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THE EFFECTS OF NAFTA ON ECONOMIC GROWTH

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ABSTRACT
This paper evaluates the effects of the North American Free Trade Agreement on the economic growth of Mexico, the United States and Canada by means of an augmented Solow growth model. Such a model is estimated with panel data through two econometric methods: 1) the Arellano-Bond dynamic panel Generalized Method of Moments, and 2) Feasible Generalized Least Squares. The two techniques are consistent in indicating that trade raises Gross Domestic Product (GDP) per capita, controlling for physical capital stock per capita, human capital formation, total factor productivity, and the capital depreciation rate. However, the most important source of GDP per capita growth is human capital formation, which highlights the need to promote trade while investing more in long-term formal education, short-term training programs and the whole process of knowledge transferring.
Key words: Economic growth, international trade, human capital formation, panel data models.
JEL Classification: C51, F14, O47.

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LOS EFECTOS DEL TLCAN EN EL CRECIMIENTO ECONÓMICO

RESUMEN

Esta investigación evalúa los efectos del Tratado de Libre Comercio de América del Norte en el crecimiento económico de México, Estados Unidos y Canadá mediante una versión ampliada del modelo de crecimiento de Solow. El modelo se estima con datos en panel mediante dos métodos: 1) el método generalizado de momentos de Arellano y Bond, el cual se aplica a un panel dinámico y 2) mínimos cuadrados generalizados factibles. Ambos indican que el comercio incrementa el producto interno bruto (PIB) per cápita, controlando para el *stock* de capital físico y humano, la productividad total de los factores y la tasa de depreciación del capital. Sin embargo, la principal fuente de crecimiento económico es la formación de capital humano, por lo que se debe estimular el comercio internacional e invertir más en educación formal de largo plazo, programas de capacitación de corto plazo y todo el sistema de transferencia del conocimiento.
Palabras clave: crecimiento económico, comercio internacional, formación de capital humano, modelos de datos en panel.
Clasificación JEL: C51, F14, O47.

1. INTRODUCTION

This paper evaluates the effects of the North American Free Trade Agreement (NAFTA) on the economic growth of Mexico, the United States (US) and Canada. Such a task is carried out by means of an augmented version of the Solow growth model, which is estimated with panel data through two complementary econometric methods: The Arellano-Bond (AB) dynamic panel Generalized Method of Moments (GMM), on the one hand, and Feasible Generalized Least Squares (FGLS) with cross-section weights, on the other. The Arellano-Bond GMM estimator (AB-GMM) is consistent, robust to endogeneity problems and requires no information as to the distribution of the disturbance term, whereas the FGLS estimator accounts for serial correlation and is thus useful in achieving more efficient estimations.

As is well known, NAFTA came into force in January 1994 and was aimed at attaining five major objectives within the region: Liberalize trade in goods and services, improve business practices, protect intellectual property rights, enhance cooperation, and set up a formal system for solving trade controversies (Abbott, 2000). Mexico and Canada were also seeking permanent access to the US market (Whalley, 1998) to raise exports and attract foreign direct investment (FDI). For Mexico, NAFTA was also a means of cementing the structural and macroeconomic reforms undertaken since the early 1980s (Moreno-Brid, Rivas, and Ruiz, 2005). Nonetheless, the long-term outcome pursued by the three countries were economic growth and job creation. Therefore, our study seeks to assess the impact of NAFTA on economic growth.

Our evidence is consistent in indicating that international trade has a positive impact on the Gross Domestic Product (GDP) per capita, controlling for physical capital accumulation, human capital formation, depreciation and even total factor productivity. We also show that human capital formation is the most important source of GDP per capita growth, which highlights Mexico's need to invest more in long-term formal education, short-term training programs and the whole knowledge transferring process.

The rest of the paper is organized as follows. Section 2 is an overview of the literature concerning the link between trade and economic growth. Section 3 analyses some relevant data on the evolution of trade since the NAFTA implementation. Section 4 describes the theoretical approach, whereas Section 5 specifies and estimates the panel data models. Section 6 briefly identifies Mexico's winners and losers in the context of NAFTA. Finally, we summarize the findings and policy implications.

2. BRIEF REVIEW OF THE LITERATURE

This section highlights some relevant contributions regarding the impact of trade liberalization on economic growth. We first focus on the orthodox view, namely on those works suggesting that opening up to trade brings about economic growth. Then we deal with the heterodox view, which either finds no relationship between trade and output growth or maintains that such a relationship is potentially negative for some countries.

Based on a sample of 95 developing countries over the 1976-1985 period, Dollar (1992) provides evidence that a tariff reduction in intermediate goods can encourage economic growth. The linear regressions estimated by this author show that lowering protection to the industry of intermediate inputs played a key role in launching economic growth in the East Asian Tigers.

Using five different criteria of trade restriction, Sachs *et al.* (1995) construct an economic openness indicator to determine the impact of trade liberalization on economic growth. The study relies on cross-country growth regressions, which control for other determinants of growth. The empirical analysis comprises 134 countries and pays attention to their trade policy changes over the 1970-1989 period. In this context, these authors conclude that trade openness exerts a positive influence on economic growth.

Edwards (1998) resorts to nine trade openness indicators and assesses their impact on total factor productivity (TFP) and thus on economic growth. Such indicators are combined with a cross-country data set spanning 93 countries during the 1980s. Edwards estimates nine Weighted Least Squares (WLS) regressions, each one including a trade openness indicator and a set of control variables. The evidence shows that TFP rises significantly when developing countries open up to trade.

Winters (2004) reviews the literature concerning the relationship between international trade and growth, concluding that trade liberalization leads to a transitory increase in the growth rate of output. Winters also contends that liberal trade policies cannot raise long-term economic growth unless they are supported by sound policies and institutions. In this context, trade liberalization can have a positive interplay with solid non-discretionary policies as well as with institutional development.

The orthodox view provides plausible explanations as to why international trade raises GDP growth. Some authors argue that international trade gives rise to knowledge spillovers from developed to developing countries (Sachs *et al.*, 1995; Aghion and Howitt, 2009, p. 353). Other authors contend that an outward-oriented strategy allows countries to better exploit scale economies and capacity utilization (Salvatore and Hatcher, 1991). A related argument is that free trade agreements reduce the technology gap among the countries involved (Gonzaga, 2001).

According to the heterodox view, by contrast, the effect of trade on economic activity is either statistically insignificant or potentially negative for some countries. Rodríguez and Rodrik (2000) find that reduced average tariffs are not conducive to economic growth. The authors state further that most econometric models are underspecified because they fail to capture the institutional and structural differences among the countries.

