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László ERDEY
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Structural Changes of Mexico-US Merchandise Trade in the Light of Intra-Industry Trade

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ABSTRACT:
This paper aims to analyze the Mexican-US trade structure in the pre-NAFTA period and also the changes in the NAFTA era. The time horizon starts in 1981 and ends in 2007. The source of data was UN’s Comtrade database.
László Erdey: Structural changes of Mexico-US merchandise trade in the light of intra-industry trade

For long time the most important results of studies researching trade liberalization between developed countries showed that deepening trade relations resulted in changes of international merchandise flows that could not be explained by traditional trade theory. Two-way trade of goods belonging to the same industry (intra-industry trade – IIT) turned to be the fastest growing component of international trade between these countries.

By our days trade theorists accepted as a stylized fact that the analysis of intra-industry trade flows is an important tool to characterize a country’s integration into the world economy.

The wide choice of various indices of IIT effectively grab the demand and supply side of international integration, moreover the marginal indices are good means to demonstrate changes in these processes.

This paper aims to analyze the Mexican-US trade structure in the pre-NAFTA period and also the changes in the NAFTA era. The time horizon starts in 1981 and ends in 2007. The source of data was UN’s Comtrade database.


This part mostly concentrates on Mexican-US intra-industry trade preceding NAFTA, however I try to present the long term trends of IIT using the well-known Grubel-Lloyd index, in spite of the several problems raised by the accessibility of relevant data sources. One of the most important of these problems is that the exports and imports of the maquiladora industry, which grew very fast since the beginning of 1980s were excluded of Mexican trade statistics before 1992. This means that tendencies of IIT before 1992 can be analyzed only in indirect ways: a) surveying previous research in Mexico’s IIT; b) calculating global and bilateral GL-indices without maquiladora trade flows; c) reflecting bilateral indices on those calculated using US mirror statistics.

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1 United Nations Commodity Trade Statistics Database, DESA/UNSD.

2 Maquiladora comes from the Spanish word maquilar meaning “to perform a task for another”. Today, maquiladora refers to a Mexican corporation, wholly or predominantly owned by foreigners, which assembles (partly imported) products for export to the U.S. or other foreign country or the Mexican market.
Although the results of these methods turned to be in good harmony, it must be stressed that they are not to be compared to each other directly. The methodological problems in case a) come from the various data sources and different level of aggregation of trade flows used by previous studies, in case b) from the lack of maquiladora exports and imports data, and in case c) from the discrepancy between Mexican-US and US-Mexican mirror statistics originating in different methods used in measuring and classifying trade flows.

Previous research and my own calculations also show that IIT’s share in total trade grew significantly in the decade of the 1980s. Globerman (1992) reports an increase of 60% of US-Mexican IIT between 1980 and 1988, Gonzalez–Velez (1993) shows the duplication of bilateral two-way trade flows in the 1982-1990 period, similarly to Esquivel (1992). It needs to be stressed again that the GL-indices calculated by these authors are not comparable directly to each other because of the different classifications and measuring methods used by them.

The motivation to expand my research to the 1980s comes from the above mentioned problems. My aim was to build longer time series to be able to demonstrate and explain long run tendencies of bilateral IIT.

Figure 1a shows Mexico’s global IIT measured by the trade weighted GL index using 3-digit SITC Rev. 1 trade data for 181 industries (of sections 0-9), where

\[ GL = \sum_{i=1}^{n} w_i GL_i, \text{ where} \]

\[ GL_i = \frac{(X_i + M_i) - |X_i - M_i|}{X_i + M_i} = 1 - \frac{|X_i - M_i|}{X_i + M_i}, \text{ where} \]

\[ X_i \text{ and } M_i \text{ are exports and imports of industry } i, \text{ and } w_i \text{ is industry } i \text{'s trade share in total trade:} \]

\[ w_i = \frac{X_i + M_i}{\sum_{i=1}^{n} (X_i + M_i)}. \]

Figure 1b and 1c show GL indices similarly for sections 0-8 (177 industries – excluding the high trade volatility commodities and transactions not classified according to kind) and sections 5-8 (102 industries), which is manufacturing.

