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SYNCHRONIZATION OF ECONOMIC ACTIVITY BETWEEN MEXICO AND THE US: WHAT ARE THE CAUSES?****

SINCRONIZACION DE LA ACTIVIDAD ECONOMICA ENTRE MEXICO Y LOS ESTADOS UNIDOS: ¿CUALES SON LAS CAUSAS?

RAMON A. CASTILLO PONCE*
California State University, Los Angeles
and Universidad Autónoma de Baja California

ROGELIO VARELA LLAMAS**
Universidad Autónoma de Baja California

JUAN MANUEL OCEGUEDA HERNANDEZ***
Universidad Autónoma de Baja California

Abstract

Using data on manufacturing production for the entire industry and 8 of its 9 divisions, we find little evidence of synchronization between manufacturing output in Mexico and the US. Hence, it is unlikely that the synchronization of the business cycles of these two countries emerged as the result of the synchronization of economic activity in the manufacturing industry, as previous studies have suggested. Given these results, we propose two alternatives for explaining business cycles synchronization: the dynamics of the gross domestic product

* California State University, Los Angeles, Department of Economics and Statistics, and Universidad Autónoma de Baja California, Facultad de Economía y Relaciones Internacionales. 5151 State University Drive, Los Angeles, CA 90032 USA. E-mail: rcastil@calstatela.edu

** Facultad de Economía y Relaciones Internacionales. Calzada Universidad No. 14418 Mesa de Otay, Tijuana Baja California, México 22390. E-mail: rvarela@uabc.edu.mx

*** Facultad de Economía y Relaciones Internacionales. Calzada Universidad No. 14418 Mesa de Otay, Tijuana Baja California, México 22390. E-mail: jmocegueda@uabc.edu.com

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of the service sector and aggregate consumption. We show that both Mexican variables share common trends and common cycles with their US counterparts. We recommend further research to evaluate how these aggregates have contributed to the synchronization of the business cycles in Mexico and the US.

Keywords: *Synchronization, common trends, common cycles, manufacturing, consumption, service sector.*

JEL classification: *C32, E32, F4.*

Resumen

Empleando datos de producción manufacturera para la industria en su totalidad y 8 de sus 9 divisiones, encontramos escasa evidencia de sincronización entre las producciones manufactureras en México y en Estados Unidos. Así, es poco probable que la sincronización de los ciclos económicos entre estos dos países haya surgido como resultado de la sincronización de la actividad económica en la industria manufacturera, como ha sido sugerido en estudios previos. Dado esto, proponemos dos alternativas para explicar la sincronización de los ciclos económicos: la dinámica del producto interno bruto del sector servicios y el consumo agregado. Mostramos que ambas variables mexicanas comparten tendencias y ciclos comunes con sus contrapartes estadounidenses. Recomendamos que se lleven a cabo investigaciones más rigurosas para evaluar cómo estos agregados han contribuido a la sincronización de los ciclos económicos de México y Estados Unidos.

Palabras Clave: *Sincronización, tendencias comunes, ciclos comunes, manufactura, consumo, sector servicios.*

Clasificación JEL: *C32, E32, F4.*

I. INTRODUCTION

Standard economic theory suggests that, as the trade of goods and services between countries intensifies, their business cycles tend to synchronize. Based on this theory, various studies have analyzed economic integration in North America. Cuevas *et al.* (2003), Rosmy and Simons (2007), and Castillo and Ramirez (2008), among others, have considered the three economies: Canada, Mexico and the United States (US). The first examines the sensitivity of the Mexican economy to shocks in the northern most economies after 1994. The second explores the stochastic properties of the gross domestic products and finds a common cycle but not common trends. In contrast, the third identifies both for the period of 1980-2006.

However, research has focused on the relationship between Mexico and the US, especially since the signing of the North American Free Trade Agreement (NAFTA). Torres and Vela (2003), for instance, examine the importance of the manufacturing sector as an engine of integration. The authors consider a sample from 1992 to 2001 and classify the movements of the business cycles in three stages. They recognize a gradual and increasing synchronization of the cycles by looking at the 2001 economic slow-down and noticing a closer association of economic variables since. Similarly, Chiquiar and Ramos-Francia (2005) analyze the contribution of production-side links to the synchronization of economic activity. According to them, the strengthening of these links after the signing of NAFTA led to the synchronization of the business cycles. Table 1 summarizes the literature on this topic and lists the methodologies used in their analysis.

TABLE 1

Authors	Year	Methodology
Castillo-Ponce, R.; A. Diaz-Bautista and E. Fragoso	2004	Cointegration
Chiquiar, D. and M. Ramos-Francia	2005	Spectral Analysis
Cuevas, A.; M. Messmacher and A. Werner	2003	Correlations and Regression Analysis
Herrera, J.	2004	Cointegration and Common Cycles
Mejia-Reyes, P.; E. Gutierrez and C. Farias	2006	Kydlan and Prescott Methodology
Torres, A. and O. Vela	2003	Correlations and Regression Analysis

Overall, the consensus reached in previous literature about the economic integration of Mexico and the US, centers on the claim that the trade agreement accentuated the interrelation across the manufacturing industries and, as a result, the business cycles of the two countries became synchronized. While the argument appears reasonable, we find evidence that economic activity in the manufacturing industry is not the decisive factor leading to the synchronization of the business cycles. First, we show that activity in Mexico's manufacturing is, in some cases, more closely associated with the overall economic activity in the US than with its US counterpart. That is, production in various divisions of Mexico's manufacturing industry responds more significantly to aggregate output than to production in their US mirror divisions. Moreover, we establish that manufacturing productions in Mexico and the US do not share a common cycle. If the synchronization of the business cycles is the result of the symmetric behavior of the manufacturing industries, we should expect to find that manufacturing productions are also synchronized; but this is not the case.

In this document we consider two alternative explanations for the high degree of economic interdependence between Mexico and the US: the dynamics of the service sector and aggregate consumption. We believe the first explanation is a natural candidate, since participation of services in aggregate output in both economies is significant, around 60%. Therefore, similarities in the behavior of this variable across

countries may shed light on the cause, or causes, of business cycles synchronization. The other alternative, consumption patterns, seems plausible to the extent that we recognize the interrelation between developments in financial markets, aggregate consumption and overall economic activity in Mexico and the US since at least the early 1990´s. In particular, prior to the 1994 peso crisis the credit market expanded vigorously in Mexico, as did consumption and GDP.[1] This expansion coincided with the recovery of the US from the 1990-1991 economic slowdown. After a brief period of contraction, the Mexican credit market was reactivated in the late 1990's and expanded, slowly, until the end of 2008, –when the US financial crisis took its toll on the Mexican market. A similar expansion occurred in the US in the early to mid 2000's, until the dramatic financial crash in 2007. Thus, growth in Mexico from 1988 to 1994 can be associated with the activation of the Mexican credit market. This expansion corresponded with growth in the US after the early 1990's contraction. After the 1995 recession, the Mexican economy recovered and expanded, with the exception of a downturn beginning in late 2008. Similarly, US economic activity was robust until 2007 when the credit market collapsed. Hence, one can argue that the similarities in economic growth between the US and Mexico during the late 1980's, part of the 1990's, and late 2000's were primarily due to the dynamics of consumption patterns in both countries (with the exception, of course, of 1995).[2]

Our argument as to why we identify similarities between consumption in the US and Mexico is based on the observation that credit markets in both countries have followed comparable patterns during certain periods of time. We see this as a reasonable explanation. In fact, other authors have also mentioned this possibility. For example, Sidaoui and Ramos-Francia (2008) discuss a "global credit market" transmission mechanism. The authors suggest that, as credit markets evolve, the effects of external shocks on developing economies may be accentuated. We recognize, however, that the task of examining statistical relationships across asset markets is a daunting one, and deserves devoted effort. Given the scope of this document, we center our attention on determining if consumption in Mexico and the US do in fact share common characteristics.[3]

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[1] We would like to point out that, despite the credit sector in Mexico representing a small share of GDP (3.1% in 1994, 2% in 2004 and up to 4% in 2006), its growth rate has at times been very robust. For instance, from 1988 to 1994 credit granted to the private sector grew at historically high rates.