According to Jung and Marshall (1985), many studies based on regressions of economic activity over export variables lack reliability to the extent that they do not establish the direction of causality. After performing causality tests between economic growth and exports for 37 developing countries, they find no evidence that exports lead to economic growth. Other papers, also relying on Granger causality tests, reach an analogous conclusion for different countries and regions. For instance, Shan and Sun (1998) for the case of the little dragons and Shan and Sun (2010) for the case of Australia.

Using data for 45 developing countries during the 1971-2005 period and panel cointegration tests, Dreger and Herzer (2013) show that the average long-run effect of exports on non-export GDP is negative. A plausible explanation is that developing countries that open up to trade prematurely, can neither take advantage of the new commercial opportunities abroad nor withstand the sudden arrival of foreign competitors to the domestic market (Aghion and Howitt, 2009, pp. 369-371).

Kneller, Morgan, and Kanchanahatakij (2008, p. 701) analyze the recent skepticism regarding the impact of trade openness on output growth, acknowledging that such an impact is not always positive and that the empirical dispute is not settled. Their study comprises 37 countries and highlights the fact that, although on average there seems to be a positive link between trade and GDP growth, many countries depart significantly from the general result. To the extent that these departures remain unexplained, some investigations consider that focusing on a case-by-case analysis may be more rewarding than taking wide cross-country analyses even further (Bhagwati and Srinivasan, 2002; Kneller, Morgan, and Kanchanahatakij, 2008). In such a context, this paper focuses on the NAFTA case.

3. EVOLUTION OF MEXICAN TRADE WITH THE US AND CANADA

This section analyzes the evolution of trade between Mexico and its North American partners, on the one hand, and the rate of economic growth of the three countries since 1994, on the other. Table 1 shows the average annual growth rates of Mexico's imports and exports (excluding oil) to the US and Canada over different time intervals. Each figure within a parenthesis is the variation coefficient of the corresponding average growth rate. The variation coefficient of a given variable, say Y_t, is calculated as follows:

$$EVC = (S/\overline{GR})(1+1/4T) \qquad [1]$$

where *EVC* stands for the estimated variation coefficient of the growth rate of Y_t; whereas *S* is the sample standard deviation of the growth rate of Y_t; $\overline{GR}$ is the sample average growth rate of Y_t, and *T* is the sample size. In this context, (1 + 1/4*T*) represents the small sample bias-correction factor developed by Rohlf and Sokal (1995). Therefore, an *EVC* is an unbiased and normalized measure of volatility.

The period 1994-2016 was broken down into three subperiods for analytical reasons: The first subperiod (1994-2001) lies between the implementation of NAFTA and the accession of China to the World Trade Organization (WTO) in December of 2001; the second subperiod (2002-2007) covers from the start of China's export boom in 2002 to the advent of the US economic slowdown in December 2007; and the third subperiod (2008-2016) comprises the years of the crisis and post-crisis of the US economy. Regarding Mexican non-oil exports to the US we can observe in Table 1 that, during the period 1994-2001, this variable experienced the greatest and most stable average annual growth rate (*i.e.*, the variation coefficient is smaller than in the following two periods).

As we move to the following subperiods (*i.e.*, 2002-2007 and 2008-2016), the Mexican non-oil exports to the US exhibited a decreasing average annual growth rate (AAGR) and an increasing volatility, which is conceivably due to the more intense competition from China in the US market. Lastly, throughout the 1994-2016 period, the AAGR of Mexico's non-oil exports to the US was 9.84% with a variation coefficient of 1.12.

During the whole reference period (1994-2016), the Mexican non-oil imports from the US grew at an AAGR of 6.3% with a variation coefficient of 1.97, so that they were notably less dynamic and more unstable than non-oil exports to the US. Regarding the trade with Canada, we can see that: 1) in the period (2008-2016) exports to Canada grew much faster than imports from that country; and 2) over the whole 1994-2016

Table 1. Mexican imports and exports to the US and Canada over different time intervals: Average annual growth rates and variation coefficients

Trade flows/Period	1994-2001	2002-2007	2008-2016	1994-2016
Exports to US	17.1 (0.57)	6.48 (0.98)	5.64 (2.19)	9.84 (1.12)
Exports to Canada	12.16 (2.42)	13.1 (1.08)	7.42 (1.66)	10.55 (1.82)
Imports from the US	12.7 (1.04)	2.42 (2.56)	3.21 (4.37)	6.30 (1.97)
Imports from Canada	18.56 (0.98)	11.38 (1.17)	2.77 (4.66)	10.51 (1.50)

Notes: 1) The data correspond to non-oil exports and non-oil imports. 2) Figures within parentheses are variation coefficients.
Source: Authors' calculations based on data from the Instituto Nacional de Estadística y Geografía (INEGI) of Mexico.

period, imports and exports to Canada grew roughly at the same pace. Therefore, the conclusion is that trade flows between Mexico and its two trading partners significantly increased during the 1994-2016 period.

Table 2 depicts the behavior of GDP and GDP per capita in the three countries. The first panel relates to the AAGR of GDP and allows for making three points: First, Mexico grew faster during the 1994-2001 subperiod (*i.e.*, before China entered the WTO) than in the two subsequent subperiods. Second, over the whole reference period (1994-2016), the Mexican economic growth was slightly higher than that of the US and Canada. And third, the magnitude of the variation coefficients of the AAGRs indicate that Mexico's economic growth was the most unstable.

The second panel of Table 2 displays the AAGRs of the GDP per capita of each country, based on current purchasing power parities (PPPs). First, notice that during the 1994-2001 interval, GDP per capita grew much less in Mexico than in its two North American counterparts. This lackluster performance can be explained by the mistake of December 1994 and the ensuing economic crisis. Second, if we focus exclusively on the 2002-2007 and 2008-2016 subperiods, the conclusion is that Mexico's GDP per capita grew slightly faster than that of the US and Canada. Lastly,

Table 2. GDP **and** GDP **per capita of Mexico, the US and Canada over different time intervals: Average annual growth rates and variation coefficients**

GDP growth/Period	1994-2001	2002-2007	2008-2016	1994-2016
Mexico	2.98 (1.46)	2.84 (0.66)	2.05 (1.42)	2.58 (1.21)
US	3.66 (0.35)	2.69 (0.31)	1.28 (1.41)	2.48 (0.69)
Canada	3.63 (0.41)	2.63 (0.23)	1.50 (1.27)	2.54 (0.68)
GDP per capita growth/Period	**1994-2001**	**2002-2007**	**2008-2016**	**1994-2016**
Mexico	2.76 (2.06)	4.93 (0.68)	2.88 (1.09)	3.38 (1.21)
US	4.38 (0.24)	4.33 (0.31)	2.02 (1.02)	3.45 (0.55)
Canada	4.44 (0.30)	4.63 (0.34)	1.26 (2.25)	3.25 (0.79)

Notes: 1) Figures within parentheses are variation coefficients. 2) Each country's GDP per capita is computed based on current purchasing power parities.
Source: Authors' calculations based on data from the *World Development Indicators* of the World Bank.

