Economic Growth Driven by the Mexican Fourth Transformation Policy

Routledge
Taylor & Francis Group

Review of Political Economy

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/crpe20

Economic Growth Driven by the Mexican Fourth Transformation Policy

José María González Lara, Laura Policardo & Edgar J. Sanchez Carrera

To cite this article: José María González Lara, Laura Policardo & Edgar J. Sanchez Carrera (11 Mar 2024): Economic Growth Driven by the Mexican Fourth Transformation Policy, Review of Political Economy, DOI: 10.1080/09538259.2024.2326092

To link to this article: https://doi.org/10.1080/09538259.2024.2326092

Published online: 11 Mar 2024.

REVIEW OF POLITICAL ECONOMY
https://doi.org/10.1080/09538259.2024.2326092

Routledge
Taylor & Francis Group

Economic Growth Driven by the Mexican Fourth Transformation Policy

José María González Lara[a], Laura Policardo [b] and Edgar J. Sanchez Carrera [c,d]

[a]Universidad Autónoma de Coahuila (UAdeC), Saltillo, Mexico; [b]Agenzia delle Dogane e dei Monopoli (Customs and Monopolies Agency), Firenze, Italia; [c]University of Urbino Carlo Bo, Urbino, Italy; [d]Applied Mathematics Research Center CIMA UAdeC, Saltillo, Mexico

ABSTRACT

The economic policy of the fourth transformation (4T) of Mexico - as the actual president Andrés Manuel López Obrador defines his mandate - is characterized by being cautious and responsible for public spending, making investment decisions more effective, and redistributing wealth to sustain domestic consumption. The internal demand has been promoted by increasing poor people's disposable income through subsidies and transfers and several policies aimed at raising minimum wages. As a framework for these direct policies to boost economic growth, the fight against corruption helped achieve these results more effectively. This work aims to analyze whether the 4T policy increased economic growth in Mexico. We applied two econometric techniques to test our hypothesis: interrupted time series analysis, controlling for robustness of the results, and breakpoint regression analysis. In both cases, we robustly showed that the 4T economic policy has positively impacted economic growth in Mexico.

ARTICLE HISTORY
Received 24 October 2023
Accepted 26 February 2024

KEYWORDS
Breakpoint regression; economic growth; mexican public policy; structural change

JEL CODES
C32; E60; E65; O40

1. Introduction

The election of the President Andrés Manuel López Obrador (in the following AMLO) and his settlement in december 2018 after the presence of Peña Nieto (PRI) and, before, Felipe Calderon (PAN) at the Mexican Government has been followed by evocative promises of the new President about a radical course change for Mexico (he claimed that he would have started a 'Fourth transformation'[1]) and zero tolerance against corruption (González Lara and Sánchez Carrera 2019).[2] As part of the Fourth Transformation (4T) of Mexico, López Obrador promised to grow the Mexican economy, reduce violence, build infrastructures, and expand social programs to reduce poverty and inequality (Regidor and Iber 2018; Speck 2019).

CONTACT Edgar J. Sanchez Carrera edgar.sanchezcarrera@uniurb.it University of Urbino Carlo Bo, via Aurelio Saffi 42, 61029 Urbino (PU), Italy

[1]The first three transformations AMLO refers to are the Mexican War of Independence (1810–21), the Reform War (1858–61) and the Mexican Revolution (1910–17)

[2]Although from the political perspective Mexico with more than three decades of a free-market managerial Mexican State regime, in 2018 the government of the MORENA political party and its Allies faced the country fully damaged by corruption, and economic and social inequalities that affected economic growth and the well-being of Mexicans. Such issues influenced the electoral and political positioning in december 2018 of the candidate Andres Manuel Lopez Obrador (AMLO), now President of the Mexican Republic, who packaged his administration as the Fourth Transformation (4T) of Mexico

The 4T became AMLO's bombastic claim to historical significance, following the landmark events of Mexican independence in the early nineteenth century, liberal reform in the 1850s and 60s, and the national revolution in the early twentieth century. The Fourth Transformation called for by the current federal government would consist of building participatory democracy, eradicating corruption, optimizing public spending, boosting aggregate demand for growth, and repositioning the country in international relations, valid governance, and perspective points. Strictly speaking, it is not a revolutionary transformation but rather repositioning the popular classes with increasing levels of well-being. That is, social programs are acceptable palliatives but not a structural solution to the problem of poverty and the unequal distribution of wealth (Coughlin 2023; Weizenmann 2018).

After decades of endemic corruption, low and unequal economic growth and a spiraling security situation, AMLO succeeded in gathering twice as many votes as his first opponent at the poll and represented - for most citizens - a welcome opportunity to address Mexico's serious shortcomings. After four years of AMLO's mandate, his popularity among Mexicans is still astonishing despite the international public opinion seeming more cautious in defining AMLO's policy as suitable for a significant turn in the Mexican economy and welfare (Oxford-Analytica 2020; Sánchez-Talanquer and Greene 2021).[3] Foreign public opinion see AMLO's Four Transformation astonishingly similar to the old regime he promised to replace, despite a handful of policy reforms.[4]

During his mandate, AMLO stood out from his predecessors in his austerity in government spending. Since the start of the pandemic, Mexico's deficit rose to only 2.3 percentage of GDP from 1.8 percentage in 2020, while the median of similar countries climbed to 5.8 percent (Vizcaino and Wilson 2022). This was favorable for Mexico because it remained one of the few developing countries with access to the international bond market when investors were wary of investing in countries with deteriorating finances. In the first eight months of 2022, Mexico sold a record $9.47 billion in bonds overseas, doubling the median of the past 10 years.

AMLO is also a nationalist.[5] However, AMLO never wanted to reverse NAFTA agreements. However, it is widely accepted that FDI in the north of the country operating through maquila does not improve productivity. The NAFTA agreement, which, if from one side it increased the manufacturing sector in Mexico, on the other side it immiserated 1.3 million small farmers throughout the whole nation, which could not compete with the U.S. subsidized corn,[6] beans, and dairy products. Furthermore, if the NAFTA agreement eviscerated Mexican agriculture, and economic liberalization would have savaged the nation's broader apparatus and energy sovereignty. Under president Peña Nieto (2012–18), Mexican neoliberals made the energy sector privatized, and starting from December 2013, Mexico's state oil and electric companies were subject to

[3]See: https://www.as-coa.org/articles/approval-tracker-mexicos-president-amlo

[4]See the article appeared on American Affairs Journal on November 20th, available at https://americanaffairsjournal.org/2022/11/amlo-and-mexicos-fourth-transformation/

[5]With the entry of the AMLO government, the common sentiment in the foreign public opinion is that, after all, AMLO was a populist who gains his success among his citizens primarily by discrediting his opponents, the media and closely allied PRI and PAN, as well as smaller center-left parties.See: https://www.opendemocracy.net/en/democraciaabierta/plebeian-populism-lopez-obrador/, https://www.e-ir.info/2020/09/07/amlo-populist-or-man-of-the-people/, https://americanaffairsjournal.org/2022/11/amlo-and-mexicos-fourth-transformation/

[6]By 2004, U.S. corn export to Mexico quadrupled, while Mexican corn price fell by 66 percentage

competition from private (mainly foreign) competitors for the first time in 75 years. This policy was made with the expectation to increase oil production of 75 percentage, but it reached a different result: private and public production of oil declined of about 43 percentage in 2019 concerning to 2013 (Alves-Passoni and Neria 2023; Gutierrez, Vargas, and Vite 2021; Levy-Orlik 2022).

Since assuming office in 2018, one of AMLO's priorities has been to save the two leading national firms of the sector, namely, Pemex and CFE, from the harsh foreign competition. First of all, one of his first initiatives was to break the vicious circle of thefts from Pemex's pipelines, a well-estabilished racket for organized crime. Secondly, his government has allotted preferential contracts to national firms while targeting foreign firms with bureaucratic red tape. This, of course, raised a lot of controversies both in international public opinion and among the Mexican environmentalist left-wing parties. In a sector where the development of renewables primarily involves foreign firms, preferring the national extractive firms goes against any trade commitment and violates climate goals (Silva Gutierrez, Paz, and Moreno Vite 2021). Moreover, foreign investors have howled that gas and oil prices will rise if Pemex and CFE prevail in the Mexican market, but the facts suggest a different thing. AMLO's policies have kept gas prices astonishingly low. In June-July 2022, for example, the mean gas price per gallon in Mexico was $3, while the same price in California was $6 (Averbuch 2022).