[2] It is interesting to note that at the beginning of 2008, even though manufacturing activity in the US and Mexico was slowing down, the sentiment in Mexico was that the US economic contraction would not impact the Mexican economy significantly; primarily because financial markets were perceived to be immune to what was happening in the US, and no one realized the problem in the US would be so severe. Once it became clear that the financial crisis in the US was far worse than first thought, and that financial markets in Mexico would be greatly impacted, the political discourse in Mexico changed. Policy makers recognized the magnitude of the problem and accepted that Mexico would also experience a recession resulting from the crises in financial and credit markets in both countries. Not the slow-down in the manufacturing industry.

[3] Another possibility for explaining similar consumption patterns in both countries is related to remittances. Castillo-Ponce (2001), for instance, shows that remittances to Mexico are positively associated with the US business cycle. When the US economy expands (contracts) remittances increase (decrease). Given that remittances represent the primary source of income for many families in Mexico, it would not be surprising

One may notice that the GDP of the service sector and aggregate consumption do not exhibit a direct transmission mechanism of synchronization between the Mexican and US economies. That is, there are no clear channels of trade or exchange under either of them; services and consumption are for the most part non-tradable. In this respect, we are in fact suggesting that similar movements in the economies of Mexico and the US are the result not only of increasing trade, since trade between the two countries has been intense for decades, but also the consequence of additional factors that have become common in the two countries; namely, the orientation of productive activities to the service sector and consumption patterns.[4] We contend that the synchronization of their business cycles may be the result of a combination of factors not previously considered; including the transformation of Mexico into a more service oriented economy and the development of credit markets and the consequent evolution of consumption patterns. In other words, economic activities in both countries have become more similar and as a result their aggregate production has tended to synchronize. We certainly do not write this document with the intention of providing definitive evidence that the service sector and aggregate consumption are the main factors explaining the synchronization of economic activity between Mexico and the US. Our aim is less ambitious. We limit ourselves to provide suggestive evidence of the possible causes of synchronization; more rigorous theoretical and empirical studies would follow this initial effort to evaluate the sources of economic synchronization between these two countries.[5]

We conduct our analysis by implementing various econometric estimations which yield results supporting our contentions. First, we identify a low degree of synchronization, as defined by the existence of common movements in the short-run and long-run, between pairs of manufacturing divisions in Mexico and the US; and between US imports and manufacturing production in Mexico. Second, we show that activity in the Mexican manufacturing industry is closely associated with overall economic activity in the US. Thus, similar movements in manufacturing productions may be the result of the industries responding to a common factor (aggregate output) and not the cause of that common factor. In other words, we alert of a potential endogeneity problem when analyzing manufacturing as the source of business cycles synchronization. Third, we evaluate the degree of interdependence between the GDPs of the service sector and aggregate consumption in Mexico and the US. The econometric exercise identifies

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to find that consumption in Mexico is also correlated with remittances and the US business cycle. Evidently, a much more careful analysis of this possibility is required to formally establish the link.

4 It is worth mentioning that the debate about the factors that contribute to economic synchronization continues to this day with no consensus. While some claim that the increase in intra-industry trade may serve as an engine of integration, others pose that factors such as input endowments may be more relevant to achieve synchronization. See Imbs (2003) for a detailed discussion or Cuevas, Messmacher and Werner (2003) for a nice description of the relevant literature.

5 Ideally, one would develop a theoretical model showing how the homogenization of the service sectors and consumption patterns in different countries leads to business cycles synchronization. In our view, this is the first attempt to offer a novel argument as to how the economies of Mexico and the US became synchronized; given that we find no evidence that the behavior of the manufacturing sectors is **the** main factor of synchronization.

the existence of common trends and common cycles between these variables. Overall, we find evidence suggesting that, while production-side links may have contributed significantly to the synchronization of the business cycles, it is unlikely that increased integration in the manufacturing sectors is *the* factor that explains similar dynamics in the economic cycles of Mexico and the US.

The rest of this document is organized as follows: Section II presents the analysis for the manufacturing industries. First, we consider the association across production for the entire industry and individual divisions. Secondly, we evaluate the relationship between US imports and manufacturing output in Mexico. For both cases, we include statistical and econometric estimations. In Section III, we conduct the analysis of our two candidates for explaining the synchronization of the business cycles: GDP in the service sector and aggregate consumption. Section IV presents the conclusions.

II. THE MANUFACTURING INDUSTRY

2.1. Data

We consider data on production for the entire industry and eight of its nine divisions. We do not include division nine since the products contained in the Mexican classification do not match those reported for the US. The source was the National Institute of Statistics and Geography (INEGI). For the US, we obtained data on manufacturing production and industrial production from the Bureau of Economic Analysis. Our study required data on imports from the US and the GDPs of Mexico and the US. The source for the first was the Census Bureau and for the second and third Banco de Mexico. The sample for the manufacturing data covers the period from January 1980 to June 2007 at monthly frequency. Since product classification is not homogeneous for the manufacturing divisions across Mexico and the US, we performed a matching exercise for every division included in the analysis. A full description of the same is reported in the appendix.[6] The exercise for the GDPs includes data from the first quarter of 1980 to the fourth quarter of 2007; imports were available from 1987 to 2007. All data are expressed in constant terms.

We first illustrate the now widely known joint behavior of the gross domestic products of Mexico and the US. Graph 1 presents the series in levels and Graph 2 the annual growth rates.[7] As previously noted, if we were to restrict our attention to the period around 1994 we may erroneously conclude that the signing of NAFTA led to the synchronization of the growth rates. For instance, take the 1990-1992 and 1996-1997 periods. The cycles move in distinctly opposite directions during

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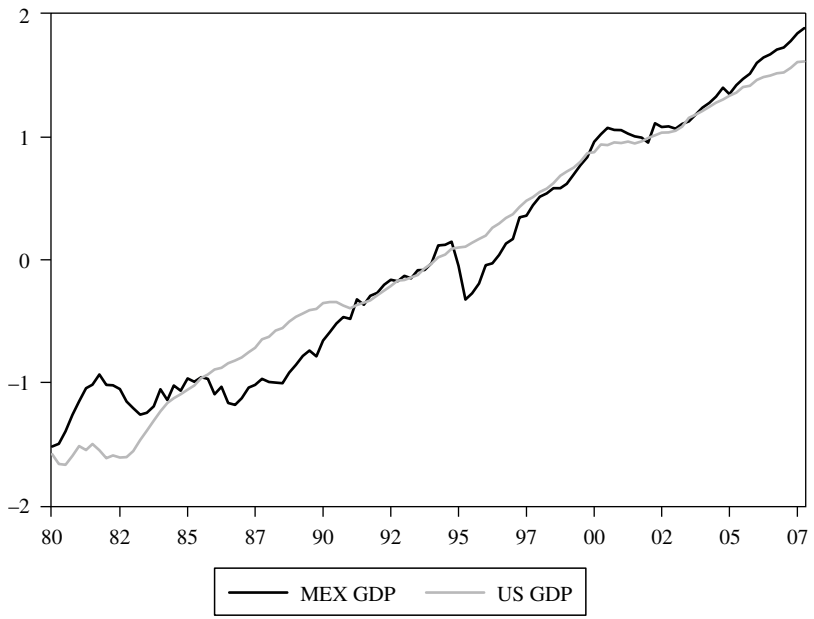
[6] Our matching strategy for the manufacturing divisions is similar to that employed in previous studies, including Fragoso, Herrera and Castillo-Ponce (2008).

[7] Throughout the document, graphical representations use a normalized scale to better illustrate the behavior of the variables. Hence, the numbers on the *y* axis do not correspond to specific units. Also, we consider the logarithmic transformation of the variables. The normalization is performed by simply dividing the variables by their standard deviation.

the first period while they are very similar in the second. However, it is evident that in the early 1980's the series also exhibited similar dynamics.[8] In fact, only from 1990 to about 1992 do the growth rates follow distinct patterns. This observation is consistent with the findings of Rosmy and Simons (2007), in identifying a North American business cycle and three common contractions in the economies of Canada, Mexico and the US: in the early 1980's, early 1990's and 2001. Hence, it is highly unlikely that the signing of NAFTA triggered the synchronization of these countries' economies.

