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COVID-19: Differential impact on income distribution in Mexico and China

COVID-19: impacto diferenciado en la distribución del ingreso en México y China

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Abstract

In this paper we discuss the impacts of the COVID 19 pandemic on income distribution inequality globally by using Mexico and China as examples. Kuznets ideas are reviewed since he considers that economic growth reduces, in the medium and long run, inequality. From our review, it is found that there are two opposing views with regards of the impacts on inequality, the ones that argue that it will be reduced and the ones that say that it will increase. We found that, using and difference in differences econometric model, in the case of Mexico and China, it is not possible to categorically agree with what conventional economic theory concludes, and we argue that more information is needed in order to gather more evidence with regards on what the final impacts of the pandemic will be on income inequality globally, and in Mexico and China particularly However, immediate action is recommended in order to reduce the high levels of inequality present both in Mexico and China.

JEL Code: A10, E00, I14, O11
Keywords: economics; distribution; income; inequality; Kuznets; COVID-19

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Resumen

En este trabajo se discute el impacto que la COVID19 ha tenido en la desigualdad en la distribución del ingreso utilizando a México y China como ejemplos. Las ideas de Kuznets son revisadas y su argumento de que el crecimiento económico, en el mediano y largo plazo, reduciría la desigualdad. De nuestra revisión, encontramos que existen dos visiones encontradas en cuanto al impacto en la desigualdad, las que argumentan que se reducirá y las que opinan que se incrementará. Encontramos que, utilizando un modelo econométrico de diferencias en diferencias, para el caso de México y China, no es posible comprobar categóricamente lo que la teoría convencional predice y argumentamos que es necesaria una mayor cantidad de información para lograr más evidencia sobre cuál será el impacto final de la pandemia. en la desigualdad a nivel global y para México y China en particular. Sin embargo, se recomiendan acciones inmediatas para reducir los altos niveles de desigualdad que se observan en ambos países.

Código JEL: A10, E00, I14, O11
Palabras clave: economía; distribución; ingreso; desigualdad; Kuznets; COVID-19

Introduction

Income distribution is one of the most complex phenomena in economics, both from a theoretical and practical point of view, due to the large number of elements involved in its determination. Although at first it may seem logical and rational that each factor of production should be remunerated according to its contribution to the gross domestic product (GDP), income distribution is rarely equitable anywhere in the world.

From the point of view of contemporary economic science, there are explanations such as that of Simon Kuznets (1955). He proposed that if there were high and sustained economic growth, there would be an improvement in income distribution and, therefore, a reduction in inequality. This reduction would occur in the long term since inequality could worsen in the first stages of high and sustained economic growth, but then lead to an improvement in distribution.

The question guiding this article is: Is there a sine qua non for countries with high and sustained economic growth to reduce inequality? This is a difficult question to answer since inequality is a multidimensional phenomenon. There are various attempts to explain or answer it, and in general they do not only have to do with GDP growth or any other economic variable.

Indeed, to reduce inequality, a whole set of economic policy measures are needed. These measures generally have to do with variables such as the level of schooling, investment in education, health, and scientific research and development, as well as wage policies that benefit the labor factor and control over key economic variables such as price levels, interest and exchange rates, and even external and government balances, among others.

Although inequality has existed in countries for centuries, it was in the 1980s when it increased worldwide due to the implementation of economic and distributive policies that favored the capital factor to the detriment of the labor factor (ECLAC, 2018). One of the results of these policies is that inequality in the world is high, as it is currently 0.63, four points higher than in 2010 (Milanovic, 2021).

It is difficult to reduce inequality in developing countries. Mexico is one of the most illustrative cases of what neoliberal policies have meant and their effect on the deterioration of the population's income, despite the distributive social policy implemented from the 1990s to the present. There is also the case of the People's Republic of China (China, hereafter), which underwent a long process of economic transformation from the early 1980s, leading to a high and sustained level of economic growth, but which has not yet translated into a gradual decrease in inequality, as proposed by Kuznets in the 1950s.

Some authors consider that if there has been any reduction in income inequality in the world in recent decades, it is due, more than to neoliberal policies favoring the capital factor, to the fact that China recorded advances and reversals in its economic transformation process that led it to experience improvements but impacted income distribution both in China and on a global scale (Molero, 2011).

This article will analyze income distribution in Mexico and China, countries with high income inequality and which have achieved different results in reducing it, although China has had high GDP growth rates for decades and Mexico has had only mediocre growth. The purpose of this paper is twofold: on the one hand, to analyze and, on the other, to measure the determinants that explain inequality in both countries, particularly in the periods of the two major economic crises of the 21st century: the 2009 crisis, reflected in 2010, and the 2020 crisis caused by COVID-19.

The questions to be answered are: How has inequality evolved in the world? What are the stylized facts and key variables associated with inequality in both countries? What are the determinants that explain income inequality in the cases of Mexico and China? The hypothesis is that Mexico and China register a marginal differential impact on income distribution that was accentuated by the COVID-19 economic crisis.

The article is structured in the following sections: this introduction; the second section will analyze inequality on a global scale; section three will review the literature; section four will describe the economic variables associated with inequality; section five will analyze the stylized facts of Mexico and China; section six will analyze the results; section seven will discuss the results; and the final section will develop a set of conclusions.

Inequality in the world in recent decades and COVID-19

Inequality in income distribution has been a constant in the world for centuries. Nonetheless, it became evident after the industrial revolution in the 18th century, when the current economic system was structured based on massive labor to transform natural resources (Milanovic, 2002). Inequality is understood as the differentiated way in which the benefits of a society's economic and social product are distributed between the labor and capital factors.