Thus, the fourth economic transformation of Mexico proposes as a driving force the efficiency of public spending with reorientation to social programs and productive infrastructure, strengthening aggregate demand through increasing household disposable income. It is important to note that the economic policies undertaken be AMLO's government do not fit with the definition of populist policies.[7] This is further demonstrated by the fact that his policies have been criticized from the neo-Keynesian perspective for maintaining a zero budget deficit because it does not promote the multiplier effect of spending (Albertini et al. 2021; Gonzalez 2002). This paper contributes to the literature on economic growth through several lines. Firstly, it reexamines the role of precautionary public expenditure-investment, that is, the one that is not wasted in current spending and is effectively measured as investment on economic development (Bose, Haque, and Osborn 2007; Devarajan, Swaroop, and fu Zou 1996; Iniguez-Montiel 2010; Larre and Bonturi 2001; Sánchez-Juárez and García-Almada 2016).

Secondly, it aims to test the impact of AMLO's effect (the 4T economic policy) on Mexican economic growth. We want to keep a distant and aseptic approach that is not motivated by any interests and uses scientific methods of analysis and accurate data of the (almost) 5 years of AMLO's mandate. We intend to measure how well AMLO's policies performed for economic growth in Mexico. In Mexico's modern history, governments never deviated from the archetype of a liberal economy. Still, economic results have proven unsuccessful, leaving Mexico stuck in the middle-income trap. Endemic corruption is often pointed out as the main reason for economic stagnation.

[7]A fairly agreed definition of populism is those of Encycolpedia Britannica, which sees populist parties claim to promote the interest of common citizens against the elites; they pander to people's fear and enthusiasm; and they promote policies without regard to the long-term consequences for the country. It is precisely the last condition that is not found in AMLO's policy, since he implemented more austere policies for public spending than similar countries (Vizcaino and Wilson 2022).

Still, certainly, other awesome (and very corrupt) examples of developing countries like China show off much better economic performances.

Our task is complex. First, because the period analyzed is small, data may be missing or inaccurate. Second, it might be challenging to separate the effect of every single policy implemented from the impact that AMLO (which we remind has still a huge consensus among Mexicans) might have induced on the citizens' confidence and, therefore, on global internal demand, as the theory of self-fulfilling prophecies may suggest. We will try to do that using different econometric approaches: i) Interrupted time series (with a section devoted to the robustness of results concerning to the inclusion of different covariates, thus hoping to be able to find essential insights on AMLO's approach to economic growth) and ii) Ordinary least squares with breakpoints, i.e. ,structural change regimes. To achieve our goal, the rest of the paper is organized as follows: Section 2 develops the interrupted time series approximation, thus showing the positive trend of economic growth during the 4T policy, while Section 3 develops the least squares estimation with breaking point and showing that the structural change regime of the 4T policy drives the Mexican economic growth.

2. Interrupted Time Series Approach

As previously anticipated, we hypothesize that AMLO and his predecessors have two different economic growth targets for the country, with Obrador's one higher than his predecessors'. To catch AMLO's effect on economic growth, therefore, a suitable approach could be Interrupted time series (ITS). ITS is a powerful quasi-experimental approach for evaluating the effects of interventions or naturally occurring events (Campbell and Stanley 1963; Cook and Campbell 1979; Farrington 2003). Borrowed from psycology, segmented regression analysis of ITS data allows us to assess, in statistical terms, how much an intervention changed an outcome of interest, immediately and over time, instantly or with delay, and whether factors other than the intervention could explain the change. In this vein, therefore, we will test this hypothesis via successive regressions, so as to verify:

- Whether AMLO per se generates higher rates of economic growth in Mexico (possibly by inducing higher expectations for the future in the population or by implementing non-measurable policies)
- Whether the potential increase in economic growth depends on a particular (measurable) policy implemented and which one.

Where necessary, we will control for endogeneity problems via instrumentation of the endogenous covariates and discuss the results. In all the regressions performed, we deal for heteroscedasticity using the Huber-White sandwich methodology (Huber 1967; Kauermann and Carroll 2001; Long and Ervin 2000; White 1980, 1982).

Our main task is to check whether a positive trend is associated with AMLO in economic growth. By introducing some macro variables that affect growth, check whether this trend for AMLO to keep being positive and significant. When this trend stops being significant (through the progressive introduction of new covariates), we can

claim that the variable just introduced is responsible for the effect on growth, and NO more AMLO per se (that is, personality or his non-measurable policies).

The reason for the subsequent inclusion of covariates (keeping of course, the two trends in the regression, one for the period before AMLO and one for the period after AMLO), is to verify whether controlling for different economic policies that might be undertaken under the two different regimes, the trends for AMLO keep remaining positive and significant. Indeed, a priori, the inclusion of a given covariate in a regression measures the effect of a marginal increase of that variable in the dependent variable, keeping all the other $N-1$ covariates constant. A priori, there is no reason to believe that a given policy should have a different impact on growth before and after our 'treatment', that is, AMLO. If the trend for AMLO, after the inclusion of all these covariates, remains significant; it's his 'personality' or his non-measurable policies that are caught by the trend that affects growth the most.

As a final regression, we should include consumer's confidence (prior to checking the exact meaning and way of computation) to see if just the confidence that induces in his citizens drives growth. To carry the analysis, we use data from Banco de Mexico[8] from January 2008 to January 2023 and the following monthly aggregates:

- Global Indicator of Economic Activity (GIEA).[9] We used the seasonally adjusted series with base 2013 (2013=100). Since we did not find monthly data for GDP, we used this variable since it is its best predictor. This variable constitutes, of course, our dependent variable and was used in the analysis in first difference since Dickey Fuller test performed on this variable showed integration of order 1.[10]
- Incidence of death for COVID-19 (original name of the series 'new_deaths_smoothed') and incidence of cases of COVID-19 (original name of the series 'new_cases_smoothed'), from Our World in Data.[11] These two variables have been included in the regression both in levels, in its quadratic term, and in their product to catch their joint effect. The reasons for the inclusion of the quadratic terms are that evidence shows that the effect of the number of deaths for Covid-19 has an higher impact on growth during the first year of the pandemic. Still, later it shows a rebound, especially for developing and underdeveloped countries (Gagnon, Kamin, and Kearns 2023). The inclusion of the joint effect of deaths and cases was introduced to exploit the maximum explanatory power of the effect of the pandemic on economic growth.
- Stringency Index of anti-Covid-19 non-pharmaceutical measures. From the Our World in Data's Website.

These three variables were used as a prototype of regression, together with the two trends, namely, trend before AMLO, going from 1 in January 2008 to 131 in November 2018 and 0 otherwise, and a trend after AMLO, going from 1 in December 2018 to 52 in March 2023. We decided to include in the first regression the three variables, namely, deaths for Covid-19, cases of covid, and stringency index, for disregarding the effect of the

[8]Data were downloaded during April/May, 2023 at https://www.banxico.org.mx/SieInternet/
[9]The original name of the series which can be downloaded from the Mexican's Central Bank is SR16735.
[10]We performed the Dickey Fuller test on this variable without drift and with one lag and we get that the p-value associated to the null of random walk is 0.5768.
[11]Data available at https://ourworldindata.org/coronavirus, downloaded on May 2nd, 2023.

pandemic on growth since COVID-19 was the pandemic with the most serious global economic consequences since 1600's. Since it is mainly an exogenous shock, we deemed it right to control for that to see that, once the effect from the pandemic, AMLO and his predecessors may have different impacts on growth. Despite the availability of data before the year 2008, we decided to carry on the analysis since January 1st, 2008, because taking a longer period before the election of AMLO could involve longer macroeconomic and potentially external factors that may play as a confounder of the effects of national policies.

For the first 'prototype' regression, additional variables were included one by one. We used the following procedure of analysis:

(1) We chose one variable and include it in the model. Since economic problems often, if not always, involve endogeneity issues (in our specific analysis, we might suspect potential simultaneity), when appropriate, we estimate a two-step IV regression where at the first step, we regressed the actual value of the endogenous variable over its value one year before (used as an instrument), and all the other covariates, predicting its fitted value. At the second-step, we regress variations in GIEA over the incidence of deaths for COVID and its squared term, the level of the stringency index of anti-covid measures, other relevant variables (only after the first iteration of this algorithm) and the predicted level of the potentially endogenous variable estimated at the first step.
(2) Suppose this new added variable turns out to be non-significant. In that case, we split the new added variable into two variables: the first, with suffix _b, meaning that this variable is equal to the original variable when the trend before AMLO is different from zero, and zero otherwise, and the second, with suffix _a, meaning that this variable is equal to the original variable when the trend after AMLO is different from zero, and zero otherwise. This test aims to see whether these two variables, once included in the regression in place of the original one, are still significant and check if they have a different impact on the variation of GIEA. If both the originally added variable and both the corresponding split variables turn out to be non-significant, they are dropped from the model. If, instead, at least one of the two split variables is significant, they are kept in the model. The algorithm goes to point 4.
(3) If instead, the variable included at point 1 is statistically significant, we split the newly added variable into two variables as in the previous point: the first, with suffix _b, meaning that this variable is equal to the original variable when the trend before AMLO is different from zero, and zero otherwise, and the second, with suffix _a, meaning that this variable is equal to the original variable when the trend after AMLO is different from zero, and zero otherwise. As in point 2, This test has the aim to see whether these two variables, once included in the regression in place of the original one, are still significant and check if they have a different impact on the variation of GIEA. If the splitted variables have the same statistical impact on growth, we keep the original variable in the model. Otherwise we keep the two splitted variables. The algorithm goes to point 5.
(4) The recursive inclusion of new variables may have the effect of making variables included previously non-significant. If the inclusion of one variable makes another

variable(s) included previously non-significant, the non-significant variable is removed from the model. The algorithm then goes to point 5.