GRAPH 1

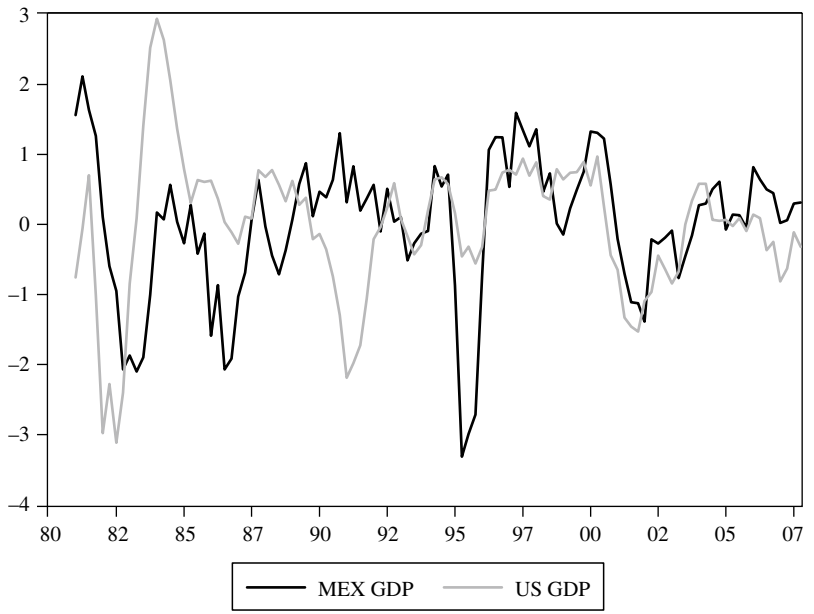
GDP SERIES IN LEVELS



[8] We should emphasize that there is no correspondence between highly correlated annual growth rates and synchronization of the cyclical components of the time series. That is, if we were to estimate the annual growth rates of two time series and were to find that they are highly correlated, that would not imply that the series share a common cycle. As defined in Vahid and Engle (1993), the existence of a common cycle is determined by the existence of serial correlation common feature among the first differences of a set of I(1) variables. This is the definition we use for our analysis. A detailed discussion of the methodology is provided in the empirical section.

GRAPH 2

GDP SERIES IN GROWTH RATES



2.2. Manufacturing in Mexico and the US

We begin with a rudimentary comparison for total production and production in each of the eight divisions in Mexico and the US. Table 2 presents simple correlations across the series in levels. With the exception of total manufacturing and division 5, in all cases the Mexican divisions show a higher correlation with industrial production than with the US manufacturing divisions. For comparison purposes, we also computed the correlations for the post NAFTA period of 1996-2007.[9] The numbers are presented in Table 3. Interestingly, the correlations between manufacturing series are lower in the shorter period, with the exception of division 2. The correlations with respect to industrial production, for the most part, continue to be stronger. That is, the linear association of manufacturing production with respect to overall economic activity remains significant while decreasing with respect to US manufacturing. In other words, it appears that manufacturing production in Mexico is more correlated with industrial production than with the manufacturing industry in the US.

[9] Although NAFTA was signed in 1994, we choose to consider the post NAFTA period beginning in 1996. The intention is to avoid the noise in 1994 and 1995 created by the political instability that prevailed in Mexico.

TABLE 2

SIMPLE CORRELATIONS: SERIES IN LEVELS SAMPLE 1980-2007

Mexico	Total	1	2	3	4	5	6	7	8
US									
Total	0.97								
1		0.91							
2			–0.30						
3				0.13					
4					0.74				
5						0.96			
6							0.88		
7								0.62	
8									0.94
US Ind. Prod.	0.97	0.97	0.61	0.18	0.91	0.96	0.95	0.97	0.95

TABLE 3

SIMPLE CORRELATIONS: SERIES IN LEVELS SAMPLE 1996-2007

Mexico	Total	1	2	3	4	5	6	7	8
US									
Total	0.93								
1		0.61							
2			0.52						
3				–0.02					
4					–0.09				
5						0.72			
6							0.70		
7								0.28	
8									0.88
US Ind. Prod.	0.92	0.88	–0.06	–0.03	0.67	0.78	0.89	0.82	0.90

We proceed to estimate simple correlations for the growth rates of the series, we do it for the entire sample and for the 1996-2007 period. The results are presented in Tables 4 and 5, respectively. This exercise is, as indicated in the introduction, similar to what other authors have done to examine synchronization. In general, it is argued that a strong correlation between these "business cycle" series is evidence of synchronization. We now recognize why other authors have concluded that the signing of NAFTA led to the synchronization of economic activity in the manufacturing sector, and consequently to the synchronization of the economic cycles; just about every division-division correlation increased significantly after 1996. In the case of total manufacturing, the correlation went from 0.31 to 0.77. We would like to highlight,

however, that the correlation between manufacturing production and industrial production also increased, with the exception of division 7. More importantly, in the larger sample the correlation between manufacturing in Mexico and US industrial production is greater than the correlation with US manufacturing, excluding divisions 1 and 8. For the shorter sample this is true for all cases. Thus, even for the growth rates there appears to be a more significant association between manufacturing activity and overall economic activity, than across manufacturing industries.

TABLE 4

SIMPLE CORRELATIONS: ANNUAL GROWTH RATES SAMPLE 1980-2007

Mexico	Total	1	2	3	4	5	6	7	8
US									
Total	0.31								
1		0.09							
2			0.14						
3				0.05					
4					0.11				
5						0.09			
6							0.11		
7								0.57	
8									0.42
US Ind. Prod.	0.37	0.01	0.23	0.25	0.23	0.28	0.28	0.61	0.38

TABLE 5

SIMPLE CORRELATIONS: ANNUAL GROWTH RATES 1996-2007

Mexico	Total	1	2	3	4	5	6	7	8
US									
Total	0.77								
1		0.03							
2			0.50						
3				0.27					
4					0.53				
5						0.35			
6							0.43		
7								0.51	
8									0.67
US Ind. Prod.	0.77	0.33	0.67	0.58	0.69	0.60	0.51	0.55	0.73

If we were to simply consider the previous results, we may be tempted to conclude that there is evidence of synchronization in the manufacturing industry. However, as we indicated in footnote 8, the concept of synchronization, or sharing a common cycle, does not apply to the growth rates of time series, but to the existence of serial correlation common feature among the first differences of a set of I(1) variables. With this concept in mind, we compute the simple correlations between the first differences of the series as an illustrative exercise. The results for the entire period and for the post NAFTA period are presented in Tables 6 and 7 respectively. For more than half of the division-division correlations in the larger sample the magnitudes are either

TABLE 6

SIMPLE CORRELATIONS: FIRST DIFFERENCE SAMPLE 1980-2007

Mexico	Total	1	2	3	4	5	6	7	8
US									
Total	0.28								
1		–0.07							
2			0.25						
3				–0.16					
4					–0.07				
5						0.06			
6							0.27		
7								0.05	
8									0.43
US Ind. Prod.	0.21	0.03	0.22	–0.18	0.05	0.06	0.19	0.08	0.35

TABLE 7

SIMPLE CORRELATIONS: FIRST DIFFERENCE SAMPLE 1996-2007

Mexico	Total	1	2	3	4	5	6	7	8
US									
Total	0.32								
1		–0.12							
2			0.16						
3				–0.44					
4					–0.05				
5						–0.06			
6							0.28		
7								0.10	
8									0.53
US Ind. Prod.	0.26	0.03	0.21	–0.38	0.20	–0.07	0.33	0.21	0.46

negative or close to cero. Correlations increase in the 1996-2007 sample for total manufacturing and divisions 6, 7, and 8, however, the magnitudes remain relatively small. In sum, we find little evidence of a high degree of association between the first differences of the series.

Although the previous by no means represents a formal analysis, at least it provides an illustration of what we can expect to find when adequate methodologies are applied. In the following section we implement the econometric exercise to formally test the statistical relations between the series.