Mexico's GDP per capita, as well as its GDP growth, is highly volatile. The inherent instability of the Mexican economy and the insufficient economic growth must be addressed through a proper combination of economic policies and structural reforms.

4. THEORETICAL FRAMEWORK

We draw on Mankiw, Romer and Weil (1992), as well as Solow (1956), to assess the impact of NAFTA on the economic growth of Mexico, the US, and Canada. Here we follow Mankiw, Romer and Weil's procedure and complement it with trade within the region. So, let us consider first the following production function:

$$Y = K^{\alpha}H^{\beta}(AL)^{1-\alpha-\beta}\,;\, 0 < \alpha + \beta < 1 \qquad [2]$$

where Y is aggregate output, L is labor, and K and H stand for physical and human capital, respectively. Moreover, A reflects the state of technology and is usually referred to as TFP. The assumptions regarding these variables are:

$$\dot{K} = s_K Y - \delta K \qquad [3]$$

$$\dot{H} = s_H Y - \delta H \qquad [4]$$

$$\frac{\dot{L}}{L}\left(\equiv \frac{\mathrm{d}L/\mathrm{d}t}{L}\right) = n \qquad [5]$$

$$\frac{\dot{A}}{A}\left(\equiv \frac{\mathrm{d}A/\mathrm{d}t}{A}\right) = g \qquad [6]$$

where s_K and s_H represent the fraction of output invested in physical and human capital, respectively, while δ is the depreciation rate. Thus, equations [3] and [4] indicate that the evolution of physical and human capital depends positively on the corresponding fraction of output that is invested and negatively on the rate of depreciation.

Equations [5] and [6] show that L and A grow exogenously at rates n and g, respectively. The underlying assumption here is that $L = L_0 e^{nt}$ and $A = A_0 e^{gt}$, where L_0 and A_0 are the initial values of L and A. So, the interaction variable AL denotes the effective units of labor growing at a rate $n + g$, where n accounts for the change in the size of the labor force and g for the effects of technical progress (*i.e.*, g is the growth rate of TFP). In this perspective, $y = Y/AL$ is the output per effective unit of labor, and $k = K/LA$ and $h = H/LA$ are physical and human capital per effective unit of labor, respectively. The behavior of k (= K/LA) can be obtained in two simple steps. First, we take logs on both sides of $k = K/LA$, differentiate with respect to time, and then use the fact that $K = kLA$:

$$\begin{aligned}\frac{\dot{k}}{k} &= \frac{\dot{K}}{K} - \left(\frac{\dot{L}}{L} + \frac{\dot{A}}{A}\right) = \left(\frac{sY - \delta K}{K}\right) - (n+g) \\ &= \left(\frac{sY}{K} - \delta\right) - (n+g) = \left(\frac{sy}{k}\right) - (n+g+\delta)\end{aligned} \qquad [7]$$

Second, we isolate $\dot{k}$ to obtain:

$$\dot{k} = s_K y - (n + g + \delta)k \qquad [8]$$

Now, to obtain the trajectory of *h*, we proceed in a similar fashion, that is, we take logs on both sides of $k = H/LA$, differentiate with respect to time, and use the fact that $H = hLA$:

$$\dot{h} = s_H y - (n + g + \delta)h \qquad [9]$$

Equations [8] and [9] allow Mankiw, Romer and Weil to obtain the following steady-state solutions:

$$k^* = \left(\frac{s_K^{1-\beta} s_H^{B}}{n + g + \delta} \right)^{1/(1-\alpha-\beta)} \qquad [10]$$

$$h^* = \left(\frac{s_K^{\alpha} s_H^{1-\alpha}}{n + g + \delta} \right)^{1/(1-\alpha-\beta)} \qquad [11]$$

Therefore, the steady-state values of physical and human capital stock per effective unit of labor bear a positive relationship with the fractions of output that are invested and a negative relationship with the growth rates of: Population (n), TFP (g), and depreciation (δ). The last step consists of substituting k^* and h^* into the production function (*i.e.*, into equation [2]) and taking logs, so that the income per capita equation can be derived:

$$\ln\left(\frac{Y}{L}\right) = \ln A_0 + gt - \frac{\alpha + \beta}{1 - \alpha - \beta}\ln(n + g + \delta) + \frac{\alpha}{1 - \alpha - \beta}\ln s_K + \frac{\beta}{1 - \alpha - \beta}\ln s_H \qquad [12]$$

Equation [12] represents an augmented Solow growth model and implies that income per capita increases with human capital formation, physical capital accumulation and TFP growth, and falls with population growth. To equation [12] we will add international trade (TR) as measured by the sum of exports and imports as a share of GDP. Therefore, our empirical version of equation [12] is given by:

$$\ln y_t = \beta_1 + \beta_2 g_t + \beta_3 \ln (n + g + \delta)_t + \beta_4 \ln s_{K,t} + \beta_5 \ln s_{H,t} + \beta_6 \ln TR_t + v_t \quad [13]$$

where $y_t = Y_t/L_t$ and $B_1 = \ln A_0$, which means that the initial value of A is captured by the intercept term. Moreover,

$$B_3 = -\frac{\alpha+\beta}{1-\alpha-\beta},\ B_4 = \frac{\alpha}{1-\alpha-\beta},\ \text{and}\ B_5 = -\frac{\beta}{1-\alpha-\beta},$$

TR_t is international trade, g_t is TFP growth, and v_t is a stochastic disturbance term.

5. EMPIRICAL ANALYSIS

Two complementary econometric techniques are used to estimate our model: Feasible Generalized Least Squares, FGLS, with cross-section weights, on the one hand, and the Arellano-Bond GMM, AB-GMM, on the other. The FGLS estimator accounts for serial correlation and is thus useful in improving efficiency. This methodology will be applied to a fixed effects panel data model. To specify such a model, we first rewrite equation [13] so as to consider that we are dealing with three countries and 21 periods (*i.e.*, $N = 3$ and $T = 21$):

$$\ln y_{it} = \beta_{1i} + \beta_2 g_{it} + \beta_3 \ln (n + g + \delta)_{it} + \beta_4 \ln s_{K,it} + \beta_5 \ln s_{H,it} + \beta_6 \ln TR_{it} + v_{it} \quad [14]$$

where i and t denote the cross-section and time subscripts, respectively, and β_{1i} allows the intercept term to change from one country to another. The second step is to replace β_{1i} by an empirical expression that allows for capturing the heterogeneity among countries:

$$\ln y_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \beta_2 g_{it} + \beta_3 \ln (n + g + \delta)_{it} + \beta_4 \ln s_{K,it} + \beta_5 \ln s_{H,it} + \beta_6 \ln TR_{it} + v_{it} \quad [15]$$

where D_{2i} and D_{3i} are the dummy variables of the 0, 1 form associated with Canada and Mexico, respectively. This means that α_1 is the reference point, that is, the intercept term associated with the US, whereas α_2 and α_3 are intercept differentials. It is worth mentioning that the random effects model was ruled out, because to estimate it the number of cross-section units must be greater that the number of explanatory variables and such a condition is not fulfilled here.