(5) Start again the algorithm from point 1.

The algorithm is repeated several times and ends when both linear trends (before and after AMLO) become statistically non-significant or when the available covariates determining growth end. Among the variables that we consider relevant for determining economic growth and for which we have availability of monthly data, we find (in order of inclusion) Real Exchange Rate (computed as weighted averages of bilateral exchange rates for 111 countries adjusted by relative consumer prices. An increase of this indicator implies a depreciation of the national currency), Investments, Technology (as proxied by average labor productivity per person employed with base year 2013), Real Public Debt, Inflation, Interest Rate and Consumers' Confidence. The source of our data is the Mexican Economic Information System.[12] We proxy technology with average labor productivity computed for employed persons with base year 2013.

2.1. ITS Results

The Baseline Model. As previously anticipated, our baseline model consists of a simple OLS regression that accounts for potential heteroscedasticity of residuals where, as the dependent variable, we have GIEA in the first difference. This variable, therefore, represents the monthly variations in the composite index of economic activity. As covariates, we included the two trends (before and after AMLO) and three other variables, that is, the incidence of deaths for Covid-19 (including its squared value), the incidence of cases of Covid-19 (and its squared value), the interaction effect of deaths and cases, and the stringency index of anti-Covid non-medical measures. We included these variables since the Covid-19 virus generated the pandemic with the most severe global economic consequences since the 1600s, and affected only AMLO's term in office, but not previous ones. Results of this first regression are shown in Table 1.

As it is possible to observe from Table 1, there is a positive trend associated with AMLO's mandate which is positive and significant for determining the growth of the composite index of economic activity. The corresponding trend before AMLO's mandate does not show any effect on the growth of GIEA. Then, suggesting that every additional month in AMLO's mandate has a positive and statistically significant effect (with a coefficient of 0.042 and a p-value of 0.001) on the growth of the composite index of economic activity. This exciting fact needs to be deepened appropriately. We start following the algorithm and, as the first variable, we analyze the effect of the real exchange rate on growth.

Real Exchange Rate. The Real Exchange Rate is a variable that, traditionally, has been found relevant for economic growth, in particular for underdeveloped and developing countries which often use opportunistic devaluations of their currency as a tool to

[12]All the data are available at https://www.banxico.org.mx/SieInternet/ The data series downloaded were: SR28 for the real exchange rate, SL11349 for Average Productivity, SG193 for nominal public debt (the public debt was deflated using the series SP1, that is, price level or inflation), SR16525 for the investments' index, SF40823 for short-term interest rate and SR16058 for consumers' confidence.

Table 1. Baseline model.

	(1) D.GIEA
Deaths for Covid-19	0.000974**
	(2.51)
Deaths for Covid-19 Squared	−8.56e−09
	(−1.36)
Cases of Covid-19	0.00000218
	(0.65)
Cases of Covid-19 Squared	3.35e−12
	(0.98)
Deaths for Covid-19 × Cases of Covid-19	−1.07e−09**
	(−2.43)
Stringency Index of anti-Covid measures	−0.160**
	(−2.11)
Trend before AMLO	0.00323*
	(1.88)
Trend after AMLO	0.0488*
	(1.73)
Constant	−0.0885
	(−0.66)
Observations	180

t statistics in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$

improve exports and sustain internal demand (for a review and an excellent contribution to the debate, see Dornbusch, Goldfajn, and Valdés 1995; Kamin and Rogers 2000). According to the economic literature, Mexico often used this tool since 1994 to boost its internal demand. Even though recently, the effects of a devaluation of the exchange rates on growth have been found contradicting with respect to their expected effects (Bahmani-Oskooee and Miteza 2006; Kamin and Rogers 2000), this variable is considered relevant in our study and was included in the analysis. The indicator for the real exchange rate was included in the first differences (monthly differences), and, since it is computed as a bilateral weighted average of exhange rates controlled for the price levels for 111 countries, it was considered an exogenous variable, and, therefore, it was not instrumented. As the recent literature suggests, the inclusion of such variable in the model proved to be negatively and significantly correlated with economic growth. Since an increase of this indicator means a depreciation of the national currency, our results go in the opposite direction of what the traditional literature on the topic predicts, and in our sample analyzed, a depreciation implies a contraction of economic growth, in line with what Kamin and Rogers (2000) claim. To see if this variable has a different impact on growth before and after AMLO's mandate, we split this variable into two sub-variables, namely, exchange rate before and after AMLO, whose values are equal to the original value of the variable when time is subsequent to December 2018 (included) and zero otherwise (for the segmented series representing the period after AMLO), and equal to the original variable when time is antecedent to December 2018 and zero otherwise (for the segmented series representing the period before AMLO). The inclusion of these two segmented series in first differences in place of the original one produced two statistically identical coefficients (their confidence intervals indeed overlap), having basically the same sign and magnitude. Given this result, we kept the original variable in the model instead of the two segmented variables.

Investments. The second variable that is relevant for growth and which we decided to include is the level of investments. Differently from the previous indicator, this variable is suspected to be simultaneous with GIEA and, therefore, is instrumented, using as an instrument for the actual value of investments, the same value taken one year earlier. The first step regression has therefore, the actual level of investments as the dependent variable, and the level of investments 12 months before, the two trends for the period before and after AMLO, the number of deaths and cases for Covid-19 (including their square terms and their joint effect), the stringency index of the containment policies for Covid-19, and the series for the variations of the exchange rate. After this regression, we predicted the fitted value of investments (in the first differences), and we plugged it into the regression for Δ GIEA. The second-step of the IV regression has therefore the following covariates: all the covariates of the baseline model (see Table 1), the series for Δ Exchange rate, and Δ Investments as predicted in Step 1.

As expected, the variation in investments is significant for growth. Its coefficient is .224, and its p-value is 0.001 despite the control for potential heteroscedasticity. This means that a one-point variation in the investment index generates a 0.224 increase in Δ GIEA. Interestingly, the coefficients attached to the two linear trends, before and after AMLO, lose their significance, along with a series of Δ Exchange rates. This suggests that the primary determinant of growth is investment, and the exchange rate per se did not play a revelant role in growth during the analized period. We then split the investment series into two sub-variables, namely, investments after AMLO, whose value is equal to the original value of the variable when time is subsequent to December 2018 (included) and zero otherwise, and another variable, namely, investments before AMLO, whose value is the same as the original value, with the characteristic that since december 2018 this variable is coded 0.

The inclusion of these two segmented variables (in first differences) shows again that (see Table 2), while the level of investments before AMLO has a negative coefficient and is pretty tiny (despite its p-value being smaller than 0.05), the same variable after AMLO has a positive and relevant impact on growth, the coefficient being equal to .272 and p-value smaller than 0.01. The two linear trends, as before, remain non-significant, as do the series representing the exchange rate variation.

Remark 2.1 This analysis suggests an interesting fact: while important factors like investments do not seem to significantly affect economic growth, or even show negative effects before AMLO's mandate, they play an important positive effect on growth later. Then, it may suggest that AMLO implemented some non-measurable policies (such as the fighting for corruption, reducing the wastefulness of resources, and so on) such that one million pesos spent on investments was more effective for increasing growth than was before.

At this point, the algorithm terminates because the two linear trends indicating the period before and after AMLO became non-significant. One important point to deepen at this stage of the study, is to see whether our results are robust with respect to the inclusion of additional variables. The next section will be devoted to this analysis.

Table 2. Two-step regression results.