2.2.1. *Empirical Exercise*

The econometric strategy consists of testing for common trends and common cycles. Since Johansen's (1991) cointegration methodology is amply known, we spare the reader from a detailed description. We briefly describe, nonetheless, the Vahid and Engle (1993) methodology: consider the Wold representation of the stationary first difference of a $nx1$ vector y_t.

$$\Delta y_t = C(L)e_t = C(1)e_t + (1-L)C^*(L)e_t \tag{1}$$

Integrating (1) we obtain

$$y_t = C(1)\sum_{i=0}^{\infty} e_{t-i} + C^*(L)e_t \tag{2}$$

which is the common trend representation derived in Stock and Watson (1988) and in fact a multivariate version of the Beveridge –Nelson trend-cycle decomposition. In (2) the first term represents the trend component and the second the stationary cyclical component. The existence of cointegration implies that $\alpha' C(1) = 0$ and α is a nxr matrix of r cointegrating vectors. Similarly, the existence of common serial correlation features implies that $\tilde{\alpha}' C^*(L) = 0$ and $\tilde{\alpha}$ is a nxs matrix of s common features. The cointegrating relationships can be estimated employing various methodologies. We use the methodology suggested in Johansen (1991) since it allows us to compute the number of cointegrating relations (r).

The number of common features (s) is estimated by first computing the squared canonical correlations $\left(\lambda_j^2\right)$ in the system, and then testing the null hypothesis $\lambda_j^2 = 0, \forall_j = 1, 2, ..., s$. Under the null, the relevant test statistic is $C(p,s) = -(T-p-1)\sum_{i=1}^{s} \log\left(1-\lambda_i^2\right)$ and has a χ^2 distribution with $s^2 + snp + sr - sn$ degrees of freedom. The number of lags to be included in the system, p, corresponds to one less than the number of lags in the autoregressive system in levels. We would like to comment that this exercise is equivalent to testing for cointegration, but for the

short-run. In particular, the cointegration exercise searches for a linear combination of non-stationary variables that eliminates the trend and produces a stationary series. In this case, we look for a combination of stationary series that eliminates the serial correlation between the series and their past history.

Our first exercise consists of performing unit root tests for each of the series. We choose to implement the test suggested by Kwiatkowski-Phillips-Schmidt-Shin (KPSS). The results are presented in Table 8. With the exception of division 3 for Mexico, the series are integrated of order 1.

TABLE 8

UNIT ROOT TESTS

Variable	Test Statistic		Critical Value 5%	Order of Integration
	Level	First Diff.		
Manufacturing Production: US				
Total	0.209	0.135	0.146	I(1)
Division 1	0.414	0.062	0.146	I(1)
Division 2	0.442	0.070	0.146	I(1)
Division 3	0.197	0.045	0.146	I(1)
Division 4	0.530	0.047	0.146	I(1)
Division 5	0.148	0.100	0.146	I(1)*
Division 6	0.115	0.076	0.146	I(1)*
Division 7	0.159	0.073	0.146	I(1)
Division 8	0.325	0.096	0.146	I(1)
Manufacturing Production: Mexico				
Total	0.242	0.139	0.146	I(1)
Division 1	0.282	0.016	0.146	I(1)
Division 2	0.199	0.085	0.146	I(1)
Division 3	0.158	0.025	0.146	I(0)**
Division 4	0.212	0.100	0.146	I(1)
Division 5	0.231	0.033	0.146	I(1)
Division 6	0.121	0.035	0.146	I(1)***
Division 7	0.190	0.049	0.146	I(1)
Division 8	0.191	0.042	0.146	I(1)
US Ind. Prod.	0.154	0.086	0.146	I(1)

* Given that the test statistics are close to the critical value, we conducted further unit root tests to confirm the order of integration. We found evidence that the series are in fact I(1).

** From the graphical analysis, and given the fact that the test statistic is close to the critical value, it is unclear that the series is nonstationary. Hence, we conducted further unit root tests and determined that the series is I(0).

*** In this case, we also concluded from various other unit root tests that the series is I(1).

Once the order of integration has been determined, we proceed to estimate the cointegration relations. We construct two different bivariate systems. The first includes manufacturing production in Mexico and its US counterpart, for the total and each of the divisions analyzed. The second pairs individual Mexican manufacturing series with US industrial production. Table 9 presents a summary of results (complete statistics are reported in the appendix for all estimations).[10] In all cases throughout the document we normalize the vectors with respect to the Mexican variable. This allows us to determine how the Mexican economy responds to fluctuations in the US economy.[11]

First, we notice that there is evidence of cointegration for every system; with the exception of divisions 2 and 4 for the division-division set. The qualitative relation is positive, which is what one could reasonably expect. For total manufacturing the coefficient with respect to industrial production (1.04) is statistically greater than the coefficient for US manufacturing (.91). That is, in this case there appears to be a closer association between manufacturing production in Mexico and economic activity in the US, than with the manufacturing sector in the US. This result is in opposite direction of previous studies arguing that increasing integration across manufacturing divisions in both countries leads to the integration of the two economies. From our results, this claim does not seem to hold. If that were the case, we would expect to find a stronger association *vis a vis* manufacturing production relative to US industrial production.

To further evaluate the degree of integration between the manufacturing sector in Mexico and economic activity in the US, we conduct the common cycle test previously described. As was the case for the cointegration tests, here we consider two types of systems, one that contains the Mexican and US divisions, and one that includes the Mexican divisions and US industrial production. A summary of results is presented in Table 10.[12] We find no evidence of common cycles, with the exception of the Mexican division 5 and the corresponding US division. –At first glance, these results may be puzzling, but once we recognize that the common cycle test is performed on the first difference of the series, the results appear to be consistent with what the simple correlations suggested. As reported in Tables 6 and 7, the linear association between the differentiated series is very small.

One may argue that for the 1980-2007 sample the case for a common cycle is weak, since the economies were not that integrated. Thus, a test for a post NAFTA period may render different insights. We perform the common cycles test for the sample 1996-2007, the results are presented in Table 11. In this case, we find no evidence for the existence of common cycles. We should mention, nonetheless, that according to

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[10] In all tables we report only statistically significant coefficients. We do this even when there is evidence of cointegration or the existence of common cycles. Reporting non-significant coefficients would render the results somewhat confusing.

[11] Just to clarify, since we report normalized vectors, the qualitative association between the variables is the opposite of the sign shown on the tables. Also, for all econometric estimation throughout the document, we consider various specifications, i.e. adding a constant, a trend or both.

[12] We thank Professor Joao Issler (Graduate School of Economics, Getulio Vargas Foundation) for generously providing the GAUSS code to run the tests.

TABLE 9

COINTEGRATION TESTS 1980-2007

Mexican Series	US Series	Cointegration	Cointegrating Vector
Total	Total	Yes	1, –0.91 (0.05)
	Ind. Prod.	Yes	1, –1.04 (0.06)
Division 1	Division 1	Yes	1, –2.25 (0.08)
	Ind. Prod.	Yes	1, –0.96 (0.05)
Division 2	Ind. Prod.	Yes	1, –0.34 (0.08)
Division 4	Ind. Prod.	Yes	1, –0.76 (0.05)
Division 5	Division 5	Yes	1, –0.99 (0.04)
	Ind. Prod.	Yes	1, –0.83 (0.03)
Division 6	Division 6	Yes	1, –1.59 (0.18)
	Ind. Prod.	Yes	1, –0.86 (0.06)
Division 7	Division 7	Yes	1, –3.46 (0.55)
	Ind. Prod.	Yes	1, –1.19 (0.06)
Division 8	Division 8	Yes	1, –1.45 (0.11)
	Ind. Prod.	Yes	1, –1.67 (0.12)

Standard error in parenthesis.

TABLE 10

COMMON CYCLE TESTS 1980-2007

Mexican Series	US Series	Common Cycle	Cofeature Vector
Total	Ind. Prod.	No	1, –0.06 (0.03)
Division 1	Division 1	No	1, –0.16 (0.05)
	Ind. Prod.	No	1, –0.06 (0.03)
Division 4	Division 4	No	1, 0.08 (0.04)
Division 5	Division 5	Yes	1, 0.05 (0.03)
	Ind. Prod.	No	1, 0.06 (0.03)
Division 6	Division 6	No	1, –0.28 (0.06)
	Ind. Prod.	No	1, –0.13 (0.03)
Division 8	Division 8	No	1, –0.13 (0.06)
	Ind. Prod.	No	1, –0.10 (0.03)

Standard error in parenthesis.

the standard errors reported in tables 10 and 11, the regression coefficients for some division-division systems are significant. Hence, as we indicated before, the issue is not that there are no significant associations between production in the Mexican and US manufacturing industries, but that the variables do not share a common cycle as defined in this paper.

