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# ECONOMIC RESILIENCE IN LATIN AMERICA: FEATURES AND PERFORMANCE FOR SELECTED COUNTRIES IN FACE OF COVID-19

# RESILIÊNCIA ECONÔMICA NA AMÉRICA LATINA: CARACTERÍSTICAS E DESEMPENHO PARA PAÍSES SELECIONADOS FRENTE AO COVID-19

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## Abstract

The COVID-19 pandemic poses unprecedented health, economic, financial and institutional stability challenges for the world. Especially in Latin American countries the consequences will deepen existing inequalities. The objective of this article is to identify the capacity of economic resilience for selected countries in Latin America. Adopting a multivariate method, we identify three main characteristics of resilience. The paper suggests that the coordination capacity of governments may appear in various instances, mainly in the flexibility of economic policies and the support for social structure to minimize the impacts on income, inequality and health measures.

**Keywords:** COVID-19. Crise. Países da América Latina. Análise multivariada. Resiliência regional.

## Resumo

A pandemia do COVID-19 representa desafios nas áreas de saúde, economia, finanças e na estabilidade institucional sem precedentes para o mundo. Especialmente nos países da América Latina, as consequências aprofundarão as desigualdades existentes. O objetivo deste artigo é identificar a capacidade de resiliência econômica para países selecionados da América Latina. Adotando um método multivariado, identificamos três características principais da resiliência. O artigo sugere que a capacidade de coordenação dos governos será fundamental em várias instâncias, principalmente quanto a flexibilidade das políticas econômicas e no apoio à estrutura social para minimizar os impactos nas medidas de renda, desigualdade e saúde.

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**Keyword:** COVID-19. Crisis. Latin America Countries. Multivariate Analysis. Regional Resilience.

## Introduction

Since the last financial crisis (2008), countries (and markets) have not experienced such an intense period in terms of instability and uncertainty. The prognosis for the socioeconomic impacts of the COVID – 19 will be worse than the 2008 global financial crisis because of its ubiquity; its underestimation and unpreparedness (especially by the institutions and regulatory frameworks); given the speed of (global) contagion, the uncertain time horizon of duration and mainly because the pandemic will overwhelm many national health systems and cause huge economic and human damage (LUSTIG & MARISCAL, 2020).

Unlike previous capitalist system crises marked by, on the one hand, a historical dynamic of means of production, on the other, by the rise of macroeconomic and financial mechanisms, in particular, by financial innovations and deregulation of markets (LÉVY & DÚMENIL, 2013), this crisis was caused by a pandemic that will affect all social classes in different ways (AHMED et al., 2020; LABORDE et al., 2020). The expectation is that the situation for developing countries will be more contractionary due to the economic and financial restrictions as well as the bottlenecks of their infrastructure and productive structure, in short, the socio-economic situation already quite unfavorable in the period before the outbreak of the coronavirus crisis (ECLAC, 2020a; WORLD BANK, 2020a,b; HEVIA & NEYMEYER, 2020).

COVID-19 recession is creating a crisis of inequality which was large already and will most likely be even larger as the crisis it runs its course. Spreading across the world, the pandemic has deepened an economic crisis, unemployment rates will rise substantially and weakened welfare safety nets will further threaten health and social insecurity. According to OECD (2020a) Small and Medium Enterprises (SMEs) are the main job-creating firms harmed by the economic COVID-19 pandemic, more so than during the 2008 financial crisis.

Workers at smaller firms already tend to earn lower wages and in many times under informality conditions. According to Bell et al. (2020) aggregate shocks have different effects depending on size of firms, workers and gender. Many of the most affected industries in the short-run by the COVID-19 shock, such as hospitality and travel, contain a high proportion of female workers. This stands in sharp contrast to previous downturns, where male-dominated industries (such as finance, construction and manufacturing) were affected. Many Latin American and Caribbean (LAC) countries have important tourism sectors, which will suffer together with services, SMEs and exports of basic products (FRANZ, 2020).

Major negative economic effects are associated with the loss of employment and wages, which can only be compensated to a limited extent by the much-needed income support measures introduced by governments such as guaranteed incomes, tax relief, etc. (LUCCHESE & PIANTA, 2020). As stated by these authors, the resulting fall in demand will further slow down the production, while the increase in health expenditure is unlikely to have significant expansionary effects on the economy as a whole. In some countries, such as Latin American case, a deterioration of the financial situation of SMEs could have systemic effects on the formal and informal employment, on tax collection and on the banking sector as a whole (ECLAC, 2020a,b,c). For emerging economies, the spread of COVID-19 occurs at the same time as the fall in the prices of raw materials (25%) and an increase in sovereign credit spreads (HEVIA & NEYMEYER, 2020).

Historically, Latin America and the Caribbean is the world's most unequal region, even though this inequality has decreased in the 21st century, in most of these countries (BOGLIACINO & ROJAS-LOZANO, 2017). This region has a rich history of severe adverse shocks, including precipitous falls in commodity prices, dramatic tightening of financial conditions, and major natural disasters (WORLD BANK, 2020a, b). These countries present systemic current account deficits and are likely to experience a sharp drop in capital flows. Experience tells us that these shocks often cause strong recessions in the region (OCAMPO, 2017).

But the Covid-19 epidemic brings in a new dimension for Latin American countries because it unmasks the structural problems of the region, both on the demand side (internal and global) led by the recessionary shock and the preceding period of low economic growth (ECLAC, 2020a; b, WORLD BANK, 2020a), and on the supply side characterized by the dependence on commodity prices, international technological and financial flows (AKYÜZ, 2020, OCAMPO, 2017). It could have

a strong impact on national economies and global growth prospects, on expectations, and even on the financial sector, which may already be under strain by non-performing portfolios.

Corroborating this diagnosis, Ahmed et al. (2020) highlight that COVID-19 could cost the world more than $10 trillion and for each percentage point reduction in the global economy, more than 10 million people are plunged into poverty worldwide. As stated by these authors, the poorest populations are more likely to have chronic conditions, which puts them at a higher risk of COVID-19-associated mortality. Many households do not have the resources to cope with the lockdowns and quarantines needed to contain the spread of the epidemic. Many of them also depend on income transfer, or remittances, which are collapsing as activity shuts down in host countries, with migrant workers among the most affected (WORLD BANK 2020a, p. 06). Many workers are self-employed, and informality is common even among wage earners. Historically, countries like Brazil have shown high levels of inequality, which should increase in the post-pandemic context (CARVALHO *et al*, 2020; NASSIF PIRES *et al*, 2020).

Latin America comprises of a set of very heterogeneous countries in terms of the degree of development and financial integration (MARTINS, 2017; BLANCO, 2013); different duration of adjustment period and alignments of exchange rate, monetary policy regimes, types of inflation and their persistence (GIANNELLIS & KOUKOURITAKIS, 2013); level of development and complexity of productive structure (HARTMANN *et al*, 2020; 2016; CIMOLI et al, 2010); the degree of dependence on capital flow (AKYÜZ, 2020, OCAMPO, 2017); demographic and human terms, especially with respect to inequality (OCAMPO, 2017, BOGLIACINO & ROJAS-LOZANO, 2017, ECLAC, 2020a).

These features let us to consider that these countries will have different patterns of resilience and, therefore, they presented different types of vulnerabilities to extreme shocks. As crises periodically disrupt the economic activity, a part of the literature was dedicated to understanding the reasons behind the crises, their mechanisms, effects and, most of all, the determinants of resilience capacity and the ability to overcome hardships by adapting and changing.

Based on this brief contextualization, the objective of this article is to identify the features of economic resilience for 19 selected countries in Latin America considering four dimensions: i) productive, ii) financial, iii) macroeconomic and iv) socioeconomic infrastructure, in order to analyze its conditions of vulnerability to the COVID-19 shock. Once identified the characteristics of resilience in each studied country, the idea is to verify how these countries have responded to the pandemic in terms of actions and measures to control the pandemic. There are few studies that address the structural problems of LAC countries and their vulnerability using the perspective of regional economic resilience. Therefore, this work aims to fill the gap.