	(1) D.GIEA	(2) D.GIEA	(3) D.GIEA	(4) D.GIEA
Trend before AMLO	0.00322*	0.00274	0.000303	0.00111
	(1.73)	(1.46)	(0.15)	(0.58)
Trend after AMLO	0.0443*	0.0428*	0.0276	0.0273
	(1.76)	(1.72)	(1.31)	(1.30)
Deaths for Covid-19	0.000913***	0.000905***	0.000713***	0.000675***
	(2.66)	(2.66)	(3.13)	(3.22)
Deaths for Covid-19 × Deaths for Covid-19	−7.70e−09	−7.59e−09	−2.10e−09	−9.57e−10
	(−1.37)	(−1.36)	(−0.56)	(−0.26)
New cases of Covid-19	0.00000233	0.00000239	0.000000950	0.000000487
	(0.77)	(0.80)	(0.38)	(0.19)
New cases of Covid-19 × New cases of Covid-19	2.98e−12	2.90e−12	4.98e−12*	5.54e−12*
	(0.94)	(0.92)	(1.73)	(1.87)
Deaths for Covid-19 × New cases of Covid-19	−1.03e−09**	−1.03e−09**	−1.18e−09***	−1.21e−09***
	(−2.51)	(−2.51)	(−3.39)	(−3.55)
Stringency Index of anti-Covid measures	−0.151**	−0.150**	−0.116**	−0.108**
	(−2.22)	(−2.22)	(−2.47)	(−2.46)
D.Real Exchange rate	−0.120*		−0.0847	−0.0718
	(−1.78)		(−1.46)	(−1.30)
D.Real Exchange rate before AMLO		−0.115*		
		(−1.73)		
D.Real Exchange rate after AMLO		−0.134*		
		(−1.87)		
D.Investments index			0.224***	
			(2.72)	
D.Investments before AMLO				−0.0309**
				(−2.12)
D.Investments after AMLO				0.272***
				(2.75)
Constant	−0.0736	−0.0318	0.150	0.0741
	(−0.52)	(−0.22)	(0.95)	(0.49)
Observations	180	180	168	168

t statistics in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$

2.2. Robustness Analysis

This section aims to test whether the previous results are robust regarding the inclusion of additional (and potentially relevant for growth) covariates. We included several other covariates to the model as result of the analysis of investments (and after removing the series for the exchange rate, since it turned out to be non-significant in the model): these covariates are consumers' confidence, real public debt, and inflation. All the series have been included both as a single series and as a truncated series. We are aware that there could be other potentially relevant variables to be included, but since we are using monthly data, we are forced to rely on the data available to Mexico's Central Bank with monthly observations. Therefore, the inclusion of these variables is important to check if the results obtained in the previous section are robust and keep their sign and significancy after the inclusion of new covariates. In doing so, we decided to remove the series for the variation of the exchange rate from the model since it proved to be non-significant after the inclusion of the variation(s) of investments. All the results discussed below are provided in Table 3

Technology, as proxied by productivity, was added to the model in first differences after being instrumented with its value one year earlier. The first step regression from which we computed the fitted values of productivity that were included in the

Table 3. Robustness analysis.

	(1) D.GIEA	(2) D.GIEA	(3) D.GIEA	(4) D.GIEA	(5) D.GIEA	(6) D.GIEA	(7) D.GIEA	(8) D.GIEA
Trend before AMLO	0.000685	0.000326	0.000240	0.000418	−0.000600	−0.000779	−0.000524	−0.000579
	(0.34)	(0.16)	(0.11)	(0.19)	(−0.29)	(−0.38)	(−0.26)	(−0.28)
Trend after AMLO	0.0249	0.0199	0.0190	0.0190	0.0159	0.0159	0.0205	0.0215
	(1.20)	(0.98)	(0.90)	(0.91)	(0.77)	(0.77)	(1.00)	(1.03)
Deaths for Covid-19	0.000667***	0.000631***	0.000625***	0.000615***	0.000608***	0.000555***	0.000564***	0.000568***
	(3.22)	(3.21)	(3.15)	(3.18)	(3.13)	(3.09)	(3.18)	(3.17)
Deaths for Covid-19 × Deaths for Covid-19	−1.35e−10	1.77e−09	2.07e−09	1.98e−09	2.49e−09	4.41e−09	4.66e−09	4.50e−09
	(−0.04)	(0.48)	(0.56)	(0.54)	(0.68)	(1.24)	(1.35)	(1.27)
New cases of Covid-19	0.00000120	0.00000182	0.00000194	0.00000142	0.00000188	5.39e−09	9.02e−08	0.000000264
	(0.43)	(0.60)	(0.62)	(0.41)	(0.60)	(0.00)	(0.02)	(0.07)
New cases of Covid-19 × New cases of Covid-19	5.31e−12*	5.43e−12*	5.42e−12*	5.73e−12*	5.48e−12**	7.10e−12**	7.54e−12**	7.50e−12**
	(1.84)	(1.96)	(1.95)	(1.93)	(1.98)	(2.22)	(2.31)	(2.27)
Deaths for Covid-19 × New cases of Covid-19	−1.28e−09***	−1.39e−09***	−1.41e−09***	−1.38e−09***	−1.41e−09***	−1.39e−09***	−1.46e−09***	−1.47e−09***
	(−3.85)	(−3.98)	(−4.01)	(−4.11)	(−4.06)	(−4.19)	(−4.46)	(−4.41)
Stringency Index of anti-Covid measures	−0.107**	−0.102**	−0.101**	−0.0988**	−0.0991**	−0.0904**	−0.0920**	−0.0921**
	(−2.51)	(−2.54)	(−2.53)	(−2.51)	(−2.51)	(−2.38)	(−2.43)	(−2.42)
D.Real Exchange rate	−0.0801	−0.0698	−0.0690	−0.0630	−0.0797	−0.0446	−0.0667	−0.0678
	(−1.41)	(−1.26)	(−1.23)	(−1.14)	(−1.34)	(−0.77)	(−1.11)	(−1.16)
D.Investments before AMLO	−0.0295**	−0.327*	−0.340*	−0.500**	−0.330*	−0.359**	−0.377**	−0.399**
	(−1.99)	(−1.94)	(−1.84)	(−2.45)	(−1.80)	(−2.02)	(−2.30)	(−2.26)
D.Investments after AMLO	0.335***	0.454***	0.446***	0.484***	0.451***	0.468***	0.477***	0.489***
	(3.35)	(2.67)	(2.67)	(2.83)	(2.75)	(2.94)	(3.24)	(3.23)
D.Productivity	−0.0921							
	(−0.88)							
D.Productivity before AMLO		0.330*	0.350*	0.375*	0.339	0.170	0.194	0.164
		(1.81)	(1.67)	(1.85)	(1.63)	(0.77)	(0.94)	(0.80)
D.Productivity after AMLO		−0.209	−0.207	−0.199	−0.213	−0.206	−0.222	−0.217
		(−1.18)	(−1.17)	(−1.11)	(−1.22)	(−1.17)	(−1.39)	(−1.33)
D.Consumers' confidence			0.0535		0.0333	−0.104	−0.103	−0.0871
			(0.27)		(0.17)	(−0.50)	(−0.50)	(−0.40)
D.Consumers' confidence before AMLO				0.311				
				(1.51)				
D.Consumers' confidence after AMLO				−0.0698				
				(−0.29)				
D.Public debt					−0.0251			

(*Continued*)

Table 3. Continued.

	(1) D.GIEA	(2) D.GIEA	(3) D.GIEA	(4) D.GIEA	(5) D.GIEA	(6) D.GIEA	(7) D.GIEA	(8) D.GIEA
					(−0.60)			
D.Public debt before AMLO						0.0145	−0.00576	−0.0185
						(0.37)	(−0.15)	(−0.50)
D.Public debt after AMLO						−0.197*	−0.209*	−0.171
						(−1.83)	(−1.95)	(−1.11)
D.Inflation							−0.387	
							(−1.47)	
D.Inflation before AMLO								−0.363
								(−1.43)
D.Inflation after AMLO								−0.461
								(−1.29)
Constant	0.104	0.161	0.173	0.180	0.261	0.258	0.364*	0.369*
	(0.63)	(0.96)	(0.98)	(1.04)	(1.56)	(1.52)	(1.83)	(1.83)
Observations	167	167	166	166	165	165	164	164

t statistics in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$

second-step (those who see Δ GIEA as the dependent variable) has the actual value of productivity (in levels) as the dependent variable, the value of productivity 12 months earlier (in levels), the real exchange rate in first differences, the two truncated series of Δ investments (before and after AMLO) and all the variables included in the baseline model, that is, the two trends before and after AMLO, and the Covid-related variables with eventual square values and joint effects. The addition of productivity in the first differences in the model, as result of regression 4 in Table 2, appears not significant (see regression 1 in Table 3). We then followed the algorithm and we split the series of productivity into two sub-series, namely, productivity after AMLO, whose value is equal to the original value of the variable when time is subsequent to December 2018 (included) and zero otherwise, and productivity before AMLO, whose value is the same as the original value, with the characteristic that since December 2018 this variable is coded 0. These two sub-series were included in the model in first differences in place of the original series. It is worth noting that the two series have a different impact on growth. While productivity has a positive and significant impact on growth during the periods before AMLO, after AMLO this variable does not have a relevant role. Investment is the main responsible for growth after december 2018, while technological progress was the responsible for growth before. Due to the different effects on growth of the variations of technology before and after AMLO, we decided to keep in the model the two truncated series (instead of the whole original series) and add the next variable, that is, consumers' confidence.

Consumers' confidence index is added to the model after being instrumented with its value one year earlier. The first step regression from which we computed the fitted value of consumers' confidence that is included in the second-step (those who see Δ GIEA as the dependent variable) has the actual values of consumer's confidence as the dependent variable, the value of consumers' confidence 12 months earlier, the real exchange rate in first differences, the two truncated series of Δ investments (before and after AMLO), the two truncated series for Δ productivity, and all the variables included in the baseline model, that is, the two trends before and after AMLO, and the Covid-related variables with eventual square values and joint effects.