Figures 1/a-c show that the IIT increased significantly for each grouping in the 1981-1991 period. Taking total trade (Figure 1/a) the GL index grew from 0,16 in 1981 to 0,35 by 1991.

\footnote{The earliest studies were published by Aquino (1978), Balassa (1979), and Havrylyshyn–Civan (1983) using 1972, 1974, and 1978 data, respectively.}

\footnote{Theory and empirical research show that IIT predominantly exists in manufacturing.}
Figure 1/a-c: Mexico’s global, multilateral intra-industry trade, 1981-1991 (without maquiladora industry), SITC Rev. 1., 3-digit industries, Sections 0-9, 0-8, 5-8

Source: own calculations.
The most dramatic changes – in accordance with the expectations – happened in manufacturing where the Grubel—Lloyd index grew from the low level of 0,17 in 1981 to almost its triple (0,45) by the end of the period.

The calculated GL values are partly under- and partly overestimated. The overestimation comes from multilateral trade data and known as the geographical bias\(^5\). The underestimation originates in the lack of maquiladora trade flows. My further calculations below show that high share of the maquiladora industry’s trade flows appear as IIT when SITC 3-digit level of disaggregation is used. The importance of this sector is significant: it gave 37,09% and 23,58% of total exports and imports in 1991, respectively\(^6\).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.png}
\caption{GL indices of Mexico’s global, multilateral trade, 1981-2007, 3-digit SITC Rev. 1 classification without maquiladoras until 1991}
\end{figure}

Source: own calculations

In order to estimate the bias coming from the lack of maquiladora data I compared the Grubel—Lloyd indices of 1991 to those of 1992 which already contain trade flows of the maquiladoras. Figure 2 shows that GL-indices grew significantly with the inclusion of maquiladora exports and imports. Since during1991-1992 there were no larger fluctuations in Mexico’s situation in the world economy, in her trade and economic structure, we may suppose that the 17-19 percentage points increase in the GL-indices can be attributed to the inclusion of maquiladora trade flows. Without taking into account the above problems of maquiladora trade flows it is obvious that the growth of the share of intra-industry trade was the highest in the 1983-1986 period.

\(^5\) Geographical bias arises when different partner countries are put together before doing the calculations.

\(^6\) Source: INEGI
The next section deals with IIT between Mexico and its dominant trade partner (see Figure 3), the US between 1981 and 1991, first without maquiladoras then including them using US mirror trade data.

*Figure 3: Share of the US in Mexico’s exports and imports, 1981-1991 (%) (without maquiladoras)*

Source: own calculations

If we use Mexican trade data which does not contain the trade flows of the maquiladoras (Figures 4/a-c) we can see the similarity of bilateral trade to the global multilateral trade flows analyzed above. The GL index of total bilateral trade grew from 0,16 of 1981 to 0,33 by 1991, the increase in the index of manufacturing is even higher from 0,16 to 0,45. The pattern of the growth of bilateral IIT is very similar to the global two-way trade: the most important changes happened in the first half of the 1980s.

The GL-indices of bilateral trade are underestimated as well because of the same reason: the lack of maquiladora data. The bias can be estimated in the same way (see Figure 5), its extent is about 18-19 percentage points. The bilateral indices of the end of the period (1991) underestimate the share of intra-industry trade in total bilateral trade approximately by this extent.

*Figure 6/a-c* show tendencies (see also Table 1) which are in accordance with the above analysis. The GL indices calculated using more reliable mirror trade data reported by the US demonstrate the obvious increase in bilateral IIT. The share of two-way trade was doubled by the end of the period. The higher indices also confirm my earlier hypothesis about the downward bias resulting from the lack of maquiladora trade flows.