The distribution of wealth was hardly studied worldwide because the production system on a global scale did not expand until the twentieth century. However, it is considered that from the beginning of the 19th century there were already measurements of wealth distribution (Bourguignon & Morrison, 2002; Milanovic, 2021). It was not until the establishment of the New International Economic Order (NIEO) after World War II that inequality was observed in its true dimensions, and from that point on, measurements and explanations of inequality emerged.

After the end of World War II, the world began to produce goods and services based on the participation of labor and capital. This meant that, according to their share in GDP, the remuneration of one or the other factor was according to the rules in force and the economic and distributive policies of governments, which, in their rhetoric, sought equity. Measured from the point of view of GDP at factor cost and taking the Lorenz Curve as a reference, when the distribution was closer to 0, it was more equitable, and when it was closer to 1, it was less equitable.

Historically, the Gini coefficient was the index that best measured this distribution, although it has recently been questioned by researchers such as Palma (2013), who considers that the Gini hides information for better measurement. This coefficient is the main index used to measure income concentration at different scales and to compare countries, groups of countries, or the whole world, which is why it is used in this article.

Some measurements of the Gini on a global scale, of continents, regions, or groups of countries, date back to the 1960s. Authors such as Hong, Han, and Kim (2018) or Lackner and Milanovic (2015) find that since the 1960s, inequality has been reduced globally, particularly in the 1990s and the first decade of the 21st century. Others consider that it has increased (Davies et al. 2010; Keeley, 2015) if China and India are left out. These are not only the most populated countries in the world but also the ones that have grown the most in terms of GDP.

Depending on many factors, such as the variables to be considered, the base year, the methodology, the econometric technique, and the concepts of inequality proposed by Milanovic (Ferreira, 2021), there is greater or lesser inequality. As a result, analyses, conjectures, discussions, and evaluations

of economic and distributive policies are made, positions are taken, and recommendations are made as to what explains inequality and how to reduce it.

Although it could be accepted that inequality has tended to reduce in recent decades worldwide, this reduction has not been generalized but rather differentiated, reaching its maximum level for many countries in 2018 and for a few more in 2019. Both were the years of the end of the economic cycle and a prelude to the onset of the 2020 economic crisis.

The China-US trade conflict, and especially the economic crisis triggered by COVID-19, have generated two conflicting positions regarding the final effect on inequality in the world. On the one hand, the World Bank (2021), UNDP (2021), and ECLAC (2021) consider that inequality is very likely to increase, while Deaton (2021), Milanovic (2021), Andrew, Conchita, and Lepinteur (2021), and Ferreira (2021) consider that it will decrease.

In the same line, Deaton (2021) states that since emerging countries suffered fewer deaths per capita in 2020 than rich countries and also had proportionately smaller reductions in their GDP per capita, they will be less affected by the impact of COVID-19 on income inequality. The author notes that the 97 poorest countries lost on average 5% of their 2019 GDP per capita, while the 96 richest countries, which have 6.25 times higher income, lost on average 10%. This author used IMF and WB data to make correlations between per capita income growth and deaths per million; per capita income growth and absolute per capita income for 2019 and 2020; and Gini coefficients of per capita income, unweighted and weighted by population.

For Samuels (2020), the economic collapse caused by the huge waves of contagion and the measures taken to combat the disease translate into a wider inequality gap. On the one hand, despite the collapse of the stock markets that caused billionaires to suffer considerable losses of their assets, these were transitory, since between March 18 and December 31, 2020, the fortune of the world's 1,000 richest billionaires increased by $3.94 trillion dollars. Their combined wealth amounted to $11.95 trillion, the equivalent of the sum that the G20 governments have mobilized to alleviate the consequences of COVID-19.

Samuels (2020) points out that job losses are more than three times higher than during the two years of the Great Recession. Moreover, in agreement with OXFAM (2021), he finds that while the wealthy regain and even increase their wealth, it could take more than a decade for the poorest and most subject to inequality to return to pre-pandemic income levels.

As can be seen, there is no consensus on whether there has been a reduction in inequality in the world in recent decades or on what the ultimate effect of the COVID-19 economic crisis will be on inequality in the world. This is because there are conflicting positions among researchers and agencies and among inequality scholars. This debate is interesting because it encourages research into the

determinants of inequality, at least in the comparison of Mexico and China, which are countries with high inequality. Mexico is considered an example of high inequality, and China is an example of the global reduction of inequality in this century.

Review of the literature

Jian, Sachs, and Warner (1996) test the hypothesis of income convergence among China's regions using a simple econometric model, in which they find evidence that overall inequality in the Maoist period (1949-1978) had periods of lower inequality (1953-1957), then of increasing inequality (1965-1977), and then decreasing again, particularly since the 1980s. However, in 1993, they found income gaps between the coastal region and the central and eastern regions since human and physical resources and foreign investment were channeled to the former region and, unlike the other regions, all kinds of facilities were provided to encourage production. They conclude that economic openness and high economic growth had an impact on reducing the income gap within and among China's regions.

For the period 1978-1993 and using the Solow cross-section panel data growth model, Chen and Fleisher (1996) find that there is conditional regional convergence in the reduction of inequality, which is explained by investment in infrastructure, human capital, and FDI in the coastal region. They conclude that for China to promote regional growth equity it is necessary to direct physical investment to these regions and alleviate labor mobility restrictions.

Using the Gini and Theil indices, Forsyth (2006) found that inequality decreased in China's interior regions between 10% and 20% in 2005, in relation to the 1980s, when inequality indices were between 70% and 80%. This reduction was because the central and eastern regions began to incorporate themselves into the country's international trade flows.