The IV second-step regression, as usual, included the monthly variations of GIEA as a dependent variable, the two linear trends, all the covid related variables, with square values and joint effects as in the baseline model, the two interrupted series (before and after AMLO), the variation of the real exchange rate, the two sub-series of fitted values of investments and productivity in first differences, and finally the first difference of the predicted values of consumers' confidence obtained at the first step. Variations in consumers' confidence in this model do not appear to be relevant for growth. As the algorithm predicts, we generated (the generation mechanism is the same applied for the other series) the two sub-series of consumers' confidence (in levels) before and after AMLO, and we plugged into the model in first differences in place of the whole series. As expected, we do not observe a differentiated impact on consumers' confidence before and after AMLO since the coefficients attached to these two sub-series are insignificant. After the inclusion of these two series of consumers' confidence in the model, the two interrupted series for the variation of investments remain significant, with the series before AMLO negative and the series after AMLO positive, and, in absolute value, of similar magnitude. The coefficient of Δ investments before AMLO equals -0.5, while

those after AMLO equal 0.484. We do not have a reasonable explanation for this opposite effect observed for investments on growth in the two periods. One possible conclusion that can be drawn from this result is that one major determinant of growth in the period before AMLO was due to the technological progress, as if only the investments diverted at improving technology were really responsible for growth. Subsequently, the main driver of growth was investment (being technological progress less relevant) as if all the money spent for this purpose accounted for economic development. This effect may suggest that AMLO made investments more effective, possibly reducing waste and corruption, which implied inefficacy of investments.

Public Debt is another relevant variable for economic growth for which we have availability of monthly data from the Mexican Central Bank. We included this variable in real terms, by dividing the nominal amount by the price level (again, available from the same source of data). As we did for the other covariates, we instrumented the actual level of real public debt with the same level one year before by regressing real public debt over 12 lags of real public debts, the two real trends before and after AMLO, deaths and cases for covid, their square terms and joint effects, the stringency index of covid containment policies, the variation of the real exchange rate, the two interrupted series of the variations of investments and productivity and the series for the variation of consumers' confidence. We predicted the value for real public debt, and we included this series in the regression for Δ GIEA. The whole regression for economic growth had then among the regressors: the two actual trends before and after AMLO, all the covid-related variables as in the baseline model, the variation of real exchange rate, the two interrupted series of the variation of investments and productivity, the variation of consumers' confidence, and the variation of the fitted values of real public debt as it was obtained at the first step. As it is possible to observe, the variation in real public debt does significantly affect economic growth, and the sign and significance of the other covariates remain qualitatively unchanged. At this point, we proceed with splitting the series for public debt into two subseries, one representing the variable before AMLO and zero after, and the other representing the variable after AMLO and zero before. Includding these two interrupted series into the regression model in place of the whole variable shows that public debt affects the level of economic activity only during AMLO's mandate, and its effect is - as expected from the economic literature - negative. The two series do show a different impact on growth (the series representing public debt before AMLO is not significant, but the series representing public debt after AMLO has a negative and significant coefficient). All the other covariates keep their sign and significance, with the exception of the series representing the variations of productivity before AMLO, which becomes non-significant.

Inflation. The last variable that we decided to include in the model to check the robustness of the qualitative results obtained in the previous section is inflation, as represented by the price level in the Mexican Central Bank database. As previously, we first instrumented this variable with its level one year earlier (that is, 12 lags earlier), all the variables included in the baseline model, the variations of the real exchange rate, the two interrupted series of the variation of investments and productivity, the series for the variation of consumers' confidence and the two interrupted series representing the variations of public debt. We then predicted the fitted values of inflation, which we included in the second-step regression model.

The second-step has as a dependent variable the variation of GIEA, and, as covariates, the two actual trends before and after AMLO, all the Covid-related variables with square values and joint effects when applicable, the series representing the variations of the real exchange rate, the two interrupted series of the variation of the fitted values of investments, productivity, public debt, the series of the fitted values of consumers' confidence, and the variation of the price level. Including the variation of inflation in the regression model does not appear to be significant and does not change the sign and significance of the other explanatory variables. The variables linked to the pandemic emergency keep their sign and significance level, and so the two interrupted series for investments. Investments after AMLO have a significant positive effect on growth, while the series of investments before AMLO has a negative (and significant) impact. The variation in technological change, as proxied by productivity, after the inclusion of all these covariates loses its significance, and therefore, his effect cannot be considered robust. Consumers' confidence, as before, does not appear to play a relevant role in the variation in economic activity. Following the algorithm, we then splitted the series for inflation into two subseries, one representing inflation before AMLO (and zero after) and the other representing inflation after AMLO (and zero before). We then made the same regression including the two interrupted series instead of one single series for inflation, but without any relevant different result.

Remark 2.2 In particular, one lesson that we can learn from this analysis is that after AMLO was elected, the mexican economy is responding to macroeconomic factors in a way that was expected by the literature. In particular, the Mexican economy's growth is lead from investments, while an increase in public debt has a detrimental effect (despite not robust after the inclusion of the price levels).

As anticipated in the introduction, we now complement the previous econometric exercise with another model of analysis, that is, least squares with breakpoints, in order to measure the impact of the public sector's economic policy on the level of economic activity before and after AMLO, and to check whether our previuos results are compatible or not with the results obtained with this model.

2.3. OLS with Breaks

We estimate linear regression models that are subject to structural change, where the regime breakpoints may be known and specified a priori, or they may be calculated using the Bai, Lumsdaine, and Stock (1998), Bai and Perron (1998), Bai and Perron (2003), and related techniques (Casini and Perron 2021).[13] Hence, we consider that a single know-break occurs at time $t = [\rho_0 T]$ where $\rho_0 \in (0, 1)$, and $[\,\cdot\,]$ is the greatest smaller integer function. So we estimate

$$y_t = \mu + \delta 1\{t > t\} + \beta' X_t(\gamma) + \epsilon_t, \quad t = 1, \ldots, T$$

where $\delta 1\{t > t\}$ is an indicator function that equals one if $t > t$ and zero otherwise, and

[13]Extensive literature describes structural break estimation methods, starting with maximum likelihood estimators (MLE) on breakpoints. The main problem with the breakpoint LS estimation is that its finite sample behavior depends on the size of the parameter shift. In many cases, empirically relevant magnitudes are 'small' in a statistical sense (Casini and Perron 2021).

X is the column vector of explanatory variables, none of which is supposed to be time-invariant, and β' is the vector of corresponding coefficients.

As before, our database is from the Central Bank of Mexico (BANXICO) and the National Institute of Statistics and Geography (INEGI): https://www.banxico.org.mx/SieInternet/. The structural breakpoint is defined such that two temporary analysis periods are obtained, with a monthly frequency. The first period is the one before the fourth transformation, which covers January 2008 to December 2018. The second period, that of the 4T, goes from January 2019 to May 2023. Our dependent variable is given by the Global Indicator of Economic Activity (GIEA) measuring the monthly evolution of the real sector of the economy, i.e. ,it is a proxy for the Gross Domestic Product: https://en.www.inegi.org.mx/programas/igae/2013/. The set of explanatory or independent variables is given by:

- The Consumer Confidence Indicator (CCI) measures the current perception and future expectations that people have about their economic situation, their family, and the country in general, with respect to the purchase of consumption durables and non-durables, as well as employment, inflation, and savings.
- Monthly Indicator of Domestic Private Consumption, seasonally adjusted data (Consumption). Information that measures the evolution of household spending on consumer goods and services, both national and imported, thereby allowing monthly monitoring of the most significant component of the product, on the demand side: https://www.inegi.org.mx/temas/imcp/
- Contractual wage increase (percentage GW), is the weighted average of the wages increments of the corresponding month. The weights correspond to the number of workers involved.
- Effective consumption (EffConsumption) is a proxy that we build by multiplying the wage increase with the indicator of domestic private consumption (%GW $\times$ *Consumption*). So, the aim is to analyze the interaction between wage increases and consumption in the domestic market; this is called the effective consumption of Mexican households.
- Revenues by Workers' Remittances. Direct remittances, that is, those delivered in cash and kind, are calculated by the National Institute of Statistics and Geography (INEGI) from the Surveys of International Travelers and provided to the Bank of Mexico for the compilation and publication of the statistics of the balance of payments. The income from direct remittances for the publication of the monthly remittance statistics is preliminary estimates by Banco de Mexico, which are reviewed quarterly with the final statistics provided by INEGI.
- The effect of remittances on domestic consumption (RemConsumption). This proxy is simply obtained by multiplying (*Remmitances* $\times$ *Consumption*).
- Government Current Expenditure (GCE). The Mexican federal government's expense is destined to the remuneration of its public personnel and the consumption of goods and services necessary for the proper development of government activities.
- General Government Fiscal Balance (GGFB) measures the resources left over or missing after exercising the total net expense. In other words, it shows the government's financial resource needs and is evaluated by subtracting the costs incurred in a given period from its income. When the expense is greater than its income in said

period, a fiscal deficit is obtained (lack of resources); when the expense is less than its income, a surplus is obtained (remaining resources).