The AB estimator (Arellano and Bond, 1991) draws heavily on the GMM developed by Hansen (1982). The GMM estimator is robust to endogeneity problems and does not require knowledge about the exact distribution of the disturbance term. These features are useful to ensure consistency and to make conventional significant tests more reliable when the distribution of the error term is unknown. Finally, the AB-GMM is applied to a dynamic panel data model (*i.e.*, a model that includes a lagged dependent variable, $\ln y_{t-1}$, on the right-hand side), so that the effects of the other explanatory variables on y_t are now conditioned on the past behavior of this variable. See equation [16]:

$$\ln y_{it} = \gamma \ln y_{it-1} + \beta_2 g_{it} + \beta_3 \ln (n + g + \delta)_{it} + \beta_4 \ln s_{K,i} + \beta_5 \ln s_{H,it} + \beta_6 \ln TR_{it} + u_{it} \qquad [16]$$

where $u_{it} = \mu_i + v_{it}$, so that in this case μ_i captures the heterogeneity among countries. The standard assumptions here are that $\mu_i \sim \text{IID}(0,\sigma^2_\mu)$ and $v_i \sim \text{IID}(0,\sigma^2_v)$. For simplicity, equation [16] can be rewritten as:

$$\ln y_{it} = \gamma y_{it-1} + x'_{it}\beta + \mu_i + v_{it} \qquad [16']$$

where γ is a scalar, x'_{it} is $1\times K$, β is $K\times 1$ and $K = 5$, since we have five explanatory variables in x'_{it}. Now, if $\ln y_{it}$ depends on μ_i so does $\ln y_{it-1}$. Of course, the lagged dependent variable, $\ln y_{it-1}$, can also be correlated with the second component of the error term (v_{it}). Moreover, one or more variables in x'_{it} may involve endogeneity problems and thus be correlated with u_{it}, in which case the Ordinary Least Squares (OLS) estimator would be biased and inconsistent.

The AB estimator gets rid of the endogeneity problems by creating a set of instrumental variables that exploits the orthogonality conditions that exist between the lags of the explanatory variables in levels (*i.e.*, the lags of y_{it-1} and x'_{it}) and the second component of the disturbance term, v_{it}. To make it easier for the instrumental variables to satisfy the orthogonality conditions, we must suppress the individual effect, μ_i, by first differencing. After eliminating μ_i, the instrumental variables must only be orthogonal to v_{it}. See equation [16'']:

$$\Delta \ln y_{it} = \gamma \Delta y_{it-1} + \Delta x'_{it}\beta + \Delta v_{it} \qquad [16'']$$

The instrumental variables are created in a sequential fashion from $t = 3$ to the last observation in the series. For $t = 3$, equation [16''] becomes:

$$\ln y_{i3} - \ln y_{i2} = \gamma(\ln y_{i2} - \ln y_{i1}) + (x'_{i3} - x'_{i2})\beta + (v_{i3} - v_{i2}) \qquad [17]$$

The instruments created for equation [17] are $\ln y_{i1}$, x_{i1} and x_{i2}. All of them are uncorrelated with ($v_{i3} - v_{i2}$), whereas $\ln y_{i1}$ is strongly correlated with ($\ln y_{i2} - \ln y_{i1}$) and x_{i1} and x_{i2} are both strongly correlated with ($x'_{i3} - x'_{i2}$). Similarly, for $t = 4$ we have that:

$$\ln y_{i4} - \ln y_{i3} = \gamma(\ln y_{i3} - \ln y_{i2}) + (x'_{i4} - x'_{i3})\beta + (v_{i4} - v_{i3}) \qquad [18]$$

The instruments created in this case are $\ln y_{i1}$ and $\ln y_{i2}$ for ($\ln y_{i3}$ – $\ln y_{i2}$), on the one hand, and x_{i1}, x_{i2} and x_{i3} for ($x'_{i4} - x'_{i3}$), on the other. The procedure continuous in this way to the last observation (T). The matrix of instruments for each county is given by:

$$Z_i = \begin{bmatrix} [\ln y_{i1}, x'_{i1}, x'_{i2}] & & & 0 \\ & [\ln y_{i1}, \ln y_{i2}, x'_{i1}, x'_{i2}, x'_{i3}] & & \\ & & \cdot & \\ 0 & & & \cdot \\ & & & [\ln y_{i1}, \ldots, \ln y_{iT-2}, x'_{i1}, \ldots, x'_{iT-1}] \end{bmatrix} \qquad [19]$$

As we are dealing with three countries in this case, $Z = [Z'_1, Z'_2, Z'_3]'$ and the following orthogonality conditions are satisfied $E(Z'_i \Delta v_i) = 0$ or every i (Hansen, 1982; Ahn and Schmidt, 1995). As Baltagi (2008, pp. 147-155) shows, equation [16''] can be pre-multiplied by Z in vector form to produce equation [20]:

$$Z'\Delta \ln y = Z'\Delta y_{-1}\gamma + Z'\Delta X\beta + Z'\Delta v \qquad [20]$$

where ΔX stands for the stacked matrix of data regarding Δx_{it}, with dimension $N(T-2)\times K$. The AB estimator is built in two steps: The first is to estimate the parameters γ and β in [20] by Generalized Least Squares (GLS), thereby giving rise to the first-stage consistent estimators $\hat{\gamma}_1$ and $\hat{\beta}_1$:

$$\begin{pmatrix} \hat{\gamma}_1 \\ \hat{\beta}_1 \end{pmatrix} = \frac{([\Delta y_{-1}, \Delta X]' Z V_N^{-1} Z' \Delta y)}{[\Delta y_{-1}, \Delta X]' Z V_N^{-1} Z' [\Delta y_{-1}, \Delta X]} \qquad [21]$$

where $V_N = \sum_{i=1}^{N} Z_i'(\Delta v_i)(\Delta v_i)' Z_i$. Let us denote the residuals emerging from the first-step consistent estimator as Δv_{GLS}. Arellano and Bond (1991) derive the second-step GMM estimator for $\hat{\gamma}_2$ and $\hat{\beta}_2$ by: 1) replacing Δv in equation [20] by Δv_{GLS}, and 2) making use of formulation [21] once more, but this time with Δv_{GLS} rather than Δv. Put differently, the second-step estimator makes use of the first-step residuals to construct a consistent covariance matrix that allows one to relax the assumption that $\Delta v_{it} \sim \text{IID}(0, \sigma_v^2)$.