Dong, Tang, and Wei (2018) applied a panel model at the provincial level. They found that between 1996 and 2011 income inequality measured by Gini increased due to the aging of the population and concluded that such an increase is explained by variables such as inflation, urbanization, real GDP per capita, globalization, and the rate of financial interrelationship.

Piketty, Yang, and Zucman (2019) analyze the inequality of wealth distribution at the national level in China between 1978 and 2015, using the China Household Income Project (CHIP), the China Family Panel Study (CFPS), and the Hurum Annual Ranking of the richest households using the generalized Pareto interpolation technique, which yields a smooth wealth distribution, consistent with all quantiles observed in the survey. They find that, over the analysis period, inequality grew in China from the 1980s to 2016 and began to decline after that. Notwithstanding this progress, they consider that China

in the 1980s had a distribution similar to that of the Scandinavian countries and currently has a distribution more similar to that of the USA or even Mexico.

Fu, Villas-Boas, and Judge (2019), for the intercensal period of 2005-2015 and using the entropy-based divergence method, found that the heterogeneity of the probability functions of income distribution is more homogeneous for the 31 Chinese provinces thanks to the price mechanism fulfilling its function of distribution and allocation of resources. So, this distribution changes over time or, as they put it, is dynamic.

Using the Gini and Theil coefficients, Yu et al. (2021) find for the 31 provinces of China that there is inadequate distribution of the physical infrastructure of health services, with these being concentrated in cities with high population density. They consider that, knowing how the concentration of income favors urban areas and large cities, public policies could be generated to serve populated cities with inferior health service infrastructure, thereby reducing inequality.

Shen et al. (2021) find that income inequality in China is fundamentally regional and is explained by fiscal decentralization, urbanization, geographic advantages and disadvantages, migration, population size, and wage reduction in benefits. Also, to measure the impact of COVID-19 in China during and after the implementation of the health and economic measures, they conducted a dynamic distribution analysis in 295 prefecture-level cities using a nonparametric stochastic kernel method. This method allowed them to understand the impact on income distribution as the health measures were removed and the economy returned to normal. They found that in urban areas and in industrial, service, and to a lesser extent, primary activities, the impact on inequality was differentiated. However, they conclude that inequality will increase in the short term despite China's early recovery of economic activity.

Székely et al. (2007) measured inequality for each state in Mexico using the Entropy Index (EI) family. They found that at the national level, the value of the Theil index, which is obtained using the income imputation procedure, is 0.425, with Querétaro being the state with the highest inequality and Baja California the one with the lowest inequality. Thus, they found that almost 83% of inequality at the national level is due to income disparities within each state, while only 17% is due to inequalities between states.

Lustig, López-Calva, and Ortiz Juárez (2014) find that between 2001 and 2011, the level of inequality in Mexico decreased. They suggest two explanations for this change: i) a reduction in inequality in labor income per hour, and ii) a higher volume and increased progressiveness of public transfers. The evidence suggests that the decline in returns to primary, secondary, upper secondary, and tertiary education, relative to no or incomplete primary schooling, led to a decline in inequality in labor income per hour.

Campos-Vázquez et al. (2014) suggest that a Pareto-based adjustment method should be used to determine inequality. They estimated the average disposable income per capita from the Mexican System of National Accounts. With the average income per decile and the average disposable income, they calculated the income shares from decile one to nine, finding that the share of decile 10 was equal to 100 minus the sum of the shares of decile one to nine.

Del Castillo (2017) presents a variety of indicators and statistical information on the magnitude of inequality in the distribution of both physical and financial assets in the country. The author finds that the Gini Coefficient for asset distribution is 79 and that the concentration of financial assets is even more pronounced.

Esquivel (2010) uses 2 synthetic coefficients: the Gini Coefficient and the Theil Index. The author also uses the ratio of income between the 90th percentile and the 10th percentile of the distribution, indicating the multiple of times the income that someone at the top of the distribution receives compared to what someone at the bottom receives. This author also uses the Palma index, concluding that inequality in different economies was rooted in income distribution between the richest decile and the poorest two quintiles. This is because the income shares of the bottom 50 percent of the population tend to be relatively stable across economies and over time.

Lustig and Martinez (2021) analyze the impact of COVID-19 on poverty and inequality in Mexico. They report that income losses may be more pronounced for the moderately poor and those vulnerable to falling below the poverty line rather than among the very poorest. This is because social assistance programs account for a larger share of the total gross income of the poorest, especially in rural areas. Thus, they conclude that COVID-19 causes a smaller increase in poverty in rural areas because this is where consumption of own production—as a share of gross income—is larger.

On the other hand, Salas et al. (2020), Huesca et al. (2020), and Monroy-Gómez-Franco (2021) consider that inequality increased in 2020 as an effect of the COVID-19 pandemic, resulting from the economic shutdown that occurred at both the sectoral and regional levels. That is, there was a shutdown in the main front-line activities, causing significant job losses and consequently, a loss of labor income. Regardless of the measurement and simulation models used, what they do not concur on is the deciles in which the greatest impact would be registered.

Moreover, Salas et al. (2020), Huesca et al. (2020), and Monroy-Gómez-Franco (2021) consider that inequality would increase in 2020 as an effect of the COVID-19 pandemic, resulting from the economic shutdown that occurred at both the sectoral and regional levels. That is, there was a shutdown in the main front-line activities, where a significant percentage of unemployment occurred and consequently, a loss of labor income. Regardless of the measurement and simulation models used, what they do not concur on is the deciles in which the greatest impact would be registered.