The main hypothesis is that small LAC countries are more prone to exposure to exogenous shocks and economic vulnerability, having less capacity for economic resilience and are the most affected by the pandemic in the short term. Faced with this recent scenario and uncertainty caused by the pandemic, the main contribution of this article is: i) to identify the components that explain the resilience in LAC countries best and ii) which most contribute to their vulnerability and iii) identify the capacity of the reaction by the LAC central governments against the pandemic.

The approach adopted in this paper is based on general government documents, data and news published on institutional websites and newspapers. It does not consider procedures related to the process of implementing measures by central governments and the federative units. Finally, as the pandemic is still progressing, this work presented information on the design of public and institutional policies that support its operationalization at the moment (June of 2020) and that can contribute to reflection by the policy makers in addressing the Covid-19 pandemic and other future shocks.

The paper is structured as follows: Section 1 discusses relevant literature to understand the general economic and structural characteristics of Latin American countries and the low economic resilience of these countries which affects their vulnerability to shocks. For this propose, four dimensions of resilience were considered in our analysis: social infrastructure, macroeconomic, productive and financial structure. Section 2 describes the data and provides the summary of statistics on the economic resilience. Section 3 describes the empirical methodology and Section 4 details results of the short-term analysis, relating the characteristics of the resilience to the spread of the coronavirus in these countries. Lastly, final remarks will be made.

## Crisis, vulnerability and economic resilience in latin american countries.

The coronavirus pandemic can be considered a contractionary shock of an external order - due to the effects of the pandemic worldwide, but also internal, affecting all levels of disaggregation: sectoral, regional, institutional, political. The impact of COVID-19 crisis is also differentiated within the countries, with some regions and cities being harder hit than others. The ability of governments to work in a coordinated manner at its different levels (international, national and subnational), the scale and effectiveness of the measures implemented are fundamental for an effective response to the crisis. However, the first impacts of the pandemic in Latin American countries have shown their structural weaknesses and the lack of a joint effort and regional coordination to control this crisis, as will be revealed in this work.

The heterogeneous structural conditions of the LAC countries has been studied since 1940's. Authors such as Furtado (1961a, b), Prebisch (1962), Pinto (2000) and Rodríguez (2009) highlighted the high degree of structural heterogeneity and the peripheral international insertion, the low capacity for accumulation and innovation, the high income inequality which makes it difficult to form vigorous internal market and the strong external restriction to growth (as a result of high productive specialization) as obstacles to the development of the LAC region.

As stated by Marconi, Rocha & Magacho (2015), since the Structuralist approach of Latin American thinking[5] to the 'New Developmentalism theory'[6] have reported the limitations of promoting economic development based on a productive trade structure of low value-added products; on the negative effects of currency appreciation in the manufacturing sector caused by exports of commodities (the 'Dutch disease'); the vulnerability of the exchange rate and the effects on the competitiveness and deindustrialization (Ibid. p.472). For Rodríguez (2009, p. 84-85): in the periphery, industrialization took place late and it was characterized by more restrictive and disadvantageous economic conditions; by backward and modern productive sectors operating at the same time, which intensified heterogeneity and specialization.

Akyüz (2020) identifies four factors as potentially leading to instability in countries characterized by commodity production: the commodities price, exportation level, international interest rate, and exchange rate. The interest rate, specially determined by the FED in the United States, and the exchange rate are important driving factors of the commodities price and production, affecting economic dynamics, price vulnerability and the dependence of LAC countries. The structural conditions in Latin America, associated with the effects of the local and international economic situation reflect the low economic performance of these countries in recent years. The pandemic has affected the global economy and the trade between China and Latin America. Exportation from South America to China decreased 24.4% in mining, commodities and soy sectors. The most affected countries are Argentina, Brazil, Chile and Peru because more than 20% of their exportation is to China (ECLAC, 2020b). In terms of manufacturing, losses will be greater mainly for Brazil and Mexico. The disruption in supply chain may decrease Brazilian manufacturing by 5.2% and Mexican manufacturing by 6.5% according to ECLAC (2020b,c).

Productive specialization in the primary sector increases economic losses in crisis contexts. Latin American countries have been affected by the reduction of output and exportation level, the fall in manufacturing prices, and the collapse in oil price and as consequence the interruption in the supply chain (ECLAC 2020b). The collapse in oil prices can be a relief to the oil-importing Caribbean and Central American economies. It affects fiscal and external accounts of several South American countries, as well as Mexico and Trinidad and Tobago. Chile and Peru suffer from the decline in copper prices (OCDE 2020b). Finally, financial volatility, the worsening of financial conditions and large capital outflows have brought a strong depreciation of LAC currencies and the reduction of financial assets in debt and equity markets, affecting the solvency of large LAC companies (Ibid, p.4).

A recent study provided by IMF (2020) proposed that the COVID-19 will worsen the inequality, poverty, and wages at the same time causing the supply chain disruption and negatively affecting GDP. According to ECLAC (2020c), the 5.3% drop in GDP and the 3.4 percentage point increase in unemployment would have a direct negative effect on household income and the availability of resources sufficient to satisfy basic needs. According to this report, the poverty rate would increase 4.4 percentage points during 2020, which means 28.7 million more people in poverty.

[5] See, for example: Prebisch (1962); Furtado (1961 a,b); Pinto (2000); Rodriguez (2009) and for a synthesis of the evolution of ECLAC ideas in LAC countries: Domínguez et al (2019).
[6] See, for example, Bresser-Pereira (2020; 2009); Bresser-Pereira, Oreiro & Marconi (2015).

For its part, extreme poverty would grow by 2.5 percentage points, which represents an increase of 16 million people (Ibid, p.16).

Another evidence of problematic situation aggravated by the COVID-19 crisis in the LAC region is the labor market. According to ECLAC (2020c, p. 14), the projections anticipate a deterioration in labor indicators in 2020. The unemployment rate would be around 11.5%, an increase of 3.4 percentage points compared to the 2019 level (8.1%). Thus, the number of unemployed in the region would reach 37.7 million, which would imply an increase of close to 11.6 million with respect to the 2019 level (26.1 million unemployed). Caribbean countries would suffer a greater fall due to the tourism sector, which is the source of more than 50% of employment in many of them.

Another important feature of the labor market in LAC region is the informality. As disclosed by ECLAC (2020c), the high rate of labor informality in this region makes workers very vulnerable to the effects of the pandemic and the measures to face it. The high participation of small and medium-sized enterprises in job creation (more 50% of formal employment) increases the negative effects, since this sector has been hard affected by the crisis. This recessive cycle has important implications for gender inequality which will be accentuated by measures such as the closure of schools, social isolation and the increase in the number of sick people, as it will increase the overload of unpaid work for women (Ibid. p. 14-16).

Fundamental issues for pandemic control refer to the population access to the health system, urbanization and sanitation needs. The health system expenditure as a proportion of GDP in 2017 represented 11,3% in Cuba and fluctuated around 9% in Brazil, Uruguay, Argentina and Chile, before the COVID-19 crisis. According to ECLAC (2020c), the LAC countries invested on average 2.2% of GDP in health system in 2018, a low level according to the World Health Organization which defends the minimum budget of 6% of GDP for public health. Moreover, the low levels of the population using the sanitation in 2017 indicate the need for further social agenda which must be implemented together with the macroeconomic policies as an alternative to reduce the macroeconomic constraints (ROJAS-LOZANO, 2018).

The features of LAC countries help to understand the distinct patterns of resilience, vulnerability and difficulties facing responses to shocks, such as COVID-19 pandemic. As much as countries like Brazil, Mexico and Argentina have managed to establish a relatively diversified production base and exportation, improving their insertion in international trade and internal economic development, many authors highlights the importance of the structural change to foster economic development in the long run, improving the sectoral composition of production, increase in this sector's competitiveness, the productivity and exports in products of higher complexity (ALENCAR et al, 2018; MARCONI et al, 2016; CIMOLI et al 2010).

For this reason, the discussion on regional economic resilience is fundamental. Identifying patterns of resilience is an important effort to protect against and deal with future and unexpected shocks. The regional economic resilience literature is well consolidated in Europe and the United Kingdom (PIKE *et al* 2010; SIMMIE and MARTIN, 2012; DAWLEY *et al* 2010; MARTIN, 2012; FINGLETON *et al*, 2012; MARTIN & SUNLEY, 2015; BOSCHMA, 2015; MARTIN *et al* 2016), but still not widespread in Latin America. In general, the authors cited define regional economic resilience as the ability to understand how regions, in their various scales, scope and conditions (macro and microeconomic) resist disruptive changes, recover, adapt and consolidate (or not) adaptive capacity in the face of natural or induced processes, such as catastrophes, natural disasters, financial crises, technological shocks, pandemics, etc.

