model. Lastly, the homoscedasticity assumption was verified using heteroscedasticity tests that combine levels, squares, and cross terms.

Results

Transition channel of climate shocks on finance

This article considers the effect of climatic shocks on the financial system via agricultural damage or loss caused by drought. The transition channel is illustrated in Figure 1. Here, the agricultural sector is represented by agricultural GDP, while the financial system includes the total credit portfolio and the modifications of its conditions (3RMC19). The effects include a worsening of credit profiles, risk of default, loss of value in assets linked to agriculture, and macroeconomic risks.

Figure 1. **Transition channel of climatic (drought) shocks**

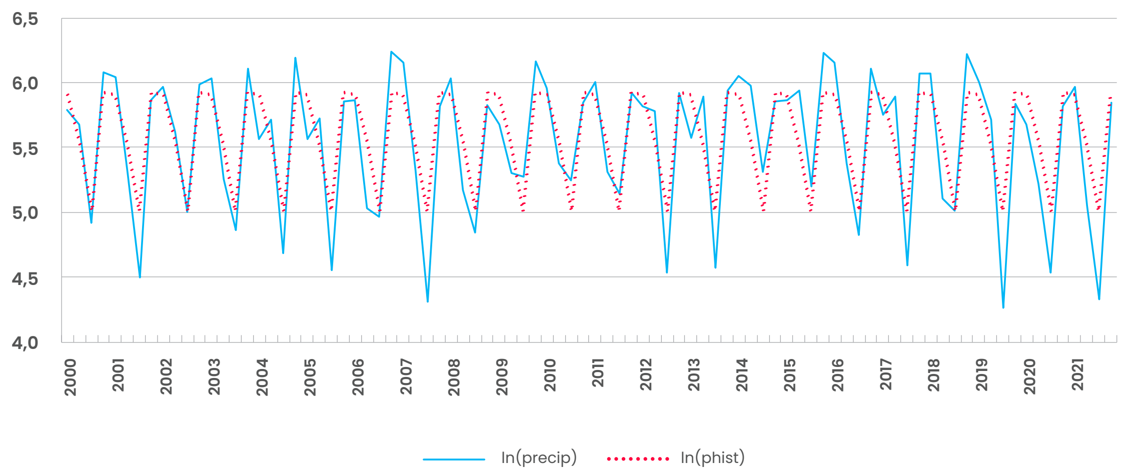


Note. Elaborated by the authors

Drought shocks

Precipitation under historical average levels reveals drought events. Figure 2 presents quarterly precipitation levels, *ln (precip)*, compared to their corresponding historical average, *ln (phist)*. The data shows that droughts were experienced in 2007, 2019, and 2021, with quarterly precipitation significantly under average levels. The third quarter of the year has the lowest precipitation level, which is considered a seasonal behaviour.

Figure 2. **Precipitation levels in Paraguay, period 2000-2021**

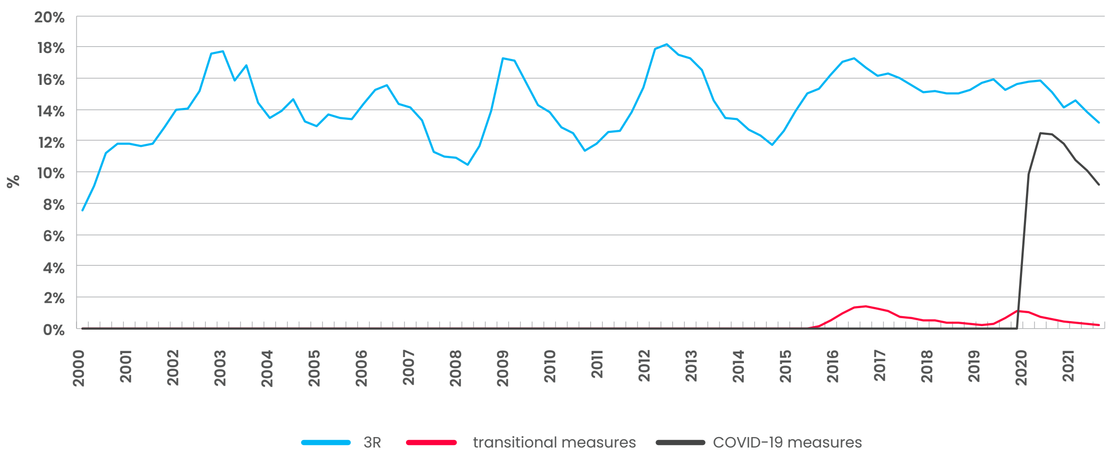


Note. Adapted from Climate Change Knowledge Portal by World Bank Group (2024b).