Salas et al. (2020) and Huesca et al. (2020), with simulation models on the impact of COVID-19 on income distribution, find that inequality would increase in Mexico by the end of 2020, particularly due to the decrease in the labor income of the working population, both formal and informal. For Salas et al. (2020), the impact on income distribution ranges from less than 1% to 9.7%. This means that, in general, the impact affects all deciles, particularly the first ones, due to the decrease in their wage income due to layoffs or the cessation of companies' activities. Huesca et al. (2020) find that the greatest impact will be felt by the middle deciles, although they expect an overall increase that will bring the Gini from 0.487 in 2018 to 0.52 in 2020.

Similarly, Monroy-Gómez-Franco (2021) finds that inequality remained high, particularly in the third quarter of 2020, when it reached 0.44 compared to 0.42 in the first quarter. Like Salas et al. (2020) and Huesca et al. (2020), he considers that this increase in inequality is explained by the fall in labor income, manifested in job losses. Contrary to Salas and Huesca, he considers that such inequality increased more in the first deciles and to a lesser extent in the last deciles (IX and X).

Finally, as can be seen, the inequality measurement studies for China and Mexico, in general, confirm that inequality is high; that there have been periods of increase and decrease, but it is not possible to be conclusive and affirm that its trend is toward a decrease or an increase. The econometric measurement technique, the periods of analysis, and the variables used for its measurement are decisive.

Description of variables

In this section, some macroeconomic variables are analyzed, with the clarification that only those most associated with inequality and which, in the literature review, were found to be significant, are described. For the purpose of this article, these variables are those with a specific weight in the behavior of China and Mexico. Before describing them, it is important to mention the data sources and the period of analysis.

The data analyzed in the following pages come from national sources such as the National Bureau of Statistics for China[1], and INEGI[2] and CONEVAL[3], in the case of Mexico. The international data sources were obtained from the World Bank.

The period of analysis of the research is from 2010 to 2020. This is to analyze the variables in the second decade of this century, considering the high growth but with a tendency to decrease in China, on the one hand, and the low level of growth in Mexico, on the other. Both followed the international

[1]Some data for China were complemented with the Bureau of Statistics database, which can be consulted at the following link: http://www.stats.gov.cn/tjsj/ndsj/2020/indexeh.htm
[2]For Mexico, queries were added to the data from its national database consulted at https://www.inegi.org.mx/datos
[3]For Mexico, queries were added to the data from its national database consulted at https://www.inegi.org.mx/datos

economic crisis of 2009. On the other hand, the behavior of the main macroeconomic variables that record the consequences of COVID-19, which are relevant for the analysis of inequality, is analyzed.

Another point to highlight is that, in the analysis of the variables, most of them are treated in relation to the percentage of GDP, and when this is not the case, it is specified. Likewise, the variables are studied using descriptive statistics, with the clarification that this study does not examine poverty, as the objective of the work is to analyze the determinants that explain inequality between China and Mexico from the point of view of distribution.

Figure 1-A shows the GDP growth rate of China and Mexico. Furthermore, the whole world is considered for the period 2010-2020, which highlights the decrease in GDP in practically the entire world with a contraction of -3.59% in 2020 (World Bank, 2021a), the first year of COVID-19. Also noteworthy is Mexico's contraction of -8.23% and China's growth of 2.3%.

Figure 1-B shows the GDP of China and Mexico in constant dollars. The purpose of this graph is to demonstrate the sustained growth of China during the analysis period and the gap between the size of both economies, highlighting that Mexico's GDP appears to be a constant. However, this is due to the size of China's economy compared to Mexico's.

Concerning per capita GDP growth (Figure 1-C), it can be seen that the two economies have similar behavior since their movement is parallel, although China's growth is much larger due to the size of its economy. In terms of GDP per capita at constant prices, the sustained growth that China has shown in the last decade is indisputable. Although Mexico is superior to China in this indicator, the size of the Chinese population compensates as it is ten times larger than that of Mexico. China's population, despite its size, is very close to Mexico in terms of social inequality (see Figure 1-D).

Figure 1-E shows the trade balance of goods and services as a percentage of the GDP of both countries. It shows how, in the last decade, China has fluctuated between 2% and 4% of its GDP, and Mexico has had negative numbers in eight of the ten years of analysis, with a significant recovery in 2019 and 2020, which strengthens the analysis in the following section, related to the reduction of inequality.

Concerning government spending as a percentage of GDP, it is clear that both countries show similar behavior because, although it is evident that the Chinese government spends more than the Mexican government, the trend in both is consistent with the size of each country's economy. The behavior of Mexico's spending in recent years stands out, with an increase in the last couple of years in social programs, scholarships, and greater coverage of salaries (see Figure 1-F).