As a result, the literature on economic resilience is important for the analysis of structural changes and definition of strategies for productive reconversion, which is essential to make the regions more resistant to contractionary shocks, or even to provide a short-term demand. The difficulty in producing certain goods, inputs and services aimed at coping with COVID 19 (such as respirators) and the restrictions on importing them revealed the urgency of this debate. As stated by Sensier & Devine (2018), it becomes imperative to design strategies for more resilient local industries, which, together with an analysis of the economic and industrial policies should be undertaken by Governments in their various administrative spheres. It is also important to analyze the processes for adaptation and regions' adaptability to new shocks - especially for regions with greater productive specialization, considered to be more vulnerable (TUPY et al, 2018).

For that reason the discussion on regional economic resilience must bring together a coordinated effort between economic policy instruments (monetary, fiscal, exchange rate, credit), industrial policy, regional policy and its various stakeholders (governments, public and private

banks, firms of different sizes, shareholders). The recession caused by a pandemic is of a particular nature, in which the continuity of operations and the maintenance of the productive capacity of many firms, whose services are not considered essential, is not possible. Thus, the general nature of the suspension of activities tends to worsen the conditions for job recovery in the post-crisis period. The adjustment process tends to be slower and the possibilities for rehiring more limited in cases where a large number of workers is moved simultaneously (NYSTRÖM, 2018).

It's is important to highlight the specificity of the ubiquity of this COVID – 19 crisis and its scale. The greater the supply and demand connections between local firms, the greater the spread of the shock. For example, part of the LAC countries, which have regions with particular economic structure (i.e. mining areas in Chile, Peru, Bolivia, Brazil and Mexico), rely on a particular firm or sector as an essential element of their productive and employment base, served by a network of diverse suppliers and derived activities that depend fundamentally on this central activity. If that sector/ main firm is hit by the shock, its closure or a drastic downturn can lead to bankruptcy and decline for most of the remaining regional economy.

Therefore, the regional economic resilience literature can contribute to understanding the sectoral and regional dynamics of the crisis in the labor market and will be fundamental for the definition of policies and strategies for mitigating damages in the short term. Or, in the same way, to identify and understand the specifics and barriers of the LAC countries, and to analyze, for example, the possibilities of adapting local productive structure to the shock, based on the idea of adaptability, that is, the capacity of the regional economy to recombine its productive resources.

Understanding the characteristics of LAC countries allows to identify the factors affecting the adaptation-adaptability relationships, mainly economic-structural, political and institutional, including the endogenous and exogenous dynamics. In sum, the purpose of identifying the resilience patterns is to map the conditions and bottlenecks of LAC countries that enhance their conditions of vulnerability in the face of shocks and, in doing so, contribute to the definition of short and medium-term economic actions and strategies and long term measures that assist in the economic recovery of the countries through more inclusive and sustainable economic growth in the post-pandemic context.

## Resilience indicators

The discussion of economic resilience to COVID-19 effects in Latin America will be realized through an ex-ante analysis. This ex-ante resilience discussion will be based on the identification of certain categories of indicators that might reveal some advantages and some fragilities in country structures that deal with and respond to the Pandemic and its impacts. However, the restriction of available information in the sort-run inhibits a complete coverage of all relevant characteristics inherent to resilience indicator of the countries of Latin America. Therefore, to measure the degree of resilience of the selected nations, a range of indicators were selected to make it possible to cover key dimensions, based on the available statistics.

The pre-existing national capacity to resist the early impacts of COVID-19 will be analyzed in four different dimensions: socioeconomic infrastructure; macroeconomic context, financial and banking structure; and productive structure and environmental capacity. Each of these groups of variables aims to reflect important features of country responses related to social and health conditions of populations, institutional capacity to react and implement policies, conditions to maintain social distancing and to support affected firms and households as well as possibilities to re-direct and restructure economic activity due to Pandemic context.

There are several aspects that make low (and developing) income populations more heavily contaminated by the COVID-19, such as the use of public transport, the greater number is of residents per household, the lack of access to basic sanitation and to healthcare, difficulty to maintain social isolation without excessive loss of income or employment (AHMED et al., 2020; CARVALHO et al, 2020; NASSIF et al, 2020). So, the indicators of socioeconomic infrastructure ($X_1$ to $X_3$) seek to identify the factors that indicate social vulnerability, through life expectancy, health expenses and mortality due to the lack of basic infrastructure. The coronavirus crisis exposed problems typical to poor countries, such as higher inequality of income, lethality in slums and on the periphery of cities, poor infrastructure and difficulties in accessing basic conditions for survival, famine (RAVAILLON, 2020; LABORDE et al, 2020). In LAC area, health care systems are under pressure, reflecting bottlenecks that existed before the pandemic, huge debts and fiscal crisis (EICHENGREEN, 2020),

austerity policies and lack of resources for the healthcare system (FRANZ, 2020; OECD, 2020a,b; ECLAC, 2020,a,b). Countries with greater social vulnerability tend to be less resilient to crises.

The indicators of macroeconomic dimension as GDP per capita ($X_5$) has been positively associated with economic resilience and negatively to the economic vulnerability suggesting that the less vulnerable countries could be more resilient as are result of an economic success. The vulnerable employment ($X_4$) and inflation ($X_6$) variables may be associated with the economic monetary policy implementation as related to the resilience of a shock-absorbing nature (BRIGUGLIO et al 2009; BRISTOW & HEALY, 2017). The government budget position has been associated with fiscal policy, which is one of the main tools available to the government that explains the resilience of a shock-counteracting nature (BRIGUGLIO et al 2009) represented by general government net lending divided by borrowing ($X_7$). It can be viewed as an indicator of the financial impact of general government activity on the economy.

In this manner, the variables $X_8$ to $X_{10}$, refer to the financial dimension and intend to verify the capacity of the national financial system to provide external resources to firms and households. During economic crises firms experience reductions in their monetary flows, revenues and profits as well as in the value of their assets and, therefore, a decrease in the value of possible collaterals (BLANCHARD, 2009). In this sense, the access to the financial system is essential to allow firms to resist at some level to the impacts of the shock, keeping their employees and, in last instance, remaining viable and avoiding bankruptcy (BLANCHARD, 2009; MARTIN & SUNLEY, 2015). This is even more relevant during the Pandemic, in which the economic shutdown exacerbates the disruption in firms' monetary flows, especially those treated as non-essential (BALDWIN & DI MAURO, 2020). The variable ($X_8$) private credit to GDP (%), can be understood as a proxy for the depth of the national financial sector (BRIGUGLIO, 2016). The credit to deposit ratio ($X_9$) is a general measure of liquidity in the banking system and the number of bank branches per 100.000 adults ($X_{10}$) is a measure of financial access.

Lastly, the dimension of productive and environmental capacity ($X_{11}$ to $X_{13}$) aggregate variables related to the gross domestic expenditure on research and development (R&D) as a percentage of GDP ($X_{11}$); the production-based $CO_2$ productivity, GDP per unit of energy-related $CO_2$ emissions ($X_{12}$); and population density per $km^2$ ($X_{13}$). The first indicator $X_{11}$ represents the effort on the part of the governmental sphere to implement industrial and targeted policies in specific sectors, such as technological ones, with the objective of reinforcing innovation in Latin American countries. Thus, it is possible to identify the allocation of human capital on technological activity and the most qualified labor (CABRER-BORRÁS & SERRANO-DOMINGO (2007); AUDRETSCH & FELDMAN (1996); CARLINO *et al* (2001); BODE (2004); BILBAO-OSORIO & RODRÍGUEZ-POSE (2004)).

Regarding variable $X_{12}$, the objective is related to current levels of economic activity, that is, it also measures the damage caused by economic activity to human health and/or the environment. LAC countries have experienced rapid economic growth and intense industrialization over the years. The result of a dynamic of vigorous investments in issues related to urbanization, infrastructure and the prominence of a new consumer class in these countries, made the concern with sustainability stand out, paying particular attention to the the increase of polluting gases in the atmosphere (HASCIC *et al*, 2010). Finally, the $X_{13}$ indicator is intended to measure the size of the country. In other words, the indicator was used to capture the influence of spatial concentration and its performance related to population dynamism that can encourage economic development and the resilience of countries.