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7 Using mirror trade data reported by the US means that exports and imports are those of the US here.
Figure 4/a-c Mexico—US intra-industry trade, 1981-1991 (without maquiladoras), 3-digit SITC Rev. 1 classification, Sections 0-9, 0-8, 5-8

Source: own calculations
From 1986 US-Mexican trade became dominantly intra-industry type, moreover this was true for manufacturing even from 1982. The highest growth rates can be observed in the 1982-1984 and 1986-1988 periods reflecting the structural adjustment and the changes in the pattern of international trade induced by the orthodox and heterodox stabilization packages and drastic trade liberalization. Between 1988 and 1993 the level of protection did not decrease any more, moreover, the average and weighted tariff rates slightly increased, so it is not surprising that the levels of IIT did not increase at the end of this period.

Table 1: Summary data of Mexican intra-industry trade for the period 1981-1991, 3-digit SITC Rev. 1 classification

<table>
<thead>
<tr>
<th>Year</th>
<th>Mexico–World (Figure 1(a-c))</th>
<th>Mexico–US (Figure 4(a-c))</th>
<th>US–Mexico (Figure 6(a-c))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GL (0-9)</td>
<td>GL (0-8)</td>
<td>GL (5-8)</td>
</tr>
<tr>
<td>1981</td>
<td>0.16</td>
<td>0.16</td>
<td>0.17</td>
</tr>
<tr>
<td>1982</td>
<td>0.15</td>
<td>0.15</td>
<td>0.25</td>
</tr>
<tr>
<td>1983</td>
<td>0.27</td>
<td>0.27</td>
<td>0.58</td>
</tr>
<tr>
<td>1984</td>
<td>0.32</td>
<td>0.32</td>
<td>0.60</td>
</tr>
<tr>
<td>1985</td>
<td>0.32</td>
<td>0.32</td>
<td>0.54</td>
</tr>
<tr>
<td>1986</td>
<td>0.44</td>
<td>0.44</td>
<td>0.61</td>
</tr>
<tr>
<td>1987</td>
<td>0.37</td>
<td>0.37</td>
<td>0.55</td>
</tr>
<tr>
<td>1988</td>
<td>0.42</td>
<td>0.42</td>
<td>0.56</td>
</tr>
<tr>
<td>1989</td>
<td>0.38</td>
<td>0.38</td>
<td>0.50</td>
</tr>
<tr>
<td>1990</td>
<td>0.36</td>
<td>0.38</td>
<td>0.48</td>
</tr>
<tr>
<td>1991</td>
<td>0.35</td>
<td>0.38</td>
<td>0.45</td>
</tr>
</tbody>
</table>

* without maquiladoras
**using US mirror statistics
Source: own calculations

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*See also Erdey (2006).*
Figure 6/a-c: US-Mexican intra-industry trade, 1981-1991, 3-digit SITC Rev. 1., US mirror statistics
Sections 0-9, 0-8, 5-8

Source: own calculations
Using the most appropriate 3-digit SITC classification to reflect the concept of „industries” the calculated GL-indices show quite obviously that by the second half of the 1980s Mexican—US trade cannot be analyzed only by using traditional trade theory basing on the differences of the trading partners.

The differences in productivity and endowments clearly remained significant but a bunch of new factors emerged which cannot be explained entirely using the Ricardian or the Heckscher-Ohlin model. Some of the most important of these new factors are the exploitation of economies of scale, agglomeration effects and the international production sharing which is very intense between the two countries because of the maquiladora industry.

The intensity of intra-industry trade between US and Mexico reached the levels of IIT of the most developed countries\(^9\). This means that on the surface Mexico-US bilateral trade – as a consequence of unilateral and multilateral (GATT) trade liberalization and the stabilization packages – became more similar to trade flows of developed countries caused by intra-industry specialization, instead of the expected inter-industry specialization motivated by the differences of the trading countries.