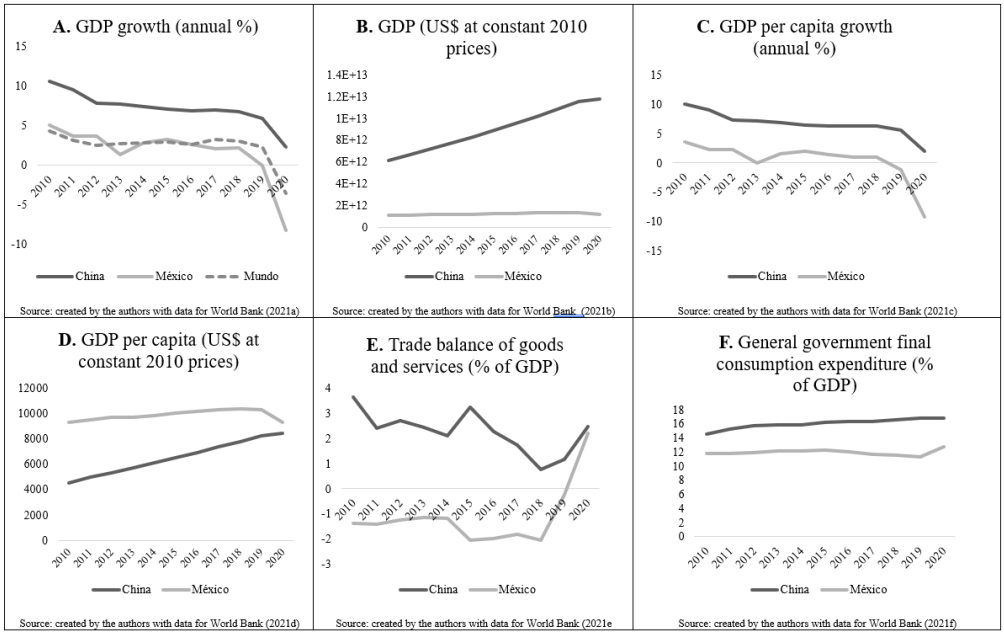

Figure 1. Macroeconomic Variables

Regarding the balance of the current account in relation to GDP, in most of the analysis period, it is observed that Mexico is in deficit close to 3% of GDP, while from 2018 onwards, a significant recovery begins. This is significant because in 2020 the COVID-19 pandemic did not affect that growth, but it seems that an opposite effect occurred, increasing the strength of growth.

With respect to China, its current account behaves very differently, as it is at no time in deficit, although in 2018 it recorded a significant decrease, the largest in the period under analysis. Since that year China has experienced significant growth in this category once more (see Figure 2-A).

Regarding unemployment, it oscillates between 4% and 6% in both countries, with China having a fairly stable behavior in most of the analysis period and presenting a slight increase as of 2018, a year that is a turning point for China, as analyzed. Mexico experienced a decrease in the percentage of unemployment in 2016, and it is evident how the effects of the lockdown impacted this indicator almost immediately after the declaration of the pandemic (see Figure 2-B).

Moreover, one of the significant variables in macroeconomic behavior is inflation, which is also analyzed from 2010 to 2020. It shows the behavior of each of the economies analyzed, where Mexico's inflation is higher than China's in the last 7 years of the period. It also shows how China manages to meet the inflation target by registering two percentage points for each year (see Figure 2-C).

Analyzing the real interest rate, it is observed that China's rate adopts a Gaussian bell shape, which is explained by the cut it made from 2015 to 2017. Nonetheless, in recent years it has recovered similarly to its downward trend, reaching 3.5% in 2020. On the other hand, from 2016 Mexico experienced significant growth in its interest rate, peaking in 2019 with a real interest rate of just over 4%, and in 2020 it experienced a cut again very close to 1% (see Figure 2-D).

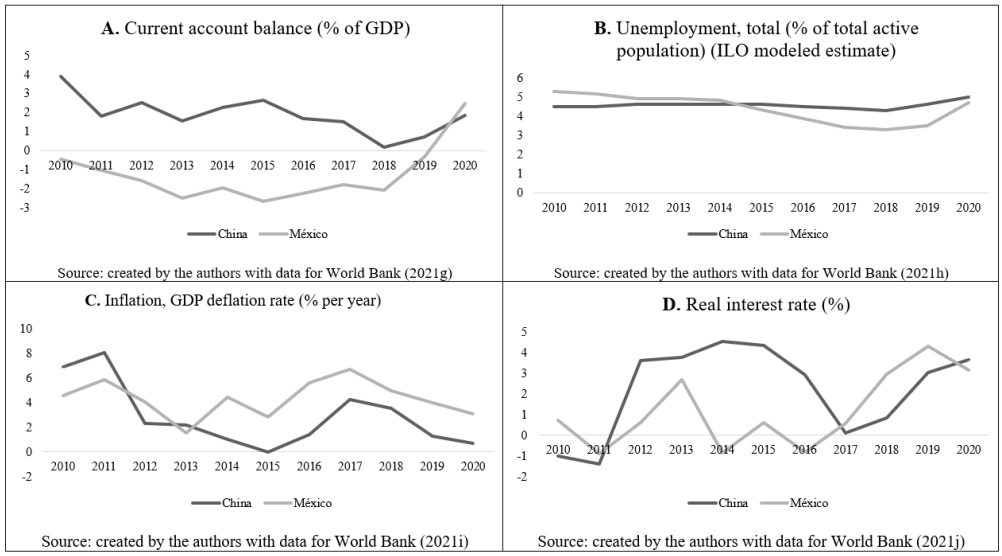

Figure 2. Macroeconomic Variables

The above is an overview of the behavior of the main macroeconomic variables of China and Mexico, which reveals the difference between the two economies. COVID-19 impacted them differently, but both nations were adversely affected.

Stylized facts

Stylized facts undoubtedly play an essential role in a topic as broad as economic inequality since they help to show in a simplified way some essential data for the analysis of the topic, as well as empirical findings in search of trends or patterns identified with the behavior.

This paper analyzes in detail the fact that several authors, such as Kuznets (1955) and Aguilera (1998), assume that inequality is reduced by economic growth, i.e., when a nation experiences growth, a whole series of possibilities are enabled for the population, and thus the gap between the bottom deciles and the top ones narrows. Accordingly, Cingano (2014) sees income inequality as exerting a statistically

significant negative effect on subsequent economic growth. Berg and Ostry (2011) conclude that prolonged periods of growth are strongly associated with greater equity in income distribution.