The information used for the elaboration of the database is secondary and covers sources such as: World Bank Data (WBD), Organization for Economic Co-operation and Development (OECD), The International Monetary Fund (IMF), ECLAC Database (2020). Table 1 summarizes all dimensions and their variables used in the construction of the resilience indicator. In addition, for better verification of the variables, all descriptive statistics are presented in Annex 1.

**Table 1:** Description of variables

| Dimensions | Variables | Description | Database | Year |
|---|---|---|---|---|
| Socioeconomic infrastructure | X1 | Life expectancy | World Development Indicators (WBD) | 2017 |
| | X2 | Expenditure health system divided by GDP | WBD | 2017 |
| | X3 | Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (per 100,000 population) | WBD | 2016 |
| Macroeconomic Conjuncture | X4 | Vulnerable employment, total (% of total employment) | WBD | 2019 |
| | X5 | GDP Per capita (%) | International Monetary Fund (IMF) | 2019 |
| | X6 | Inflation | IMF | 2019 |
| | X7 | General government net lending divided by borrowing (Percent of GDP) | IMF | 2019 |
| Financial and Banking Structure | X8 | Private Credit divided by the GDP (%) | World Bank | 2017 |
| | X9 | Bank Credit divided by Bank Deposits (%) | IMF | 2017 |
| | X10 | Number of commercial bank branches per 100.000 adults | IMF | 2017 |
| Productive Structure and environmental capacity | X11 | Gross domestic expenditure on R&D: as a percentage of GDP | OECD | 2015 |
| | X12 | Production-based CO2 productivity, GDP per unit of energy-related CO2 emissions | OECD | 2015 |
| | X13 | Population density - inhabitants per km2 | OECD | 2015 |

Source: Own elaboration.

Regarding the sample selection, two criteria were adopted. We considered LAC countries that until May 8 had presented at least 10 deaths from COVID 19, and, secondly, the availability of complete and recent data to compose the factors.[7] The variables refer to different years, to avoid problem of simultaneity and decrease issues related to the direction of causality.

## Empirical design

The main purpose of this article is to identify the structural characteristics of the selected LAC countries through four important dimensions (socioeconomic infrastructure, economic, financial and productive) in order to identify *ex-ante* patterns of regional resilience between these countries. For this reason, a multivariate statistical analysis technique (Principal Component Analysis - PCA) will be used. Principal Component Analysis is a method widely used to reduce the

[7] According to Coronavirus Research Center database (Johns Hopkins University, 2020). Available at: https://coronavirus.jhu.edu/map.html. Access: 08 th May 2020 and 12th June 2020.

dimensionality of multivariate data. The technique allows expressing the information available in a few variables (components). In this manner, the reduction in the number of variables will simplify the analysis and visualization of the data. However, the PCA method requires a choice between simplicity, with a small number of dimensions (variables) and completeness, that is, more dimensions that can capture a greater amount of information.

The main objective of principal component analysis is to group $X_1$, ..., $X_{13}$ variables and create $Z_1$, ..., $Z_{13}$ indices that are uncorrelated in the order of their importance and that explain the data variation (COOPER &MANLY, 2008). Therefore, the choice of the method aims to synthesize the variability of information regarding the countries. The first main component, represented by $Z_1$, is the linear combination of the variables $X = [X_1, ..., X_{13}]$ with the greatest possible variance. The second component $Z_2$, is given by the linear combination of X that explains most of the information not captured by $Z_1$. It is noteworthy that the PCA technique seeks to maximize variance, which can be highly sensitive to differences in scale between variables. Therefore, it is common to standardize the data that can be obtained by decomposing the eigenvalue of the correlation matrix. Each eigenvector, indicated by u, represents the direction of one of these main axes. The vector u controls the weights used to form the linear combination of Xs, which results in the points of the main component, is represented as follows:

$$Zi = Xs.u \quad (1)$$

Each eigenvalue, represented by λ, is equal to the variance of the main component $Z_i$. The covariance matrix for the main components, represented by D, is a diagonal matrix with $(\lambda_1,... \lambda_i)$ diagonally. The sum of the variances of all the main components is equal to p, which is the number of variables in the matrix X. Therefore, the proportion of variation explained by the first major components is given by:

$$\sum_{i-1}^{c} \frac{\lambda_i}{p} \quad (2)$$

According to the interpretation of the main components, it is valid to observe loads of these components, which are defined as being the correlations between the original variables X and the main components Z. The load matrix, represented by F, can be calculated as:

$$F = U \quad (3)$$

where U represents the matrix of eigenvectors and D the covariance matrix of the main components. In this way, building the resilience main component for selected Latin American countries will help us to identify specific characteristics of resilience and relate them to the capacity of the countries in post crisis.

## Results

The principal component analysis makes it possible to extract information on the characteristics of the nineteen countries in the sample in a condensed manner, considering the thirteen original variables (random vector)[8]. Table 2 shows the results of the PCA based on the percentages of the variance linked to each of the variables, the first component being represented by 27% of the data variability, the second component by 23% and the third by 14%. In the second component, the variability of the random vector accounted for 23% and represents a strong weight in terms of the representation of the variables. Then, the third component represents only 14% of the data variance. It is worth mentioning that the technique is used when the main concern is the minimum number of new variables (components) important to represent a large portion of the total variance of the original variables. As a basic principle, a minimum number of components that reaches 70% of the total sample variance is selected. Therefore, according to the results of the analysis of main components, there was a preference for the selection of the three main components of greatest weight. Taking into account the weight of the first three components, which account for

[8] Tests were performed to capture the best adherence of the variables according to the selected dimensions. The Alpha test, which measures the internal consistency or coherence of a group of selected measurement items, calculated based on the cross correlation between the items, indicated a good consistency (Alpha= 0.7253). As for the Lawley test, we reject the null hypothesis and conclude that there are probably differences in the correlations of the variables (Lawley =135.83;p-value 0.0000). In the case of the tests for multivariate normality none rejected the null hypothesis of multivariate normality (Mardia mSkewness = 131.254 (p-value= 0.1130); Mardia mKurtosis = 179.479 (p-value= 0.087); Henze-Zirkler= 0.994 (p-value= 0.0710)).

64% of the variability of the set of information, the following will be discussed. Next, the results observed by the first three components, in contrast to the variation found in the other eigenvalues, equal and less than 10%.

**Table 2**: Proportion of variance explained through Principal Component Analysis (PCA)

| Components | Explained Variance | |
|---|---|---|
| | Individual | Cumulative |
| Comp 1 | 27% | 27% |
| Comp 2 | 23% | 50% |
| Comp 3 | 14% | 64% |
| Comp 4 | 10% | 74% |
| Comp 5 | 6% | 80% |
| Comp 6 | 6% | 85% |
| Comp 7 | 5% | 91% |
| Comp 8 | 4% | 94% |
| Comp 9 | 3% | 97% |
| Comp 10 | 2% | 99% |
| Comp 11 | 1% | 100% |
| Comp 12 | 0% | 100% |
| Comp 13 | 0% | 100% |

Source: Own elaboration.

According to the results of Table 3, it is observed that Component 1, presents countries with characteristics that match an advanced infrastructure in both macroeconomic and financial dimensions. Variables such as GDP (X5), Expenditure on healthcare (X2) and Gross domestic expenditure on R&D (X11) stand out in relation to the weight between the groups of variables used. In addition, the first component stands out among the others for presenting characteristics of countries with great resilience, that is, those able to overcome adversity despite the opposite external conditions. Therefore, we can call component 1 as "Macro-financial" with Brazil, Chile, Colombia, Ecuador, Panama and Uruguay as examples. However, just as there are positive characteristics of the resilience power of the highlighted countries, they also exhibit characteristic aspects of Latin American countries such as inequalities as highlighted by the following variables: mortality rate (X3), vulnerable employment (X4), inflation (X6). As Rojas-Suarez (2015) reinforces, emerging countries usually do not take advantage of periods with more favorable economic conditions to implement structural reforms. According to this author, recent evidence was the decline in the prices of commodity exports (2013–2014) which was not mitigated by previous reforms to overcome the savings gap in relation to investment. *The good years of high commodity prices were not used to protect these countries from the sharp drops in commodity prices* (Ibid, p.5).