Next, we will gather annual data over the 1994-2014 period[1] for Mexico, the US and Canada for the following variables: GDP per capita (as a proxy for GDP per effective unit of labor) at current PPPs, TFP at current PPPs, physical capital stock per person (as a proxy for physical capital per effective unit of labor) at current PPPs, human capital index based on years of schooling and returns to education, international trade as measured by the sum of non-oil exports and non-oil imports as a share of GDP, average depreciation rate of the capital stock, and population growth rate.[2]

5.1. Panel unit root tests

According to Phillips and Moon (1999), spurious results arise when the variables involved in a panel regression equation are nonstationary and,

1 Unfortunately, the current information available for the variables of the model does not go beyond 2014.

2 Source: *Penn World Table*, version 9.0, of Groningen Growth Development Centre (GGDC) of the University of Groningen; the INEGI of Mexico; US Department of Commerce, and Canada's National Statistical Agency.

at the same time, are not cointegrated. To eliminate this risk, we conduct three types of panel unit root tests for each variable of the model: Levin, Lin, and Chu (2002), Im, Pesaran, and Shin (2003), and Fisher-type tests (Maddala and Wu, 1999). The methodology proposed by Hamilton (1994, p. 501) is utilized to decide whether to include an intercept in the test equation or an intercept and a trend. In this manner, we make sure that each test equation captures the behavior of the variable. See Table 3.

The general picture emerging from this battery of tests is that two variables can be treated as stationary or I(0): International trade as a share of GDP ($\ln TR_{it}$) and the log of the sum of population growth, TFP growth and depreciation ($\ln(n + g + \delta)_{it}$). The rest of the variables can be reasonably taken as I(1).

Table 3. Panel unit root tests

Probability values for the null hypothesis of unit root (or nonstationarity)

Variable	Levin, Lin and Chu Test	Im, Pesaran and Shin Test	Augmented Dickey-Fuller-Fisher Test	Conclusion
$\ln y_{it}$	0.06	0.28	0.30	I(1) or I(0)
$\Delta\ln y_{it}$	0.00	0.00	0.00	I(0)
g_{it}	0.02	0.50	0.40	I(1) or I(0)
Δg_{it}	0.00	0.04	0.00	I(0)
$\ln(n + g + \delta)_{it}$	0.00	0.00	0.00	I(0)
$\ln s_{K,it}$	0.00	0.14	0.17	I(1) or I(0)
$\Delta\ln s_{K,it}$	0.08	0.04	0.05	I(0)
$\ln s_{H,it}$	0.88	0.58	0.65	I(1)
$\Delta\ln s_{H,it}$	0.00	0.00	0.00	I(0)
$\ln TR_{it}$	0.00	0.00	0.00	I(0)

Notes: 1) A p-value lower than 0.10 leads to the rejection of the null hypothesis with at least a 90% confidence level. 2) An individual intercept term is included in the test equation. 3) The Schwarz information criterion is used to determine the number of lags of the test equations. Source: Own estimations based on data from *Penn World Table*, version 9.0, of the GGDC of the University of Groningen; the INEGI of Mexico; the US Department of Commerce, and Canada's National Statistical Agency.

5.2. Estimated panel regression models

Table 4 presents the empirical evidence stemming from the fixed effect model, estimated by panel FGLS with cross-section weights. To ensure the stationarity of the model, some of the variables in Table 4 are expressed in first differences (*i.e.*, the I(1) variables). The estimated coefficients associated with physical capital stock per person ($\Delta\ln s_{K,it}$), human capital formation ($\Delta\ln s_{H,it}$), international trade as a share of GDP ($\ln TR_{it}$)and TFP (Δg_{it}) are all positive and statistically significant, which means that all these variables bear a positive relationship with GDP per capita ($\Delta\ln y_{it}$).

After assessing several model specifications, we concluded that it takes time for the population growth rate and the average depreciation rate of capital stock to have an impact on GDP per capita. Therefore, $\ln(n+g+\delta)_{it-2}$ enters the panel regression model as a lagged variable. According to what the theory predicts, $\ln(n+g+\delta)_{it-2}$ has a negative impact on GDP per capita.

The parameter estimates associated with the dummy variables suggest that the countries are not fully homogeneous. Given that only α_1 and α_3 are statistically significant, we can say that the US and Canada share the same intercept and that the intercept term of Mexico takes on a higher value as compared with that of its North American counterparts.

Table 5 shows the outcome of four types of standard residual tests. The Wooldridge test for serial correlation yields a probability value of 0.3071 for the null hypothesis of no first-order serial correlation, whereas the Likelihood Ratio (LR) heteroscedasticity test produces a probability value of 0.0002 for the null hypothesis of homoscedasticity. Thus, panel regression residuals are free of first-order serial correlation but are not homoscedastic. On the other hand, based on the Breusch-Pagan test for cross-section dependence and the Jarque-Bera normality test, it is reasonable to conclude that such residuals are not contemporaneously correlated and follow a normal distribution.

In this context, the LR-test for heteroscedasticity is the only one yielding an unsatisfactory outcome. Nonetheless, to increase the reliability of the evidence we resort to an alternative econometric method that, among other advantages, does not depend on the behavior of the disturbance term.

Table 4. Estimated fixed effect coefficients
Dependent variable: $\Delta \ln y_{it}$
Estimation method: Panel FGLS with cross-section weights

Variable	Coefficient	Standard error	t-Statistic	Probability
$\Delta \ln s_{K,it}$	0.106308	0.056813	1.871178	0.0673
$\Delta \ln s_{H,it}$	8.047190	1.231513	6.534395	0.0000
$\ln TR_{it}$	0.041408	0.015064	2.748715	0.0084
$\ln (n + g + \delta)_{it-2}$	−0.150285	0.071153	−2.112153	0.0398
Δg_{it}	1.364551	0.149308	9.139156	0.0000
α_1	−0.432176	0.212394	−2.034782	0.0473
α_2	−0.003828	0.016263	−0.235360	0.8149
α_3	0.055576	0.015373	3.615072	0.0007
Adjusted R^2	0.781823	Standard error of regression		0.016923
Durbin Watson statistic	2.220908	Probability value (F-statistic)		0.0000

Note: α_1 is the estimated constant term for the US, whereas α_2 and α_3 are the estimated differential intercepts for Canada and Mexico, respectively.
Source: Own estimations based on data from *Penn World Table*, version 9.0, of the GGDC of the University of Groningen; the INEGI of Mexico; the US Department of Commerce, and Canada's National Statistical Agency.

