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POLITICAL-BUSINESS CYCLE AND CAPITAL FORMATION IN MEXICO, 1993.1-2016.4

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ABSTRACT

The relationship between political-business cycle and capital formation is studied in Mexico along 1993.1-2016.4. The political-business cycle theory (PBC) argues that economies experience expansions in elections times and, as consequence, slowdowns in the first year of the new presidential government. Time series and dynamic panel data models allow to confirm this hypothesis: for each federal government, the capital formation is higher in the last year than the first year. This result is evidence of an artificially created political-business cycle distorting the market signals and the decisions of production. Consequences for the economy are more than visible: displacements of aggregate demand originating economic recessions.

Keywords: political-business cycle, capital formation, unit roots, dynamic panel data

JEL Classification: C22, E22, E32, O11

INTRODUCTION

Contemporary democracies consist in a political model based in the periodical and programmed succession of authorities of government, which nests the denominated political cycle. This process emerges when incumbent governments seek to retain political power and, directly or indirectly, to influence in the electoral processes. They seek to create a climate of economic certainty, rising expenditures, and investments in electoral years to handle the citizen's vote to their party favor. Generally, it is necessary to adjust the budget in the first year of the new government to compensate the excessive expenditure committed in the past electoral year.

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The idea on how the political-business cycle (PBC) may distort the market signals and the decisions of production and demand, has received much attention since it was originally stated by Nordhaus (1975) and followed afterwards by other authors. Hibbs (1977) presented a model where policymakers have different macroeconomic goals; Rogoff and Sibert (1988) and Rogoff (1990) introduce imperfect information; Alesina (1987, 1988) proposes a partisan postelectoral cycle that is consistent with rational expectations; Drazen (2000) presents a model of political budget cycles including monetary and fiscal policy in a rational opportunistic framework. More recently, Brender and Drazen (2005) find a political deficit cycle in countries with weak democracy; Ferris (2008) finds political opportunism in the monetary policy of Canada; in Klomp and de Haan (2013) fiscal policies have a significant effect on the electoral support for the political parties in government, mainly in countries with a political budget cycle. In Foremny and Riedel (2014) the timing of the elections affects the tax policy of German municipalities, while Bove, Efthyvoulou and Navas (2017) develop a theoretical model to explain the trade-off between social and military expenditure that increases the re-election chances of politicians.

One of the most sensible sectors at the PBC is the construction, or the capital formation. It has been extensively analyzed in developed economies (Alesina and Roubini 1992, and Alesina, Roubini and Cohen 1999), but there is scarce evidence for developing countries. The capital formation, artificially generated in electoral periods, has serious consequences on overall economy because it can cause setbacks on aggregate demand, and reduce the investment and employment. In summary, it sends wrong signals to decision makers of the private sector about the market behavior.

In emerging countries this kind of studies began to appear in the nineties. Some examples are Larrain and Assael (1995, 1997) in Chile, Ogura (2000) in Brazil, Ergun (2000) in Turkey, and Lopez, Gallón and Fresard (2002) in Colombia. Later, Riesco Urrejola (2008) analyzes a set of ten Latin American countries, using both instruments of monetary and fiscal policies.

In Mexico, Gámez and Botello (1987) analyzed the relationship between the presidential cycle and some macroeconomic variables. They find that presidential cycle significantly influences the behavior of public expenditures, exports, and aggregate income. Magaloni (2000), in the 1970 to 1998 period, estimates significant increases in public expenditures, private consumption, and the growth of the economy before elections, while Grier and Grier (2000) study the timing between electoral cycles and economic growth and inflation uncertainty in Mexico. They identify a significant economic collapse, elections create but not resolve the inflation uncertainty. Costa-i-Font, Rodriguez-Oreggia and Lunapla (2003) highlight a political opportunism in the regional allocation of the public investment in Mexico. Also, capital formation and labor productivity tend to slow down in the first year of each presidential government of Mexico (Gámez 2012a and

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2012b and Germán-Soto and Gámez 2017). However, until now, statistical evidence analyzing the stochastic properties of the capital formation and the changes registered in time have not been reported.

This work uses techniques of time series and dynamic panel models to measure the changes in capital formation in both electoral and not electoral periods. Database considers national-wide values on the most important components of the capital formation. Results indicate that PBC and capital formation are quite linked in the political transition period, which could have serious consequences on the economic activity.

The structure of the work is as follows. First section treats theoretical aspects of the political-business cycle and reviews some empirical works on Mexico. Second section shows some stylized facts of the capital formation behavior in the last four replacements of the Mexican federal administration. Third section presents the data, whereas fourth section describes the methodology used in the analysis. Fifth and sixth sections discuss the results and conclusions, respectively.

1. THE PBC THEORETICAL FRAMEWORK AND EMPIRICAL EVIDENCE ON MEXICO

1.1. The PBC framework

The logic behind of the PBC theory is very simple: it starts with the fact that the state of an economy influences the voting intention of the citizens. That is, if the economy is in good shape, the voters tend to award the party in power voting in its favor. However, if the economy is in bad shape, the voters tend to punish the party in power, voting for the opposite party. In other words, the state of the economy affects the probabilities of victory of the incumbent party.