Modifications in credit conditions

The set of renewed, refinanced, and restructured credits, as a percentage of the total credit portfolio, presents a regular performance (Figure 3). While there are highs and lows within the range of 10 to 20%, the set represents around 14% of the total credit portfolio on average. Transitional measures have appeared since 2016, with low proportions of the total credit portfolio (less than 2%). For the case of COVID-19 measures, there is a visible peak of 12.5% in 2020, followed by a decreasing trend to 9% in the last quarter of 2021.

Figure 3. **Modifications in credit conditions, period 2000-2021**

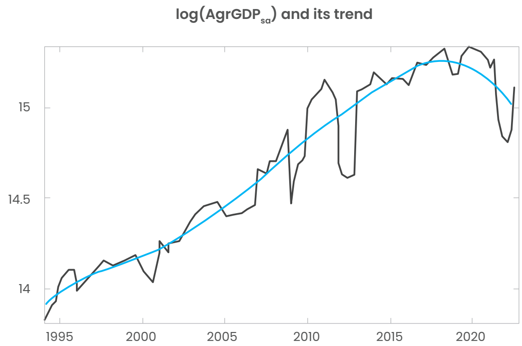


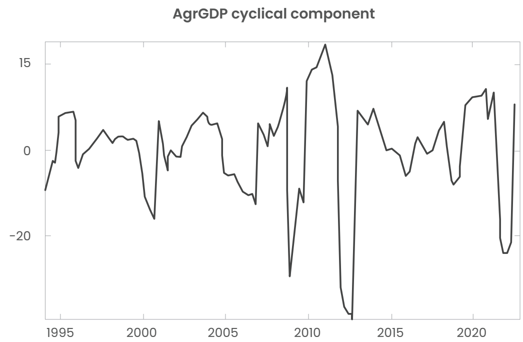
Note. Adapted from Financial Bulletins of the Superintendency of Banks by CBP (2024b).

Agricultural GDP

Agricultural GDP exhibits an increasing trend, as shown in Figure 4 (left). When taking into account the cyclical component (right), 2001, 2009, 2013, and 2020 have the most noticeable drops. These years coincide with the precipitation deficits seen in Figure 2, except for 2009 when the Great Recession repercussions could have impacted GPD.

***Figure 4.* Agricultural GDP of Paraguay, period 2000-2021**





Note. Adapted from Quarterly National Accounts Bulletins by CBP (2023).

Summary of findings

Table 1 presents the summary statistics of the variables discussed above. There is an average precipitation deficit of 5.5% with respect to the quarterly historical average, indicating drought, and its standard deviation is 27%. The agricultural sector has a cycle that, on average, represents 0.1% of its trend, but with a volatility of almost 13%. The modification in credit conditions average is 15.3% of the total credit portfolio, with around 4% of the standard deviation.

***Table 1.* Summary of variables, period 2000-2021**

Variable	Mean	Standard deviation	Percentiles (5% – 95%)
pdeficit	5.5	27.1	(-30.6 – 49.7)
*agrgdp**	0.1	12.8	(-30.2 – 18.6)
ln(credit)	4.3	1.1	(2.9 – 5.7)
3RMC19	15.3	3.9	(11.1 – 25.2)

Note. Adapted from Climate Change Knowledge Portal by World Bank Group (2024b), Quarterly National Accounts Bulletins by CBP (2023), and Financial Bulletins of the Superintendency of Banks by CBP (2024b).
* The cyclical component of agricultural GDP.

Diagnostic tests

There was no stability issue present within the model, as all inverse roots lie within the unit circle. This implies that statistical properties remain constant over time. The outputs from this and the subsequent tests are in Appendix 3. Furthermore, the LM test rejects the null hypothesis of no serial correlation at lag 1, while it cannot reject further lags. This result supports the idea of one lag specification, in line with the results from the Hannan-Quinn criterion used in the study. Finally, the heteroscedasticity tests showed evidence in favour of homoscedasticity. Overall, the diagnostic tests evidenced a correct model performance.