**Mexican-US intra-industry trade, 1992-2007**

**The GL-indices**

The intra-industry trade between Mexico and the US doubled between 1981 and 1989. The highest levels are measured in the manufacturing sector which is in accordance with our expectations. *Table 2* contains my calculations for the whole 1981-2007 period.

*Source: own calculations*

\(^9\) See also Gonzalez–Velez (1995).
Taking a look on the indices for the period of 1994-2007 we might find it surprising that the trade liberalization in the framework of NAFTA, which came into force on January 1, 1994 has not increased the bilateral levels of intra-industry trade. The GL-indices of the period compared to those of the 1980s have been – as a matter of fact – stagnating. This tendency is contrary to the experience of earlier history of regional trade integrations. The tendencies are shown on Figure 7.

Table 2: GL indices of intra-industry trade between Mexico and the US, 1981-2007

<table>
<thead>
<tr>
<th>No. of industries</th>
<th>US mirror: SITC Rev. 1 3-digit</th>
<th>US mirror: SITC Rev. 3 3-digit</th>
<th>SITC Rev. 1 3-digit</th>
<th>SITC Rev. 3 3-digit</th>
<th>HS 1992 6-digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>0.31</td>
<td>0.29</td>
<td>0.37</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1982</td>
<td>0.32</td>
<td>0.32</td>
<td>0.50</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1983</td>
<td>0.32</td>
<td>0.32</td>
<td>0.58</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1984</td>
<td>0.42</td>
<td>0.41</td>
<td>0.65</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1985</td>
<td>0.43</td>
<td>0.42</td>
<td>0.62</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1986</td>
<td>0.32</td>
<td>0.51</td>
<td>0.66</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1987</td>
<td>0.55</td>
<td>0.54</td>
<td>0.67</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1988</td>
<td>0.61</td>
<td>0.60</td>
<td>0.71</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1989</td>
<td>0.62</td>
<td>0.60</td>
<td>0.73</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1990</td>
<td>0.62</td>
<td>0.60</td>
<td>0.73</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1991</td>
<td>0.62</td>
<td>0.61</td>
<td>0.72</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1992</td>
<td>0.62</td>
<td>0.61</td>
<td>0.71</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1993</td>
<td>0.64</td>
<td>0.63</td>
<td>0.71</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1994</td>
<td>0.64</td>
<td>0.62</td>
<td>0.70</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1995</td>
<td>0.58</td>
<td>0.57</td>
<td>0.65</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1996</td>
<td>0.57</td>
<td>0.55</td>
<td>0.63</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1997</td>
<td>0.60</td>
<td>0.58</td>
<td>0.66</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1998</td>
<td>0.59</td>
<td>0.57</td>
<td>0.62</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>1999</td>
<td>0.57</td>
<td>0.56</td>
<td>0.61</td>
<td>...</td>
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</tr>
<tr>
<td>2000</td>
<td>0.56</td>
<td>0.55</td>
<td>0.61</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2001</td>
<td>0.55</td>
<td>0.54</td>
<td>0.59</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2002</td>
<td>0.55</td>
<td>0.54</td>
<td>0.60</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2003</td>
<td>0.55</td>
<td>0.55</td>
<td>0.61</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2004</td>
<td>0.56</td>
<td>0.55</td>
<td>0.63</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2005</td>
<td>0.55</td>
<td>0.54</td>
<td>0.62</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2006</td>
<td>0.54</td>
<td>0.53</td>
<td>0.61</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>2007</td>
<td>0.52</td>
<td>0.51</td>
<td>0.59</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>


The dramatic growth rates of bilateral trade flows between 1994-2000 – exports grew by 2,87 times to USD 147 billion, imports by 2,33 to USD 128 billion – were not followed by the growth rates of IIT, not even by those in manufacturing, however the GL indices of manufacturing are higher than the indices of total bilateral trade. While the experience of 1981-1989 period was in accordance with the theories predicting positive relationship
between trade liberalization and intra-industry trade, the tendencies of the NAFTA era were contradictory to this widely shared point of view.