From the previous results we gather that the manufacturing industry contributed very little to the synchronization of the business cycles of Mexico and the US. It seems to us that the similar patterns in the behavior of industrial production and the manufacturing series are the result of a response to one or various factors, not a causal relation running from the manufacturing industry to aggregate output.

TABLE 11

COMMON CYCLE TESTS 1996-2007

Mexican Series	US Series	Common Cycle	Cofeature Vector
Division 1	Division 1	No	1, –0.14 (0.08)
	Ind. Prod.	No	1, –0.12 (0.05)
Division 2	Ind. Prod.	No	1, 0.13 (0.06)
Division 5	Ind. Prod.	No	1, 0.14 (0.04)
Division 6	Division 6	No	1, –0.19 (0.07)
	Ind. Prod.	No	1, –0.20 (0.06)
Division 7	Ind. Prod.	No	1, –0.13 (0.07)
Division 8	Division 8	No	1, –0.27 (0.08)
	Ind. Prod.	No	1, –0.14 (0.04)

Standard error in parenthesis.

2.3. Manufacturing in Mexico and US Imports

Clearly, analyzing the association between divisions across countries may not be entirely satisfactory, since there is no reason to believe that economic activity among comparable divisions is related across the border; although Chiquiar and Ramos-Francia (2005) indicate that after the signing of NAFTA the interdependence of manufacturing divisions in Mexico and the US intensified. To address this concern, we perform another set of estimations but now considering imports from the US and manufacturing production in Mexico. This exercise is similar in spirit to that conducted in the just mentioned article.

Our first exercise consists of estimating simple correlations for the levels, growth rates and first differences of the series. The results are presented in Table 12. Interesting, the correlations for the series in levels for the sample period 1987-2007 are higher that the correlations for the period 1996-2007. The correlations for the growth rates,

however, are in general greater for the more recent period, a feature that has been interpreted as evidence of synchronization between Mexico and the US. For the first differences we get mixed results, in some cases the correlations are greater for the post NAFTA period and in other cases smaller.

TABLE 12

SIMPLE CORRELATIONS

	Series in Levels		Series in Growth Rates		Series in Differences	
	1987-2007	1996-2007	1987-2007	1996-2007	1987-2007	1996-2007
Mex Division						
Total	0.93	0.87	0.30	0.50	0.76	0.82
1	0.94	0.89	0.15	0.23	0.52	0.57
2	0.57	–0.19	0.24	0.44	0.52	0.56
3	0.18	–0.03	0.32	0.49	0.23	0.19
4	0.80	0.59	0.22	0.47	0.40	0.27
5	0.92	0.79	0.31	0.44	0.64	0.67
6	0.92	0.92	0.15	0.31	0.67	0.63
7	0.94	0.83	0.35	0.40	0.50	0.47
8	0.91	0.79	0.20	0.43	0.61	0.60

2.3.1. *Empirical Exercise*

To formally estimate the statistical association between the series, we perform cointegration and common cycle tests and present the results in Tables 13 and 14 respectively.[13] We find no evidence of cointegration for the sample 1987-2007, with the exception of division 1, for which we obtained a significant and positive long-run elasticity of 0.61. For the post NAFTA sample, however, we identify the existence of common trends for all cases, excluding division 6. The elasticities are positive and significant, which is in line with what we expected.

As for the common cycle results, we find that the series for total manufacturing does not share common movements with US imports in the short-run. Notice, nonetheless, that the estimated coefficient is statistically significant and positive. We may interpret this as indicating a statistically significant association between the manufacturing series of the two countries. The series, however, do not share a common cycle. Indeed, only two of the divisions appear to share cycles, division 2 and division 7, though the statistics are significant only at the 99%.

[13] Unit root tests on US import suggested that the series is integrated of order 1. We do not report the results for brevity.

The case of division 7 is particularly interesting, since it represents one of the major contributors to total manufacturing production in Mexico. Given this fact, we could concede that the signing of NAFTA produced a closer association of cyclical activity, for at least some of the manufacturing divisions, across Mexico and the US. On the other hand, we should stress the absence of evidence for synchronization of the manufacturing industry as a whole. Hence, we maintain our contention that synchronization of the business cycles between the two countries is not likely to have been the result of synchronization of the manufacturing industry.

TABLE 13

COINTEGRATION TESTS

Mexican Series	Sample 1987-2007		Sample 1996-2007	
	Cointegration	Cointegrating Vector	Cointegration	Cointegrating Vector
Total	No		Yes	1, –0.29 (0.07)
Division 1	Yes	1, –0.61 (0.04)	Yes	1, –0.54 (0.04)
Division 2	No		Yes	1, –0.87 (0.03)
Division 4	No		Yes	1, –0.21 (0.07)
Division 5	No		Yes	1, –0.26 (0.03)
Division 6	No		No	
Division 7	No		Yes	1, –0.36 (0.05)
Division 8	No		Yes	1, –0.31 (0.15)

Standard error in parenthesis.

TABLE 14

COMMON CYCLES TESTS 1996-2007

Mexican Series	Common Cycle	Cofeature Vector
Total	No	1, –1.05 (0.10)
Division 1	No	1, –0.87 (0.11)
Division 2	Yes	1, –0.76 (0.16)
Division 5	No	1, –0.56 (0.11)
Division 6	No	1, –0.82 (0.12)
Division 7	Yes	1, –1.11 (0.18)
Division 8	No	1, –0.46 (0.08)

Standard error in parenthesis.

III. SERVICE SECTOR GDP AND AGGREGATE CONSUMPTION

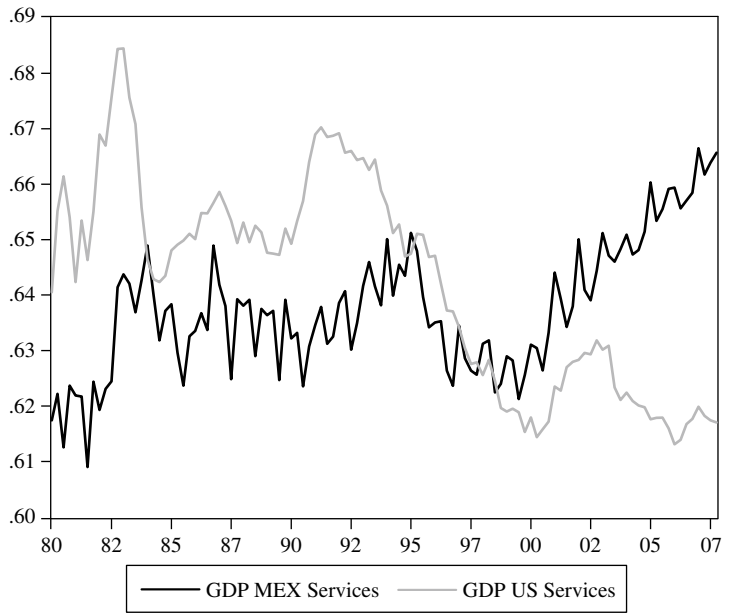
3.1. The Argument

Here we suggest two possible channels whereby the economic dynamics of Mexico and the US became homogeneous. First, we argue that the transformation of Mexico into a service oriented economy –initiated in the late 1980's– contributed to producing similar economic fluctuations to those observed in the US. That is, as Mexico made the transition from a manufacturing oriented economy to a more service oriented economy, the dynamics of aggregate output in both countries tended to become more closely associated. This transition is illustrated in Graph 3, which shows the participation of the service sector GDP to the aggregate. Data were obtained from Banco de Mexico and cover the period 1980-2007. It is worth noticing how the participation of this sector increased significantly after the 1994-1995 peso crisis. That is, not only did trade increase after the signing of the trade agreement, but the productive orientation of the Mexican economy also changed. In Graph 3 we also report participation of services in the US. Similar movements in the series are evident from the early 1980's to about 2003.

Once we recognize this fact, it can be reasonably argued that the similarities between the economic cycles of Mexico and the US may be the consequence of the transition of Mexico into a service oriented economy. This argument could be at least as plausible as the argument that claims that the strengthening of the production-side links between the manufacturing industries in the two countries was the cause of economic synchronization.