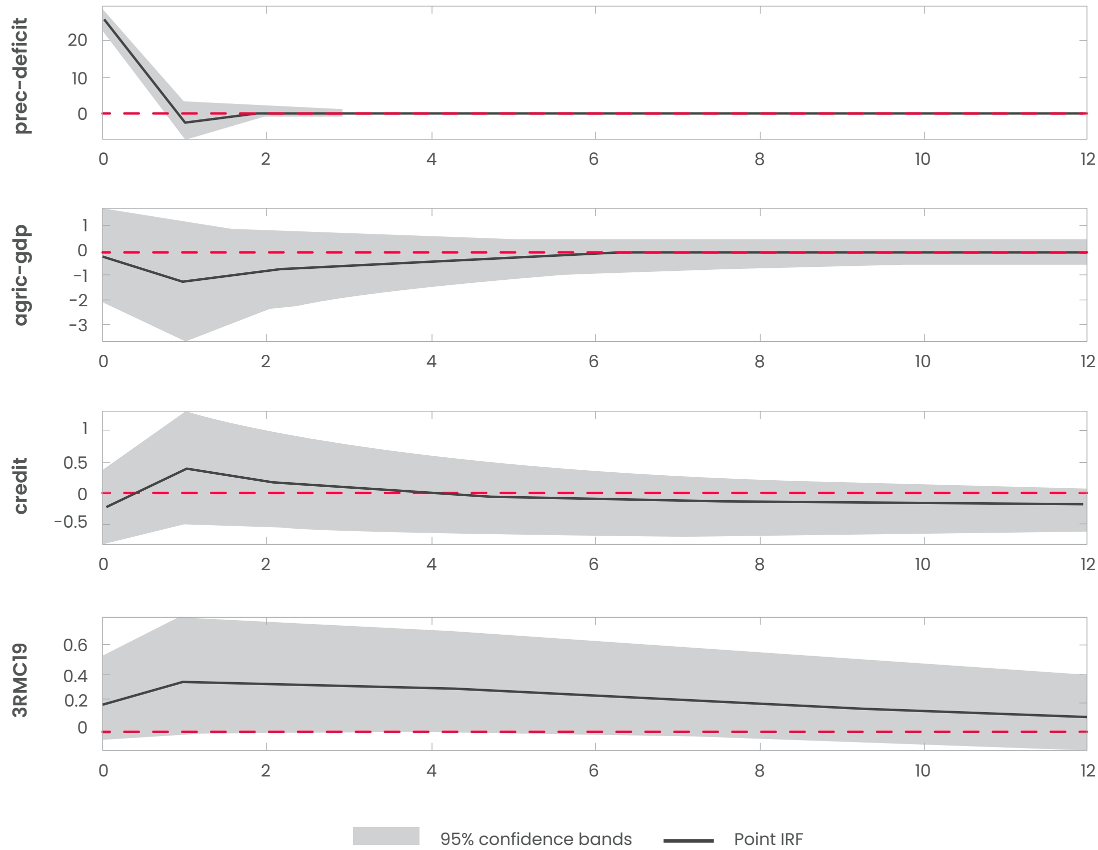
The '3RMC19' credit portfolio included COVID-19 measures that aided producers in debt recovery following the 2019 drought.

Impulse-response functions

After the estimation and diagnostic tests, impulse-response functions show statistically significant effects of a precipitation deficit on 3RMC19, mainly within the second and fourth quarter after the shock (Figure 5). The shock leads to a drop in agricultural GDP and a contraction in the total credit portfolio. However, the effects on agricultural GDP and total credits are not statistically significant at the 5% significance level. With the significant effect on 3RMC19, one standard deviation (27%) increase in precipitation deficit generates 0.2 percentage points[2] increase in 3RMC19, reaching three percentage points after 3 years. Since the total credit portfolio value at the end of 2021 was approximately USD 16,700 million, the effect of three percentage points constitutes more than USD 500 million after 3 years.

2. Note the difference between the concepts of percentage and percentage points. Percentage relates two quantities as a fraction with 100 as denominator. Percentage points is the difference (arithmetic subtraction) between two percentages.

Figure 5. **Agricultural GDP of Paraguay, period 2000-2021**



Note. Elaborated by the authors.