If that is so, and the incumbent government knows it, or sense it, then he has a powerful incentive “to improve” the economic conditions in the months previous to elections, even if this improvement is transitory. This way, the governments can influence the perception of the voters and increase their probabilities to have a victory in the elections.

After the elections, the capital formation will be less than expected, then output declines. This means that post-electoral years are recessives. Otherwise, in the election time, government increases the expenditure, and consequently increases the output, and an expansion moment has place. Voters are manipulated, and this situation can be demonstrated analyzing the behavior of the capital formation in the election years in comparison to those of non-election.

1.2. Review of studies on Mexico

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Mexican experience is widely conclusive on the existence of political cycle. For Grier and Grier (2000) elections create but not resolve the inflation uncertainty. Gonzalez (2002) highlights systematic use of public spending in infrastructure and current transfers as a means to earn votes. Costa-i-Font, Rodriguez-Oreggia and Lunapla (2003) highlight a political opportunism in the regional allocation of the public investment. The greatest effect of the PBC is in the change of presidential administration. One of the main characteristics of the Mexican economy is the so called "curse of the first year". This is the deceleration (or contraction) that the Mexican economy has passed in the first year of the new regime since the administration of Miguel Aleman, in 1947. In eleven of the last twelve presidential terms (*sexenios*) the economy has decelerated in the first year of the new regime. In three occasions (1983, 1995, and 2001) this deceleration has represented negative growth rates (Gámez 2012a; Amarillas, Gámez and Reyes 2016).

An explanation leads to the behavior of public expenditures, with strong expansions in the last year of each *sexenio*, followed by contractions in the first year of the next administration. This pattern is notorious in capital expenditures, which includes infrastructure and public works (Gámez and Amarillas 2011). One of the most affected sectors is the investment, or the capital formation.

Gámez (2012a) studied the political cycle and the aggregate demand between 1981 and 2010. He finds evidence of an expansion in aggregate demand, in the last year of each administration, followed by a contraction in the first year of the next government. He also finds a sharp pattern in domestic demand, especially for capital formation.

Amarillas et al. (2016) study the effects of the presidential transition in the economic activity along 1994-2013. This stage covers four presidential transitions that presented deceleration of the economic activity in the first year of each administration, especially in sectors oriented to domestic market: 1994-1995, 2000-2001, 2006-2007, and 2012-2013.

Germán-Soto and Gámez (2017) study the effect of the PBC on manufacturing productivity along 1993 to 2014. They detect that productivity returns are smaller in the quarters following the change of *sexenio* than in the other periods. Besides, the elasticity falls in the first year of government and increases in the last.

2. MEXICO: STYLIZED FACTS ON CAPITAL FORMATION

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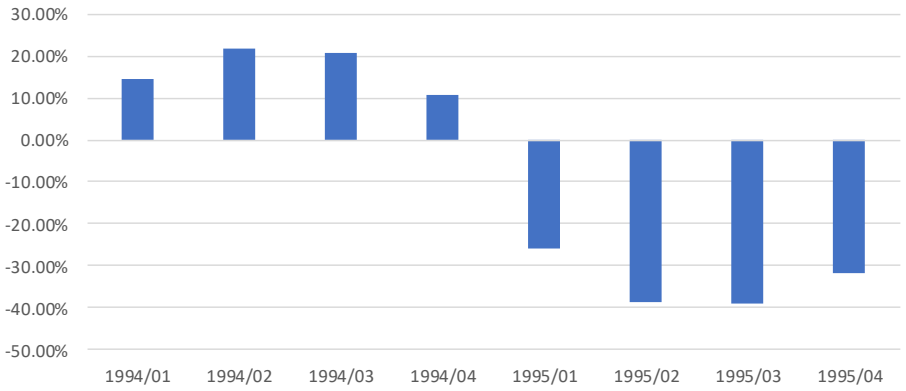
The capital formation in Mexico presents some regularity in the last four presidential transitions, which can give place to what can be known as stylized facts.[1] In the last year of the administration of Carlos Salinas de Gortari (1989-1994), the capital formation grew 12.9%, in average (Fig. 1). This situation reversed in the first year of the *sexenio* of Ernesto Zedillo (1995-2000). Negative rates were registered in the four quarters of his first year, averaging a rate of -25.3%.

During the transition from the presidency of Ernesto Zedillo to Vicente Fox, between 2000 and 2001 (Fig. 2), a similar pattern is observed, although now it is less sharp. In the last year of the Zedillo regime, the capital formation grew 8.3%, in average. This situation was reversed in the first year of Vicente Fox (2001-2006), with a rate of growth of -3.3%.

Fig. 1: Capital formation growth by political transition period: from Carlos Salinas to Ernesto Zedillo: 1994-1995



Source: Own elaboration.

[1] Presidential transition is conformed as the last year of each administration and the first one of the following administration.