Table 5. Diagnostic tests for the residuals

Type of test	Null hypothesis	Test statistic	Probability value
Wooldridge test for serial correlation	No first-order serial correlation	1.847	0.3071
LR-test for heteroscedasticity	Homoscedasticity	19.38	0.0002
Breusch-Pagan cross-section dependence test	No cross-section dependence (correlation) in weighted residuals	5.3745	0.1463
Jarque-Bera normality test	Normality	1.7481	0.4173

Source: Own estimations based on data from *Penn World Table*, version 9.0, of the GGDC of the University of Groningen; the INEGI of Mexico; the US Department of Commerce, and Canada's National Statistical Agency.

Table 6. Dynamic panel model estimated by the AB-GMM technique
Dependent variable: $\Delta \ln y_{it}$

Variable	Coefficient	Standard error	t-Statistic	Probability
$\Delta \ln y_{it-1}$	–0.011573	0.036321	–0.318618	0.7515
$\Delta \ln s_{K,it}$	0.189578	0.002597	72.99770	0.0000
$\Delta \ln s_{H,it}$	2.941733	1.066607	2.758030	0.0084
$\Delta \ln TR_{it}$	0.157772	0.049129	3.211408	0.0024
$\Delta \ln (n + g + \delta)_{it-2}$	–0.150814	0.091731	–1.644098	0.1071
Δg_{it}	0.936904	0.224209	4.178709	0.0001

Note: All variables are stated in first differences.
Source: Own estimations based on data from *Penn World Table*, version 9.0, of the GGDC of the University of Groningen; the INEGI of Mexico; the US Department of Commerce, and Canada's National Statistical Agency.

Table 6 shows the results of the second panel regression model, which was estimated by the AB-GMM dynamic panel estimator. All variables were subjected to first differencing to suppress the individual effect (μ_i), so that the instrumental variables could satisfy the orthogonality conditions. We can see that the parameter estimates of physical capital stock per person ($\Delta \ln s_{K,it}$), human capital formation ($\Delta \ln s_{H,it}$), international trade as a share of GDP ($\Delta \ln TR_{it}$) and TFP (Δg_{it}), are all positive and statistically significant at the 1% level. The implication is that these four variables are directly related to GDP per capita ($\Delta \ln y_{it}$). At the same time, $\Delta \ln (n + g + \delta)_{it-2}$ has a negative sign that is borderline significant (*i.e.*, its probability value is slightly higher than 0.10).

In brief, the empirical evidence is consistent across econometric methodologies as to the main sources of economic growth. The most important point, however, relates to the positive impact that international trade and human capital formation have on GDP per capita. The estimated coefficient of human capital formation indicates that, regardless of the econometric technique employed, this variable is a major determinant of GDP per capita growth.

6. SOME WINNERS AND LOSERS IN THE CONTEXT OF NAFTA

Conventional economic theory contends that international trade produces a net gain for each of the countries involved. Nonetheless, within each country one can always identify winners and losers. The winners are supposed to gain more than the losers lose, so that the country overall can obtain a net benefit. In this context, this section identifies some winners and losers in the case of Mexico.

In their analysis of the Mexican economic transformation under NAFTA, Gereffi and Martínez (2005, p. 126) recommend focusing on export performance given that the country's development strategy is predominantly export-oriented. Therefore, our identification of winners and losers under NAFTA is based on the export performance of different industries in the US market. The export performance of each industry is assessed in terms of import market shares (IMSs) in the US. To calculate Mexico's shares in the US import market, we resort to Lall's (2000) methodology and to the Standard International Trade Classification (SITC) Revision 3.

In this perspective, the following steps were taken: First, Mexico's exports are classified into several groupings, which are then assigned to five technology categories: 1) primary products, 2) resource based, 3) low technology, 4) medium technology, and 5) high technology. Second, these categories are further decomposed into subcategories, each one with different technology characteristics (see Table 7). Third, by means of the same procedure, US imports from the rest of the world are classified. Finally, Mexico's shares in the US import market are calculated for each category and subcategory of products. These shares are referred to as import market shares (IMSs). Table 7 shows the outcome of these calculations for categories of goods (1) through (5) and their corresponding subcategories. This is done for selected years over the 1994-2017 period.

Table 7 shows the evolution of Mexico's shares in the US import market since 1994. From this standpoint, the main winners were the automotive industry (MT1), the agroforest-based manufactures (RB1), and the electronic and electrical products (HT1). Of course, the most remarkable progress in terms of IMS gained in the US was in automotive products, given that this industry almost quadrupled its IMS in the US during the 1994-2017 period. The second place is for the Mexican agro-

Table 7. Mexico's shares in the US imports by technology category and subcategory of products (%)

	1994	1998	2002	2006	2010	2014	2017
Primary products (PP)	NA	NA	15.67	14.01	14.57	14.73	15.32
Resource based (RB)	4.29	4.83	4.34	4.12	4.62	5.14	6.70
RB1: Agro/forest based	4.28	5.91	7.60	8.35	10.59	11.24	12.28
RB2: Other products	4.30	3.94	2.21	1.97	1.75	1.84	2.46
Low technology (LT)	5.40	9.28	9.12	6.96	6.61	7.48	7.43
LT1: Textile/fashion cluster	4.47	10.17	9.64	5.90	4.35	4.19	4.21
LT2: Other products	6.32	8.43	8.71	7.68	8.22	9.72	9.38
Medium technology (MT)	9.03	12.87	14.43	13.88	17.37	19.43	21.15
MT1: Automotive products	7.42	13.83	15.67	15.64	22.40	26.25	29.06
MT2: Process products	5.15	6.91	5.67	5.93	5.35	6.48	6.92
MT3: Engineering industries	11.50	13.42	15.33	14.82	17.46	18.31	18.77
High technology (HT)	7.48	11.16	13.45	12.06	13.27	11.57	12.17
HT1: Electronic and electrical products	8.23	12.78	15.97	14.72	16.58	14.23	15.18
HT2: Other products	3.41	4.38	6.03	3.98	3.66	4.68	4.73

Notes: 1) NA = Not available. 2) The import market shares in the US of, say, Mexican automotive products, is the percentage participation of Mexican automotive exports in total US automotive imports.
Source: Own estimations based on data from the International Trade Administration of the US Department of Commerce.

forest-based industry, whose IMS rose from 4.28% in 1994 to 12.28% in 2017. Finally, the third place goes for electrical and electronic products, whose IMS increased from 8.23% in 1994 to 15.18% in 2017.