Discussion and actionable recommendations

Effect of drought on the financial system

This article investigated the effect of climatic shocks on Paraguay's financial system by analysing agricultural production damage or loss caused by drought. The results demonstrate a significant reaction to drought of modified credit conditions, indicating that climate disruptions affect the Paraguayan financial system. It is estimated that modifications in credit conditions (3RMC19) increase by around USD 500 million after 3 years.

The results also show that the measures taken by the Central Bank kept farmers' credit profiles from default. When the 3RMC19 set increases, it means that credits are not being paid and, instead of labelling those credits as defaulted, they are reshaped. Hence, 3RMC19 appears as a financial tool to prevent the agriculture sector from default.

The key role of Central Banks

Several macro-financial risks emerge from climate change, with repercussions on economic growth and price stability. The results of this article suggest that without measures to overcome the financial effects of severe weather, the default rate would have been higher, and credit prices could have gone out of control. This highlights the crucial role that central banks have in maintaining price stability and looking after the financial system in the face of intensifying climate change, as has been argued in similar studies (Carè et al., 2024; Kim et al., 2022; Ciccarelli, & Marotta, 2021).

As each country has different regulations, there is no unique formula to safeguard agriculture from climatic disruptions through finance.

The case of Paraguay serves as a model for supporting agricultural activities through credit condition modifications that provide relief to debtors. The 3RMC19 measures were timely and prudential, making them trustworthy. For example, the Central Bank saved a portion (say 5%) from the remaining balance of the modified credit as a contingency reserve (CBP Resolution No. 5, 2019). Similarly, the bank's emphasis on supervision to validate that each request was indeed related to the impacts of drought increased the effectiveness of measures and helped avoid negative incentives.

As each country has different regulations, there is no unique formula to safeguard agriculture from climatic disruptions through finance. However, relief from default appears crucial to foster agricultural resilience when extreme weather events take place. In this way, central banks can safeguard the financial system while supporting agricultural growth. One important factor for the effectiveness of measures in the case of Paraguay was the independence of its Central Bank (declared through its Organic Charter, Law No. 489 Article 1), which increased trustworthiness. The institution's credibility is essential to de-risk and incentivise investment. In the Paraguayan case, the measures to modify credit conditions (3RMC19) were well received.

Lessons for climate finance

The results of this article provide evidence that financial measures can help support the agricultural sector when facing severe consequences from adverse weather events. Recognising the effect of climate change on financial stability is particularly important for Global South countries, where agriculture supports many livelihoods. In Paraguay, for instance, the agriculture sector holds one of the major shares of the credit portfolio and faces severe consequences from adverse climatic situations (Abbass et al., 2022).

While there are ambitions to improve climate finance in the Global South, it is crucial that national authorities take the lead in understanding the financial consequences of climate change and ensuring economic stability. Existing policies are often designed at the micro level, highlighting the need for broader strategies to mitigate the macro-financial impacts of climate change. Intersectoral coordination and renewed strategies are needed, for which international capacity sharing would be of great help. This is in line with the Pact for the Future's goal of scaling up climate adaptation finance, capacity-building and technology transfer to support climate action and build resilience in developing countries (United Nations, 2024). Increased development cooperation, SDG investments, and a renewed international financial architecture can also support developing countries in reaching the SDG targets (United Nations, 2023).

Beyond finance, it is important to keep in mind the human face behind it all. Around 1.4 billion people—18% of the global population—are employed in agriculture, shouldering the main economic effects of climate change (Meza et al., 2020). In countries with fully privatised agricultural insurance, such as Paraguay, public subsidies can help de-risk and incentivise private investment in favour of farmers' relief. Public subsidies for agricultural insurance have been shown to reduce the cost of policies in Brazil, Chile, and Uruguay (García, 2024). Additionally, building a specific public fund for extreme weather events can act as a guarantee for the financial sector in the face of severe climatic disruptions. Private investors may feel confident to loan or invest in agriculture knowing that there is some backup from the government. This can contribute to building a more enabling regulatory and investment environment, as envisioned in the Pact for the Future (UN, 2024).

Conclusions and future research

This research represents the first effort to address the effects of climate disruption on the financial sector through modified credits, based on the case of Paraguay. Evidence was found in favour of implementing financial measures to support farmers facing the consequences of adverse climatic situations. Further research is needed to consider a combination of other climatic variables (floods, temperature, wind speed) or climate indices with alternative approaches for the financial sector (e.g., asset valuation, crop yields, commodity prices, or insurance).