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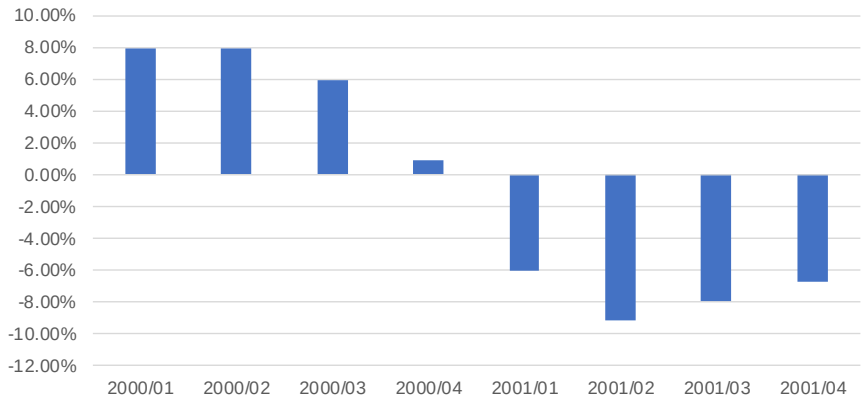
Fig. 2: Capital formation growth by political transition period: from Ernesto Zedillo to Vicente Fox: 2000-2001

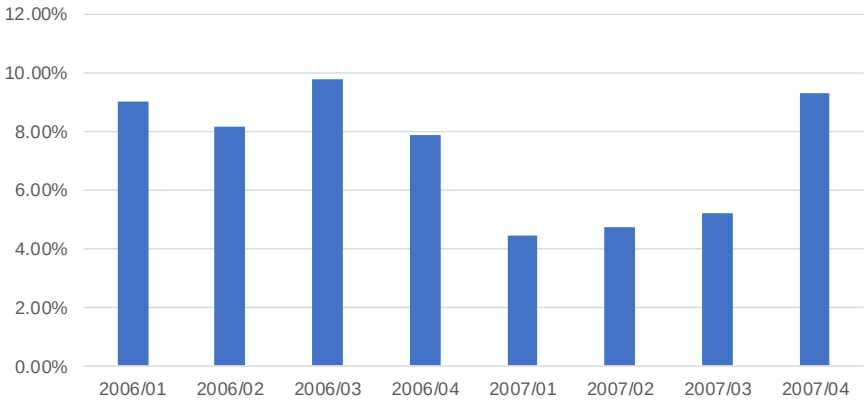


Source: Own elaboration.

In the transition of power from Vicente Fox to Felipe Calderón (2006-2007, Fig. 3) there is a deceleration in the capital formation, although this time negative rates are not registered. The capital formation averaged 8.7% in the last year of Vicente Fox, but it fell to 5.8% in the following year.

Finally, in the transition from Felipe Calderón to Enrique Peña Nieto (2012 to 2013, Fig. 4), negative rates of the capital formation appeared again in the first year of the new administration. Average growth in the last year of the *sexenio* of Calderón was 4.8%, whereas it decreased -1.5% in the first year of Peña Nieto President.

Fig. 3: Capital formation growth by political transition period: from Vicente Fox to Felipe Calderón: 2006-2007



Source: Own elaboration.

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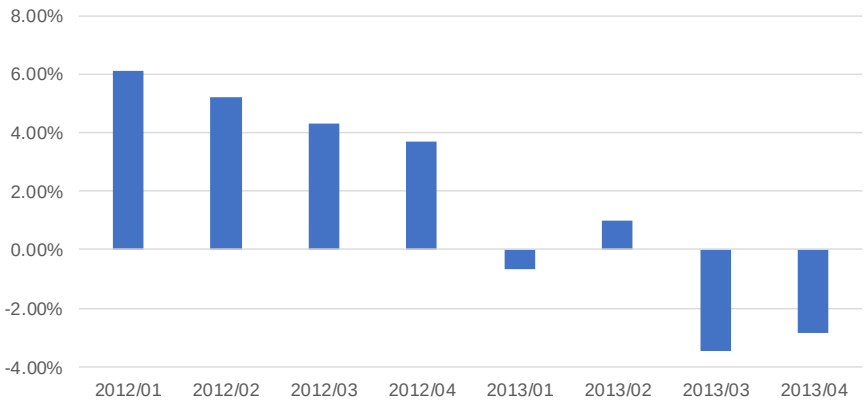
Fig. 4: Capital formation growth by political transition period: from Felipe Calderón to Enrique Peña Nieto: 2012-2013



Source: Own elaboration.

Table 1 contains the rates of growth for the presidential transitions reflected on the Fig. 1 to Fig. 4. The analysis is for the total capital formation (TCF) and its main sectors: construction (CONST), machinery and equipment (M&E), and private (PRIV) and public (PUB) investment. It is evident that capital formation is in disadvantage in the quarters of initial years of each administration. During 1993-2016, the construction sector represented 71.2% of the capital formation, whereas the remaining 28.2% is for machinery and equipment. Both components have a cyclical behavior, especially construction, which averages a rate of growth of 7.7% in the last year, but it is negative in the first year (-10.2%).