GRAPH 3

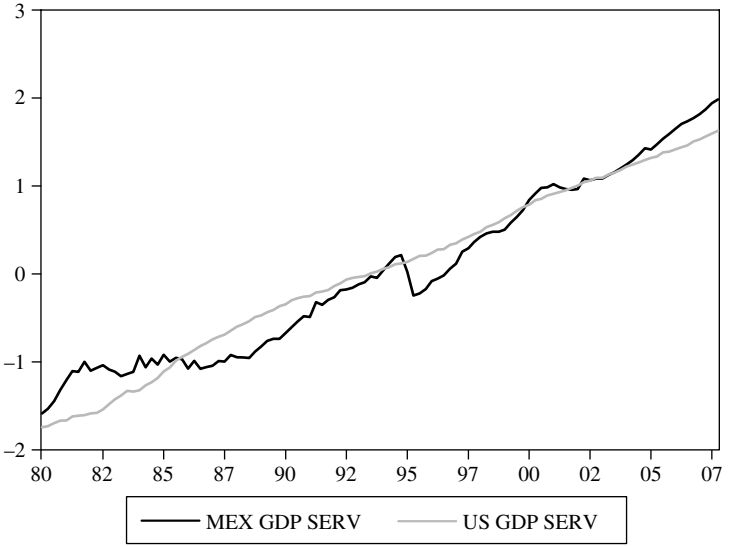
PARTICIPATION OF THE SERVICE SECTOR IN TOTAL GDP IN MEXICO AND THE US



As a preliminary examination of this possibility, we illustrate the Mexican and US service GDP series in levels, growth rates and first differences in Graphs 4, 5, and 6 respectively. From the first graph, it is evident that the variables follow a similar trend, though in the last few years they appear to have somewhat distinct trajectories. As for the growth rates and quarterly changes, in both cases we observe comparable fluctuations; especially since 1995. In the case of growth rates, the similarities are clear for the economic slowdowns of the early 1980's, 1994-1995 and 2001. In fact, the only period in which the series appear not to follow the same pattern is in the early 1990's: while the US experienced a recession, Mexico's GDP grew at sustained rates. These dynamics hold for the series in first differences, which is a characteristic not found when analyzing the series for the manufacturing industry.

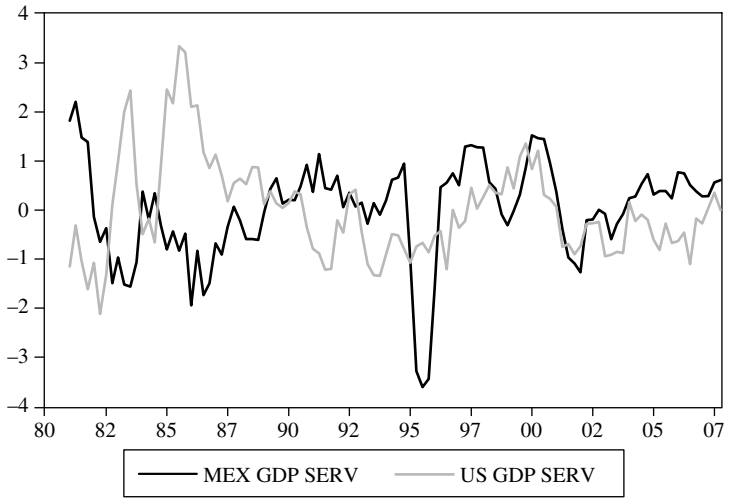
GRAPH 4

SERVICE SECTOR GDP IN LEVELS



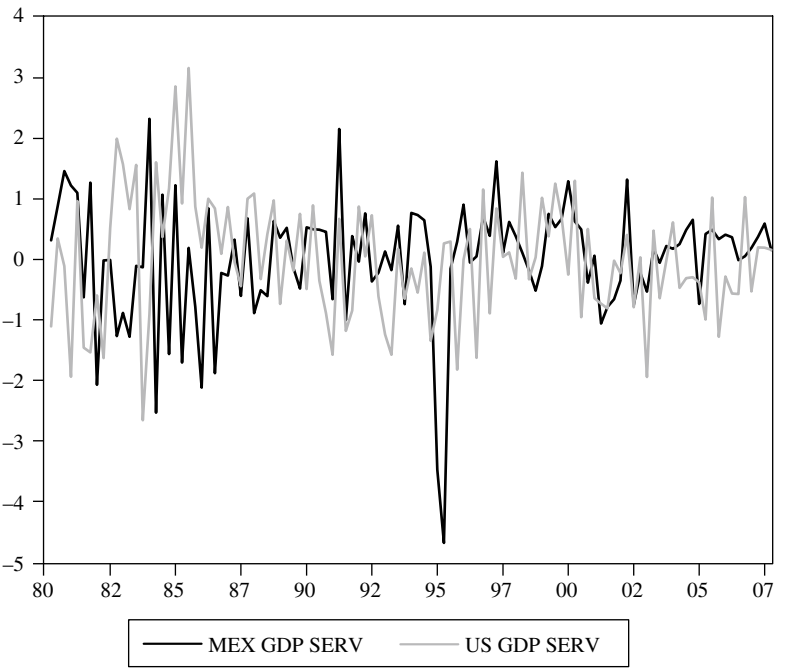
GRAPH 5

SERVICE SECTOR GDP IN GROWTH RATES



GRAPH 6

SERVICE SECTOR GDP IN FIRST DIFFERENCES

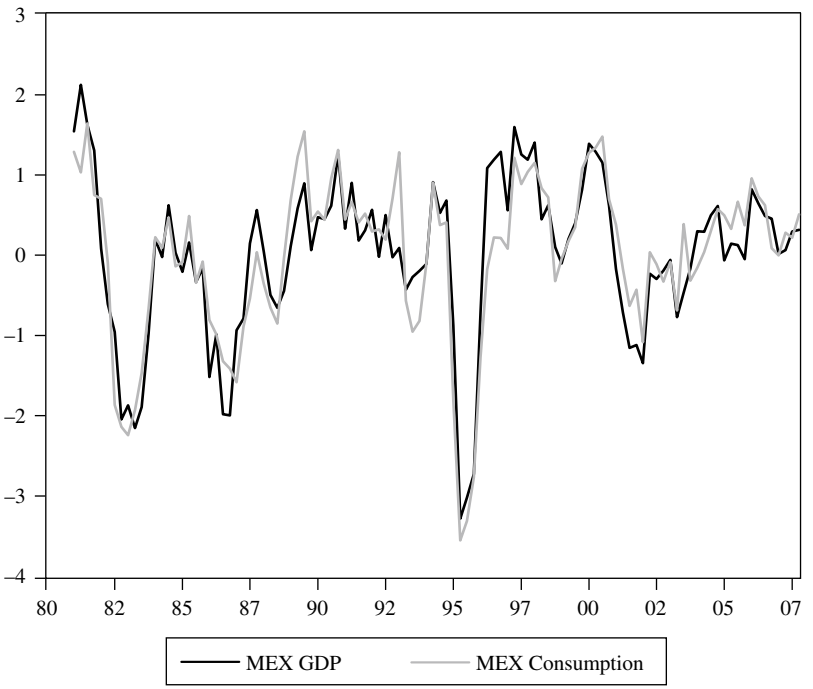


The second possibility we offer is related to the behavior of aggregate consumption in both countries, particularly since 1988. As it is amply known, in that year Mexico began a profound transformation of its economy: market openness, privatization and liberalization were officially initiated. One of the most significant changes during this episode occurred in the credit market. From 1988 to 1994 credit to the private sector grew at dramatic rates, resulting in reported growth rates for consumption above those observed for GDP.[14] Graph 7 shows this evidence. Consumption data were obtained from Banco de Mexico and cover the sample period 1980-2007. Clearly, after the liberalization of the financial sector, and until just prior to the 1994 economic crisis, consumption grew faster than GDP. However, this was not the case before 1988. From 1994 to about 2000 consumption and GDP progressed at reasonable rates. After the 2001 economic slowdown, sustained growth returned and continued until the end of 2007.

[14] For a detailed analysis of the credit market and consumption in Mexico see Castillo-Ponce (2003).