It seems that the specialization of NAFTA-period was predominantly inter-industry type which was more in accordance with the difference in the two countries’ factor endowments than the tendencies of the earlier period. It is quite evident on the basis of Hufbauer-Chilas (1974), Lipson (1982), and Marvel-Ray (1987) that the high initial levels of intra-industry trade had positive effects on creating NAFTA, causing higher support for trade liberalization in both countries.

The stagnating share of IIT in the fast growing bilateral trade needs further explanation. One solution might be the possibility described by Shelburne (2001): the GL-indices might be downward biased because of the high trade surplus of Mexico in the bilateral trade which is especially high in manufacturing trade (Figure 8).

![Figure 8: Mexico’s trade surplus in Mexico-US trade, 1992-2007 (USD)](image)

*Source: own calculations*

When bilateral trade is unbalanced, the GL-index is downward biased. There were several attempts (Grubel—Lloyd, 1975, Aquino, 1978) to decrease this bias but by our days it is a common understanding that the additional distortions created by methods aiming at decreasing this bias are higher than the ones caused by the bias itself. Shelburne (2001) using the Aquino-method estimates this downward bias to be about only 1-2 percentage points between 1989-1999 in the GL-indices of US-Mexican bilateral trade.

It seems to be more plausible to explain the tendencies in another way: the NAFTA has not influenced significantly the Mexican-US trade pattern, the structure was created by the structural adjustment and unilateral and multilateral (after the GATT accession) trade
liberalization of the 1980s. The fast growing Mexican FDI-import and deepening production sharing of the 1990s, with the effects of the 1995 peso crises consolidated this trade structure making the growth rate of bilateral trade flows very dynamic. The comparison of the pre-NAFTA and NAFTA periods and the experience of the 1995, 1998 and 2001-2004 downturns show that the bilateral trade patterns have not become more similar to those of developed countries.

![Figure 9: Mexico’s trade structure](source: own calculations using CEFP data)

Although the bilateral level of IIT is quite similar to that of developed countries, its structure is very different. Below I demonstrate indirectly and directly, that high bilateral GL-indices are partly caused by international production sharing (outward processing trade).
Trade statistics published by CEFP\textsuperscript{10} show that the major part of Mexico’s imports and exports are imports and exports of intermediate products (see Figure 9).

In order to describe Mexican-US trade I calculated the average share of intermediate products for the period 1998-2004 using UN’s BEC\textsuperscript{11} classification and the conversion table of Lemoine–Ünal-Kesenci (2003:33). The average share of intermediate products in imports from US was 65.08\% and in exports to the US 37.94\% in the 1998-2004 period.

Analyzing the bilateral trade flows we can come to the conclusion that international production sharing makes a significant part of it: Mexico imports intermediate products from the US and after further processing, exports them back to the northern neighbor. This outward processing trade, even if does not comply with the theoretical definition of intra-industry trade, appears in the bilateral Grubel-Lloyd indices even in the highest 6-digit level of disaggregation biasing upwards these indices.

Mexico’s methodological changes in publishing trade statistics made it possible to estimate this upward bias: trade statistics before 1992 do not contain the maquiladora (outward processing) industry’s trade flows which became included from 1992. Since in 1991 and 1992 there were no larger fluctuations in Mexico’s exports and imports, we may attribute the big leap in the GL-indices from 1991 to 1992 to the inclusion of maquiladora data (see Figure 5).

\textit{Table 2} shows that the inclusion of maquiladora data had an increasing effect of 14-19 percentage points which we can observe even in the deepest (5024 products) HS\textsuperscript{12} 1992 6-digit disaggregation.

The 14-19 percentage point bias is a lower estimation because the well-known aggregation bias of GL-indices – which might be between 11-28 percentage points on the basis of data shown in \textit{Table 2} – should be added to these amounts.