Table 1: Growth rates of the capital formation in political transition periods, 1993-2016

Quarter	TCF	CONST	M&E	PRIV	PUB
-4	9.4	7.8	12.3	10.5	8.0
-3	10.8	10.4	10.6	11.5	11.4
-2	10.2	9.3	11.7	10.9	10.5
-1	5.8	3.4	11.2	7.7	-0.7
1	-7.1	-8.0	-5.5	-7.1	-6.5
2	-10.6	-12.6	-6.8	-10.8	-7.7
3	-11.3	-12.3	-9.3	-11.4	-9.8
4	-8.0	-7.3	-10.5	-10.4	2.5
Last year average	9.0	7.7	11.5	10.1	7.3

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First year average	-9.2	-10.2	-8.0	-9.9	-5.4
Overall average	3.4	2.3	6.6	3.4	4.4

Notes: for each presidential administration, quarters labeled as -4 to -1 correspond at the last year,

while those labeled as 1 to 4 are for the first year. TCF: total capital formation, CONST: construction, M&E: machinery and equipment, PRIV: private investment, PUB: public investment.

Source: own elaboration.

Distribution of the capital formation between private and public sectors is 80.3%, for the first, and 19.7%, for the second. Also, the political cycle is important in the private investment, which grew 10.1% in the quarters of the last year of government and -9.9% for those of the first year. The study of capital formation between public and private capital is relevant. For example, in other countries this link is quite powerful. Everaert and Heylen (2001) study the impact of public capital formation and the productivity of the private sector in Belgium in the 1953-1996 period. They find a strong positive relationship between public capital formation and the productivity of the rest of the economy and the private investment. Also, Altar and Samuel (2004) show that public capital formation has a powerful impact in the productivity of private capital, due to the intertemporal effect of public expenditures have on the private sector. Therefore, for the Mexican case, we suspicious that private capital formation follows a similar cycle that public capital.

3. THE DATA

The capital formation series are from *INEGI: Banco de Información Económica* (BIE).[2] These values are at constant prices of the base year 2008 and measured in millions of pesos. Main disaggregation of the capital formation is on construction, machinery and equipment, and private and public investment. In addition, INEGI provides information about residential and non-residential construction. Then, besides to the total series, it is possible to consider until 16 branches of the capital formation.

Data is available from the first quarter of 1993 to fourth quarter of 2016. This period contains four presidential transitions corresponding to the years 1994-1995, 2000-2001, 2006-2007, and 2012-2013. With this statistical information it is possible to analyze the impact of the PBC in the capital formation.

[2] Economic Information Database (BIE, by its acronym in Spanish). See the INEGI web page: http://www.inegi.org.mx/sistemas/bie/ (accessed on April 12th, 2018).

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4. METHODOLOGY

Firstly, the business-cycle of the capital formation is estimated through the Hodrick-Prescott filter. Then, estimates are used to calculate the changes of elasticity along the period. This second part of the method is based on univariant tests of stationarity and dynamic panel data regression. Finally, results can be used to compare if the cycles of the capital formation are higher in the quarters of the final year of each presidential administration than those of the initial years.

Considers a time series, Y_t, describing a data generator process (DGP) as follows:

$$Y_t = \rho Y_{t-1} + u_t \qquad (1)$$

where (1) is an autoregressive process of first order and the ρ-coefficient allows to see if the process is or not stationary. Commonly, this type of processes will be non-stationaries – but their first differences generally are stationaries – unless residual term is spherical. Due to the endogeneity problem, Dickey and Fuller (1979), Phillips and Perron (1988), Elliot, Rotenberg and Stock (1996), Ng and Perron (2001), among others, suggest transforming the model as

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \qquad (2)$$

where ΔY_t is Y_t in first differences, $\delta = (\rho - 1)$ and the m lagged terms of the dependent variable are used to control the serial correlation, so the residual term (ε_t) is now white noise. The null hypothesis $\delta = 0$ against the alternative $\delta < 0$ is now the interest of investigation. If the null hypothesis is rejected, the equation (2) can be used to infer about the stationarity. However, the parameters distribution is not standard, so estimates through Monte Carlo algorithms generate the critical values to decide on the significance of the parameters. Once equation (11) is estimated and tested, the significance of δ, the elasticity, is direct clearing ρ, that is $\rho = (1 - \delta)$.

In addition, evidence of the political-cycle effects – elections time: last and first year of each presidential administration – is supported on estimates of a dynamic panel data model. The panel structure – 16 series of capital formation and four changes of presidential administration – constitutes an enough database to infer on their elasticity differences. The idea is to see if quarters of the government transition period are significantly different to the remaining periods. If so, then it will be evidence of the political-cycle effect on the capital formation.

Equation (12) describes the empirical panel data model to estimate:

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$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \sum_{j=1}^{4} \alpha_j D\_QLY_{i,t} + \sum_{j=1}^{4} \gamma_j D\_QFY_{i,t} + \eta_i + \varepsilon_t \quad (3)$$

where Y_{it} is as before, the sums of the four terms represent dummies for the quarters of the last year (D_QLY) and those of the first year (D_QFY) of each change of presidential administration; subscripts i and t indicate sector and quarterly, respectively. In (3) β_0 is the intercept and represents the average in the periods without government transition, while differential impacts are calculated from α's and γ's.

