

NAFTA's impact on Mexico*

Esteban Colla-De-Robertis[†] Alfredo Del Rio Provencio[‡]

Amaranta Riva Palacio Ayala[§]

December 19, 2017

Very preliminary and incomplete.

Abstract

We evaluate the impact of NAFTA on the per capita gross domestic product of Mexico using the counterfactual analysis framework. The impact is the difference between the GDPPC that is observed versus the one that would have been observed in the absence of the intervention. To construct the counterfactual (Mexico without NAFTA) we use the synthetic control method. We do not find evidence of a positive effect of NAFTA on GDPP despite the increase in Mexico's trade with the USA and CAN. We find (weak) evidence of a negative impact. A possible explanation is lack of reforms to increase competitiveness in innovating sectors, before the signing of the NAFTA.

Keywords: NAFTA, Growth Empirics, Innovation, Reforms, Impact Evaluation, Synthetic control method.

JEL Codes: F43, F14, F15

*The article expresses exclusively views of the authors, and does not necessarily reflect the opinions of the institutions to which the authors are affiliated.

[†]Corresponding author. Universidad Panamericana. Escuela de Gobierno y Economía. Augusto Rodin 498, México, Ciudad de México, 03920, México. ecolla@up.edu.mx

[‡]Deloitte México - aldelrio@deloittemx.com

[§]Beam Suntory México - amaranta.riva.palacio@beamsuntory.com

1 Introduction

We evaluate the impact of NAFTA on the per capita gross domestic product of Mexico (GDPPC) using the counterfactual analysis framework proposed by Rosenbaum & Rubin (1983). The impact is the difference between the GDPPC that is observed versus the one that would have been observed in the absence of the intervention. To construct the counterfactual (Mexico without NAFTA) we use the synthetic control method (Abadie & Gardeazabal (2003), Abadie et al, 2010 textbf ADH).

Validity of NAFTA: January 1, 1994 (USA, CAN). Fall of the GDPPC during the 80'. Post-crisis reforms of 70's and 80's: liberalizations (1986, 1990's). The construction of the counterfactual is difficult. A positive impact could be confused with reforms after the fall. Poor performance of Mexico compared to other emerging countries in the last two decades.

2 Literature Review

Dornbusch & Werner (1994), Kehoe & Ruhl (2010), Billmeier & Nannicini (2013), Treffer (2004)

2.1 Empirics of growth

Model uncertainty - Bayesian model averaging

- Endogeneity

- Effect of FTA's on growth

- Effect of R&D on growth

- Effect of competition on growth

3 Methodology

Synthetic Mexico is defined as a weighted average of countries (chosen from a pool of donors) that did not receive treatment). Countries with GDPPC and GDPPC predictors similar to Mexico are chosen for a long period prior to the intervention.

For any semi-definite positive matrix V , $\|u\| = \sqrt{u'Vu}$ defines a semi-norm. Synthetic control $W^* = (w_2^*, w_3^*, \dots, w_{J+1}^*)'$ is chosen to minimize $\|X_1 - X_0W\|$ subject to W being in the J -simplex (greater than 0 and adding 1), where J is the number of donors. V is chosen to weight the predictors according to their predictive power over the impact variable. X_1 is a vector that contains the predictors for the unit treated (Mexico) in the period before the intervention, X_0 is an array with J columns that contains the values of the same variables for donors. In this way the function to be minimized is $\sum_{m=1}^k v_m (X_{1m} - X_{0m}W)^2$, where v_m are the weights of each predictor and k is the number of predictors.

Procedure to implement the method is as follows: Identify predictors of the impacted variable (GDPPC), identify donor countries to build synthetic Mexico, choose a method to establish the weights of the predictors (inner maximization), choose weights from donor countries (outer maximization). Assess the goodness of fit in the period prior to treatment (GDPPC of synthetic Mexico vs. GDPPC of Mexico observed) and perform placebo tests to establish the significance of the impact estimate. (**synth** on untreated donors.)

It is recommended to choose good predictors of GDPPC. It is also convenient that the pre-treatment period is long (capture trend), and it should include some lags of the GDPPC indicative of its tendency in the pre-treatment (not all because the predictors lose explanatory power). Also, exclude countries that received similar treatments. Other FTAs with USA and Canada should be removed from the donor pool. Finally, values of the predictors of the donor pool should be similar to Mexico.