- Government Capital Expenditure (GKE). Expenditures of capital expenditure destined both to public works in infrastructure and to the acquisition and modification of real estate, purchases of personal property associated with these programs, and rehabilitations that imply an increase in the capacity or useful life of the infrastructure and real estate assets and their maintenance.
- Subsidies and Transfers (GST). Outflows of resources without consideration that affect the production, consumption, or remuneration of economic agents. These resources are current and can also be grouped by the institutional sector supported.
- The effect of subsidies and transfers on domestic consumption (STConsumption). This proxy is simply obtained by multiplying ($GST \times Consumption$).
- Real Compensation per Worker in Manufacturing Sector, 2008 = 100 (REM). Information is obtained from the Monthly Survey of Manufacturing Industry (Encuesta Mensual de la Industria Manufacturera, EMIM), available from January 2007 to date. This survey includes both transformation and export manufacturing.
- Productivity per Worker in Manufacturing Sector (Lprod). Productivity per worker is calculated using the total manufacturing production index, computed by INEGI.
- National Debt (DI). It is the total liabilities of the Federal Government payable within the country. These are mainly derived from the placement of government securities, and the Promotion and Development Bank, Leases, and resources of the Savings System for the Retirement (SAR).
- External Debt (DE). This corresponds to loans contracted by the public sector with foreign financial entities and payable abroad in a currency other than the national currency.
- Real Exchange Rate Index, RERate, which is calculated considering consumer prices and with respect to 111 countries (base year 1990). An increase in the real exchange rate index represents a depreciation of the Mexican currency. Source: International Financial Statistics of the IMF, INEGI, Bank of Mexico, central banks and statistical institutes.[14]

The results are presented in Table 4 below. The results of the three models are shown. Model 1 is the base or simplest model since it does not consider the effects of boosting domestic demand, such as actual domestic consumption, domestic consumption through remittances, and domestic consumption through subsidies and transfers. While model 2 does consider actual domestic consumption. The full model is the one that feels the effects of the boost to the domestic market, such as consumption, that is, effective consumption, consumption through remittances, and consumption through subsidies and transfers.[15] In qualitative and general terms, the results of the full model (Table 4) establish that:

[14]Source: International Financial Statistics of the IMF, INEGI, Bank of Mexico, central banks and statistical institutes, https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CR60&locale=es

[15]In the models we also add macroeconomic stability measured by the real exchange rate index. Our regression results are conditional to robust standard errors, i.e. ,performed under the heteroskedasticity-robust methodology (Huber-White sandwich methodology. Huber 1967; Kauermann and Carroll 2001; Long and Ervin 2000; White 1980, 1982)

Table 4. GIEA - economic activity.

	2008M01–2018M12			2019M01–2023M05		
	Model 1	Model 2	Full Model	Model 1	Model 2	Full Model
CCI	0.1214** (0.0419)	−0.3880*** (0.1106)	0.3405*** (0.0777)	0.1262 (0.1050)	0.6025*** (0.1430)	0.6338*** (0.1415)
Consumption	0.7020*** (0.0267)	–	–	0.5236*** (0.0631)	–	–
%GW	−0.0727 (0.1497)	−8.8591*** (1.9520)	5.2001 (3.2236)	−0.1126 (0.1163)	−2.9460* (1.7418)	−0.9328 (2.0238)
EffConsumption	–	0.09005*** (0.0188)	−0.0442 (0.0310)	–	0.0253*** (0.0147)	0.0072 (0.0170)
Remmitances	−0.0007* (0.0004)	$7.58e^{-05}$ (0.0009)	−0.0197** (0.0065)	−0.0012*** (0.0004)	−0.0024*** (0.0007)	−0.0132*** (0.0035)
RemConsumption	–	–	0.0002** ($6.31e^{-05}$)	–	–	$9.35e^{-05}$*** ($2.99e^{-05}$)
GCE	$-2.30e^{-06}$ ($1.57e^{-06}$)	$4.81e^{-06}$ ($3.94e^{-06}$)	$2.58e^{-05}$*** ($5.17e^{-06}$)	$8.94e^{-06}$ ($6.04e^{-06}$)	$2.74e^{-05}$*** ($6.77e^{-06}$)	$1.81e^{-05}$** ($7.28e^{-06}$)
GGFB	−0.0001 (0.0001)	0.0004* (0.0002)	0.0001 (0.0003)	0.0030 (0.0088)	−0.0027*** (0.0097)	−0.0051 (0.0097)
GKE	$-2.50e^{-06}$ ($2.25e^{-06}$	$1.83e^{-06}$ ($2.80e^{-06}$)	$5.74e^{-06}$** ($2.64e^{-06}$)	$-6.99e^{-06}$ ($4.96e^{-06}$	$-8.65e^{-06}$ ($5.72e^{-06}$	$-1.04e^{-05}$* ($5.95e^{-06}$)
GST	−0.0153 (0.0207)	−0.0559* (0.0255)	0.4036*** (0.0866)	−0.0612 (0.0530)	−0.1806*** (0.0680)	−0.4518*** (0.1075)
STConsumption	–	–	−0.0060*** (0.0011)	–	–	0.0029*** (0.0009)
REM	0.0175* (0.0091)	0.0552** (0.0210)	−0.0397 (0.0192)	0.0303** (0.0149)	0.0476* (0.0283)	0.0439** (0.0228)
Lprod	0.1094*** (0.0169)	0.3306*** (0.0445)	0.2575*** (0.0397)	0.2212*** (0.0355)	0.3943*** (0.0449)	0.3907*** (0.0415)
DI	0.0023*** (0.0003)	0.0051*** (0.0007)	0.0047*** (0.0007)	0.0001 (0.0003)	0.0013** (0.0005)	0.0018*** (0.0053)
DE	−0.0017*** (0.0004)	−0.0039*** (0.0014)	−0.0061*** (0.0012)	0.0012 (0.0013	0.0027 (0.0023)	0.0010 (0.0021)
RERate	−0.0023 (0.0184)	0.2282*** (0.0520)	0.2282*** (0.0408)	0.0065 (0.0611)	−0.0497 (0.1112)	0.0974 (0.1080)
Adjusted R^2	0.9875	0.9431	0.9571	0.9875	0.9431	0.9571
Prob(F-statistic)	0.0000	0.0000	0.000	0.0000	0.0000	0.0000
S.D. dependent var	6.9719	6.9719	6.9719	6.9719	6.9719	6.9719
Schwarz criterion	3.5455	4.0219	3.7462	3.5455	4.0219	3.7462
Akaike icriterion	3.079	3.5554	3.2078	3.079	3.5554	3.2078
Hannan-Quinn criter.	3.2682	3.7446	3.4262	3.2682	3.7446	3.4262

Method: Least Squares with Breaks (break 2019M01). White hetoreskedasticity-consistent standard errors & covariances. Allow heterogeneous error distributions across breaks
Source: Own elaboration. Std. Error in (). * significance at 0.1, ** significance at 0.05 and *** significance at 0.01

- The CCI variable has a positive (statistical significance) impact on the GIEA in both periods, but its impact coefficient is stronger in the 4T period. The latter means that the 4T policy on economic growth is oriented on internal demand and consumer confidence.
- The wage increase variable, %GW, may be readed as a production cost, does not impact the GIEA in both periods. Furthermore, the interaction of this variable with consumption, that is, the so-called effective consumption (EffConsumption), does not effect the GIEA, in the full model. But in Model 2, this EffConsumption variable positively impacts the GIEA.
- Remittances have a negative effect on the GIEA both in the first period and in the second period. However, remittances directed to consumption in the domestic market (the so-called RemConsumption variable) have a statistically significant positive effect on GIEA, ie. the economic activity. This implies that the domestic market is once again an engine of economic growth, although this is driven by external sources such as remittances.
- The levels of public current expenditure, GCE, are high in the first period; it has a statistically significant and positive effect on economic activity, GIEA, in both periods, although such coefficient is almost null, that is its effect, although significant, is very poor to indicate it as a driver of the GIEA. Furthermore, its reduction during the 4T has an effect on the GIEA such that the coefficient falls even more.
- The public balance (GGFB) is not statistically significant on the GIEA. In model 2, we observe statistical significance coefficients, with a negative coefficient during the 4T period, implying that the greater the public deficit the lower the GIEA. Therefore, the 4T policy of containing balanced public finances is proper.
- Federal resources to preserve or increase the country's capital assets and the amortization of financial commitments, which are capital expenditures (GKE), have a positive impact on the GIEA in the first period, while their negative impact is almost null in the second period, probably due to the regionalization of such type expenditure, that is in the southeast of the Mexican country.
- Subsidies and transfers, GST, which is a crucial variable of 4T policy, have a positive impact on the GIEA in the first period. In contrast, their significant impact is negative in the second period since they are primarily social transfers. However, this variable focused on consumption or potentialization of the domestic market, the so-called STConsumption variable, it shows us that in the first period the impact is negative, while in the second period the impact is statistically significant and positive. This reflects the efficient redistributive policy of the 4T, the boost to the domestic market, as an engine of economic activity, GIEA.
- Note that the variable that measures the average real remuneration per employed person, REM, positively impacts the GIEA in the 4T period (its impact is not statistically significant in the previous period), and therefore the salary increases reflect an efficient redistributive policy during the 4T period. This is a driver of economic activity, and without inflationary effects since it is measured in real terms, and there is labor productivity (see Sánchez Carrera, González Lara, and Policardo 2021). In both periods, it can be observed that labor productivity, where its coefficient is higher in the 4T period, has a positive impact on the GIEA.