The bias caused by outward processing trade (maquiladoras) is an obvious proof that a significant part of high intra-industry trade measured between Mexico and the US must be attributed to international production sharing\textsuperscript{13}. This structure differs from intra-industry flows between developed countries which consist of two-way trade of horizontally and vertically differentiated products.

\textit{Horizontal and vertical intra-industry trade between Mexico and the US}

The above analysis suggests some hypotheses about horizontal and vertical intra-industry trade. I expected high and stable share of two-way trade (TWT) in the NAFTA period

\textsuperscript{10} Centro de Estudios de las Finanzas Públicas (CEFP) de la Cámara de Diputados
\textsuperscript{11} Broad Economic Categories
\textsuperscript{12} Harmonized System
\textsuperscript{13} Shelburne (2001) comes to the same conclusion finding that the percentage of U.S. components in the value of US imports by product is significantly related to the IIT indexes even at the most extensive level of product disaggregation.
consisting of higher share of vertical intra-industry trade (VIIT) due to the differences in endowments and the growing international production sharing and lower share of horizontal intra-industry trade (HIIT). The results shown below confirm my hypotheses.

I calculated the HIIT- and VIIT-indices using different methods offered by the literature using the Greenaway–Hine–Milner-method (GHM)\(^\text{14}\), with \(\alpha = 25\%\) and \(\alpha = 15\%\) parameters for 1981-1991, the original way and with the Azhar–Elliott (AE)\(^\text{15}\) geometrical method, also the Fontagné–Freudenberg-method (FF)\(^\text{16}\) with \(\gamma = 10\%\), and \(\alpha = 25\%\) parameters, and using the AE-method (\(\gamma = 10\%\), and \(\alpha = 15\%\)), too. The results are shown in Table 3 and Table 4 using the Fontagné–Freudenberg–Gaulier (2005) type separation of trade flows.

The GHM-indices which break down the GL-indices to HIIT and VIIT, the FF-indices which separate the shares of one-way trade (OWT), horizontal, vertical and not specified two-way trade (HTWT, VTWT, NSTWT) in total trade and the AE-indices confirm my hypotheses. VIIT was predominant in two-way trade between Mexico and the US in the 1992-2007 period.

The statistics for the period of 1981-1991 do not contain the trade flows of the maquiladoras. The high proportion of missing data of trade quantities made it impossible to use US mirror statistics and raised as a problem for 1994, 1995 an to a lesser extent for 2000, 2001 and 2007 in trade statistics reported by Mexico (see NSTWT indices in Table 4), too.

For the 1981-1991 period I could not calculate HIIT and VIIT indices because of two problems: a) the Mexican statistics did not contain the maquiladora trade flows, b) the US mirror statistics for most of the years were in lack of data on trade quantities with the only exception of the 1985-1987 period (see Table 3). The 1985-1987 indices show the high share of intra-industry trade in vertically differentiated products (VIIT).

In the 1992-2007 period we find growing share of HIIT and a decreasing share of VIIT. The share of IIT in total trade was decreasing from 2000 parallel to the diminishing share of VIIT.

Comparing the two periods we can come to the same conclusion as before: there were no significant changes in the structure of Mexican-US trade if we take the share of IIT in total trade into account. Exact explanation of growing HIIT and diminishing VIIT shares from 1999 needs further research; they might be attributed to more effective exploitation of economies of scale in the production and stronger agglomeration effects.