4 Data

pwt90 (Feenstra et al. 2015), **WDI**

Pre-treatment: 1950-1993

Post-treatment: 1994-2014

Pool: 35 countries for which there are info on predictors and have not received similar treat-

ments throughout the period. A pool of about 100 countries can be used if the period considered is smaller (1970-1994).

The pool of donors exclude countries with an FTA with USA or Canada. See Table 1.

The following articles also use the method to synthesize the GDPPC (or its growth). Note that there are predictors that are commonly used:

Abadie & Gardeazabal (2003) Pop density, investment share, sectoral shares, human capital (several indices)

Billmeier & Nannicini (2013) Pop growth, human capital (secondary school enrollment), investment share, inflation, democracy.

Cavallo et al. (2013) Trade openness, stock capital, land area, pop, human capital (secondary enrollment), latitude, polity2.

Abadie et al. (2015) Trade openness, inflation rate, industry share, human capital (schooling), investment rate.

5 Results

Table 2 shows predictors and source.

Table 3 shows the composition of synthetic Mexico and table 4 shows the average value for the predictors for Mexico and its synthetic Mexico. In general, there is strong similarity between both.

Table 5 shows the relative importance of each predictor. TFP is a strong predictor of growth, while other predictors are not relevant at all.

GDPPC path of the real and of the synthetic Mexico is shown in figure 1. Note the lower GDPPC of the real Mexico since 1994 and figure 2 shows the difference of this effect.

A placebo study is exhibited in figure 3. It replicates the procedure for each of the donors. Mexico is below most of the countries, which means that the effect is presumably not due to randomness.

Table 4 shows the probability of a random effect (Cavallo et al. 2013).

Robustness (to be done): Larger pool, fewer periods, different combinations of predictors, treatment in different years. (time-placebos), inclusion of countries with FTA with USA after NAFTA (similar to Mexico, such as Chile, Peru, Colombia).

6 Discussion

We did not find evidence of a positive effect of NAFTA on GDPP despite the increase in Mexico's trade with the USA and CAN.

Weak evidence of a negative effect. Robustness checks needed: Incorporation of shares of sectors and indices of institutional strength. Same study for another case (Chile, Colombia).

NAFTA did not have a positive effect Mexican GDPPC. Which of the mechanisms suggested by the literature did not work?

Market size effect: Commercial openness increases the size of markets that can be targeted by successful innovators. Elimination of trade barriers increases the scale of production and the possibility of learning-by-doing externalities (Alesina et al. 2005).

Spillover effect: Knowledge spillovers from more developed to less developed countries should be produced (Keller 2004).

Competition effect: After liberalization, foreign producers would compete with domestic producers. This competition purifies the local industry and forces domestic producers to innovate (Trefler 2004).

The abovementioned effects may require the implementation of reforms previous to the signing of the agreement. Weak institutions (Rodrik et al. 2004). Failure to convert gains from liberalization reforms Dornbusch & Werner (1994), Kehoe & Ruhl (2010).

Can there be a negative effect of the commercial opening on the GDPPC? Aghion & Howitt (2009 ch15) points out the need of reforms promoting innovations before the free trade agreement. If these reforms in the home country have been implemented recently, the home country may still

be behind the foreign country in all sectors, and all innovating monopolies will choose to reside in the foreign country and remain there forever.

To convert benefits of a free trade agreement, reforms that improve productivity should be implemented (Aghion & Howitt 2009) previously.

Rodrik et al. (2004): Institutions rule: they have primacy over geography and integration in economic development. Were the reforms sufficient during the previous 10 years? NAFTA would not create incentives to resolve institutional weakness or insecurity (implicit in the TFP).

7 Concluding remarks

Current debate on the possible effect of USA's opting out from NAFTA.

Importance of reforms and it's timing.