5. RESULTS AND ANALYSIS

Fig. 5 gives an exploratory look of the business-cycle for the total capital formation series. Each government transition period is highlighted by continues and discontinues bars. An expansion phase is mainly formed around the final years of each government administration (continues bars), followed by a depressive phase around the quarters of the start year (discontinues bars). In addition, the fourth quarter tends to locate on the crest of the cycle, the quarter one is on the contractive phase, and quarters two and three, located on the expansion phase, complement the cycle. This behavior is easily appreciated in the final and the start years of each transition period (continues and discontinues bars).

Firstly, from a pool structure, Table 2 reports the stationarity tests and the corresponding elasticity estimates (ρ column). Higher elasticities are for Machinery and other national goods (0.63), Machinery and imported equipment (0.62), and Machinery and total equipment (0.59). A smaller elasticity is estimated for Total public investment (0.14), Public Investment on Construction (0.24), Construction (0.27), and Equipment of imported transport (0.27).

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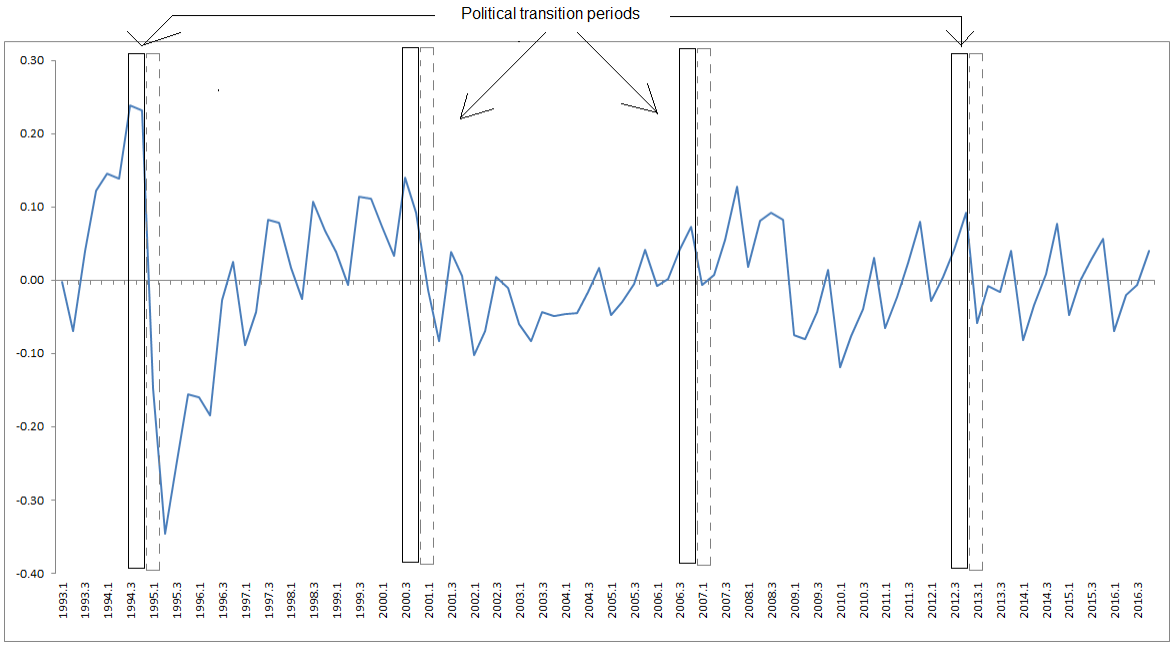
Fig. 5: Capital formation cycle and politic transition



Source: own elaboration.

Table 2: Unit roots and elasticity of the capital formation cycle by sector, 1993.1-2016.4

	Y_{t-1}	ρ	R^2	D-W	K	N
Total	-0.485 (-44.655) *	0.52	0.83	2.14	8	87
Construction	-0.733 (-7.254) *	0.27	0.71	1.72	4	91
Residential construction	-0.557 (-4.225) *	0.44	0.80	1.91	4	91
Nonresidential construction	-0.723 (-8.105) *	0.28	0.60	1.61	4	91
Machinery and total equipment	-0.407 (-4.375) *	0.59	0.61	2.01	4	91
Machinery and national equipment	-0.465 (-5.102) *	0.54	0.67	1.57	4	91
National transport equipment	-0.549 (-5.177) *	0.45	0.65	1.76	4	91
Machinery and other national goods	-0.367 (-4.108) *	0.63	0.69	1.98	4	91
Machinery and imported equipment	-0.379 (-3.691) *	0.62	0.54	2.13	4	91
Imported transport equipment	-0.730 (-4.597) *	0.27	0.67	2.02	8	87
Machinery and other imported goods	-0.549 (-4.469) *	0.45	0.50	1.94	6	89
Total private investment	-0.483 (-4.847) *	0.52	0.70	2.16	8	87
Construction private investment	-0.636 (-6.065) *	0.36	0.56	1.77	4	91
Machinery and equipment private investment	-0.552 (-4.716) *	0.45	0.68	1.96	8	87

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Total public investment	-0.857 (-6.388) *	0.14	0.81	2.09	4	91
Construction public investment	-0.757 (-5.498) *	0.24	0.79	2.07	4	91
Machinery and equipment public investment	-0.486 (-5.497) *	0.51	0.24	1.88	0	95

Notes: critical values (MacKinnon, 1996): -2.59 (1%) y -1.94 (5%). t-values are in parentheses. N = sample size. The superscript * indicates significance at 1%.