Given that COVID-19 measures included in the study were for general financial relief during the pandemic, the 3RMC19 set covered climatic and non-climatic issues during this period. Unfortunately, data about the COVID-19 measures is not disaggregated by activity, which would have led to more precise results. Nevertheless, the study's results shed light on the relevance for central banks to embed climate-related risks into their policy framework.

More could be done to mitigate the financial effect of climate disruptions on agriculture. A range of financing instruments could be implemented, including but not limited to public funds, agricultural insurance, and green loans. International organisations could also contribute with a call for proposals on the topic, such as PPPs for climate-related projects, R+D on drought-resistant crop varieties, and technical assistance for farmers. These actions would represent a remarkable support for agricultural resilience in the face of climate change, while also looking after the financial system.

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Appendices

Appendix 1. Financial variables description

Variable*	Definition
Total credit portfolio	The total set of credits of the banking system, expressed in monetary terms.
Renewed	Credits with a delay of 1-60 days, in which interest and other applicable charges are paid.
Refinanced	Credits with a delay of 1-60 days, in which interest and other required charges are paid, plus 10% of the unpaid capital.
Restructured	Credits in which their structure is modified (dues, rates, places, others).
Transitional measures	Applied since December 2015, these measures allow for the formalisation of credit renewals, refinancing or restructuring, including interest and other charges, to interrupt the calculation of the default period.
COVID-19 measures	Exceptional complementary support measures applied since April 2020, for the formalisation of credit renewals, refinancing or restructuring.
*All variables expressed in monetary terms in this study are in Guarani (₲), the Paraguayan national currency. To September 2024, USD 1 is equivalent to approximately ₲ 7,800, according to the CBP	

Appendix 2. SVAR model

A SVAR model was applied. To recover data of the structural model, a reduced form of VAR(p) helped by orthogonalizing the errors. VAR(p) in its reduced form can be represented as:

$$y_t = c + A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t$$

Where y_t is a $K\times 1$ vector of endogenous variables, c is a $K\times 1$ vector of constants, A_i for $i = 1, \dots, p$ are $K\times K$ matrices of autoregressive coefficients, and u_t is a $K\times 1$ vector of errors assumed to be normally distributed $u_t \sim iidN(0,\Sigma_u)$, with covariance $\Sigma_u = E(u_t u_t')$.

The SVAR(p) model can be as follows:

$$B_0 y_t = \mu + B_1 y_{t-1} + \cdots + B_p y_{t-p} + w_t$$

Where B_i for $i=1,\ldots,p$ are $K \times K$ matrices of autoregressive coefficients, B_0 reflects the immediate relationship among the model's variables, w_t is a $K \times 1$ vector of structural shocks without serial correlation and diagonal covariance matrix $\Sigma_w = E(w_t w_t')$ with complete rank.

VAR(p) in its reduced form and SVAR(p) are linked through $A_i = B_0^{-1} B_i$ and $u_t = B_0^{-1} w_t$. Also, by construction, $\Sigma_u = B_0^{-1} B_0^{-1\prime}$ is a system of equations in the elements of B_0^{-1}.

B_0^{-1} estimation requires additional restrictions to the data generation process. The first method to determine B_0^{-1} was proposed by Sims (1980). The basic idea is to establish short-term restrictions to the B_0 matrix of how shocks affect variables in the system.

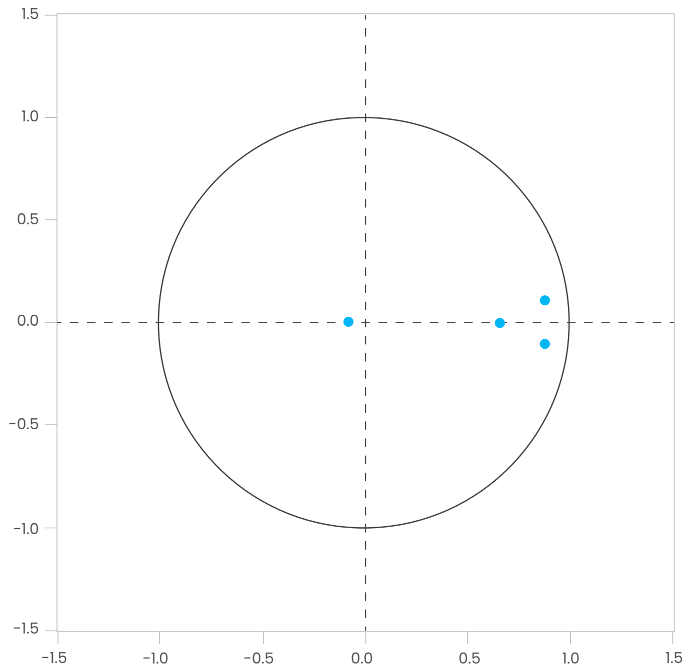
Once Σ_u is estimated from the reduced form of VAR(p), the Cholesky decomposition establishes $\Sigma_u = PP'$, where P is a triangular matrix.