GRAPH 7

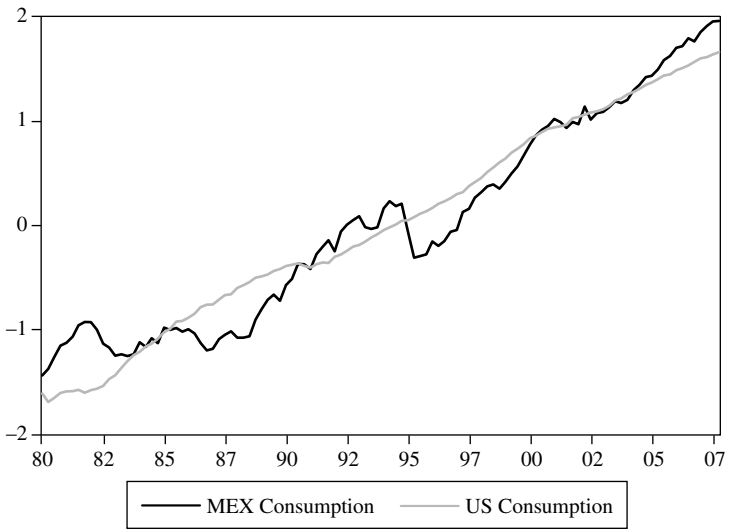
GDP AND CONSUMPTION IN MEXICO: GROWTH RATES



Just as we did in the case of the service sector GDP, here we present the levels, growth rates and first differences of consumption in Mexico and in the US. The series are illustrated in Graphs 8, 9, and 10 respectively. We observe a more or less similar trend between the series from about 1993 to 2004. For the more recent years, the Mexican series appears to have a steeper slope than the US series. This is reflected in the growth rates. From 2004 to 2007, the series head in opposite directions. It is worth mentioning that the growth rates exhibit similar dynamics for most of the rest of the sample, with the exception of the early 1990's. Interestingly, for the first differences it is difficult to identify an episode when the series do not behave in a similar fashion; perhaps the only evidence of this is in 1991. In general, throughout the sample the ups and downs of consumption in Mexico follow the ups and downs of its US counterpart. As such, the graphical evidence provides some hope to establish the existence of common cycles between consumption in Mexico and in the US.

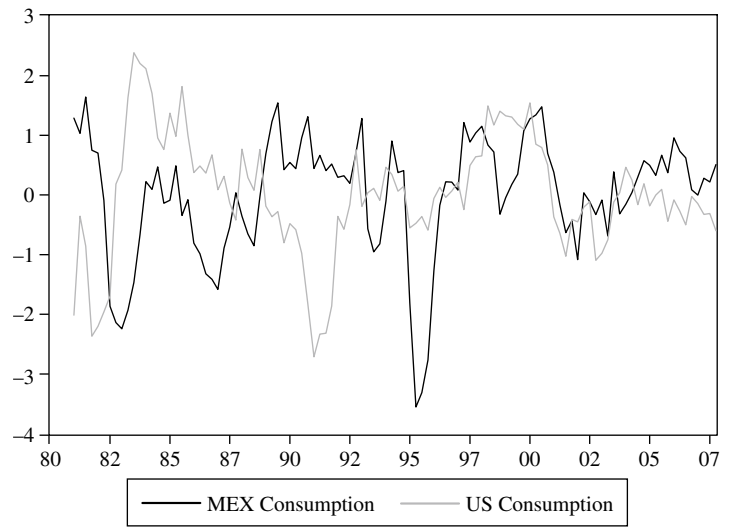
GRAPH 8

CONSUMPTION IN LEVELS



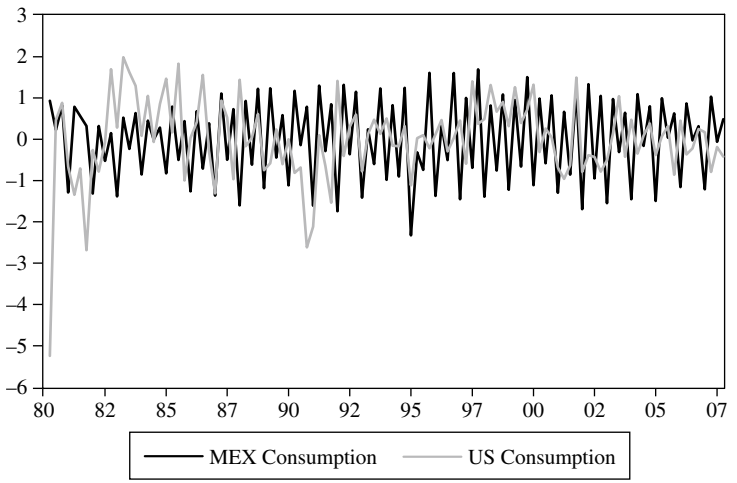
GRAPH 9

CONSUMPTION IN GROWTH RATES



GRAPH 10

CONSUMPTION IN FIRST DIFFERENCES



3.2. Econometric Exercise

To formally investigate the association between production in the service sectors of Mexico and the US, and between aggregate consumption in both countries, we conduct cointegration and common cycle tests. As previously mentioned, we consider the gross domestic product from the service sector as reported by Banco de Mexico and the Bureau of Economic Analysis for the US. The data for aggregate private consumption comes from the same sources. In both cases the entire sample is from the first quarter of 1980 to the last quarter of 2007, though we also conduct tests for a shorter sample, 1996-2007. The series are in constant terms and were adjusted to account for seasonality.[15] The results are presented in Table 15.[16]

We find cointegration for all cases. Long run elasticities for the 1996-2007 sample period are greater than for the entire period. It is worth mentioning that for consumption, the increase in the elasticity is substantial, from 0.92 to 1.53. In all cases, the qualitative association is positive and the coefficients are statistically significant at conventional levels.

As for the common cycle tests, the results suggest the existence of common cycles for both candidates. In the case of the service GDP, we identify a significant and positive relationship for the two samples. The magnitude of the coefficient is greater for the post

[15] We were unable to obtain sets of non-seasonally adjusted series for both, Mexico and the US. Nonetheless, our results appear to be robust with the use of seasonally adjusted series. See Herrera (2004) for the argument.

[16] Unit root tests results indicate that all the series considered in this section are I(1). Results are not shown for brevity.

NAFTA period, suggesting a short-run elasticity of the Mexican series with respect to the US series of 0.82. For consumption, we find that the two series share a common cycle only for the more recent sample period. Our assessment is that the failure to identify a common cycle for the entire sample is possibly due to the distinct patterns of behavior in the early 1990's, as shown in the graphical evidence. Although there appears to be a strong and positive relationship in other periods, the influence of that episode may be sufficient to reject the hypothesis of the existence of a common cycle. On the other hand, while consumption patterns are not similar in recent times, common movements in the 1996-2004 period are strong enough to produce a common cycle between the series. It would be interesting to perform the test in the future to evaluate whether the 2007 credit crisis in the US led to the disruption of the common cycle currently present.

Overall, the econometric results confirming the existence of common cycles in the service sector GDPs and consumption, serve as the basis for arguing that the behavior of these two variables could very well be the source of economic synchronization in Mexico and the US. Evidently, what we present here is only an introduction to a topic that certainly requires a more in-depth analysis. We will surely pursue this line of reasoning in future research.

TABLE 15

COINTEGRATION AND COMMON CYCLES TESTS

Cointegration Tests				
Mexican Series	US Series	Sample	Cointegration	Cointegrating Vector
GDP Services	GDP Services	1980-2007	Yes	1, –1.23 (0.05)
GDP Services	GDP Services	1996-2007	Yes	1, –1.34 (0.03)
Consumption	Consumption	1980-2007	Yes	1, –0.92 (0.03)
Consumption	Consumption	1996-2007	Yes	1, –1.53 (0.03)
Common Cycle Tests				
Mexican Series	US Series	Sample	Common Cycle	Cofeature Vector
GDP Services	GDP Services	1980-2007	Yes	1, –0.71 (0.13)
GDP Services	GDP Services	1996-2007	Yes	1, –0.82 (0.10)
Consumption	Consumption	1980-2007	No	
Consumption	Consumption	1996-2007	Yes	1, –0.15 (0.09)

Standard error in parenthesis.