**Table 3:** Coordinates of the variables of the four axes of the main components

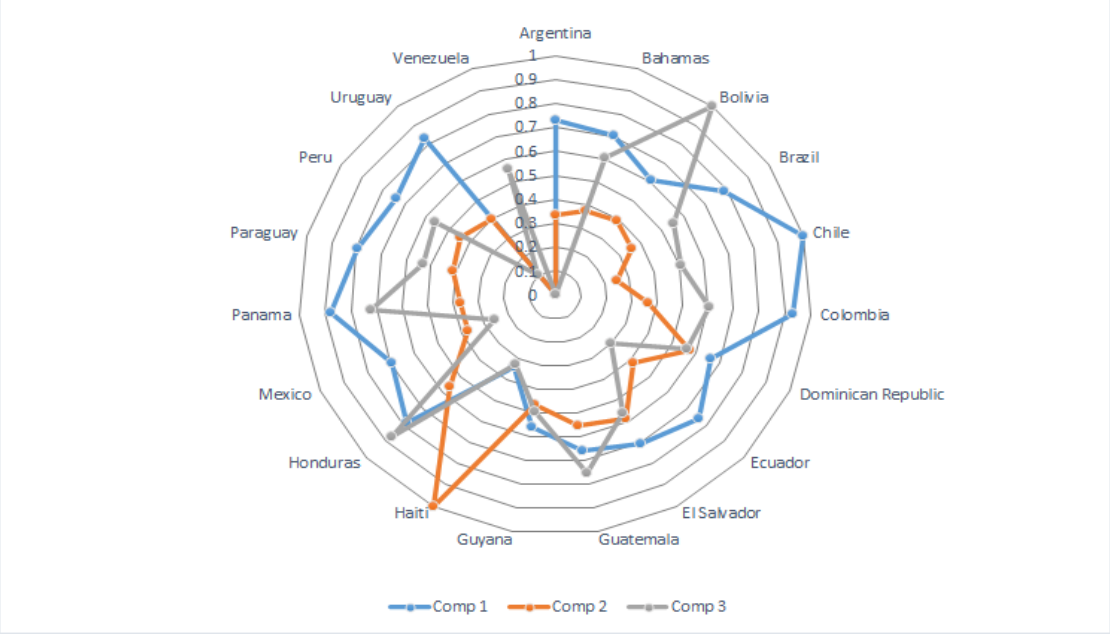
| Variables | Component 1 | Component 2 | Component 3 |
|---|---|---|---|
| X1 | 0.3812 | -0.3378 | -0.0696 |
| X2 | 0.3658 | 0.1815 | -0.2255 |
| X3 | -0.2337 | 0.451 | 0.0264 |
| X4 | -0.0239 | 0.1511 | 0.4328 |
| X5 | 0.3926 | 0.3078 | 0.0752 |
| X6 | -0.4059 | -0.319 | 0.0294 |
| X7 | 0.3200 | 0.3122 | -0.0515 |
| X8 | 0.2602 | -0.1564 | 0.391 |
| X9 | 0.3192 | -0.1672 | 0.2282 |
| X10 | 0.0362 | -0.1298 | 0.4995 |
| X11 | 0.1062 | -0.2246 | -0.5358 |
| X12 | 0.1963 | 0.0713 | -0.0726 |
| X13 | -0.1540 | 0.4560 | -0.0188 |

Source: Own elaboration.

In the second component, lower values (weights) of the variables are visualized in the socioeconomic infrastructure and financial dimensions, mainly life expectancy (X1), financial depth, liquidity and financial access (X8, X9 and X10) and gross domestic expenditure on R&D (X11). The result represents countries with a lower resilience capacity compared to component 1, representing countries with great social and economic inequalities, which can be called Financial Dependence. This component includes the Dominican Republic, El Salvador and Haiti. The characteristics presented confirm the behavior of countries marked by social, institutional and cultural tensions, in addition to crime, drug trafficking, wars or guerrilla movements as well as structural economic bottlenecks that make them dependent on foreign capital. The recurrent dependence on external resources, the worsening of external debt and high indebtedness rates make these countries more vulnerable to adverse external shocks (AKYÜZ, 2020; ROJAS-SUAREZ, 2015, RODRÍGUEZ, 2009).

The last component to be analyzed corresponds to 14% of the data variability, characterizing regions with low life expectancy (X1), expenditure health system (X2), gross domestic expenditure on R&D (X11) and production-based CO2 productivity (X12). These results indicate that, despite the minimal macroeconomic and financial conditions, these countries face low productive and environmental capacity, which can be called Structural deficiency. In this context, the following countries stand out: Bahamas, Bolivia, Guatemala, Honduras and Venezuela, notably, countries with high productive specialization. In addition to the inequalities and conflicts associated with Latin American countries, in this dimension, unlike other components, there is a low investment in R&D. This result seems to reflect the actions of countries that have technological segments of medium and low sophistication and limited internal R&D investment in firms (CABRER-BORRÁS & SERRANO-DOMINGO, 2007; HARTMANN et al, 2016). In the Figure 1 is possible to visualize all results associated with the main components and their respectives countries.

**Figure 1:** Latin American Countries and the Principal Components




Source: Own Elaboration based on the PCA results.

After the analysis of the three main components and their dimensions of resilience, it is important to compare the main information about the evolution of the pandemic and government actions in the selected countries. Considering the evolution of the growth rate of the number of deaths, the analysis of data referring to the period from May 8 to June 12, 2020 shows that countries like Guatemala (1352%); Nicaragua (1000%), Chile (829%), Mexico (438%); Haiti (433%), Bolivia (423%), Brazil (342%), Peru (274%) and Colombia (270%) stand out among LAC countries. In terms of absolute numbers of deaths, stand out, respectively, from highest to lowest: Brazil, Mexico, Peru, Ecuador, Chile, Colombia (Figure 2).

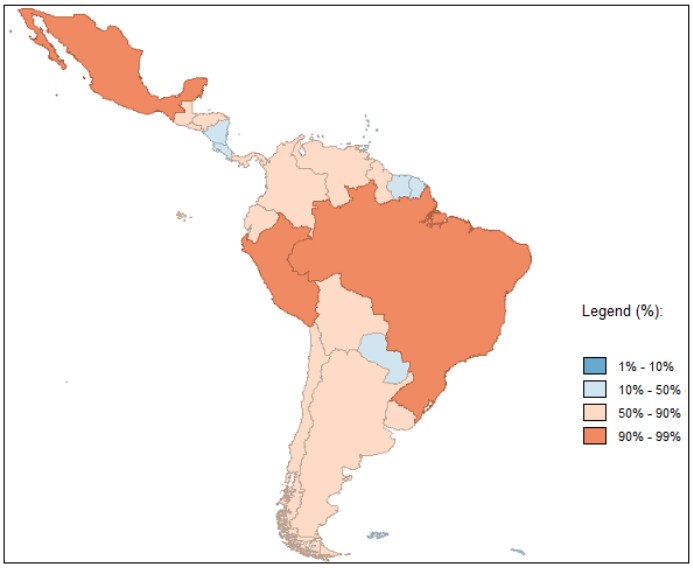
In general, most LAC countries reacted quickly to the crisis, with Peru standing out in the first place. Indigenous populations in countries such as Peru, Ecuador, Bolivia and Mexico are very vulnerable to pandemics, as they have more informality, precarious sanitary conditions, lack of social protection and high rates of other diseases (malaria, dengue, tuberculosis, hepatitis, etc.). In addition, the COVID crisis was propagated in the midst of one of the region's greatest migratory crises (OECD, 2020a).

Initially, some coordination efforts among Central Governments were undertaken. For example, the Forum for the Progress of South America (PROSUR)[9] held a meeting in order to establish joint planning and take actions in a "coordinated and efficient way" for public health emergency, establishing diverse measures of cooperation. Also, the countries of the Central American Integration System (SICA) met virtually and approved a 'Regional Contingency Plan', basically to jointly acquire supplies and medical equipment, to make available coordinated communication and response related to health and risk management (OECD, 2020a).