References

- Abadie, A., Diamond, A. & Hainmueller, J. (2015), 'Comparative Politics and the Synthetic Control Method', *American Journal of Political Science* **59**(2), 495–510.
- Abadie, A. & Gardeazabal, J. (2003), 'The Economic Costs of Conflict: A Case Study of the Basque Country', *American Economic Review* **93**(1), 113–132.
- Aghion, P. & Howitt, P. (2009), *The Economics of Growth*, Vol. 1 of *MIT Press Books*, The MIT Press.
- Alesina, A., Spolaore, E. & Wacziarg, R. (2005), Trade, Growth and the Size of Countries, in P. Aghion & S. Durlauf, eds, 'Handbook of Economic Growth', *Handbook of Economic Growth*, Elsevier, chapter 23, pp. 1499–1542.
- Billmeier, A. & Nannicini, T. (2013), 'Assessing Economic Liberalization Episodes: A Synthetic Control Approach', *The Review of Economics and Statistics* **95**(3), 983–1001.
- Cavallo, E., Galiani, S., Noy, I. & Pantano, J. (2013), 'Catastrophic Natural Disasters and Economic Growth', *The Review of Economics and Statistics* **95**(5), 1549–1561.
- Dornbusch, R. & Werner, A. (1994), 'Mexico: Stabilization, reform, and no growth', *Brookings Papers on Economic Activity* **25**(1), 253–316.
- Feenstra, R. C., Inklaar, R. & Timmer, M. P. (2015), 'The Next Generation of the Penn World Table', *American Economic Review* **105**(10), 3150–3182.
- Kehoe, T. J. & Ruhl, K. J. (2010), 'Why Have Economic Reforms in Mexico Not Generated Growth?', *Journal of Economic Literature* **48**(4), 1005–1027.
- Keller, W. (2004), 'International Technology Diffusion', *Journal of Economic Literature* **42**(3), 752–782.

- Rodrik, D., Subramanian, A. & Trebbi, F. (2004), 'Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development', *Journal of Economic Growth* **9**(2), 131–165.
- Rosenbaum, P. R. & Rubin, D. B. (1983), 'The central role of the propensity score in observational studies for causal effects', *Biometrika* **70**, 41–55.
- Trefler, D. (2004), 'The Long and Short of the Canada-U. S. Free Trade Agreement', *American Economic Review* **94**(4), 870–895.

Tables

Year	USA	CAN
1985	Israel	
1994	NAFTA (Mexico, Canada)	NAFTA (Mexico, USA)
1997		Israel
1998		Chile
2001	Jordan	
2003		Costa Rica
2004	Chile, Singapore	
2005	CAFTA (Honduras, El Salvador Guatemala, Costa Rica Nicaragua, Dominican Republic)	
2006	Bahrain, Morocco, Oman	
2007	Peru	
2010		EFTA (Iceland, Liechtenstein, Norway, Switzerland), Peru
2012	Panama, Colombia South Korea	Colombia
2013		Jordan
2014		Panama
2015		Honduras, South Korea

Table 1: FTA's with USA/CAN.

Predictor of GDPPC	Source
human capital	pwt90
TFP	pwt90
trade (M + X) as % of GDP	pwt90
GDPPC in 1960, 1970, 1980, 1990	pwt90
inflation	pwt90
population growth	pwt90
stock of capital	wdi
investment rate	wdi

Table 2: Predictors

id	Country	Weight
9	Ecuador	.169
18	Japan	.075
29	T. Tobago	.204
30	Turkey	.388
32	Venezuela	.017
33	S. Africa	.147

Table 3: Synthetic Mexico.

Predictor	Treated	Synthetic
ctfp	0.9663	0.9663
openness	0.1073	0.2521
hc	1.8014	1.7998
popg	0.0277	0.0222
inflation	0.0637	0.0557
csh_i	0.2096	0.2094
pre-gdppc	8474	8472

Table 4: Average of predictors (pre-treatment period) for Mexico and Synthetic Mexico.

	ctfp	open	hc	popg	infl	csh_i	pre-gdppc
ctfp	0.772						
openness	0	0					
hc	0	0	0.006				
popg	0	0	0	0			
inflation	0	0	0	0	0		
csh_i	0	0	0	0	0	0.002	
pre-gdppc	0	0	0	0	0	0	0.218

Table 5: Weight of predictors.