The higher although diminishing share of VIIT consists of two components: a) the two-way trade of vertically differentiated products where the more developed country (the US) exports


\(^{15}\) Azhar–Elliott (2004)

\(^{16}\) Fontagné–Freudenberg (1997)

<table>
<thead>
<tr>
<th>Year</th>
<th>GL (α=25%)</th>
<th>GLGM,NS (α=25%)</th>
<th>GLGM,H (α=25%)</th>
<th>GLGM,V (α=25%)</th>
<th>GLGM,AE,H (α=15%)</th>
<th>GLGM,AE,V (α=15%)</th>
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<td>1981</td>
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<tr>
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<td>0.05</td>
<td>0.01</td>
<td>0.05</td>
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<tr>
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<td>0.01</td>
<td>0.04</td>
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</tr>
<tr>
<td>1987</td>
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<td>0.06</td>
<td>0.27</td>
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</tr>
<tr>
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<td>0.06</td>
<td>0.27</td>
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<td>0.26</td>
</tr>
<tr>
<td>1989</td>
<td>0.48</td>
<td>0.29</td>
<td>0.06</td>
<td>0.13</td>
<td>0.07</td>
<td>0.12</td>
</tr>
<tr>
<td>1990</td>
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<td>0.11</td>
</tr>
<tr>
<td>1991</td>
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<td>0.28</td>
<td>0.05</td>
<td>0.13</td>
<td>0.06</td>
<td>0.13</td>
</tr>
</tbody>
</table>


Source: own calculations

However according to the peculiar pattern of specialization between the two countries, about half of the VIIT – taking into account the changes caused by the appearance of maquiladora trade flows in Mexican trade statistics – is only caused by the sectoral aggregation bias which stems from insufficient disaggregation in the trade classifications: the lesser the detail of the nomenclature used, the more products are lumped together into a single industry. In the latter case an exchange of intermediate goods for final goods belonging to the same industry can be easily measured as intra-industry trade. As far as my calculations show this happens with the trade flows of the maquiladora industry increasing the share of VIIT. Simultaneous exports and imports within an industry but at different production stages however should not be considered as intra-industry trade but as an international fragmentation of the production processes. The appearance of maquiladora trade flows increased HIIT only to a lesser extent.

The changes in the share of IIT in total trade confirm my earlier hypothesis. Trade patterns between Mexico and the US in the NAFTA era are determined predominantly by the productivity and endowment differences of the two countries. This might have caused significant adjustment costs in both countries, especially after 2000.

Most of the data show that there were no revolutionary changes in the structure of bilateral trade – with the exception of the changing share of HIIT and VIIT from 1999, where the explanation needs further research –, we are witnessing the deepening of the trade patterns of
the 1980s. In order to estimate the trade induced adjustment costs the last section of this paper deals with marginal intra-industry trade.

Table 4: Horizontal and vertical two-way trade in the Mexican-US trade

<table>
<thead>
<tr>
<th>Year</th>
<th>GL</th>
<th>FFWT (α=25% γ =10%)</th>
<th>FFWT (α=25% γ =10%)</th>
<th>FFWT, NS (α=25% γ =10%)</th>
<th>FFWT, H (α=25% γ =10%)</th>
<th>FFWT, V (α=25% γ =10%)</th>
<th>FFWT, AE, H (α=15% γ =10%)</th>
<th>FFWT, AE, V (α=15% γ =10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
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<td>0.29</td>
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</tr>
<tr>
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<td>0.30</td>
<td>0.02</td>
<td>0.09</td>
<td>0.18</td>
<td>0.10</td>
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</tr>
<tr>
<td>1992</td>
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<td>0.45</td>
<td>0.55</td>
<td>0.04</td>
<td>0.13</td>
<td>0.38</td>
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</tr>
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<td>0.55</td>
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<td>0.23</td>
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<td>0.25</td>
<td>0.36</td>
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<tr>
<td>2005</td>
<td>0.38</td>
<td>0.38</td>
<td>0.62</td>
<td>0.02</td>
<td>0.24</td>
<td>0.35</td>
<td>0.28</td>
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<tr>
<td>2006</td>
<td>0.37</td>
<td>0.38</td>
<td>0.62</td>
<td>0.02</td>
<td>0.24</td>
<td>0.35</td>
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<td>0.31</td>
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<tr>
<td>2007</td>
<td>0.37</td>
<td>0.37</td>
<td>0.63</td>
<td>0.06</td>
<td>0.23</td>
<td>0.34</td>
<td>0.26</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Source: own calculations

Marginal intra-industry trade (MIIT) between Mexico and the US

The relationship between MIIT and adjustment costs is not perfectly elaborated theoretically, but empirical research in this field\textsuperscript{17} shows that it is plausible to suppose the existence of it. \textit{Figure 10} shows the Shelburne indices\textsuperscript{18} based on current prices and the Brülhart A indices\textsuperscript{19} – using USD-based export and import price indices\textsuperscript{20} as deflators – between Mexico and the US.