In order to summarize the current panorama of the evolution of the pandemic in LAC and the main measures of containment proposed by the Central Governments, the Table 4 should be considered. From the ECLAC Database (2020), it was found that among the 6 countries with the highest number of deaths by June 12, Brazil and Peru have adopted more measures in terms of Movement, Health, Social Protection and Education. Unlike Peru, Brazil has introduced more measures in terms of Economy and Labor. According to this information, Mexico's situation is very problematic as it is one of the most populous and unequal LAC countries and where the pandemic has evolved more. At the same time, it is one of the countries that has least implemented measures and has one of the lowest health expenditures.

[9] The Forum for the Progress of South America (PROSUR) is composed by the Heads of State of Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Bolivia (observer) and Uruguay (special guest). For more details, please check OECD (2020a).

**Figure 2:** Percentage map of the number of deaths by COVID-19




Source: Own elaboration, based on Fonte: Coronavirus Research Center database (Johns Hopkins University) at 12th June 2020.

On the other hand, countries such as Honduras, Guatemala, Bolivia and Colombia represent the worst indicators in terms of inequality, poverty and life expectancy among the analyzed countries having made some efforts mainly in terms of emergency support to Social Protection and Labor (Honduras). Other countries with high poverty incidence such as Haiti, Panama and Honduras have concentrated short-term measures on the Economy, Labor and Social Protection. According to the ECLAC Database (2020), the largest number of actions in the Social Protection category refer to cash transfers (applied by 61% LAC countries) followed by food transfers (applied by 42%). Also, according to this data, 82% of LAC countries introduced Labor Protection Measures. The general scope of the measures adopted by the LAC central governments is summarized in the table 4 (below):

Measures of direct cash and food transfer were followed by the suspension of payment for basic services (water, energy, telephone and internet) and the increase in the amount of cash transfers. Most of the actions were taken in business policy, employment and income in this initial stage of the pandemic.

The fiscal and monetary policies have been implemented as an alternative to avoid the economic breakdown in Latin American countries and to provide credit temporarily reducing the costs of the outbreak. As can be seen in table 4, the measures implemented by LAC countries have been generally marked by monetary policies characterized by reduction of interest rates, the reduction in reserves requirements and creating different credit lines in order to support small and medium businesses and employment.

It should be noted that initially LAC countries engaged in a joint coordination effort to contain the COVID epidemic. However, as the situation in each country worsened, this joint effort has dissipated, which has compromised the effectiveness of the emergency measures adopted. A problematic contrast is the Brazilian case, in which the Central Government has been lethargic and catastrophic in making decisions in response to emergency demands, operating in an uncoordinated manner and contrary to the State governments. The country is going through one of the worst political and institutional crises, leading to, for example, the replacement of 3 Ministers of Health during the COVID crisis. Finally, it should be noted that the resilience conditions presented in this article are *ex ante* to the pandemic, therefore, political components can worsen these conditions, even in the short term.

## Conclusion

The COVID-19 crisis highlighted structural heterogeneities and the difficult economic situation that LAC countries were already experiencing historically and before the pandemic. Considering these specificities, the aim of this article was to fill a gap in studies on regional economic resilience of Latin American countries frequently exposed to the most diverse shocks. For this, the features of economic resilience for selected LAC countries were identified in order to analyze their

"ex ante" situation in the face of COVID 19 pandemic. Also, the main measures applied by their Central Governments have been identified.

In general, it was found that, as predicted, there is a clear pattern of less resilient countries and their vulnerability to shocks. Although these countries are being served in the short term by emergency policies, their structural characteristics will compromise their ability to recover in the medium and long term. In addition, exacerbating external dependence (and debt) is increasing their vulnerabilities to shocks. On the other hand, countries supposedly more resilient, like Brazil (with the political crisis) and Mexico (lack of actions), have been affected by the lack of coordination of emergency policies in the short term. In the long-term perspective, these countries will also tend to be affected, especially due to their vulnerability to crises, indebtedness, problems of de-industrialization and re-primarization of the exportation, loss of competitiveness, absence/ ineffectiveness of structural reforms, etc.

We also verified that the indicators of socioeconomic infrastructure measured by life expectancy, health expenses and mortality level, worsened by the previous austerity policies and lack of resources for the public health system, make social vulnerability worse and intensify economic vulnerability. The macroeconomic dimension shows that the expansionary fiscal policy is positively related to economic resilience and negatively to the economic vulnerability and the less vulnerable countries are more resilient as a result of the resilience of a shock-absorbing and the resilience of shock-counteracting nature. The evidence of financial dimension strengthens the capacity of the national financial system to provide resources to firms and households and ensure the access to the financial system, essential to allow firms to resist at some level to the impacts of the shock, keeping their employees and avoiding bankruptcy. Regarding the dimension of productive structure and the resilience of countries, it is important to reinforce the importance of this moment to improve countries' public policy agendas for questions of productive, technological and scientific development after the pandemic.

The fragility of the countries is visible, which puts at risk all discussion on their productive and technological base. Thus, the role of the State in increasing the country's productive capacity and trying to minimize the impacts generated by the economic crisis due to the pandemic must be made a priority in policies conducted in the short and medium term in the countries under study. In addition to the vulnerability and low resilience in most countries, the characteristics seen in the selected dimensions, point to a rather pessimistic scenario in the long run, if governments do not take relevant measures.

This paper also emphasizes that the control of the pandemic in the short term is related to the coordination capacity of governments in their various instances, in addition to the flexibility of economic policies and support for social policies that minimize the impacts on income and inequality, in addition to healthcare measures. The resilience capacity of the countries will depend on the definition of long-term strategies that promote more inclusive and sustainable economic development. It is also necessary that the LACs government expand their conditional cash transfer programmes, income support and social protection to the poorest, to the unemployed and underemployed workers and the opening of special credit lines, tax relief and additional loans to the SMEs. Further, the innovation policies and specialization process can lead to the productivity growth and productive reconversion building up the structural changes in the long term.

Finally, the coronavirus crisis could be the chance to stimulate the debate in LAC countries, to guide and implement strategies for more sustainable and inclusive economy, revitalizing industry, preserving vital biodiversity systems and tackling climate change. As stated by Pikety (2020), the Covid-19 crisis will accelerate the adoption of a new, more equitable and more sustainable development model under certain conditions in terms of a clear change in priorities, with monetary and fiscal components working to the benefit of the real economy and used to serve social and ecological goals.

## References

Ahmed, F.; Ahmed, N; Pissarides, C., Stiglitz, J. (2020). Why inequality could spread COVID-19. *Lancet Public Health 2020 Published Online*. https://doi.org/10.1016/ S2468-2667(20)30085-2.

Akyüz, Y. (2020). The commodity-finance nexus: twin boom and double whammy. *Revista de Economia Contemporânea*, 24(1), e202418. .https://doi.org/10.1590/198055272418.

Alencar, J. F. L.; Freitas, E.; Romero, J. P.; Britto, G. Complexidade produtiva e desenvolvimento econômico: uma análise do caso latino-americano. *Novos Estudos CEBRAP*, v. 37, p. 247-271, 2018. http://dx.doi.org/10.25091/s01013300201800020005.

Audretsch, D. B., & Feldman, M. P. (1996). R&D Spillovers and the Geography of Innovation and Production. *American Economic Review*. https://doi.org/10.2307/2118216

Baldwin, R., & di Mauro, B. W. (2020). Mitigating the COVID economic crisis: Act fast and do whatever it takes. *VoxEU*. org eBook. Available at: https://www.gremihs.com/sitges/wp-content/uploads/2020/03/COVIDEconomicCrisis.pdf#page=48. Acess

Bell, B.; Bloom, N.; Blundell, J.; Pistaferri, L. (2020). Prepare for large wage cuts if you are younger and work in a small firm. *VoxEU*. Available at: https://voxeu.org/article/prepare-large-wage-cuts-if-you-are-younger-and-work-small-firm. Access: April 2020.