Figures

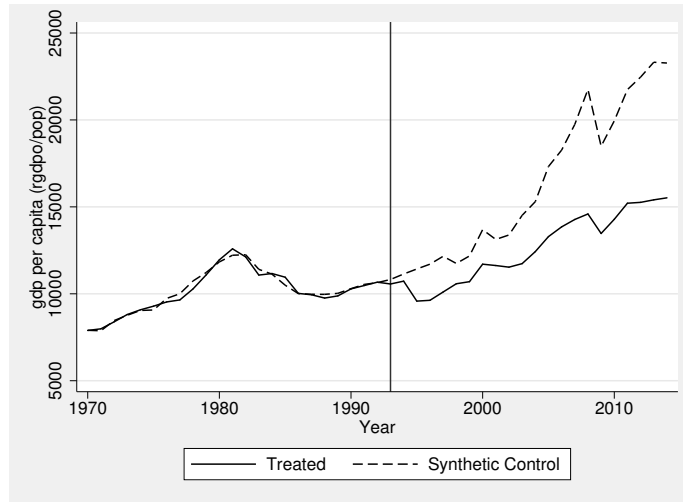


Figure 1: Real and Synthetic Mexico.

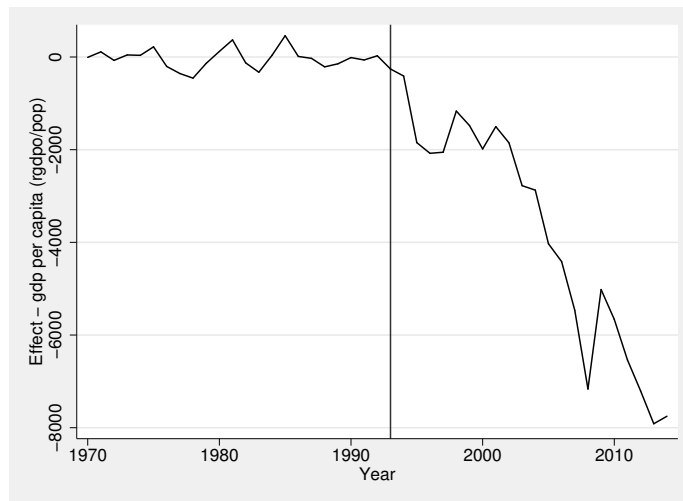


Figure 2: Effect on GDPPC.

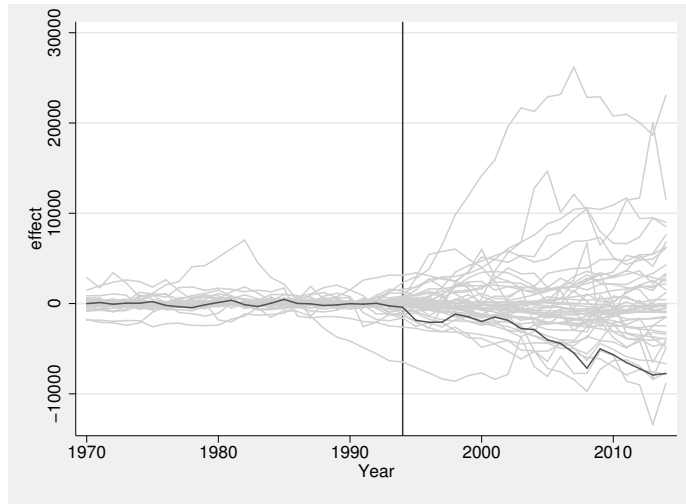


Figure 3: Mexico and placebo effects.

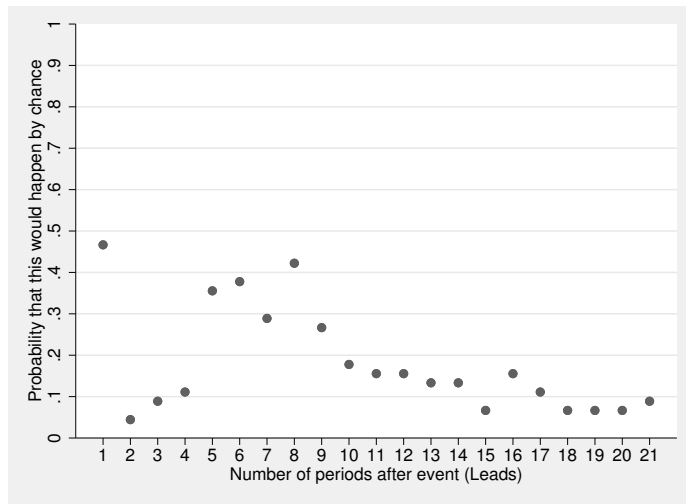


Figure 4: Probabilities that the effect is random; see Cavallo et al. (2013).

Appendix A.