Source: own elaboration.

Serial correlation seems not to be present in the estimates. The Durbin-Watson statistic (D-W) prevails in acceptable levels. Some few exceptions would be Nonresidential construction (1.61) and Machinery and national equipment (1.57). The critical values to decide on stationarity are from MacKninnon (1996), which are customized in function of the sample size and the features of the DGP.

Next, Table 3 shows the stationarity estimates by kind of quarter; that it is, following the same quarter of each year. This way, the problem of seasonality is avoided. Also, it allows assessing the elasticity differences among quarters.

According to the origin of the capital formation, similar components of the capital have also comparable behaviors. For instance, the total capital formation series shows a pattern where elasticity falls from the first to the second and third quarter, and then it augments for the fourth quarter (ρ column). It confirms the visual inspection highlighted from the Fig. 5. Likewise, capital formation sectors belonging to the construction industry – they are Construction, Nonresidential construction, and Private investment in construction – share the property to average the highest second quarter.

Table 3: Unit roots and elasticity of the capital formation cycle by quarter, 1993.1-2016.4

Quarter I	Y_{t-1}	ρ	R^2	D-W	K	N
Total	-0.422 (-2.306) **	0.58	0.19	1.74	0	23
Construction	-0.576 (-2.964) ***	0.42	0.29	1.62	0	23
Residential construction	-0.355 (-2.105) **	0.65	0.16	1.87	0	23
Nonresidential construction	-0.443 (-2.564) **	0.56	0.48	1.76	2	21
Machinery and total equipment	-0.476 (-2.513) **	0.52	0.24	1.58	1	22
Machinery and national equipment	-0.533 (-2.561) **	0.47	0.24	1.91	1	22
National transport equipment	-0.594 (-2.593) **	0.41	0.24	1.82	1	22
Machinery and other national goods	-0.448 (-2.365) **	0.55	0.22	1.91	1	22
Machinery and imported equipment	-0.402 (-1.789) *	0.60	0.24	1.70	2	21
Imported transport equipment	-0.712 (-3.417) ***	0.29	0.35	2.00	0	23

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Machinery and other imported goods	-0.431 (-1.781) *	0.57	0.22	1.74	2	21
Total private investment	-0.605 (-2.754) ***	0.40	0.33	1.78	2	21
Construction private investment	-0.757 (-2.347) **	0.24	0.47	2.01	3	20
Machinery and equipment private investment	-0.398 (-1.751) *	0.60	0.28	1.74	2	21
Total public investment	-0.409 (-1.915) *	0.59	0.26	2.03	1	22
Construction public investment	-0.425 (-1.976) **	0.58	0.27	2.00	1	22
Machinery and equipment public investment	-0.449 (-1.138)	n.s.	0.71	1.99	2	21

Table 3: Continuation

Quarter II	Y_{t-1}	ρ	R^2	D-W	K	N
Total	-0.807 (-3.896) ***	0.19	0.41	1.84	0	23
Construction	-0.401 (-2.198) **	0.60	0.44	2.02	3	20
Residential construction	-0.332 (-1.764) *	0.67	0.22	1.99	1	22
Nonresidential construction	-0.485 (-3.079) ***	0.52	0.56	2.06	2	21
Machinery and total equipment	-0.766 (-3.685) ***	0.23	0.38	1.82	0	23
Machinery and national equipment	-0.682 (-3.366) ***	0.32	0.34	1.93	0	23
National transport equipment	-0.707 (-3.468) ***	0.29	0.35	1.97	0	23
Machinery and other national goods	-0.583 (-2.485) **	0.42	0.26	1.87	1	22
Machinery and imported equipment	-0.719 (-3.519) ***	0.28	0.36	1.75	0	23
Imported transport equipment	-0.901 (-4.261) ***	0.10	0.45	1.95	0	23
Machinery and other imported goods	-0.704 (-3.455) ***	0.30	0.35	1.72	0	23
Total private investment	-0.845 (-4.015) ***	0.16	0.42	1.78	0	23
Construction private investment	-0.500 (-2.064) **	0.50	0.39	2.08	3	20
Machinery and equipment private investment	-0.717 (-3.499) ***	0.28	0.36	1.75	0	23
Total public investment	-0.464 (-2.127) **	0.54	0.31	2.03	1	22
Construction public investment	-0.461 (-2.249) **	0.54	0.26	1.95	1	22
Machinery and equipment public investment	-1.128 (-0.952)	n.s.	0.82	2.25	5	18