- The net internal debt of the public sector, DI, has a statistically significant and positive impact on the GIEA, in both periods.The net external debt of the public sector, DE, is statistically significant and negatively impacts the GIEA in the first period, while it is not significant in the 4T period. The reasons may be because such financial commitments were not assigned to economic activity, but rather to current or unproductive expenditure; contrary in the 4T period, there are no such financial obligations. Therefore, there is no significance on the economic activity of the country.
- The real exchange rate index, RERate, is statistically significant and has a positive sign during the first period, which means that a depreciation of the Mexican currency implies an increase in economic activity GIEA. This characterizes an economy driven by the external market (export-led growth). Although such RERate turns out to be not statistically significant in the 4T period, which can characterize macroeconomic stability since the RERate does not have enough variability during the 4T period, and it does not have significant effects on the GIEA.

2.4. The Success of AMLO's 4T Economic Policy

Our econometric exercises identify the success of the 4T economic policy. Such economic success can be characterized as an economic policy of precautionary but efficient public spending in the management and induction of macroeconomic variables, in addition to not generating distrust in private and social participation in a market economy.[16] Politics, from a theoretical pointof view, can be seen as the process of changing reality in line with a particular ideological perspective, but it is also the strategy for the possible. It is perceived that the 4T economic policy must be carried out with 'caution and responsibility' in public spending so as not to harm capital or repel direct national and foreign investment. When there is a lack of caution and exuberant spending habits, experience has shown us that this causes currency depreciation, inflation, rising interest rates, a drop in economic growth, unemployment, and an increase in poverty (Nalin and Yajima 2024; Vidal, Marshall, and Correa 2011).[17]

In the so-called Fourth Transformation, the strategies favor aggregate (domestic) demand and operate as an essential condition of the economic dynamics.[18] But subject

[16]The policies undertaken before AMLO's government were based on neoclassical economic theories, characterized by proportional reduction of social spending, contained salaries anchored to the inflationary projection and, therefore, fall in purchasing power, absolute and proportional decrease in public investments in productive infrastructure jointly with the increase in public debt and growth in current spending of the federal government.

[17]On November 8, 2018, the first days of the current Mexican federal government, Senator Ricardo Monreal presented a initiative bill to regulate high bank commissions for their various financial intermediation services. The next day the assets of the commercial banks reduced their value and the exchange rate went from 18.80 to 20.70, with the evident outflow of capital, especially from foreign banks established in the country. The initiative was stopped and a political negotiation was necessary with the leadership of the Association of Banks (ABM) from which it turned out that three years would be necessary to 'carry out feasibility studies' and already in the second part of the six-year term this possibility would be raised. This calmed the financial markets and the exchange rate returned to around 19 pesos per dollar. To date, no proposals have been presented in this regard and commissions have been reduced depending on the market, although not significantly. Excelsior Newspaper, 'Monreal asks for calm before the initiative on bank commissions' Mexico, 11-13-2018 https://www.excelsior.com.mx/nacional/monreal-pide-calma-ante-iniciativa-sobre-comisiones-bancarias/1278165 El Financiero Newspaper, 'What happened to the Monreal reform to eliminate ATM fees?' Mexico, 1-26-2023 https://www.elfinanciero.com.mx/nacional/2023/01/26/multired-que-paso-con-la-reforma-de-monreal-para-eliminar-comisiones-de-cajeros-automaticos/

[18]The six-year government that began in 2019 has opted to boost the economy from aggregate demand, with the boost to consumption through increases in the minimum wage and social transfers,Social programs have been elevated to

to the exogenous variables caused by the Covid-19 pandemic and the war in Eastern Europe, the fall of the Mexican product has gradually had an upward trend sustained by the strength of the domestic market. Likewise, annual increases in the minimum wage are integrated into this same strategy, regardless of social justice content, such as subsidies and transfers for the education of young people, pensions for the elderly, or the poorest. Notice that this strategy of strengthening consumption to boost aggregate demand and economic activity is not financed with a budget deficit but rather with austerity in the current spending of the bureaucracy. It is then an economic policy applied with caution so as not to negatively impact the price level and the interest rate, even though inflation has been global and not particular, and the response of high-interest rates to this distortion has affected most countries.

The economic policy of the 4T, then, is supported by the post-Keynesian economic theory combined with a hybrid economic model where the principle of effective demand, i.e. ,that demand matters both in the long and short term, does not make pressures on the public debt to finance redistributive policies and wage increases. Moreover, inflation has been kept under control and has not put put pressures on the fiscal deficit and other imbalances that may affect the dynamics of economic growth.

For these reasons, AMLO's 4T is practically far from being populist, but rather comes from the welfare state type. Particularly, productive investments in Mexican states, located in the southeastern (poorest) region of the country, with emblematic projects, such as the Maya and Interoceanic trains and the Oleca Refinery, are expected to boost the economy of that regions.[19]

It is worth mentioning that Mexico's international trade is mainly from/towards the United States (to be precise, about 80 percentage of Mexico's international trade is undertaken with the US), so López Obrador's team had to bring together diplomacy and economic strategy for the renewal of the Free Trade Agreement in 2018,[20] whose negotiations began before his mandate. If the first agreement was about economic and financial liberalization, the signature of the Treaty between Mexico, the United States and Canada on November 30, 2018, concerned additional topics like environmental protection and green transition, the promotion of digital commerce, the improvement of the dispute procedures to reach a faster justice, the implementation of good regulatory and anti-corruption measures and the creation of socially fair labor relationships between those three countries.

Differently fom the previous governments, AMLO's Fourth Transformation can be considered a social welfare policy characterized by social responsibility and accountability. Two aspects signed in the free trade agreement strengthened the political position of the federal government, that is, labor issues and national sovereignty over hydrocarbons.

the level of social rights, as constitutional rights. This generates confidence in the sense that social transfers are not only political in nature every six years, but rather long-range (Diario Oficial de la Federación, 08/05/2020: https://dof.gob.mx/nota_detalle.php?codigo=5593045&fecha=08/05/2020#gsc.tab=0)

[19]Tornel (2023), and Cornejo (2023) show that neither populist attitudes nor the belief in a corrupt elite are associated with citizens' preferential choice over AMLO, who used some populist rhetoric during his campaign, but who did not activate any populist attitude in his favor at the individual level. https://americasquarterly.org/article/the-real-reasons-for-amlos-popularity/, https://mexiconewsdaily.com/business/oecd-improves-economic-growth-forecast-for-mexico-this-year/, https://www.oecd.org/economic-outlook/november-2023/

[20]Signed in 1994, the Agreement between the United States of America, Mexico and Canada (USMCA) replaced the North American Free Trade Agreement (NAFTA) and allowed greater trade between the three signatory countries.

After the request of US and Canada's Labor Unions, new good labor practices were promoted in Mexico, such as union democracy, transparency in collective bargaining, an effective system for resolving labor disputes and, more importantly, an increase in the minimum wage that has been agreed upon by both the government and labor representation, as well as business leaders.[21]

3. Concluding Remarks

This paper presents an elaborate econometric methodology to show the effects of 4T's economic policy on economic growth (measured through GIEA). This paper shows the positive impact of the 4T's economic policy on economic growth considering different variables before and after AMLO's government.

The analysis we just performed is intriguing and could be a good starting point for future research. The data on the effect of the main macroeconomic variables on growth responds more (and better) after AMLO's mandate than before it. What information can be extracted from this analysis? A possible explanation for this intriguing effect could be given by the unobservable actions implemented after AMLO that made the policies more effective. A good example could be an effective fight against corruption, as well as the improvement of good administrative practices, that is, the efficiency of public spending.