The auto industry is undoubtedly the jewel of the crown, but its success history began years before the advent of NAFTA as this industry was part of the country's industrialization strategy during the import-substitution model (Moreno-Brid, 1996). Under this regime, specific government policies and decrees were implemented to support this industry in developing the productive capacity needed to face foreign competition.

Then, in the mid-1980s and more decisively after the implementation of NAFTA, trade protectionism gave way to a gradual liberalization process, paving the way for the automotive industry to become an export-oriented industry (Moreno-Brid, 1996).

The enactment of NAFTA meant easy access to the US market for firms located in Mexico, which in combination with low-cost row materials and a cheap workforce with different levels of qualification, gave rise to huge flows of FDI into the auto industry (Barragán and Usher, 2009). The continuous attraction of FDI was also sustained by a growing industrial and transportation infrastructure and by a manufacturing export boom (Middlebrook and Zepeda, 2003). Also, the Mexican auto industry became a promising recipient of FDI because the multinational enterprises were facing difficult times in the US and other mature markets due to high production costs, heavy regulations and increasing competition from Asian producers (Dávalos, 2016). In fact, the proliferation and consolidation of Global Value Chains (GVCs) in the auto industry and the key role given to Mexico in the North American production network were useful for multinational enterprises to lower production costs, restore profit margins and increase sales across the world (Dávalos, 2016).

On the negative side, it is fair to say that the textile-fashion cluster turned out to be a big loser. As Table 7 shows, this industry performed relatively well during the first seven-to-eight years of NAFTA. Such a trend, however, was ultimately reversed owing to the increasing competition from Chinese textile products in the US market, mainly after the accession of this country to the WTO in December 2001. In this manner, the share of Mexico's textile-fashion cluster in the US went down from 9.64% in 2002 to 4.21% in 2017.

This disappointing performance can be explained by several factors: First, apart from a deficient productive capacity, the domestic textile-fashion industry has been suffering from an underdeveloped public infrastructure and an obsolete technology (Sánchez, Vázquez, and Richardt, 2012). Second, there have been extended episodes of increasing or at least non-decreasing unit labor costs in the industry, given that labor productivity has failed to increase faster than wages over extended periods of time (Gazol, 2004). Third, there has been strong competition not only from China but from other Asian countries (Minian, Martínez, and Ibáñez, 2017).

Another industry that was certainly not a winner under NAFTA, but broadly speaking could manage to hold relatively steady in the US market was the primary products industry. As Table 7 indicates, this industry maintained an IMS in the US inside the interval of 14-to-16 percentage points over the 2002-2017 period. Within this industry, however, the Mexican agriculture has been a major cause for concern. Based on a comparative analysis, Ayvar, Navarro, and Armas (2018) show that the Mexican agriculture does not exhibit a revealed comparative advantage, as opposed to its North American counterparts. Under trade liberalization, the role of the Mexican government in fostering the national agriculture was significantly limited, given the suppression of producer price supports, the retrenchment of funds devoted to development programs, and the land reform (Calva, 2007). Secondly, not only did the trade opening process was exceedingly fast but it was also combined with an overvalued currency, which made things even harder for this sector (Calva, 2007).

In contrast, the US and Canadian agricultural sectors remained highly protected through government subsidies, which allowed them to develop a high-tech agriculture, thereby raising production and setting competitive prices (Cabrera, 2015).

7. CONCLUSIONS

Rather than undertaking a wide cross-country study as to the impact of trade on economic growth, we follow a case-by-case approach as suggested by some authors (Bhagwati and Srinivasan, 2002; Kneller, Morgan, and Kanchanahatakij, 2008). In this context, this paper assesses the impact of NAFTA on economic growth within the region. To carry out this task, we use an augmented version of the Solow growth model and estimate it by two complementary econometric methodologies. The first is FGLS with cross-section weights, which allows for a more efficient estimation of the regression parameters. The second is the AB dynamic panel GMM, which is consistent, robust to endogeneity problems, and requires no knowledge about the behavior of the error term.

Regardless of the econometric method employed, the empirical evidence leads to the following conclusions. First, GDP per capita responds positively to international trade, controlling for a whole set of variables: Total factor productivity, physical capital stock per capita, human capital formation, and the depreciation rate. Therefore, to a certain extent, NAFTA seems to have enhanced the output per capita of the countries involved, which makes our findings consistent with the orthodox view.

Although international trade seems to have produced a net gain for Mexico, the US and Canada, within each country one can always identify winners and losers and a brief exercise in this regard was conducted for the Mexican case. Of course, the new provisions stemming from the US-Mexico-Canada Agreement (USMCA) signed on November 30, 2018, represent a game changer for the three nations. In particular, the tougher rules of origin incorporated in this new trade deal are expected to render negative effects on the auto industry and the textile-fashion cluster (Burfisher, Lambert, and Matheson, 2019).

The second conclusion of this paper is that human capital formation is the most prominent source of GDP per capita growth. This evidence underlines the importance of devoting more resources to long-term formal education, short-term training programs, and the entire knowledge transferring network. This is especially true in the case of Mexico given that: 1) its labor force is less qualified than that of the US and Canada, and 2) the Mexican government has been prone to reduce educational expenditure to improve public finances.

Finally, our evidence shows that GDP per capita is also a direct function of physical capital per person and TFP. While physical capital accumulation stems from the acquisition of machinery, equipment and infrastructure, TFP basically relates to technological change. In this context, the parameter estimates provided are in line with the notion that human capital formation, physical capital accumulation, TFP, and international trade interact dynamically to raise economic growth. The salient role played by human capital accumulation in generating economic growth brings attention to the fact that education and training become more critical as industries develop and move toward the global technology frontier. ◄

REFERENCES

Abbott, F. (2000). NAFTA and the legalization of world politics: A case study. *International Organization*, 54(3), pp. 519-547.

Aghion, P., and Howitt, P. (2009). *The Economics of Growth*. Cambridge, MA: The MIT Press.

Ahn, S., and Schmidt, P. (1995). Efficient estimation of models for dynamic panel data. *Journal of Econometrics*, 68(1), pp. 5-27.

Arellano, M., and Bond, S. (1991). Some test of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), pp. 277-297.

Ayvar, F., Navarro, L., and Armas, E. (2018). *La competitividad del sector agropecuario de México en el marco el Tratado de Libre Comercio de América del Norte*. In: J.E. Isaac Egurrola and R.E. Rózga Luter (coords.), *Dinámica económica y procesos de innovación en el desarrollo regional*. Ciudad de México: Universidad Nacional Autónoma de México (UNAM) y Asociación Mexicana de Ciencias para el Desarrollo Regional A.C.