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Table 3: Continuation

Quarter III	Y_{t-1}	ρ	R^2	D-W	K	N
Total	-0.771 (-2.136) **	0.23	0.32	1.94	4	19
Construction	-0.411 (-1.820) *	0.59	0.24	2.12	4	19
Residential construction	-0.403 (-2.385) **	0.60	0.20	1.86	0	23
Nonresidential construction	-0.570 (-2.373) **	0.43	0.35	2.18	4	19
Machinery and total equipment	-0.765 (-3.696) ***	0.24	0.38	1.78	0	23
Machinery and national equipment	-0.806 (-3.838) ***	0.19	0.40	1.86	0	23
National transport equipment	-0.933 (-4.346) ***	0.07	0.46	1.91	0	23
Machinery and other national goods	-0.490 (-1.693) *	0.51	0.29	2.06	3	20
Machinery and imported equipment	-0.737 (-3.594) ***	0.26	0.37	1.75	0	23
Imported transport equipment	-0.832 (-3.893) ***	0.17	0.41	1.83	0	23
Machinery and other imported goods	-0.741 (-3.605) ***	0.26	0.37	1.75	0	23
Total private investment	-0.537 (-2.113) **	0.46	0.45	1.88	3	20
Construction private investment	-0.833 (-3.984) ***	0.17	0.42	1.80	0	23
Machinery and equipment private investment	-0.719 (-3.521) ***	0.28	0.36	1.72	0	23
Total public investment	-1.278 (-6.174) ***	n.s.	0.63	1.87	0	23
Construction public investment	-1.147 (-5.358) ***	n.s.	0.57	1.92	0	23
Machinery and equipment public investment	-1.268 (-6.171) ***	n.s.	0.63	2.06	0	23

Table 3: Conclusion

Quarter IV	Y_{t-1}	ρ	R^2	D-W	K	N
Total	-0.495 (-2.739) ***	0.51	0.25	2.09	0	23
Construction	-0.562 (-2.981) ***	0.44	0.29	2.14	0	23
Residential construction	-0.228 (-1.458)	0.73	0.08	1.71	0	23
Nonresidential construction	-0.784 (-3.972) ***	0.22	0.42	2.11	0	23
Machinery and total equipment	-0.435 (-2.507) **	0.57	0.22	1.89	0	23
Machinery and national equipment	-0.434 (-2.460) **	0.57	0.22	1.95	0	23
National transport equipment	-0.479 (-2.702) ***	0.52	0.25	2.04	0	23
Machinery and other national goods	-0.432 (-2.361) **	0.57	0.20	1.87	0	23
Machinery and imported equipment	-0.456 (-2.534) **	0.54	0.23	1.75	0	23
Imported transport equipment	-0.251 (-1.785) *	0.75	0.13	1.88	0	23

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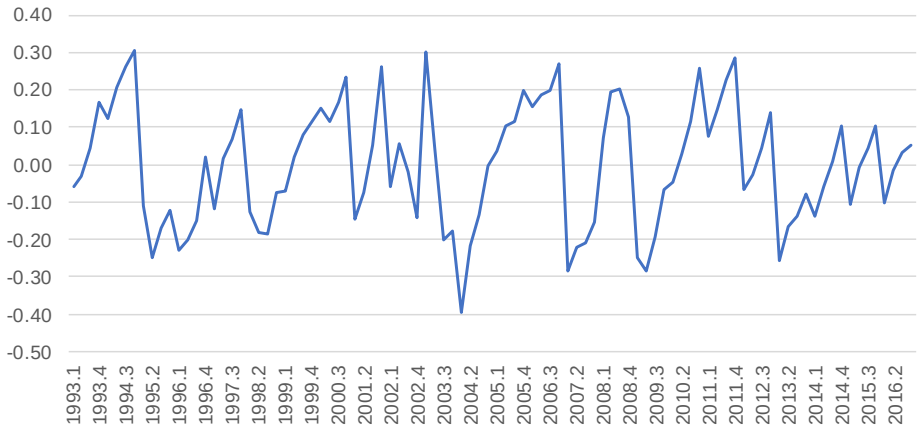
Machinery and other imported goods	-0.575 (-2.934) ***	0.43	0.28	1.72	0	23
Total private investment	-0.671 (-3.337) ***	0.33	0.34	1.91	0	23
Construction private investment	-0.817 (-3.879) ***	0.18	0.41	1.86	0	23
Machinery and equipment private investment	-0.457 (-2.585) **	0.54	0.23	1.93	0	23
Total public investment	-0.113 (-0.865)	n.s.	0.50	1.92	2	21
Construction public investment	-0.243 (-1.661) *	0.76	0.27	2.17	1	22
Machinery and equipment public investment	-0.801 (-3.853) ***	0.20	0.40	1.96	0	23

Notes: critical values (MacKinnon, 1996): -2.66 (1%); -1.95 (5%) and -1.60 (10%). D-W is the Durbin-Watson statistic; K is the number of lags, and n.s. is non-stationary. t-values are in parentheses. N = sample size. Superscripts ***, **, and * indicate significance at 1%, 5% and 10%, respectively.

Source: own elaboration.

Similarly, the capital formation sectors of Machinery and equipment, both imported and national, keep not very different results. In all them, elasticity importantly falls from the first to the second and third quarters, but it augments for the fourth quarter. However, it is not possible to obtain conclusions about the stationarity of the Public investment sectors, because for them some quarters were not stationaries. It seems to be consequence of their high volatility, as is showed on the Fig. 6. The capital formation of the Public investment in machinery and equipment presents long wages cycles, a pattern that not change in the long run. This behavior is quite similar for the remaining sectors belonging to the public investment, which also were non-stationaries.