Another important point in this section is the assumption that any factor that is not in the decision in situ should not contribute to economic inequality. Therefore, random issues such as being born in a high- or low-income family, in a town or city, or in a developed or undeveloped country, are left aside.

Finally, one last fact related to unemployment should be pointed out. As unemployment rises, families cease to receive income from their main source, which quickly makes them change in the distribution scale and increases inequality. In other words, the higher the percentage of unemployment, the greater the inequality. If this direct relation is proven, Piketty's (2013) assertion that greater inequality is caused by unemployment is fulfilled. Moreover, in the case of both countries, unemployment has increased in recent years and has become more pronounced since the COVID-19 declaration (see Figure 2-B).

Data analysis

In this section, an analysis was made of the main macroeconomic variables that affect inequality, not only from a graphical point of view but also empirically. It should be clarified that it was decided to work with econometrics since it was necessary to know the degree of correlation between the multiple variables analyzed and to know which ones best describe the behavior of inequality from the point of view under study.

The variables worked on were GDP growth, GDP per capita growth, trade balance, government spending, current account, unemployment, inflation, interest rate, and education spending, all as a percentage of GDP for both China and Mexico using Open Source R software[4]. Initially, the normality of the data was analyzed using the Shapiro-Wilk normality test at a p-Value of 0.05. Subsequently, based on economic theory, it was determined that the endogenous variable would be the Gini coefficient. Then, an analysis was carried out to establish the exogenous variables determined by the model [1].

The variables chosen were those that best explain the Gini of both nations using a simultaneous equations model (SEM), where, in order to be meaningful, it is necessary that each model contains the same variables and that these are linear in order to correlate them. This model has the characteristic of comparing similar circumstances of two scenarios. For this study, simultaneity helps to point out which

[4]R software under GPL (General Public License). The estimations were carried out with Open Source R Core Team (2013) software. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. URL. http://www.R-project.org/

variables have greater significance since their behavior explains the behavior of inequality better. It should be clarified that these variables are used because they are the ones that comply with the natural dynamics, according to the economic theory.

The model that best fits the SEM is the following:

$$y_x = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 \quad (1)$$

This model was the one that reported the best indicators and coefficients after running the regressions with a collection of 28 models for both countries. The model showed that the exogenous variables that best describe the behavior of the endogenous variable are x_1 = % of GDP per capita growth, x_2 = % of government spending, and x_3 = % of unemployment. These models are available for consultation, both in the link in the following footnote and in Appendix 1 of this article.[5]

Regarding the model's behavior, the runs performed show that the series considered to measure the Gini for China yields an increase in inequality in 2020 (Figure 3), with an approximate index of 0.47 points in relation to 2018, when 0.468 was recorded. In other words, China recorded an increase in income inequality in 2020. Nevertheless, it was among the few countries that recorded economic growth in 2020.

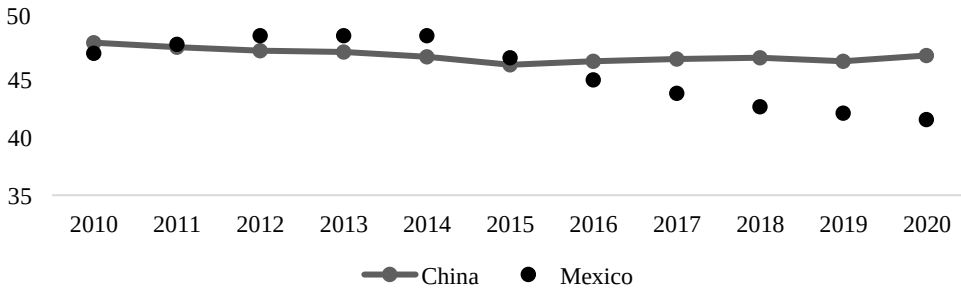

Figure 3. Gini coefficient behavior of China and Mexico, 2010-2020
Source: created by the authors with data for China from Statista (2021)
Gini index: inequality of income distribution in China obtained from
https://www.statista.com/statistics/250400/inequality-of-incomedistribution-in-china-based-on-the-gini-index/
and for Mexico (2021), from Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH) 2020
New series obtained from https://www.inegi.org.mx/programas/enigh/nc/2020/#Documentacion
Note: For China, the 2020 Gini Coefficient was estimated; for Mexico, it was taken from the ENIGH 2020

[5]All models are available at the following link: https://bit.ly/3Aaw22j

For its part, Mexico recorded a Gini of 0.415 for 2020, according to the National Survey of Household Income and Expenditure 2020 (ENIGH, 2020; Spanish: Encuesta Nacional de Ingreso y Gasto de los Hogares) conducted by INEGI, which collects information reporting the effects of the COVID-19 pandemic. This figure is lower than in 2018, which reported a Gini coefficient of 0.426, expressing a decrease in inequality.

Table 1 displays information about the endogenous variable with respect to the exogenous variables. It shows the coefficients of the model [1] for each of the countries, highlighting the positive behavior of all of them for Mexico and the negative behavior for China, which indicates that these variables significantly impact the model's development. This was determined based on the F statistic and using the significance levels of the Shapiro-Wilk normality test.

The results of the model show that GDP per capita growth, government spending, and unemployment in the case of China are the set of exogenous variables that contribute most significantly to the growth of the endogenous variable and, in turn, those that contribute most to Mexico's reduction in inequality. It should be specified that these results only occur when these two countries are combined, because if they are analyzed separately, the results are different (see Table 1).