IV. CONCLUSION

Business cycles synchronization between Mexico and the US has become accepted as a fact. The factors that contributed to this phenomenon, however, remain to be determined. Various studies have centered their attention on the manufacturing sector, for obvious reasons. However, while said exercises have shown that correlation across manufacturing productions increased since the signing of NAFTA, or that the series are cointegrated, they do not identify whether manufacturing outputs in both countries share a common cycle. That is, it is not clear that synchronization of economic activity in the manufacturing industry led to the synchronization of the business cycles. Indeed, in this document we provide evidence that, while manufacturing productions share common trends, and in most cases statistically significant short-run associations, they do not exhibit a common cycle. Hence, it renders the claim that synchronization of economic activity in this sector prompted the synchronization of the business cycles unfounded. We then propose two possibilities for explaining business cycles synchronization: GDP of the service sector and aggregate consumption. Our results show some promising avenues for further research. That is, we find that both candidates share common trends and common cycles, though in the case of consumption the latter is found only for the post NAFTA period. Nonetheless, our results should provide the basis for conducting more rigorous and detailed exercises considering the two possibilities we proposed in this document.

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APPENDIX

DATA CONSTRUCTION

US: we considered industrial production indexes according to the North American Industry Classification System (NAICS). In the case of divisions 1, 3, 6, and 7 we did not modify the series since their descriptions match those for the Mexican divisions. For divisions 2, 4, 5 and 8 we weighted the indexes by the contribution of each division to total manufacturing. The weights were obtained from the Bureau of Economics Analysis. For example, for division 2 (textiles, apparel and leather products) we proceeded as follows:

Total Weight= Percentage of textiles and related products + Percentage of apparel and leather products

Weight1 (for textiles and related products index) = Percentage/total weight

Weight2 (for apparel and leather products index) = Percentage/total weight

Division 2 series = (textiles and related products index)* Weight1 + (apparel and leather products index)*Weight2

The description for the matched series is as follows:

Mexican Divisions		US Divisions	
Division I	Food products, beverages, and tobacco	NAICS 311, 312	Food, beverage, and tobacco
Division II	Textiles, apparel, and leather industry	NAICS 313 NAICS 314	Textiles and products Apparel and leather goods
Division III	Wood and wooden products industry	NAICS 321	Wood
Division IV	Paper, paper products, printing, and editorials	NAICS 322	Paper
		NAICS 323	Printing and related support activities
Division V	Chemical substances, products derived from petroleum, rubber, and plastic products	NAICS 324	Petroleum and coal products
		NAICS 325 NAICS 326	Chemical Plastics and rubber products
Division VI	Nonmetallic mineral products, except those derived from petroleum and coal	NAICS 327	Nonmetallic mineral products
Division VII	Primary metal industries	NAICS 331	Primary metal
Division VIII	Metallic products, machinery, and equipment	NAICS 332	Fabricated metal product
		NAICS 333 NAICS 334 NAICS 335	Machinery Computer and electronic products Electrical equipment, appliance, and components
		NAICS 336 NAICS 337	Transportation equipment Furniture and related product

COINTEGRATION AND COMMON CYCLE RESULTS

Corresponds to Table 9: Cointegration Tests

Sample 1980-2007					
System	Hypothesis on *r*	p Value	System	Hypothesis on *r*	p Value
Total - Total	0	0.03	Total - IP	0	0.05
	1	0.84		1	0.86
Div. 1 - Div. 1	0	0.00	Div. 1 - IP	0	0.05
	1	0.94		1	0.85
Div. 2 - Div. 2	0	0.00	Div. 2 - IP	0	0.01
	1	0.89		1	0.92
Div. 4 - Div. 4	0	0.01	Div. 4 - IP	0	0.00
	1	0.40		1	0.89
Div. 5 - Div. 5	0	0.00	Div. 5 - IP	0	0.00
	1	0.75		1	0.92
Div. 6 - Div. 6	0	0.05	Div. 6 - IP	0	0.05
	1	0.62		1	0.95
Div. 7 - Div. 7	0	0.01	Div. 7 - IP	0	0.05
	1	0.65		1	0.97
Div. 8 - Div. 8	0	0.05	Div. 8 - IP	0	0.05
	1	0.32		1	0.68

Corresponds to Table 10: Common Cycle Tests

Sample 1980-2007					
System	Hypothesis on *s*	p Value	System	Hypothesis on *s*	p Value
Total - Total	> 0	0.00	Total - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 1 - Div. 1	> 0	0.00	Div. 1 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 2 - Div. 2	> 0	0.00	Div. 2 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 4 - Div. 4	> 0	0.00	Div. 4 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 5 - Div. 5	> 0	0.75	Div. 5 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 6 - Div. 6	> 0	0.00	Div. 6 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 7 - Div. 7	> 0	0.00	Div. 7 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 8 - Div. 8	> 0	0.00	Div. 8 - IP	> 0	0.00
	> 1	0.00		> 1	0.00

Corresponds to Table 11: Common Cycle Tests

Sample 1996-2007					
System	Hypothesis on *s*	p Value	System	Hypothesis on *s*	p Value
Total - Total	> 0	0.00	Total - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 1 - Div. 1	> 0	0.00	Div. 1 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 2 - Div. 2	> 0	0.00	Div. 2 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 4 - Div. 4	> 0	0.00	Div. 4 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 5 - Div. 5	> 0	0.26	Div. 5 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 6 - Div. 6	> 0	0.00	Div. 6 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 7 - Div. 7	> 0	0.00	Div. 7 - IP	> 0	0.00
	> 1	0.00		> 1	0.00
Div. 8 - Div. 8	> 0	0.00	Div. 8 - IP	> 0	0.00
	> 1	0.00		> 1	0.00

Corresponds to Table 13: Cointegration Tests

Sample 1987-2007			Sample 1996-2007		
System	Hypothesis on *r*	p Value	System	Hypothesis on *r*	p Value
Total - Imports	0	0.62	Total - Imports	0	0.04
	1	0.92		1	0.94
Div. 1 - Imports	0	0.01	Div. 1 - Imports	0	0.01
	1	0.91		1	0.39
Div. 2 - Imports	0	0.20	Div. 2 - Imports	0	0.05
	1	0.32		1	0.90
Div. 4 - Imports	0	0.09	Div. 4 - Imports	0	0.04
	1	0.85		1	0.81
Div. 5 - Imports	0	0.17	Div. 5 - Imports	0	0.00
	1	0.95		1	0.66
Div. 6 - Imports	0	0.36	Div. 6 - Imports	0	0.07
	1	0.83		1	0.41
Div. 7 - Imports	0	0.31	Div. 7 - Imports	0	0.01
	1	0.73		1	0.31
Div. 8 - Imports	0	0.66	Div. 8 - Imports	0	0.05
	1	0.69		1	0.64

Corresponds to Table 14: Common Cycle Tests

System	Hypothesis on *s*	p Value
Total - Imports	> 0	0.00
	> 1	0.00
Div. 1 - Imports	> 0	0.00
	> 1	0.00
Div. 2 - Imports	> 0	0.01
	> 1	0.00
Div. 4 - Imports	> 0	0.00
	> 1	0.00
Div. 5 - Imports	> 0	0.00
	> 1	0.00
Div. 6 - Imports	> 0	0.00
	> 1	0.00
Div. 7 - Imports	> 0	0.01
	> 1	0.00
Div. 8 - Imports	> 0	0.00
	> 1	0.00

Corresponds to Table 15: Cointegration Tests

Sample 1980-2007			Sample 1996-2007		
System	Hypothesis on *r*	p Value	System	Hypothesis on *r*	p Value
Services - Services	0	0.00	Services - Services	0	0.00
	1	0.11		1	0.11
Consumption - Consumption	0	0.00	Consumption - Consumption	0	0.00
	1	0.22		1	0.15

Corresponds to Table 15: Common Cycle Tests

Sample 1980-2007			Sample 1996-2007		
System	Hypothesis on *s*	p Value	System	Hypothesis on *s*	p Value
Services - Services	> 0	0.02	Services - Services	> 0	0.20
	> 1	0.00		> 1	0.00
Consumption - Consumption	> 0	0.00	Consumption - Consumption	> 0	0.16
	> 1	0.00		> 1	0.00