The results before AMLO suggest that growth was not necessarily linked to the main macroeconomic variables that the literature guides, and an important component was the feelings about the future of the Mexican population. Investments had an opposite effects on growth before and after AMLO's mandate. If the same policy before and after a given date (in particular, before December 2018) had a different effect on a target variable, particularly the level of economic activity, something else - which we cannot measure - must have happened. We are inclined to claim that this effect is due to the numerous policies implemented by AMLO aimed at redistributing wealth, reducing violence and corruption, and reducing the waste of public resources. Hence, AMLO's 4T aims to promote social economic activity and redistribute economic growth.

Acknowledgments

We thank the editor and the anonymous reviewers for their constructive comments, which helped us improve the manuscript. We thank the members of GEU (https://geu.uniurb.it) for their insightful comments and suggestions. This paper is part of the research project *Optimal Timing & Control to Eradicate Heterogeneity of Firms on Polluting Activities*, supported by DESP, University of Urbino. The usual caveats apply.

Disclosure statement

Opinions expressed in this research paper are those of the authors and do not necessarily reflect the official opinion of the Italian Customs and Monopolies Agency. The authors declare that have no relevant or material financial interests that relate to the research described in this paper. The

[21] Government of Mexico, https://www.gob.mx/t-mec/acciones-y-programas/textos-finales-del-tratado-entre-mexico-estados-unidos-y-canada-t-mec-202730?state=published

authors have no relevant financial or non-financial interests to disclose. The authors have no conflicts of interest to declare that are relevant to the content of this article.

ORCID

Laura Policardo http://orcid.org/0000-0002-7943-4690
Edgar J. Sanchez Carrera 0000-0002-1191-8859

References

Albertini, J., S. Auray, H. Bouakez, and A. Eyquem. 2021. 'Taking Off Into the Wind: Unemployment Risk and State-dependent Government Spending Multipliers.' *Journal of Monetary Economics* 117 (C): 990–1007.
Alves-Passoni, P., and A. B. Neria. 2023. 'Determinants of Growth in Mexico and Brazil Between 2003 and 2018: A Demand-led Decomposition of Growth Using Input-output Tables.' *Review of Political Economy* 35 (3): 670–686.
Averbuch, M. July 25, 2022. 'American Drivers Score. $3.11-a-gallon for Gas Over the Border in Mexico.' *Bloomberg*.
Bahmani-Oskooee, M., and I. Miteza. 2006. 'Are Devaluations Contractionary? Evidence From Panel Cointegration.' *Economic Issues* 11 (1): 49–64.
Bai, J., R. L. Lumsdaine, and J. Stock. 1998. 'Testing for and Dating Common Breaks in Multivariate Time Series.' *Review of Economic Studies* 65: 395–432.
Bai, J., and P. Perron. 1998. 'Estimating and Testing Linear Models with Multiple Structural Changes.' *Econometrica* 66: 47–78.
Bai, J., and P. Perron. 2003. 'Computation and Analysis of Multiple Structural Changes.' *Journal of Applied Econometrics* 18: 1–22.
Bose, N., M. E. Haque, and D. R. Osborn. 2007. 'Public Expenditure and Economic Growth: A Disaggregated Analysis for Developing Countries*.' *The Manchester School* 75 (5): 533–556.
Campbell, D. T., and J. C. Stanley. 1963. *Experimental and Quasi-Experimental Designs for Research*. Boston: Houghton Mifflin.
Casini, A., and P. Perron. 2021. 'Continuous Record Laplace-Based Inference About the Break Date in Structural Change Models.' *Journal of Econometrics* 224 (1): 3–21.
Cook, T., and D. Campbell. 1979. *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Boston: Houghton Mifflin.
Cornejo, R. C. 2023. 'The Amlo Voter: Affective Polarization and the Rise of the Left in Mexico.' *Journal of Politics in Latin America* 15 (1): 96–112.
Coughlin, R. W. 2023. 'The Fourth Transformation and the Trajectory of Neoliberalism in Mexico.' *Latin American Perspectives* 50 (2): 15–33.
Devarajan, S., V. Swaroop, and H. fu Zou. 1996. 'The Composition of Public Expenditure and Economic Growth.' *Journal of Monetary Economics* 37 (2): 313–344.
Dornbusch, R., I. Goldfajn, and R. O. Valdés. 1995. 'Currency Crises and Collapses.' *Brookings Papers on Economic Activity* 26 (2): 219–294.
Farrington, D. P. 2003. 'Methodological Quality Standards for Evaluation Research.' *The Annals of the American Academy of Political and Social Science* 587: 49–68.
Gagnon, J. E., S. B. Kamin, and J. Kearns. 2023. 'The Impact of the Covid-19 Pandemic on Global Gdp Growth.' *Journal of the Japanese and International Economies* 68: 101258.
Gonzalez, M. d. l. A. 2002. 'Do Changes in Democracy Affect the Political Budget Cycle? Evidence From Mexico.' *Review of Development Economics* 6 (2): 204–224.
González Lara, J. M., and E. J. Sánchez Carrera. 2019. 'Corrupción Para Los Ricos Y Los Pobres En México: ¿quién La Soporta aún Más?*.' *El Trimestre Económico* 86: 1033–1055.
Gutierrez, D. S., D. B. Vargas, and A. M. Vite. 2021. 'Energy Reform in Mexico: Its Impact on Pemex's Productivity.' *The Extractive Industries and Society* 8 (2): 100886.

Huber, P. J. 1967. 'The Behavior of Maximum Likelihood Estimates Under Nonstandard Conditions'.
Iniguez-Montiel, A. J. 2010. 'Government Expenditure and National Income in Mexico: Keynes Versus Wagner.' *Applied Economics Letters* 17 (9): 887–893.
Kamin, S. B., and J. H. Rogers. 2000. 'Output and the Real Exchange Rate in Developing Countries: An Application to Mexico.' *Journal of Development Economics* 61 (1): 85–109.
Kauermann, G., and R. J. Carroll. 2001. 'A Note on the Efficiency of Sandwich Covariance Matrix Estimation.' *Journal of the American Statistical Association* 96 (456): 1387–1396.
Larre, B., and M. Bonturi. 2001. 'Public Spending in Mexico.' TOECD Economics Department Working Papers (288).
Levy-Orlik, N. 2022. 'The New Forms of Economic Dominance in Latin American Economies in the Globalised Era: A Glance At Mexicoâs Financial System.' *Review of Political Economy*. https://doi.org/10.1080/09538259.2022.2111809.
Long, J. S., and L. H. Ervin. 2000. 'Using Heteroscedasticity Consistent Standard Errors in the Linear Regression Model.' *The American Statistician* 54 (3): 217–224.
Nalin, L., and G. T. Yajima. 2024. 'Balance Sheet Effects in a Financialized Environment: A Stock-flow Consistent Framework for Mexico.' *Review of Political Economy* 36 (1): 268–288.
Oxford-Analytica. 2020. 'Mexico Insecurity to Weigh on AMLO Approval.' *Expert Briefings*.
Regidor, C. B., and P. Iber. 2018. 'A New Hope for Mexico?.' *Dissent* 65 (2): 94–105.
Silva Gutierrez, D., M. J. Paz, and A. Moreno Vite. 2021. 'Factors that Explain the Results of the National Oil Companies: The Impact of the Fiscal Role on Pemex's Results.' *Resources Policy* 74: 102280.
Speck, M. 2019. 'Great Expectations and Grim Realities in Amlo's Mexico.' *PRISM* 8 (1): 68–81.
Sánchez Carrera, E. J., J. M. González Lara, and L. Policardo. 2021. 'Crecimiento Impulsado Por Los Salarios En México: Un Análisis De Regresión Umbral.' *Investigación Económica*81 (319): 90–116.
Sánchez-Juárez, I., and R. García-Almada. 2016. 'Public Debt, Public Investment and Economic Growth in Mexico.' *International Journal of Financial Studies* 4 (2): 1–14.
Sánchez-Talanquer, M., and K. F. Greene. 2021. 'Is Mexico Falling Into the Authoritarian Trap?.' *Journal of Democracy* 32 (4): 56–71.
Tornel, C. 2023. 'Energy Justice in the Context of Green Extractivism: Perpetuating Ontological and Epistemological Violence in the Yucatan Peninsula.' *Journal of Political Ecology* 30 (1). https://doi.org/10.2458/jpe.5485.
Vidal, G., W. C. Marshall, and E. Correa. 2011. 'Differing Effects of the Global Financial Crisis: Why Mexico Has Been Harder Hit Than Other Large Latin American Countries.' *Bulletin of Latin American Research* 30 (4): 419–435.
Vizcaino, M. E., and C. Wilson. August 30, 2022. 'Amlo's Penny-Pinching Ways in Mexico are Paying off in Bond Markets Now.' *Bloomberg*.
Weizenmann, P. 2018. 'Mexico's Clamor for Change: López Obrador and His People's Expectations.' *Harvard International Review* 39 (4): 9–11.
White, H. 1980. 'A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity.' *Econometrica* 48 (4): 817–838.
White, H. 1982. 'Maximum Likelihood Estimation of Misspecified Models.' *Econometrica* 50 (1): 1–25.