Table 1
Results of correlations of China and Mexico's Gini with macroeconomic variables

Macroeconomic Variable	Correlation		Model Coefficients		Shapiro-Wilk normality test	
	China	Mexico	China	Mexico	China	Mexico
Intercept			85.7976	-31.6958		
Growth of GDP per capita	0.60096	0.708972	-0.4433*	0.9145*	0.4077	0.3979
Government spending	-0.8528062	0.2739447	-1.7629*	5.9712*	0.4232	0.6428
Unemployment	0.01787058	0.574473	-1.6684*	1.1833*	0.2868	0.3861
R Square			0.8642	0.9222		
Fisher			4.243	7.9		

Source: created by the authors. The estimations were created under GPL (General Public License). The estimations were carried out with the Open Source R Core Team software (2013). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. URL. http://www.R-project.org/ and can be consulted at: https://bit.ly/3Aaw22j

The analysis of the Gini coefficients of China and Mexico[6] was carried out using the differential method of evaluating the impact of differences in differences, which makes it possible to compare both groups of data. One of the advantages of this method is that it eliminates the effects of what happened

[6]In the case of the analysis of the Gini's, the respective correlations were positive; see analysis at: https://bit.ly/3zeruXi

over time to make an intertemporal comparison with respect to exactly what happened to the Gini in the period of analysis.

Table 2 presents the pre and post data for the period, as well as the differentiating factor resulting in 4.6, which expresses a significant decrease in inequality in Mexico but not for China, because if the comparison is avoided and work is done in situ, the differentiating factor for China is 0.9 points between 2010 and 2020, and for Mexico it is 5.5. Finally, it should be noted that the years taken into account, 2010 and 2020, are years with the effects of a crisis as a common denominator: 2010 has the 2009 crisis, and 2020 has the COVID-19 crisis.

Table 2
Differences in differences of the Gini coefficient for China and Mexico, 2010-2020

	Pre	Post
China	48.1	47.0
Mexico	47.2	41.5
	5.5	0.9
Differentiating factor	4.6	

Source: created by the authors with data from the model

Discussion of results

Only some theory-predicted results were obtained from the model formulated to calculate the COVID-19 effect. The relations between the selected variables indicate a direct relation with inequality. However, the relation is not entirely clear, as the theory predicts—without entering into a discussion about the quality of the information or its veracity, given that people surveyed do not always provide objective information or there may be biases influencing their answers.

As a result of this exercise, in the case of Mexico and China, the variables that determine inequality are per capita GDP growth, government spending, and unemployment. The paradox is that the three variables explain the increase or decrease in inequality in opposite directions. In the case of Mexico, they decrease inequality, and in the case of China, they increase it.

Although it was expected, based on theory and stylized facts, that variables such as employment, economic openness, FDI, and, above all, economic growth would reduce inequality, the results do not clearly show that this is the case. The cases of Mexico and China are examples of this, the former with a decrease of -8.23% of GDP that reduced inequality in 2020, while the latter, with a rate of 2.3%, increased it. This situation undoubtedly represents a paradox for conventional economic theory, which postulates that economic growth reduces inequality, which did not happen in the case of China. Nor was a decrease in GDP able to reduce it.

The above result, without a doubt, should open a line of research to evaluate and analyze why in atypical economic years such as 2020 and perhaps 2021, in a context such as the COVID-19 pandemic, the GDP presents this paradox. That is, economic growth increases inequality in the case of China, and in the case of Mexico, economic contraction reduces it, at least in the short term.

If this result is confirmed in more comparative studies, it could be said that: (a) the growth-decrease paradox and the distributional impact of a pandemic such as COVID-19 means that the stylized facts in fact refute the theory; b) that it would be necessary to look for other economic variables that are sufficiently consistent and that can give real support to the theoretical prescription that contributes to effectively reducing income inequality, since contingency has disrupted the theory; and c) that inequality is confirmed as a global phenomenon, which has nothing to do with whether a system is capitalist or mixed but rather affects all nations.

Therefore, the COVID-19 crisis confirms that the distribution of income is dynamic and that it varies over time, depending on the surrounding context and the large number of factors that determine it, such as the variables to be considered, the base year chosen, the methodology, the econometric technique, the concepts of inequality chosen, and the conditions of each nation, as Milanovic suggests (Ferreira, 2021).

As a result, there will be more or less inequality and a greater number of analyses, conjectures, discussions, evaluations of economic and distributive policies, recommendations, and statements on what explains inequality, how it has behaved and, above all, how to reduce it. In this regard, although inequality has tended to reduce in recent decades around the world, this reduction has not been generalized but rather differentiated and differential depending on the specific time and country conditions in question.

Nevertheless, due to the COVID-19 crisis, it is very likely, as established by the World Bank (2021), UNDP (2021), and ECLAC (2021), that income inequality will increase, contrary to what Deaton (2020), Milanovic (2021), Andrew, Conchita, and Lepinteur (2021), and Ferreira (2021) propose. This is due to the fact that since the income of the population is measured by GDP per capita and not by the income of the family or family units, and given that the basis of the income of individuals is the salary paid to the labor factor, and given the growing unemployment rate in the last year and a half, as well as the economic downturn in 2020 and the reduction of GDP per capita, inequality needs to be analyzed from new perspectives and to be understood as a phenomenon with specific characteristics according to each nation or region analyzed.

Conclusions

From the econometric estimations made, although it was expected based on the theory, literature review, and stylized facts that variables such as employment, economic openness, FDI, or economic growth would reduce inequality, the results do not clearly show that this is the case. Mexico and China are examples of this, the former with a decrease of -8.23% of GDP that reduced inequality in 2020, while the latter, with a rate of 2.3%, increased it. This result should undoubtedly open a line of research to evaluate and analyze why the GDP presents this paradox in atypical economic years such as 2020 and 2021, in the context of a crisis such as the COVID-19 pandemic. That is, economic growth increases inequality in the case of China, and in the case of Mexico, economic contraction reduces it, at least in the short term.