Blanchard, O. (2009). The State of Macro. *Annual Review of Economics*. https://doi.org/10.1146/annurev.economics.050708.142952

Blanco, L. (2013). Finance, growth, and institutions in Latin America: What are the links? *Latin American Journal of Economics*. https://doi.org/10.7764/LAJE.50.2.179

Bilbao-Osorio, B., & Rodríguez-Pose, A. (2004). From R and D to innovation and economic growth in the EU. *Growth and Change*. https://doi.org/10.1111/j.1468-2257.2004.00256.x

Bode, E. (2004). The spatial pattern of localized R&D spillovers: An empirical investigation for Germany. *Journal of Economic Geography*. https://doi.org/10.1093/jeg/4.1.43

Bogliacino, F., & Lozano, D. R. (2018). The evolution of inequality in Latin America in the twenty-first century: Patterns, drivers and hypotheses. *PSL Quarterly Review*. https://doi.org/10.13133/2037-3643_71.286_2

Boschma, R. (2015). Towards an Evolutionary Perspective on Regional Resilience. *Regional Studies*. https://doi.org/10.1080/00343404.2014.959481

Bresser-Pereira, L. C. (2012). From Old to New Developmentalism in Latin America. In *The Oxford Handbook of Latin American Economics*. https://doi.org/10.1093/oxfordhb/9780199571048.013.0005

Bresser-Pereira, L. C. (2020). Novo desenvolvimentismo - um segundo momento do estruturalismo latino-americano. *Revista de Economia Contemporânea*, *24*(1). https://doi.org/https://doi.org/10.1590/198055272415

Bresser-Pereira, L. C., Oreiro, J. L., & Marconi, N. (2014). Developmental macroeconomics: New developmentalism as a growth strategy. In *Developmental Macroeconomics: New Developmentalism as a Growth Strategy*.

Briguglio, L., Cordina, G., Farrugia, N., & Vella, S. (2009). Economic vulnerability and resilience: Concepts and measurements. *Oxford Development Studies*. https://doi.org/10.1080/13600810903089893

Briguglio, L. P. (2016). Exposure to external shocks and economic resilience of countries: evidence from global indicators. *Journal of Economic Studies*. https://doi.org/10.1108/JES-12-2014-0203

Cabrer-Borrás, B., & Serrano-Domingo, G. (2007). Innovation and R&D spillover effects in Spanish regions: A spatial approach. *Research Policy*. https://doi.org/10.1016/j.respol.2007.04.012

Carlino, G., Chatterjee, S., & Hunt, R. (2001). Knowledge Spillovers and the new economy of cities. *Working Paper*.

Carvalho, L., Xavier, L. de L., & Pires, L. N. (2020). COVID-19 e Desigualdade no Brasil. Experiment Findings. https://doi.org/10.13140/RG.2.2.27014.73282

Cimoli, M., Porcile, G., & Rovira, S. (2010). Structural change and the BOP-constraint: why did Latin America fail to converge? Cambridge Journal of Economics, 34(2), 389–411. https://doi.org/10.1093/cje/ben060

Cooper, R. I., & Manly, B. F. J. (1987). Multivariate Statistical Methods: A Primer. Journal of the Royal Statistical Society. Series A (General). https://doi.org/10.2307/2982053

Dawley, S., Pike, A., & Tomaney, J. (2010). Towards the resilient region? Local Economy. https://doi.org/10.1080/02690942.2010.533424

Domínguez, R., León, M., Samaniego, J. L., S. O. (2019). Recursos naturales, medio ambiente y sostenibilidad 70 años de pensamiento de la CEPAL (J. Sánchez, ed.). Retrieved from https://repositorio.cepal.org/bitstream/handle/11362/44785/S1900378_es.pdf?sequence=1&isAllowed=y

ECLAC DATABASE (2020) COVID-2019 Observatory for Latin America and the Caribbean: measures by country. Updated to June 10, 2020. Available at: https://www.cepal.org/en/topics/covid-19. Access: April to June, 2020.

ECLAC (2020a) The social challenge in times of COVID-19. Economic Commission for Latin America and the Caribbean (ECLAC) Series: Special Report COVID-19 No.3 2020 -05-14. 21 p.

ECLAC (2020b). América Latina y el Caribe ante la pandemia del COVID-19 Efectos económicos y sociales, 2020 (Informe Especial/Covid-19/N.1).

ECLAC (2020c) Informe sobre el impacto económico en América Latina y el Caribe de la enfermedad por coronavirus (COVID-19), 2020-05-28, 38 p.

Eichengreen, B. (2020). Managing the Coming Global Debt Crisis. *Project Syndicate*. Retrieved from https://www.project-syndicate.org/commentary/managiing-coming-global-debt-crisis-by-barry-eichengreen-2020-05?barrier=accesspaylog

Fingleton, B., Garretsen, H., & Martin, R. (2012). Recessionary shocks and regional employment: Evidence on the resilience of u.k. regions. *Journal of Regional Science*. https://doi.org/10.1111/j.1467-9787.2011.00755.x

Franz T. (2020). *COVID-19 and economic development in Latin America*. Retrieved from https://blogs.lse.ac.uk/latamcaribbean/2020/04/16/covid-19-and-economic-development-in-latin-america/

Furtado, C. (1961a). *Desenvolvimento e Subdesenvolvimento*. Rio de Janeiro: Editora Fundo de Cultura.

Furtado, C. (1961b) Elementos de uma teoria do subdesenvolvimento. In Bielschowsky, Ricardo, ed., *Cinquenta anos de pensamento na CEPAL*. Rio de Janeiro: Ed. Record.

Giannellis, N., & Koukouritakis, M. (2013). Exchange rate misalignment and inflation rate persistence: Evidence from Latin American countries. *International Review of Economics and Finance*. https://doi.org/10.1016/j.iref.2012.07.013

Hartmann, D., Zagato, L., Gala, P., & Pinheiro, F. L. (2020). Why Did Some Countries Catch-Up, While Others Got Stuck in the Middle? Stages of Productive Sophistication and Smart Industrial Policies. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3570727

Hartmann, D.; Jara-Figueroa, C.; Guevara, M.; Simoes, A.; Hidalgo, C. A. "The structural constraints of income inequality in Latin America." 40. Washington, D. C.: Inter-American Development Bank, 2016.

Hascic, I., Watson, F., Johnstone, N., & Kaminker, C. (2010). Climate Policy and Technological Innovation and Transfer: An Overview of Trends and Recent Empirical Results. In *OECD Publishing*. https://doi.org/10.1787/5km33bnggcd0-en

Hevia, C., Neumeyer, A. (2020). Un marco conceptual para analizar el impacto económico del COVID-19 y sus repercusiones en las políticas. *PNUD América Latina y El Caribe COVID 19 | SERIE DE DOCUMENTOS DE POLÍTICA PÚBLICA*, (PNUD LAC C19 PDS No. 1), 19. Retrieved from https://www.undp.org/content/dam/rblac/Policy Papers COVID 19/UNDP-RBLAC-CD19-PDS-Number1-ES-final.pdf

IMF. (2020). *Preparing Public Financial Management Systems for Emergency Response Challenges*. Retrieved from https://www.imf.org/en/Publications/SPROLLs/covid19-special-notes

Johns Hopkins University. (2020). *International Database of Coronavirus*. Retrieved from https://coronavirus.jhu.edu

Kitsos, A., Carrascal-Incera, A., & Ortega-Argilés, R. (2019). The role of embeddedness on regional economic resilience: Evidence from the UK. *Sustainability (Switzerland)*. https://doi.org/10.3390/su11143800

Laborde, D., Martin, W., & Vos, R. (2020). Poverty and food insecurity could grow dramatically as COVID-19 spreads. *International Food Policy Research Institute*. Retrieved from https://www.ifpri.org/blog/how-much-will-global-poverty-increase-because-covid-19 .

Lévy, D., Duménil, G. (2013). *A crise do neoliberalismo* (1st ed.). Boitempo.