Fig. 6: Public investment cycle in machinery and equipment



Source: own elaboration.

From the Table 4, the last year of the federal government shows an increasing capital formation cycle along the period (see estimates of ρ). By the contrary, besides to have a low sensibility, it is

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appreciated that quarter to quarter starting years tend to fall. At the end, in the fourth quarter, it seems to start a recovery process of the capital formation.

Table 4: Capital formation cycle in the political transition period

	Y_{t-1}	ρ	R^2	D-W	K	Observations
Last presidential year						
Quarter I	-0.416 (-2.162) **	0.584	0.58	2.02	6	61
Quarter II	-0.372 (-2.175) **	0.628	0.50	1.86	3	64
Quarter III	-0.196 (-1.995) **	0.804	0.42	1.82	3	64
Quarter IV	-0.176 (-2.315) **	0.824	0.36	2.16	2	65
Start presidential year						
Quarter I	-0.685 (-6.323) ***	0.315	0.33	1.95	1	66
Quarter II	-0.756 (-5.749) ***	0.244	0.37	1.85	1	66
Quarter III	-0.788 (-1.505)	0.212	0.75	2.02	9	58
Quarter IV	-0.666 (-3.059) ***	0.334	0.77	2.01	3	64

Notes: t-values are in parentheses. Critical values (MacKinnon, 1996): -2.60 (1%), -1.95 (5%), and -1.61 (10%). Superscripts ***, ** and * indicate significance at 1%, 5%, and 10%, respectively.

Source: own elaboration.

Really, are they so different? Estimates of the political transition showed in the equation (3) guide at this respect. Table 5 reports the results. The dummy variables estimate the differential coefficient of intercept, with respect to the excluded category, for those quarters belonging to the political transition.

Technically, serial correlation is not a relevant problem – Durbin-Watson statistic is equal to 1.86. Although the R-squared is low (0.38), it is only indicative that other additional variables explaining the capital formation were not included in the model. However, to have an idea of the quarter differentials, the adjustment is quite reasonable.

Table 5: Estimates of elasticity of the capital formation cycle, 1993.1-2016.4

Variable	Elasticity	p-value
Y_{t-1}	0.528	(0.000)
Dummy of quarter 1 (last year)	-0.006	(0.511)
Dummy of quarter 2 (last year)	0.019 **	(0.022)
Dummy of quarter 3 (last year)	0.088 ***	(0.000)
Dummy of quarter 4 (last year)	0.099 ***	(0.000)

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Dummy of quarter 1 (start year)	-0.149 ***		(0.000)
Dummy of quarter 2 (start year)	-0.085 ***		(0.000)
Dummy of quarter 3 (start year)	0.003		(0.605)
Dummy of quarter 4 (start year)	0.046 ***		(0.001)
Constant	-0.001		(0.520)
R^2		0.38	
D-W		1.86	
Observations: N/T		17/96	

Notes: superscripts *** and ** indicate significance at 1% and 5%, respectively.

Source: own elaboration.

Panel data estimates also report evidence of the PBC effects on the capital formation. Start years of the presidential governments report negative estimates for the quarters 1 and 2 – this is also the case in the first quarter of the last year. This result means smaller levels of capital formation investment in those periods in comparison to the remaining quarters. That is, differentials in capital formation between electoral and non-electoral periods is highly significant. Likewise, estimated values for the quarters 2, 3, and 4 of the last government year are positive and statistically significant in comparison to the remaining periods. Therefore, empirical evidence indicates that capital formation is importantly related to the political business cycle in Mexico. PBC incentives the capital formation in electoral periods but discourages it at the start of each new presidential government.

6. CONCLUSIONS

As predicted by the theory, a political-business cycle occurs on the capital formation. It registers high rates of growth in the quarters of the last presidential administration, and they are followed by reduced and/or negatives rates of growth in the quarters of the start year of government.

A similar result was previously reported for the period 1981-2010 (Gámez 2012a). This work extends the evidence covering the most recent political transition, 2012-2013. Also, results are related to those found for Mexico in Grier and Grier (2000), Gonzalez (2002), and Costa-i-Font et al. (2003).

Political business cycle has serious consequences for economic activity. First, it constitutes an indicative that firms and government change ex ante the relationship between public and private expenditure and the productive capacity. If so, then it could occur some displacement of the aggregate demand, which is responsible of the falls and/or recessions in the economy. The PBC theory (Nordhaus 1975; Hibbs 1977; Rogoff and Sibert 1988; Dubois 2016, among others) highlights that induced augments of the economic activity tend to generate inflation. Second,

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alterations in the normal process of the capital formation directly inside on the factors productivity, the potential output, the steady growth of the economy, the creation of new jobs, on the salaries and, finally, on the well-being levels.

If synchronization between political and economic cycles is not broken in this new political transition period[3], the Mexican economy will suffer a slowdown, like in other occasions. Reductions on capital formation are consequence, as we saw, of the excessive expenditure implied by the political transition. It has negatives consequences that limit the necessary conditions directed to reinforce the economic activity.

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