Thus, income inequality will remain one of the issues to be resolved both by economic theory and by all countries, once the current pandemic is over. In the short term, the effects are contradictory, since depending on the econometric technique, the macroeconomic variables, the period of analysis, and the information available, some results affirm its reduction or increase, although they do not deny its existence. Notwithstanding this unclear situation, inequality will likely increase worldwide in the medium term, as has happened in past economic crises, regardless of what triggered them.

An exogenous economic crisis, generated by health policy measures and the disruption of productive activities, will have consequences in all countries. Even in 2020, the impact of this crisis was differentiated, and the comparative study of inequality in Mexico and China shows that inequality is high in both cases and that despite its mediocre economic growth, Mexico has other variables that have an impact on its reduction. On the other hand, despite the high economic growth recorded for decades, China still needs to strengthen measures to reduce inequality if it really wants to make progress in this area.

Evidently, both countries have high income inequality. However, while Mexico has made progress despite (or thanks to) neoliberal policies, China has not been able to find a way to return to standards of equity similar to those recorded at the beginning of the period of reform and external economic opening. The third decade of the 21st century will undoubtedly allow both countries to make better decisions if they wish to make progress in the sustained reduction of income inequality.

Finally, the results of the econometric model of differences in differences lead to the conclusion that in general both countries have a lot to do if they really want to reduce inequality, and that the economic theory should be revised, since the empirical evidence contradicts some of its most important premises and recommendations regarding the measures that should be taken to reduce inequality effectively and permanently.

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Annex

	Correl aciòn	mco1 _chi	Mco2 _chi	Mco3 _chi	Mco4 _chi	Mco5 _chi	Mco6 _chi	**Mco7 _chi**	Mco8 _chi	Mco9 _chi	Mco1 0_chi	Mco1 1_chi	Mco1 2_chi	Mco1 3_chi	Mco1 4_chi
Intercepto		43.3247	62.06354	48.1242	41.3832	43.0485	126.47	**30.357**	40.7347	19.4803	27.8494	46.956	85.7976	46.98342	45.1572
#po_cre_chi	0.585727	0.1761	-0.1792	-7.8456	-6.7971									-0.09793	
#crepp_chi	0.601			8.1972	7.1942	0.1853	-1.056	**0.1122**	0.2325	0.707	0.2376	0.1023	-0.4433		
#balcom_chi	0.7433								0.1181			-0.4353		-0.4327	-0.3272
#gasto_chi	-0.85281		-0.87642				-3.562						-1.7629		0.1084
#cuentacor_chi	0.8017									-0.8979		0.6437		0.6402	0.6277
#desempleo	0.017871	1.4812			1.119	1.4995	-4.692	**2.3467**	2.0445	6.6805	3.0104		-1.6684		
#inf_chi	0.7892		0.11554					**0.2908**				0.1922		0.19001	
#asint_chi	-0.58216										-0.244				-0.1275
#edu_chi	-0.72963	-1.0434		0.1525	0.3492	-0.9891	1.457	**1.1142**	-1.0419	-1.4081	0.1166				
RCuadrad		0.7858	0.9245	0.9016	0.9893	0.796	0.8936	**0.9727**	0.7998	0.8534	0.9111	0.9107	0.8642	0.9124	0.8247
F		2.445	8.159	6.109	23.06	2.601	1.457	**8.898**	0.9986	1.455	2.562	2.549	4.243	2.603	1.176

	Correl aciòn	mco1 _mx	Mco2 _mx	Mco3 _mx	Mco4 _mx	**Mco5 _mx**	Mco6 _mx	Mco7 _mx	Mco8 _mx	Mco9 _mx	Mco1 0_mx	Mco1 1_mx	Mco1 2_mx	Mco1 3_mx	Mco1 4_mx
Intercepto		17.81146	-34.6999	17.94	43.459	**18.093**	-41.936	26.9669	65.804	27.2153	2.6803	46.2245	-31.6958	44.2072	463.84293
#po_cre_mx	0.7186	0.27132	1.1806	-3.053	-29.186									1.5795	
#crepp_mx	0.709			3.411	30.541	**0.2823**	1.058	0.5258	5.428	0.3119	0.2652	1.7174	0.9145		
#balcom_mx	-0.4561								17.236			7.0622		6.8086	14.25293
#gasto_mx	0.27395		7.1538				7.268						5.9712		-33.67723
#cuentacor_mx	-0.49601									-2.5696		-2.7007		2.7287	-4.6197
#desempleo	0.5745	0.06513			4.438	**0.1113**	1.492	-3.0285	16.878	5.712	-1.3034		1.1833		
#inf_mx	0.169474		-1.6758					-2.7769				0.7122		0.6635	
#asint_mx	-0.76868										0.561				-4.06175
#edu_mx	0.8757	7.36465		8.541	5.107	**7.3245**	-1.83	12.0759	19.227	-2.6138	13.0822				
RCuadrad		0.9062	0.9821	0.9097	0.9417	**0.9069**	0.922	0.9836	0.9684	0.9935	0.9124	0.9967	0.9222	0.9975	0.9999
F		6.444	36.53	6.719	4.037	**6.494**	2.986	14.97	7.659	37.93	2.602	74.76	7.9	100.4	.

Figure A1. Colecciòn de modelos para el GINI de China y Mèxico
Las estimaciones se llevaron a cabo con el software de Open Source R Core Team (2013). R: Language and Enviroment for Statical Computing R Foundatiòn for Statical Computing, Viena, Austria URL. http//www. R-project.0rg/