The MIIT indices reflect three bigger shocks in the 1993-2007 period with a high possibility of increasing adjustment costs.

\textsuperscript{17} See e.g. Brülhart–Elliott (1998), Lovely–Nelson (2002), and Brülhart–Murphy–Strobl (2004).
\textsuperscript{18} Shelburne (1993)
\textsuperscript{19} Brülhart (1994)
\textsuperscript{20} The source of export and import price indices is World Bank’s WDI (World Development Indicators) database
The peso-crisis of 1995 affected deeply all sectors of the Mexican economy, however the new exchange rate significantly increased the competitiveness of Mexican exports, creating a basis for high growth rates of exports for the following years.

![Figure 10: MIIT indices of Mexican-US trade, 1993-2007](image)

Source: own calculations

The next fall of MIIT-indices can be observed in 1998. The most important causes were diminishing oil prices and the Asian financial crisis with depreciating exchange rates of South-East Asian economies, causing significant challenges for Mexico’s competitiveness. This is the same year by when the effects of 1995 real appreciation of the peso disappeared, Mexico’s trade balance turned to be negative after the trade surplus of the preceding years.

It is worthwhile to note that the MIIT-indices do not indicate the dynamics of trade but the share of intra- and inter-industry trade in the changing total trade. The higher role of the latter (lower MIIT-indices) reflects the higher effect of traditional forces in determining trade patterns with higher adjustment costs. These costs were increasing again after 2000 due to the cyclical and competitive crisis of Mexico.

Conclusions

The variation of the indices of MIIT in the NAFTA-era confirms my conclusion that the earlier hypothesis of related literature about NAFTA’s effect creating predominantly intra-industry adjustments and thus low adjustment costs does not hold. The MIIT-indices show for the whole period – especially for 1995, 1998 and 2001-2004 – that inter-industry
specialization was stronger than the intra-industry forces, thus the positive expectations about adjustment costs were not accomplished.

A question might be raised whether there were positive tendencies besides these negative processes. The answer is definitely yes. The export oriented trade and economic policy chosen in the 1980s, at least partly, reached their goals. Mexico’s reintegration to the modern transnational world economy was successful. The growth rate of merchandise exports and FDI imports were one of the most dynamic in the world.

The reality about NAFTA turned to be between the most negative expectations – the vision of very high adjustment costs in both countries with shifting millions of work places from the US to Mexico – and the most optimistic scenarios – awaiting low adjustment costs as an analogy of the history of the European integration.

The tendencies of MIIT-indices, the high share of VIIT and the aggregation bias caused by the maquiladora export processing sector prove that the differences of the trade partners had the strongest influence on the bilateral trade patterns; inter-industry specialization was higher than intra-industry specialization. These results are contradictory to previous research on the field using lower level of disaggregation\(^{21}\) with the only exception of Shelburne’s (2001) article.

The NAFTA has not influenced significantly the Mexican-US trade patterns, the structure was created by the structural adjustment and unilateral and multilateral (after the GATT accession) trade liberalization of the 1980s. The fast growing Mexican FDI-import and deepening production sharing of the 1990s, with the effects of the 1995 peso crises consolidated this trade structure making the growth rate of bilateral trade flows very dynamic. The comparison of the pre-NAFTA and NAFTA periods and the experience of the 1995, 1998 and 2001-2004 downturns show that the bilateral trade patterns have not become more similar to those of developed countries.