The triangular structure of P has an economic interpretation that justifies the order of the variables. The order should be from the most (contemporaneously) exogenous to the most endogenous variable of the system. Therefore, the precipitation deficit variable is considered to be affected only by its own shocks, i.e. an agricultural or financial shock does not affect droughts, but climatic shocks affect all variables in the system. 3RMC19 is the most endogenous variable that contemporaneously reacts to all shocks.

Appendix 3. Diagnostic tests

Figure A 1. Stability test: Inverse roots of AR characteristic polynomial

There is no stability issue, as all inverse roots lie within the unit circle.



Note. Elaborated by the authors.

Table A1. VAR residual serial correlation LM tests

LM test rejects the null hypothesis of no serial correlation at lag 1, while it cannot reject for further lags. This result supports the idea of one lag specification.

Null hypothesis. No serial correlation at lag h						
Lag	LRE* stat	df	Prob	Rao F-stat	df	Prob.
1	33,15005	16	0,0071	2,158184	(16.229,8)	0,0071
2	15,37657	t6	0,4973	0,963573	(16,M9.8)	0,4978
3	12,02201	16	0,7425	0,747991	(16.229,8)	0,7427
Null hypothesis. No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob	Rao F-stat	df	Prob.
1	33,15005	16	0,0071	2,158184	(16.229,8)	0,0071
2	51,40342	32	0,0163	1,669157	(32.263,4)	0,0165
8	91,71533	48	0,0001	2,073212	(48.260,1)	0,0002

*Edgeworth expansion corrected likelihood ratio statistic.

Table A2. **VAR residual heteroskedasticity tests**

Evidence in favour of homoscedasticity.

Null hypothesis: homoscedasticity
(Levels and squares)

	Joint test:				
Chi-sq	df	Prob			
93,80759	80	0,1386			
			Individual components:		
Dependent	R-squared	F{8,78)	Prob.	Chi-sq(8)	Prob.
res1*res1	0,116179	1,281641	0,2653	10,10754	0,2576
res2*res2	0,146497	1,673507	0,1182	12,74522	0,1209
res3*res3	0,039736	0,403454	0.9J54	3,456999	0,9025
res4*res4	0,064824	0,675840	0,7113	5,639646	0,6875
res*res1	0,660941	0,632738	0,7479	5,301899	0,7249
res3*res1	0,083107	0,883737	0,5341	7,230300	0,5120
res3*res2	0,120461	1,335354	0,2388	J0.48012	0,2329
res4*res1	0,104008	1,131789	0,3517	9,048662	0,3382
res4*res2	0,132675	1,491466	0,1739	11,54276	0,1728
res4*res3	0,061225	0,635879	0,7453	5,326608	0,7222

(Includes cross terms)

	Joint test:				
Chi-sq	df	Prob			
155,5468	140	0,1746			
			Individual components:		
Dependent	R-squared	F{8,78)	Prob.	Chi-sq(8)	Prob.
rest*res1	0,14438	0.B67819	0,5955	11S6102	0,5613
res2*res2	0,233619	1,567716	0,1098	2D.324B3	0,1202
res3*res3	0,096212	0,547481	0,8957	B.370476	0.B691
res4*res4	D.104672	0,601246	0,8554	9.J064fi7	0,8242
res2*res1	0.2J6110	1.417B32	0,1674	18,80159	0,1727
res3*res1	0,147709	0,891725	0,5708	12,85591	0,5379
res3*res2	0,236375	1.59f93?	0,1024	20,56463	0,1133
res4*res1	0,13780	0,821988	0,6433	11,98904	0,8072
res4*res2	0,18347	1,155571	0,3277	15,96287	0,3157
res4*res3	0,082166	0,4604	0,9465	7,148479	0,9288

Note. Elaborated by the authors.