Baltagi, B. (2008). *Econometric Analysis of Panel Data*. Chichester, West Sussex: John Wiley and Sons Ltd.

Barragán, S., and Usher, J. (2009). The role of multinationals in the host country: Spillover effects from the presence of auto car makers in Mexico. *Contaduría y Administración*, 228, pp. 83-104.

Bhagwati, J., and Srinivasan, T.N. (2002). Trade and poverty in the poor countries. *American Economic Review*, 92(2), pp. 180-183.

Burfisher, M., Lambert, F., and Matheson, T. (2019). *NAFTA to USMCA: What is gained?* [IMF Working Paper no. 19/73]. [online] Available through: International Monetary Fund, <https://www.imf.org/en/Publications/WP/Issues/2019/03/26/NAFTA-to-USMCA-What-is-Gained-46680 >.

Cabrera, S. (2015). Las reformas en México y el TLCAN. *Problemas del Desarrollo*, 46(46), pp. 77-101.

Calva, J.L. (2007). Políticas de desarrollo agropecuario. In: J.L. Calva (coord.), *Desarrollo agropecuario, forestal y pesquero. Agenda para el desarrollo* (vol. 9). Ciudad de México: UNAM y Miguel Ángel Porrúa.

Dávalos, E. (2016). Trump, Mexico's auto industry, and NAFTA. *Voices of Mexico*, 102, pp. 19-22. [online] Available through: <http://www.revistascisan.unam.mx/Voices/no102.php>.

Dollar, D. (1992). Outward-oriented developing countries really do grow more rapidly: Evidence from 95 LDCs 1976-85. *Economic Development and Cultural Change*, 40(3), pp. 523-544.

Dreger, C., and Herzer, D. (2013). A further examination of the export-led growth hypothesis. *Empirical Economics*, 45(1), pp. 39-60.

Edwards, S. (1998). Openness, productivity and growth: What do we really know? *Economic Journal*, 108(447), pp. 383-398.

Gazol, A. (2004). Ten years of NAFTA: A vision of the future. *EconomíaUNAM*, 1(3), pp. 9-29.

Gereffi, G., and Martínez, M. (2005). Mexico's economic transformation under NAFTA. In: R. Crandall, G. Paz and R. Roett (eds.). *Mexico's Democracy at Work: Political and Economic Dynamics*. Boulder, CO: Lynne Rienner Publishers.

Gonzaga, F. (2001). *Notes on trade and growth* [Textos para Discussão no. 166]. [online] Available through: Centro de Desenvolvimento e Planejamento Regional, Universidade Federal de Minas Gerais, <http://www.cedeplar.ufmg.br/pesquisas/td/TD%20166.pdf>.

Hamilton, J. 1994. *Time Series Analysis*. Princeton: Princeton University Press.

Hansen, L. (1982). Large sample properties of generalized method of moments estimators. *Econometrica*, 50(4), pp. 1029-1054.

Im, K., Pesaran, M., and Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), pp. 53-74.

Kneller, R., Morgan, C., and Kanchanahatakij, S. (2008). Trade liberalization and economic growth. *The World Economy*, 31(6), pp. 701-719.

Jung, W., and Marshall, P. (1985). Exports, growth and causality in developing countries. *Journal of Development Economics*, 18(1), pp. 1-12.

Lall, S. (2000). The technological structure and performance of developing country manufactured exports, 1985-98. *Oxford Development Studies*, 28(3), pp. 337-369.

Levin, A., Lin, C., and Chu, J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), pp. 1-24.

Maddala, G., and Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61(S1), pp. 631-52.

Mankiw, G., Romer, D., and Weil, D. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, 107(2), pp. 407-437.

Minian, I., Martínez, A., and Ibáñez, J. (2017). Technological Change and the Relocation of the Apparel Industry. *Problemas del Desarrollo*, 48(188). [online] Available at: <https://probdes.iiec.unam.mx/en/revistas/v48n188/body/v48n188a6_1.php>.

Middlebrook, K., and Zepeda, E. (2003). On the Political Economy of Mexican Development Policy. In: K. Middlebrook and E. Zepeda (eds), *Confronting Development: Assessing Mexico's Economic and Social Policy Challenges* (pp. 162-194). Stanford, CA: Stanford University Press.

Moreno-Brid, J. (1996). Mexico's auto industry after NAFTA: A successful experience in restructuring? [Kellogg Institute Working Paper no. 232]. [online] Available through: Kellogg Institute for International Studies, <https://kellogg.nd.edu/documents/1527>.

Moreno-Brid, J., Rivas, J., and Ruiz, P. (2005). La economía mexicana después del TLCAN. *Revista Galega de Economía*, 14(1-2), pp. 1-20.

Phillips, P., and Moon, H.R. (1999). Linear regression limit theory for nonstationary panel data. *Econometrica*, 67(5), pp. 1057-1111.

Rodríguez, F., and Rodrik, D. (2000). *Trade policy and economic growth: A Skeptic's guide to the cross-national evidence* [NBER Working Paper no. 7081]. [online] Available through: National Bureau of Economic Research, <http://www.nber.org/papers/w7081.pdf>.

Rohlf, F., and Sokal, R. (1995). *Statistical Tables*. San Francisco: Macmillan.

Sachs, J., Warner, A., Åslund, A., and Fischer, S. (1995). Economic reform and the process of global integration. *Brookings Papers on Economic Activity*, 1, pp. 1-118.

Salvatore, D., and Hatcher, T. (1991). Inward oriented and outward oriented trade strategies. *Journal of Development Studies*, 27(3), pp. 7-25.

Sánchez, J., Vázquez, M., and Richardt, L. (2012). Estrategias competitivas en la industria textil en Jalisco, ante la liberación comercial con China. In: *Red Internacional de Investigadores en Competitividad. Memoria del VI Congreso. La arquitectura financiera en las organizaciones para la competitividad*, 6(1). Available through: Red Internacional de Investigadores en Competitividad, <https://riico.net/index.php/riico/article/view/413>.

Shan, J., and Sun, F. (1998). On the export-led growth hypothesis for the little dragons: An empirical reinvestigation. *Atlantic Economic Journal*, 26(4), pp. 353-371.

Shan, J., and Sun, F. (2010). On the export-led growth hypothesis: The econometric evidence from China. *Applied Economics*, 30(8), pp. 1055-1065.

Solow, R. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics*, 106(2), pp. 327-368.

Winters, L. (2004). Trade liberalization and economic performance: An overview. *Economic Journal*, 114(493), pp. F4-F21.

Whalley, J. (1998). Why do countries seek regional trade agreements? In: J. Frankel (ed.), *The Regionalization of the World Economy* (pp. 63-90). Chicago: University of Chicago Press.