Lucchese, M., Pianta, M. (2020). The Coming Coronavirus Crisis: What Can We Learn? *Intereconomics*, *55*, 98–104. https://doi.org/https://doi.org/10.1007/s10272-020-0878-0

Lustig, N., Mariscal, J. (2020). How COVID-19 could be like the Global Financial Crisis (or worse). In B. W. Baldwin, R., Di Mauro (Ed.), *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes* (1st edition, p. 227). Retrieved from https://voxeu.org/content/mitigating-covid-economic-crisis-act-fast-and-do-whatever-it-takes

Marconi, N., Rocha, I. L., & Magacho, G. R. (2016). Sectoral capabilities and productive structure: An input-output analysis of the key sectors of the Brazilian economy. *Revista de Economia Politica*. https://doi.org/10.1590/0101-31572016v36n03a02

Martin, R. (2012). Regional economic resilience, hysteresis and recessionary shocks. *Journal of Economic Geography*. https://doi.org/10.1093/jeg/lbr019

Martins, N. M. (2017). INTEGRAÇÃO FINANCEIRA NA AMÉRICA LATINA ENTRE 2000 E 2014 AVANÇOS, LIMITES E CAMINHOS À FRENTE. *Revista Tempo Do Mundo*, *3*(2), 83–136. Retrieved from https://www.ipea.gov.br/revistas/index.php/rtm/article/view/24

Martin, R., & Sunley, P. (2015). On the notion of regional economic resilience: Conceptualization and explanation. *Journal of Economic Geography*. https://doi.org/10.1093/jeg/lbu015

Martin, R., Sunley, P., Gardiner, B., & Tyler, P. (2016). How Regions React to Recessions: Resilience and the Role of Economic Structure. *Regional Studies*. https://doi.org/10.1080/00343404.2015.1136410

Nassif-Pires, L., Xavier, L. L., Masterson, T., Nikiforos, M., Rios-Avila, F. (2020). *Pandemic of inequality* (No. 149). Retrieved from http://www.levyinstitute.org/pubs/ppb_149.pdf

Nyström, K. (2018). Regional resilience to displacements. *Regional Studies*. https://doi.org/10.1080/00343404.2016.1262944

Ocampo, J. A. (2017). Commodity-Led Development in Latin America. In *Alternative Pathways to Sustainable Development: Lessons from Latin America* (Internatio, pp. 51–76). Geneva, Boston: Graduate Institute Publications, Brill-Nijhoff.

OECD. (2020a). *COVID-19 in Latin Americaand the Caribbean: An overview of government responses to the crisis*. Retrieved from https://read.oecd-ilibrary.org/view/?ref=129_129907-eae84sciov&title=COVID-19-in-Latin-Amercia-and-the-Caribbean_An-overview-of-government-responses-to-the-crisis

OECD. (2020b). *COVID-19 inLatin America and the Caribbean:* Regional socio-economic implications and policy priorities. Retrieved from https://read.oecd-ilibrary.org/view/?ref=129_129904-k3xp17fqbl&title=COVID-19-in-Latin-America-and-the-Caribbean-Regional-socio-economic-implications-and-policy-priorities

Pike, A., Dawley, S., & Tomaney, J. (2010). Resilience, adaptation and adaptability. *Cambridge Journal of Regions, Economy and Society*. https://doi.org/10.1093/cjres/rsq001

Piketty, T. (2020). The age of green money. *Le Monde*. Retrieved from https://www.lemonde.fr/blog/piketty/2020/05/12/the-age-of-green-money/

Pinto, A. S. C. (2000). Notas sobre os estilos de desenvolvimento na América Latina. In R. Bielschowsky (Ed.), *Cinquënta anos de pensamento na CEPAL* (pp. 609–649). Rio de Janeiro: Record/Cepal.

Prebisch, R. (1962). O Desenvolvimento Econômico da América Latina e Alguns de seus Problemas Principais. *CEPAL, Boletin Económico de América Latina*. https://doi.org/1949

Ravallion, M. (2020). Could Pandemic Lead to Famine? *Project Syndicate*. Retrieved from https://www.project-syndicate.org/commentary/covid19-lockdowns-threaten-famine-in-poor-countries-by-martin-ravallion-2020-04?barrier=accesspaylog

Rodríguez, O. (2009). *O estruturalismo latino-americano*. Rio de Janeiro: Civilização Brasileira.

Rojas-Lozano, D. (2018). The Leftist Threat: Income Inequality in Latin America in the 21st Century. *Annual Meeting of the Midwest Political Science Association*. Chicago (IL).

Rojas-Suarez, L. (2015). *Emerging Market Macroeconomic Resilience to External Shocks: Today versus Pre–Global Crisis*. Retrieved from https://www.cgdev.org/sites/default/files/CGD-Essay-Rojas-Suarez-Emerging-Market-Macroeconomic-Stability_0.pdf

Sensier, M.; Devine, F. (2018). Designing a resilient local industrial strategy. In C. Berry (Ed.), *What We Really Mean When We Talk About Industrial Strategy: New Future Economies ebook argues for a more expansive industrial strategy in the UK* (p. 145). Manchester: Manchester Metropolitan University.

Simmie, J., & Martin, R. (2010). The economic resilience of regions: Towards an evolutionary approach. *Cambridge Journal of Regions, Economy and Society*. https://doi.org/10.1093/cjres/rsp029

Tupy, I. S., Crocco, M., & Silva, F. F. (2018). Resiliência e impactos regionais de crises financeiras: uma análise para os estados brasileiros - 2007/08. *Economia e Sociedade*. https://doi.org/10.1590/1982-3533.2017v27n2art9

World Bank. (2020a). *The Economy in the Time of Covid-19*. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/33555/9781464815706.pdf?sequence=5&isAllowed=y

World Bank. (2020b). *Global Economic Prospects*. https://doi.org/10.1596/978-1-4648-1553-9

## ANNEX 1

**Table A.1:** Descriptive statistics for all variables

| Variable | Observations | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| X1 | 19 | 74.4561 | 3.6418 | 63.66 | 80.04 |
| X2 | 19 | 6.8421 | 1.9998 | 1.2 | 9.5 |
| X3 | 19 | 3.0421 | 5.3203 | 0.1 | 23.8 |
| X4 | 19 | 37 | 14.5665 | 14.01 | 72.27 |
| X5 | 19 | -1.2849 | 7.7278 | -32.135 | 4.349 |
| X6 | 19 | 504505.9 | 219906 | -0.065 | 95854 |
| X7 | 19 | -3.3801 | 2.274 | -10.007 | 0.089 |
| X8 | 19 | 45.6769 | 22.271 | 13.385 | 108.6072 |
| X9 | 19 | 96.9947 | 41.6145 | 39.72511 | 211.6899 |
| X10 | 19 | 16.5779 | 9.08 | 2.6354 | 40.75032 |
| X11 | 19 | 0.2068 | 0.1738 | 0 | 0.6 |
| X12 | 19 | 5.8552 | 2.7633 | 1 | 12.38 |
| X13 | 19 | 81.2273 | 106.4315 | 3.57 | 385.42 |

Source: Own elaboration.

**Table A.2:** Correlation Matrix

| Variables | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 | X11 | X12 | X13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X1 | 1 | | | | | | | | | | | | |
| X2 | 0.3266 | 1 | | | | | | | | | | | |
| X3 | -0.808 | 0.0465 | 1 | | | | | | | | | | |
| X4 | -0.15 | -0.07 | 0.2367 | 1 | | | | | | | | | |
| X5 | 0.1293 | 0.5747 | 0.0274 | 0.0528 | 1 | | | | | | | | |
| X6 | -0.155 | -0.683 | -0.075 | -0.023 | -0.967 | 1 | | | | | | | |
| X7 | 0.2287 | 0.4085 | 0.069 | 0.1147 | 0.669 | -0.706 | 1 | | | | | | |
| X8 | 0.4326 | 0.1944 | -0.301 | 0.0043 | 0.243 | -0.167 | 0.034 | 1 | | | | | |
| X9 | 0.51 | 0.166 | -0.375 | 0.1503 | 0.193 | -0.185 | 0.195 | 0.502 | 1 | | | | |
| X10 | 0.1025 | -0.112 | -0.162 | 0.1877 | 0.097 | -0.018 | -0.204 | 0.341 | 0.065 | 1 | | | |
| X11 | 0.4043 | 0.3125 | -0.317 | -0.362 | -0.124 | -0.01 | -0.086 | -0.163 | 0.017 | -0.224 | 1 | | |
| X12 | 0.2768 | 0.2745 | -0.056 | 0.0678 | 0.189 | -0.219 | 0.152 | -0.066 | 0.345 | -0.201 | -0.082 | 1 | |
| X13 | -0.579 | 0.0676 | 0.7094 | 0.1288 | 0.115 | -0.11 | 0.269 | -0.232 | -0.341 | -0.221 | -0.331 | 0.06 | 1 |

Source: Own elaboration.